



WATER WIZARD[®]

INSTALLATION MANUAL



AN O'HANRAHAN COLEMAN COMPANY

Water Wizard 6500

SPEC SHEET

The Water Wizard Electrical requires two electrical connections into the main disconnect switch. The connections go into the Electrical Control Panel and hook up to the Safety Disconnect Switch, located in the upper right connection goes into the top of the switch. The 120 VAC hot wire goes into the auxiliary contact on the left side of the switch. The amperage requirements for the Water Wizard are explained under “**Electrical Requirements**” below:

Electrical Required:

If Water Wizard has no Electric Presoak Provided:

- 100 AMP, 3ph Breaker, 230V (65 Amp Actual Draw)
- 20 Amp, 1 Pole Breaker, 110 V (10 Amp Actual Draw)

If Water Wizard has 5kw Presoak Heater Provided:

- 125 Amp, 3ph Breaker, 230V (80Amp Actual Draw)
- 20Amp, 1 Pole Breaker, 110V (10 Amp Actual Draw)

If Water Wizard has 9kw Presoak Heater Provided:

- 125Amp, 3ph breaker, 230V (95 Amp Actual Draw)
- 20 Amp, 1 Pole Breaker, 110V (10 Amp Actual Draw)

If Water Wizard has 120-208 VAC Electrical System:

- 125 Amp, 3ph Breaker, 230V (93 Amp Actual Draw)
- 20Amp, 1 Pole Breaker, 110V (10 Amp Actual Draw)

Water Line Required:

1” Cold Water Feed to Tank – Minimum Pressure 40 psi

Dimensions:

Pumping Plant

30” Wide x 60” Long x 70” Tall

Electrical Panel – To Mount on Wall

29” Tall x 29” Wide x 8” Deep

(See Drawings for Proper Lay-Out)

WATER WIZARD 6500

INSTALLATION PROCEDURE

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Equipment Room Plumbing Schematics

Schematic # 1 Chemicals, Wash & Rinse w/ Hot Water

Schematic # 2 Chemicals, w/ Hot Water Wash & Rinse w/ Cold Soft Water

Schematic # 3 Chemicals, Wash & Rinse w/ Recirculating Hot Water

Schematic # 4 Chemicals w/ Cold Water Wash & Rinse w/Hot or Cold Soft Water
Programmable



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INSTALLATION KIT FOR THE WATER WIZARD

This list is included in the owner's manual so you can verify what should be in your shipment.

ALL EQUIPMENT IN THIS LIST IS LOCATED IN THE SHIPPING CRATE		
Qty	Description	Location
1	Boom Plate	Automatic Bay
1	Boom Plate Back Plate	Equipment Room
4	Eye Boxes with lids	Automatic Bay
2	Prox Plates	Automatic Bay
1	Treadal Plate	Automatic Bay
1	Disconnect Box for the Boom	Automatic Bay
300	Shims	Automatic Bay
2	Hold Down Brackets for Automatic	Automatic Bay
2	Undercarriage Ramps	Automatic Bay
4	1 1/4" Pillow bearings VPS 120	Automatic Bay
1	Boom Hose Cover	Wrap Hoses Between Booms
1	Thermostat	Equipment Room
1	Owner's Manual	
GEA Installation Kit		
Qty	Description	Location
2	Banner Receiver Eyes	Automatic Bay
2	Banner Transmitter Eyes	Automatic Bay
2	Turck Cables WK4.4T-4 Receiver Cable	Automatic Bay
2	Turck Cables WK4T-4 Emitter Cable	Automatic Bay
1	Communication Cable RSM531-30M	ECP to Gantry
7	Foot Valves	
7	Weights	
ELECTRICAL S. O. CHORDS		
70'	12/5 S. O. Chord for 240 VAC to Gantry Motors	WW ECP to Gantry
70'	12/3 S. O. Chord for 24 VAC to Gantry Solenoids	WW ECP to Gantry
70'	12/3 S. O. Chord for 120 VAC to On-Board Blowers	WW ECP to Blower Panel on Gantry
70'	4/4 S. O. Chord for 240 VAC to On-Board Blowers	WW ECP to Blower Panel on Gantry
1	Heat Tape (Optional)	Equipment Room to Gantry
PARKER HOSES		
1 Box	Clear Plastic Tubing	
35'	3/8" Red	Tri-foam Wax (Red)
35'	3/8" Blue	Tri-foam Wax (Blue)
35'	3/8" Yellow	Tri-foam Wax (Yellow)
35'	3/8" Green	Tire Cleaner
35'	3/8" Grey	Air
35'	1/2" Blue	Pre-soak
35'	3/4" Blue	Spot-free Rinse
35'	1/2" Red (Dual Presoak)	Low PH Pre-soak
HIGH PRESSURE WIRE BRAID HOSE AND GUARDS		
45"	1" Wire Braided Hose w/ 2 Crimped Fittings	Disconnect Box to Boom
60"	1" Wire Braided Hose w/ 2 Crimped Fittings	Boom to Gantry W/Blower
50"	1" Wire Braided Hose w/2 Crimped Fittings	Boom to Gantry W/O Blower
28"	1" Wire Braided Hose w/ 2 Crimped Fittings	Between Booms
15'	1" Wire Braided Hose w/ 2 Crimped Fittings	Pump Stand to Disconnect Box
35'	1/2" Wire Braided Hose w/ 1 Crimped Fitting	To Undercarriage



INSTALLATION KIT (cont)

Hardware		
Qty	Description	Location
15'	1" Spiral Wrap Hose Guard	
15'	2" Spiral Wrap Hose Guard	
4	1/4" Pillow Bearings VPS 120	Gantry Boom
8	1/2" SS Nylon Nuts	Gantry Boom
8	1/2" SS Washers	Gantry Boom
32	Swivel BARB 3/8" X 3/8"	3/8" Parker Hose
8	Swivel BARB 1/2" X 1/2"	1/2" Parker Hose
4	Swivel BARB 3/4" X 3/4"	3/4" Parker Hose
5	6508 Undercarriage Spray Tips	Automatic Bay
1	1" Half Union	1" Braided Hose
1	1/2" Half Union	1/2" Braided Hose
50	Blue Anchors	
50	SS Screws	
50	1/4" Washers SS	
10	1/2" Rubber Coated Clamps CL13	
16	6-32 X 3/4" Screws	Bay Eye Box Covers
1	1/2" Reusable Fitting	
100	5/2" X 1/2" Concrete Anchor Bolts (Hilti Bolts)	Automatic Bay
1	1/4" S. O. Chord Fitting	O/B Blower S. O. Chord



Water Wizard 6500

INSTALLATION PROCEDURE

The Water Wizard electrical control panel and gantry are pre-plumbed and pre-wired at the factory. This makes the installation a fairly easy and straightforward operation. The only special tools needed for the installation is a hammer drill and bits for installing the track and other bay equipment and a forklift for setting the gantry on the track. The installation can be accomplished by following a simple step-by-step procedure. These steps are expounded upon throughout the pages of the manual.

The steps you need to perform are:

1. Install equipment in equipment room
 - a. Set pump stand
 - b. Set Control Panel
2. Install equipment in automatic bay
 - a. Set tracks
 - b. Set guide rails
 - c. Set Gantry
 - d. Install Boom Assembly.
 - e. Set treadle plate, entrance, and treadle plate eyes
 - f. Set undercarriage bar and ramps.
 - g. Set 10-position sign and 2-position sign
3. Set Auto Cashier
4. Set Clearance Bar
5. Install plumbing from Gantry to Pump Stand.
6. Install electrical from Electrical Control Panel to Gantry.
7. Wire Spot-free to Self-Serve pump stand.
8. Wire Stand-alone Dryers.
9. Wire Bay Doors.
10. Install plumbing from incoming water supply to pump stand.
NOTE: Use a licensed plumber for this step.
11. Install electrical from breaker panels to the WW ECP.
NOTE: Use a licensed electrician for this step.

STEP 1: SETTING THE EQUIPMENT IN THE EQUIPMENT ROOM

a) SET THE PUMP STAND:



Pump Stand With Control Panel Mounted on the End

Take the pumping unit with electrical box still mounted on the end into equipment room. When you set the unit in place, leave at least 18" between the wall and pumping plant. The 18" clearance allows access behind the unit for plumbing and service work. You need to position the unit on the wall closest to the gantry and in a place so that the electrical box can be removed and mounted to the wall; keep in mind that the 1¼" seal tight is only 6' long. For this reason, the cabinet needs to be mounted next to pumping unit.

After the pumping unit has been set in place with at least 18" of clearance between the wall and pumping unit, level the pumping plant by placing a level on 2" frame and turning leveling legs either up or down to obtain levelness.

b) SET THE CONTROL PANEL



Pump Stand With Control Panel Removed

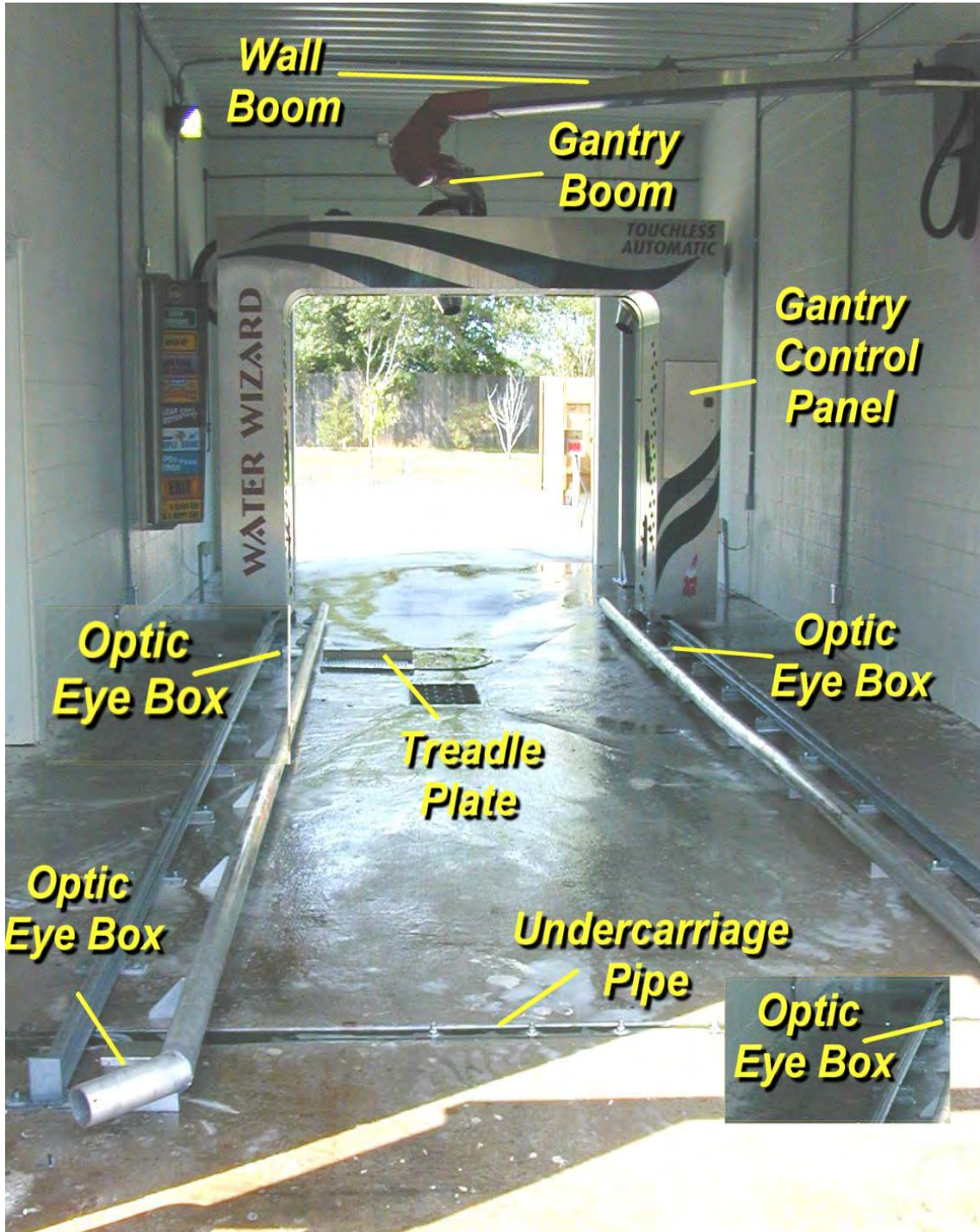
Remove the electrical control panel (ECP) from the pumping unit and mount to the wall using the proper mounting bolt according to the material of the wall. The ECP should not be left attached to the pumping unit because the vibration of the pumps and motors could cause problems with the computer devices and will void any warranties.



Control Panel Mounted to the Wall



STEP 2: INSTALL THE EQUIPMENT IN THE AUTOMATIC BAY



**a) Set the Tracks:**

You will need the blueprint labeled “**M1.0**” for setting the equipment in the bay. This gives the dimensions for the layout in the bay for the tracks and guide rails. It also gives the elevations for installing the boom and transition box.

Chalk a line 56 1/8” from the centerline of the bay to mark the center of the first track. Set one of the tracks at 56 1/2” to center from this line you chalked. Level the track along its full length, using the shims you received in the shipment. If you run out of shims, use either 5/8” washers or some 3/4” galvanized pipe couplings as shims.

NOTE: When mounting the track, always mount one side completely, then you can measure from one track to the other so that you can set the second track at 112 1/4” on center. This distance will allow the unit to run in the center of the wheels reducing wear on wheels, bearings and track

Once all bolts have been installed and tightened, set the other track at 112 1/4”. Keep in mind both tracks should be as level as possible with one another as well as along the path of travel. If a track is installed in sections, weld the gap between the tracks and grind the weld smooth. Do not grind the weld so much that you create a dip in the track.

NOTE: Always drill all the way through concrete when possible so that if you make a mistake, you can hammer the bolt through concrete and install a new bolt in the same hole. The pitch in the bay floor may require you to use longer 1/2” concrete bolts. You can purchase longer bolts at most hardware stores.

b) Set the Guide Rails

When mounting the guide rails you do not need to level the rails. Mount them directly to the floor. There is no problem if you end up with a bow in the rail. Use 1/2” concrete anchor bolts to secure the rail to the floor.

c) Set the Gantry

Once the tracks are set, pick up the gantry unit with a forklift and set it on the tracks in middle of the bay if possible. We recommend setting it the middle so when you hang the boom assembly you can rest it on the gantry while installing it.

d) Install Boom Assembly

There are two sections for the boom assembly. The longer section mounts on the wall, and the shorter section mounts on the gantry.



Gantry Boom Assembly

Mount the boom to the gantry if you have not done so already. Slide two 1¼" pillow block bearings on shaft and mount the bearings to the stainless steel plate that is welded in the center of gantry. The gantry boom needs about ¼" of clearance between the highest point of the top of gantry (which may be the top boom motor) and bottom of the boom.

You will then need to level the boom. Loosen the four ⅜" nuts on the plate located in the middle of the boom arm. This will allow you to slide plate forward or back, allowing the arm to raise or lower until it is level.

NOTE: Make sure the wall boom and the gantry boom are at the same height, or as close as possible. If the boom hits the top boom motor, you need to double check and make sure the boom is level.

Wall-Mounted Boom Assembly

Lay out the location for mounting the "boom assembly mounting bracket" on the wall. Drill holes through the wall and use the back-plate to prevent the bolts from pulling through the brick.

Once the boom bracket has been installed, slide 1¼" pillow block bearings on each end of boom shaft and hang the boom on the bracket. Then bolt the boom to the bracket using ½" stainless steel nylon self-locking nuts. **NOTE:** Use "Never Seize" on bolt threads.

Lay out the wall for the location of the disconnect box for the boom. If the equipment room is next to the automatic bay, the disconnect box will have couplings welded to the back of the box. If the automatic bay is not next to the equipment room, the box will have the fittings welded to the opposite side of the hole in the bottom of the box.

If the automatic bay is next to the equipment room, you will need to cut a hole in the wall, leaving enough space for the disconnect box to be mounted over the hole. Be careful not to cut the hole in the wall larger than 16" X 16". You can confirm the size of the hole with the box before cutting the hole. Once the hole has been cut in the wall, place the disconnect box over the hole and mount it to the wall using plastic anchors and screws.

Once the box is mounted, swing the boom towards the entrance end of the car wash and connect the 1" X 66" wire braid hose into the 1" to the stainless steel pipe in the boom. Connect the other end of the hose to the 1" half union in the transition box.

Find one of the 1" X 36" wire braided hose. Install the hose between the booms. You will need to use a half union on one end of the hose. Install the hose in the 1" stainless steel pipe in each boom.



e) Set the Treadle Plate, Entrance, and Treadle Plate Eyes

Using the print labeled “**SHEET M1.0**”, set the eye boxes for the entrance and treadle eyes with $\frac{1}{4}$ ” concrete anchors. Set the treadle plate with $\frac{3}{8}$ ” anchor bolts. Grind the bolts off flush with the nut, to avoid cars running over the bolt and inadvertently getting a flat tire.

Banner Eyes Wiring

There are four banner eyes sent with each unit. These eyes go in the stainless steel eye boxes you just mounted in the bay (see the schematic and wiring diagram on page 17). Two of the eyes are receivers and two are transmitters. Put the receivers in the stainless-steel boxes on the driver’s side of the bay, and the transmitters in the boxes on the passenger’s side of the bay.

Have your electrician run a conduit from the WW ECP to a J-box by each of the receiver eyes. You will also need a conduit going underground (or overhead) to J-boxes by each of the transmitters.

You are supplied with four gray cables that are terminated with a plug on one end. Two of the cables are labeled Turck Cables WK4T-4. The other two are labeled Turck Cables WK4.4T-4. These numbers can be found on the decal of the cable package. If the labels are missing, you can identify the wire by the number of wires. Both wires have a black, blue, and brown wire. The WK4.4T-4 has an extra white wire. Use the WK4.4T wire with the receiver, using the white wire for your input to the Omron CPU.

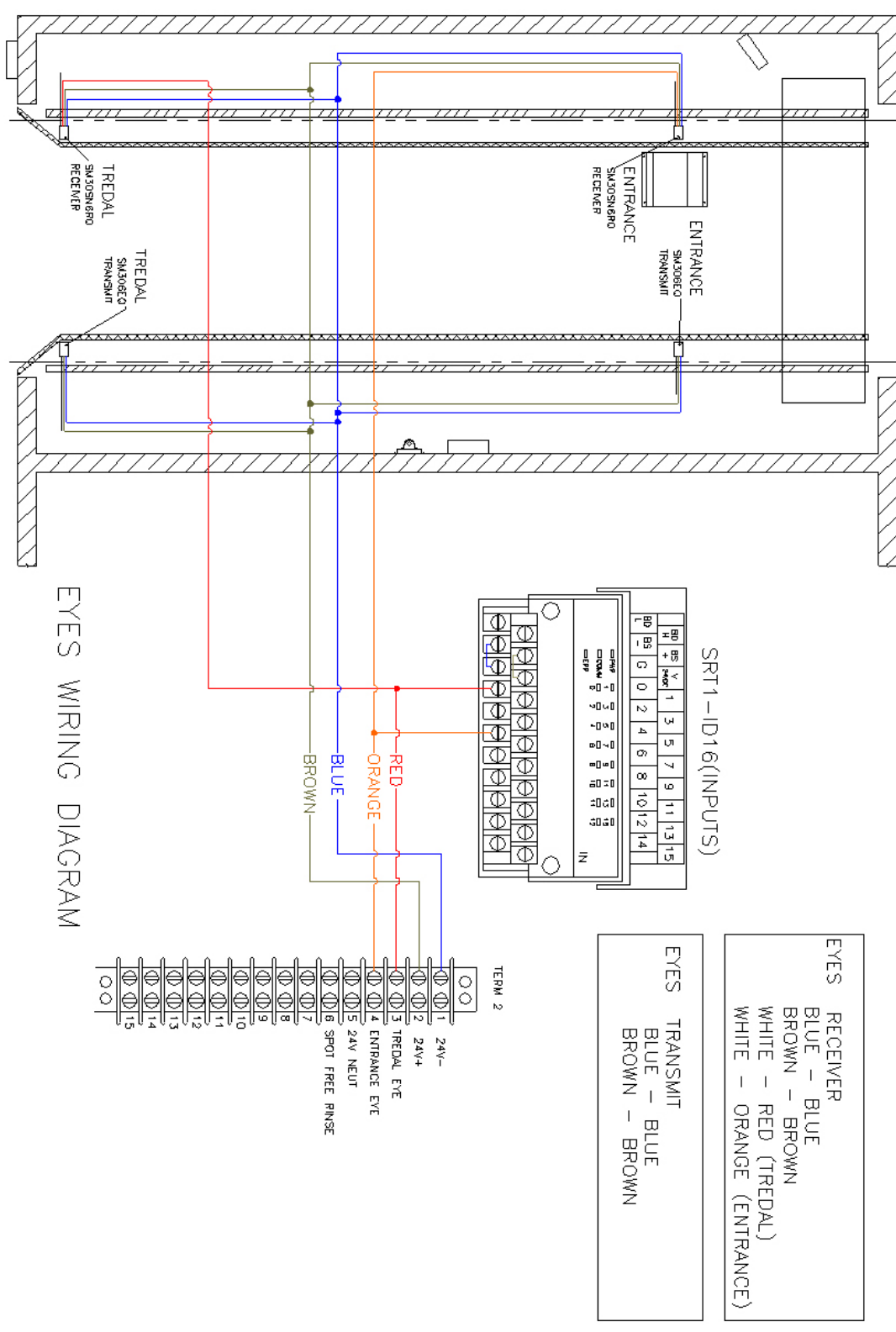
The cables are not long enough to reach to the ECP in the equipment room, so you will need to run some wires to the four J-boxes your electrician installed in the bay. The eyes are powered by 24VDC, so you need to supply each of the boxes with a brown wire for 24VDC(+), and a blue wire for 24VDC(-).

Run an extra wire to the J-boxes by both receivers. This will serve as the input wire for each set of eyes, which you will tie into the “**Term 2**” terminal strip.

The receiver eyes have a part # of SM30SN6RQ_ on the decal of the eye. The transmitter eyes have a part # of SM306EQ on the decal of the eye. Run the cable from the stainless steel eye boxes in the bay through conduit to the J-box. Run a brown for 24V DC(+), a blue for 24V DC(-) and one extra wire (for the receiver eye input of each of the eyes) through the conduit from the J-box to the ECP. You need one input for the treadle eye, and one input for the entrance eye.

In the J-box, connect the brown wires together, the blue wires together, and connect one of the extra wires to each of the white wires on the receiver eye wires. Terminate the brown [24 V DC (+)] and blue wires [24V DC (-)] in the ECP to the terminal block labeled “**EYES**”. Terminate the Treadle Eye wire on the input terminal #0 of the ID16 input card in the ECP in the equipment room. Terminate the Entrance Eye wire under the input terminal #4 of the same ID16.

EYES WIRING DIAGRAM



BANNER EYES	
WIRE COLOR	DESCRIPTION
Blue, Black, Brown, White	Receiver
Blue, Black Brown	Transmit

f) Set the Undercarriage Bar and Ramps

Still using the print labeled “**SHEET M1.0**”, install the undercarriage bar. When pouring the concrete for the bay floor, you may wish to build a trench for the undercarriage bar with a lip for a metal grate on top. Anchor the bar to the bottom of the trench with 3/8” anchor bolts. Install the metal grate over the bar.

If you don’t have a trench, anchor the undercarriage bar to the floor in the proper location. Then install the undercarriage ramps over the bar with 3/8” anchor bolts. Grind the tops of the bolts off to the nut.

g) Set the 10-Position Sign and the 2-Position Sign

Mount the 10-position sign to the floor with three 3/8” anchor bolts on the driver’s side of the bay, and in a position where the driver can see the sign. Put the stainless-steel cover on the back of the base.

Mount the **2-Position Light Can** to the side of the building on the driver’s side at a height that can be seen by the driver.

G70A-ZOC16 AND SIGN WIRING



The signs are lit by an output from the G70A-ZOC16-3-DC24 output card inside the ECP



Installation Procedures

located inside the equipment room. This output card is on the din rail located at the lower left corner of the WW ECP.

Below each relay is a column of three screws. The screws along the bottom row are the relay common contacts. These screws are jumpered together with 120VAC feeding them through a ten amp fuse, also located on the din rail.

The screws along the top row are the normally open contacts, and the screws along the middle row are the normally closed contacts (not used). Run one wire for each light function to the top row of screws (normally open contact) on the ZOC16 to the terminal strip inside of each of the light cans. (See the chart below for proper outputs).

NOTE: DO NOT use the middle row of screws. This is the Normally Closed contact, which are not used.

The SRT2-VOD16 and the G70A-ZOC16 are powered by 24VDC. Be sure to hook up the 24VDC(+) (Brown Wire) to BS(+) on both cards and 24VDC(-) (Blue Wire) to the BS(-) on both cards. On the SRT2-VOD16, hook up the communications wires (Black for BDH and White for BDL) to the BDH and BDL connections of one of the other SRT2 cards in the equipment room.

NOTE: DO NOT apply any voltage to these connections. You will burn up the communications in all of your car wash components.

In the top of the 10-position sign, you will find a terminal strip for wiring up the sign. Run a $\frac{3}{4}$ " conduit from the WW ECP to a position on the wall. Using an EMT to sealtight connector, run a $\frac{3}{4}$ " sealtight conduit from the wall to the top back of the 10-position sign. Pull the wires from the WW ECP to the sign. Terminate the wires according to the chart below:



LIGHTS-WIRING DIAGRAM

10 POSITION LIGHT INSIDE THE AUTOMATIC BAY		
G70A-ZOC16-3DC24	WIRE COLOR	DESCRIPTION
14	Red	"Stop"
24	Blue	"Enter"
34	Yellow	"Back-Up"
44	Tan	"Presoak"
54	Purple	"Bottom Blaster"
64	Black	"Clear Coat"
74	Gray	"Triple Shine"
84	Pink	"Spot Free"
94	Orange	"Exit"
104	Brown	"A Clean Car Is A Happy Car"
TERM 2		
3	White	110 Volt Neutral
4 or Ground Bus	Green	Ground

2 POSITION LIGHT AT ENTRANCE OF AUTOMATIC		
G70A-ZOC16-3-DC24	WIRE COLOR	DESCRIPTION
24	Blue	"Enter Now"
114	Red	"Please Wait"
TERM 2		
3	White	110 Volt Neutral
4 or Ground Bus	Green	Ground

TALKING WIZARD SIGN

The Talking Wizard sign has two functions. It is used in the self-serve bays or the automatic bay. To wire it for the automatic bay, you need the optional SRT2-



Installation Procedures

ROC08 (relay output card). From the cabinet to the sign you need a total of seven wires. (See the wiring diagram below for the colors and locations. Go from 24VAC Neutral of one of the terminal strips in the WW ECP to COMM 2 or COMM 3 of the ROC08. Be sure there is a jumper between COMM 2 and COMM 3 of the ROC08. To test the sign, run a jumper wire between 24VAC neutral and Terminals #6, #7, #8, or #9.

WW ECP Term3	SRT2-ROC08	Wire Color	Scrolling Sign Terminal Strip
#5	N/A	Black	#2
#6	N/A	White	#1
#11	#4	White/Red	#4
#12	#5	Orange/Black	#5
#13	#6	Yellow	#6
#14	#7	Gray	#7



The following table contains the list of messages for the automatic and tells which inputs should be on for each message:

MESSAGE	OUTPUTS			
	4	5	6	7
STOP	0	0	0	1
PRESOAK	0	0	1	0
ROCKER PANEL	0	0	1	1
RINSE	0	1	0	0
BACK UP	0	1	0	1
CLEAR COAT PROTECTANT	0	1	1	0
EXIT SLOWLY	0	1	1	1
WASH	1	0	0	0
DRIVE FORWARD	1	0	0	1
TIRE CLEANER	1	0	1	0
TRIPLE SHINE	1	0	1	1
WAX	1	1	0	0
SOAKING	1	1	0	1
SPOTFREE	1	1	1	0
BLOWER	1	1	1	1

0 = OFF 1 = ON

You can test the messages with the test screen on the Red Lion. Press **“Test Screen”**, then **“NEXT”**. Scroll through each of the lights and toggle them on and off to test each message. To test the four messages not listed on the test screen (WAX, SOAKING, SPOTFREE, BLOWER), toggle the **“Air Sol Blower”**, **“Open Ent Door”**, **“Close Ent Door”**, **“Open Exit Door”**, and **“Close Exit Door”** tests on and off.



COMMANDER C-1000 REMOTE

With the Commander C-1000, you can perform the following functions on the scrolling sign:

- Adjust the brightness of the sign
 - Press the up or down arrows on the remote
- Test each message in the sign
 - Press “0” for the main message
 - Press “1” through “9” for the first nine messages
 - Press “CNTL” + “0” through “5” for the remaining six messages
- Select different modes
 - Press the “MODE” button, then enter the password “9999”
 - Press “0” to select either Self-Serve Bay or Automatic
 - Press “MODE 2” to select the display type. “MIRROR”. The message will be displayed from right to left instead of left to right.
 - Press “3” to change the password.
 - Press “4” to test the sign. This function doesn’t really do much.
 - Press “9” to Exit.

CHANGING THE MAIN MESSAGE

The scrolling message when the automatic is not in use is changeable. To change the message, you need a “NULL MODEM” cable and a computer with “Windows”. Hook the cable to COM1 of your computer. Press the “START” button, then select “ACCESSORIES”, “COMMUNICATIONS”, “HYPERTERMINAL”.

Under a new connection, choose communications under COM1. Change the properties to 9600 Baud, and set the Flow Control to “NONE”. Press the Space Bar. A menu will come up that says:

N – New Message
H – Help
Esc – Exit

Press “N” to enter the new message. After entering the message, press the “ESC” key to exit. After you are done, you can save your Hyperterminal session. Then make a shortcut to your desktop for future use.

g) Set the Home and End of Track Prox Plates.

Ensure the prox plates are mounted close enough to the end of the track that the prox cannot pass the prox plate before the gantry hits the end of the track. Mount the plates perfectly level to give the prox an even signal as it passes over the plate. After mounting the plate, drive the gantry so the prox is above the prox plate. Set the prox $\frac{1}{8}$ " to $\frac{1}{4}$ " from the plate.

STEP 3: SET THE AUTO CASHIER

Using the print labeled "SHEET M1.0", set the auto cashier.

Electrical Hookup

120 VAC

Running from the WW ECP, you should have two conduits. In one of the conduits, run four #12 AWG wires. These wires are:

- 1-120VAC Hot
- 1-120VAC Wash Inhibit Signal
- 1-120VAC Neutral (White)
- 1-Ground (Green)

In the WW ECP, terminate the above wires to the terminal strip labeled "TERM 3".



NOTE: The auto cashier reset and power for the unit can share the neutral.

**24 VDC**

In the other conduit, run five #18 AWG wires. These wires are:

- Cycle 1 - Pink
- Cycle 2 - Brown
- Cycle 3 - Purple
- Cycle 4 - Gray
- 24 VDC(-) - Blue

In the WW ECP, terminate the above wires on the terminal strip labeled “**TERM 3**”.

AUTO CASHIER HAMILTON/ENTRY WIZARD

The Hamilton Auto Cashier and Entry Wizard Auto Cashier send and receive the same type of signals to and from the Water Wizard Electrical Control Panel (ECP). Therefore, the wiring is very similar in both units. Run the Auto Cashier wiring into the (ECP) inside the equipment room. This is where the CPU will accept signals from the Auto Cashier, as well as send reset signals. You will find a terminal strip for the Auto Cashier terminations in the lower right corner of the panel. The terminal strip and all terminations are labeled for your convenience.

You will need a total of 9 wires. They are:

- 1-110V Hot
- 1-110V Neutral
- 1-Ground
- 4-Cycle Wires 24V DC(-)
- 1-24V DC(-) Supply Voltage Blue Wire
- 1-Inhibit Signal 110V

NOTE: Run all low voltage in a separate conduit. If this is not possible, then use shielded conductor cable for low voltages.

Inside the Hamilton, there is a single gang box containing the power wires and inhibit wires. Remove the cover and terminate your 110V hot from the ECP to the Hamilton. Then terminate the inhibit signal wire from the ECP to one of the small red wires. This will leave the 110V neutral (white) wire and one small red wire in the single gang box. Twist these two wires together and terminate with the 110V neutral from the ECP. You will then need to wire the signal wires. You will wire the 24V DC (-) from the ECP to terminal #1, on the relay terminal block. Then run jumper wires to terminals #3, #5 and #7. Then wire the cycle wires from the ECP to the relay terminal block. Terminate the wire for cycle #1 wire on terminal #2, cycle #2 on terminal #4, cycle #3 on terminal #6 Cycle #4 on terminal #8.



HAMILTON/ENTRY WIZARD WIRING DIAGRAM

TERM 3	Hamilton Auto Cashier	Entry Wizard Auto Cashier
24VDC (-)	1,3,5,7	6
Cycle 1	2	7
Cycle 2	4	8
Cycle 3	6	9
Cycle 4	8	10
120VAC Hot	J-box, Black Wire	1
110V Cashier Reset	J-box, Red Wire	2
120VAC Neutral	J-box, 1 White & 1 Red Wire	4
Ground	J-box, Green Wire	Ground Bar

AUTO CASHIER UNITEC

Run the Unitec Auto Cashier wiring into the electrical control panel (ECP) inside the equipment room. This is where we will accept signals from the Auto Cashier, as well as send reset signals. You will find a terminal strip for the Auto Cashier terminations in the lower right corner of the panel. The terminal strip and all terminations are labeled for your convenience. You will need a total of 10 wires. They are:

Main Power:

- 1-110V Hot
- 1-110V Neutral
- 1-Ground

Cycle Selection Wires:

- 4-Cycle Wires 24V DC (-)
- 1-24V DC (-) Common (Supply Voltage Blue Wire)

Wash in Use Signal:

- 1-Inhibit Signal 110V
- 1-Inhibit Signal 110V Neutral (can share the neutral with the main power)

NOTE: The Red Lion will need to be changed. To change the Red Lion, select "Change Settings". Enter your four number password, and then press "Enter". Press the "Next" button three times. The top of the screen will say "Unitec Auto Cashier?". Toggle the "No" to "Yes" by pressing the button under the word "TOGGLE". Press "Exit".



We suggest that you run all low voltage in a separate conduit. If this is not possible, then use shielded conductor cable for low voltages.

Hook the wires for the main power into the 3-pronged ac connector, which comes with the unit. (See pages 18 and 19 of the Unitec Wash Select II Installation Manual. Once the cord is assembled as instructed by the manual, you can plug in the main power into the connector in the lower left corner of the cabinet

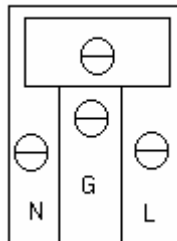
To test the Unitec Auto Cashier Reset, select "Test Screen" on the Red Lion. Press the "Next Button" Toggle Auto Cashier Reset to "On". Then go see if the Unitec gets put out of service.

UNITEC WIRING DIAGRAM

Signal	J-18 Connector
Wash-In-Use Hot	1
Wash-In-Use Neutral	2

POS4000	J-22 Connector
Pin 1 – White	Pin 1 – White
Pin 2 – Red	Pin 2 – Red
Pin 3 – Black	Pin 3 – Black
Shield-Not connected	Shield, strap to base mounting bolt in case

Signal	J-17 Connector
Cycle Common	9
Cycle #1	1
Cycle #2	2
Cycle #3	3
Cycle #4	4
Spare Option Relays	5-8



Three-Prong AC Connector

Hook the 120VAC hot to the L screw, the 120 VAC Neutral to the N screw and the ground to the G screw.

STEP 4: SET THE CLEARANCE BAR

Bolt the clearance bar to the concrete, in front of the automatic and centered with the track, using ½" anchor bolts.

NOTE: The clearance bar can be mounted before the auto cashier, to prevent taller vehicles from inserting their money into the auto cashier.



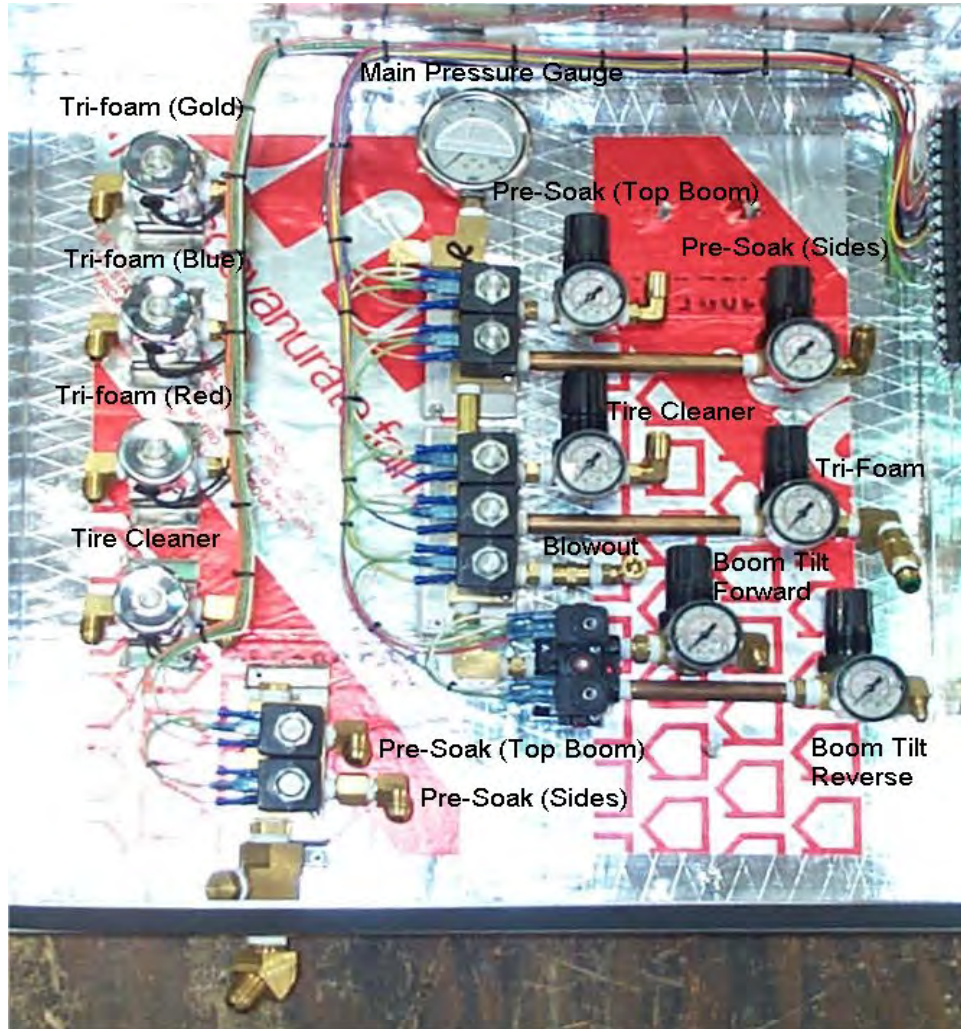
STEP 5: INSTALL THE PLUMBING FROM THE GANTRY TO THE PUMP STAND

An installation kit is shipped with each unit, which includes all of the wiring and hoses you need between the gantry and pumping stand. A list of components contained in the kit is shown at the front of this section. This list contains all of the hoses required for hooking up the product between the pumping stand and the gantry.

A standard hook-up is when the auto bay is next to equipment room. If the auto bay is not next to the equipment room, a hose extension kit is required. As a rule of thumb, add 20' of hose for each bay between the equipment room and the automatic bay. A hose extension kit is listed in the 2001 Jim Coleman price book and can be included with your car wash.

To hook up the product between the gantry and the pumping stand, you will need to use the Parker Hoses listed in the installation kit. All hoses for the products will hook to appropriate connector on the back of the pumping plant, except the blue $\frac{3}{4}$ " R. O. hose. The R. O. hose connects to the R. O. pump on the R. O. system. Each hose will then go to the appropriate connector on the back of the disconnect box mounted on the wall. In the case of a remote bay, the connectors will be located on top of the box.

Below is a picture of the low-pressure box. The solenoids on the left supply the chemicals, while the solenoids on the right supply the air.



LOW PRESSURE BOX ON GANTRY (Driver's Side)

From the connectors inside the disconnect box, run the hoses through boom to the gantry. The 1" braided hose and the blue 3/4" R. O. hose go to the high-pressure box on top of the gantry.

The 1" X 15' high-pressure hose connects directly to Cat Pump at the 1" half union. The hose then runs to back of the disconnect box to another 1" half union. Earlier in the install process we connected a wire braid hose from boom to inside of box and another hose between the two boom arms. Now, connect the 1" wire braided hose going from the boom to the gantry. This is the 57" hose for the gantry without onboard-blowers and 96" for gantries with onboard blowers. **DO NOT** connect this hose to the valve in the high-pressure box on the gantry until later. You will hook this hose to the gantry after completing the steps of the turn-on process.

The 3/4" push lock hose will run from R.O. pump to back of the disconnect box at the 3/4" flare fitting installed. From inside of box connect a 3/4" push lock hose, run along side of 1" wire braid hose down boom and over to stainless steel high pressure valve box where there will be a 3/4" flare fitting connected to a large brass para-plate check valve. DO NOT connect this line until hose has been flushed out.

All 3/8" push lock product hoses will connect at the back of the gauge on the gauge panel above the chemical tanks. Then the hose will connect to the back of disconnect box. From inside of box hose will travel along side of 1" wire braid hose down boom across gantry to driver side. You will then slide hoses between aluminum skin and stainless steel low pressure box, come up through bottom of box and connect proper hose to proper solenoid. Refer to solenoid schematic for proper order of solenoids.

NOTE: The air hose will run from compressor along with these hoses.

Below is drawing for a presoak solenoid for the product side of the low-pressure box:

The 1/2" wire braid hose will connect to the 1/2" 454P DEMA located in lower front center of pumping plant. This hose will connect to stainless steel undercarriage spray bar. Leave tips out until the hose and bar have been flushed out for 1 minute.

This completes all hose connections.

STEP 6: INSTALL ELECTRICAL FROM ELECTRICAL CONTROL PANEL TO GANTRY



The gantry needs 240VAC, 24VAC, 24VDC, and communications. In the installation kit, you will find three electrical chords: one 12/5 SO cord (70'), one 12/3 SO cord (70'), and one Communications Cable (RSM531-30M, 30 meters long).



According to the National Electrical Code, Section 400.8, you are not permitted to run flexible SO chords through a wall. Electrical inspectors have called this to our attention. To avoid this problem, you can run a seal-tight from the bottom of the WW ECP to the back of the transition box. Then run your SO chords and communications cables through the seal-tight.

Run the cord through the grommet holes of disconnect box through the boom with all of the other hoses going to the gantry. Route the wires over to the electrical box on the passenger's side of the gantry.

Terminate one end of the 12/5 SO cord in L1, L2, and L3 3-Ph connections in the line side of the contacts for the presoak heater in the WW ECP. By hooking the gantry up in this manner, you can cut power to the gantry with the main switch in the equipment room.

NOTE: The white wire in the 12/5 SO chord is not used. This can be used as a spare if you lose one of the legs in your SO chord, so don't cut it off.

Run 12/5 SO cord to the electrical box on the passenger's side of the gantry. A hole is predrilled in the back of electrical box on the gantry for the 12/5 SO to enter the box. An aluminum GC90 chord grip fitting is provided for installation into the cabinet.

Terminate the black, red, and orange wires in L1, L2, and L3 of the safety switch in the gantry ECP. This will run all three motor starters on the gantry. Terminate the green wire in the ground bar at the bottom of the cabinet.

The 12/3 SO chord and Communication Cable run along the same path as the 12/5 but terminate at different locations. These two chords terminate on a terminal strip located at the bottom left side of the electrical panel on the gantry. The 12/3 S.O. chord is used for 24V AC. Terminate the black wire of the 12/3 S.O. chord in terminal screw #1 or #2 (labeled 24 VAC hot). Terminate the white wire on terminal screw #3 or #4 (labeled 24 VAC neutral). Terminate the green wire on the ground bus at the bottom of the panel.

The communication cable connects to a twist connector mounted in the bottom of the ECP of the equipment room. In the gantry, connect the ground wire to the ground bus. The other wires, blue and brown connect to the DC Filter. The wires for the DC filter are located on a sticky back near the terminal strip. There is a brown wire, a blue wire, and a green wire. Connect the brown wires together [24V DC Positive (+)] and the blue wires together [24V DC Negative (-)]. The black and white wires in the communication cable are communication wires for the Omron computer. Terminate the black wire to terminal screw #14 (BDH Comm). Terminate the white wire to terminal screw #15 (BDL Comm).

**WATER and ELECTRIC REQUIREMENTS****240VAC - 3 Φ - 100 AMP MINIMUM****120VAC - 20 AMP DEDICATED****1" SOFT COLD WATER LINE****STEP 7: WIRE THE SPOT-FREE TO THE SELF SERVE STAND**

One of the relays next to the 25HP Motor starter in the WW ECP is for Spot-Free. The relay is pre-wired to the “**TERM 2**” terminal strip. The relay common goes to screw #7, and the relay normally-open contact goes to screw #8.

To wire the spot-free, run two wires to the spot-free cabinet (may be in self-serve equipment). Hook one wire to “**TERM 2**” screw #7. Hook the other end of the wire to 24VAC Hot in the Self-Serve Electrical Panel. You can get 24VAC hot from the commons of the output card on the PLC.

The R.O. PLC can service two automatics. The inputs for the automatic bays are inputs #10 or #11. The input wire for the first automatic terminates at input #10. The input wire for the second automatic terminates at input #11. See the wiring diagram below:

TERM 2	Wire Color	PLC Input
#7 (COMMON)	Pink	24VAC Hot
#8 (N/O)	Pink	#10 or #11

STEP 8: WIRE THE DRYERS**a) Stand-Alone Dryers**

The stand-alone dryer is controlled by output # 14 of the G70A-ZOC16 of the newer car washes, and #14 of the SRT2-ROC16 with the 120V outputs of the older car washes. You only need two wires going to the control panel of the Superior Dryer Control Panel, one 120VAC hot and one 120VAC neutral.

In the WW ECP, the 120VAC hot goes from screw #154 (Normally Open Contact) of the G70A-ZOC16 (newer units) and to the screw for output #14 of the SRT2-ROC16 (older units). The 120VAC Neutral goes to the auto cashier terminal strip to screw #2 (110V Neutral).



If you need to change the voltage for the output, take the jumpers out of the common for relay 14 in the bottom row of the G70A-ZOC16. Put a jumper wire between the commons for outputs #13 and #15. Wire the voltage you need to the common of output #14.

DIXMOR DIGITAL TIMER WIRING

To wire the Digital timer, you need four wires from the ECP to the timer. You need a black wire for 120 VAC Hot, a white wire for 120 VAC Neutral, and two control wires. See the wiring diagram below.

Eyes Terminal Strip	Auto Cashier Terminal Strip	Wire Color	Dixmor Timer Terminal Strip
	120VAC Hot #1	Black	#1
	120 VAC Neutral #2	White	#2
#9		Purple	#3
#10		Purple	#5

b) On-Board Dryers

Run the 4/4 and 12/3 S. O. Chords from the WW ECP to the Dryer Electrical Panel on the top of the gantry. In the Dryer Electrical Panel, terminate the 4/4 in L1, L2, and L3 of the main disconnect switch. Terminate the black wire for the 120 VAC in the auxiliary contact on the side of the main disconnect switch. Terminate the neutral of the 12/3 to the #18 awg red wire with a white stripe going to the smart nozzle. Terminate the green wires to the ground bus of the panel.

STEP 9: WIRE THE BAY DOORS

If the car wash is installed where temperatures will fall below freezing, you may wish to purchase the optional door package. The package includes an SRT2-ROC08 and a set of Banner Eyes. When the car wash comes with the door package pre-installed, the SRT2-ROC08 is installed in the Water Wizard ECP, and the outputs and commons come pre-wired to the eyes terminal strip. The Eyes Terminal Strip is located near the bottom of the ECP.

NOTE: When the Door Control Package is purchased separately, you must install the SRT2-ROC08 in the ECP. The SRT2-ROC08 is powered by 24VDC and communicates to the Car Wash CPU over the BDH and BDL lines. Terminate BDH with a black wire to BDH of one of the other terminal cards. Terminate BDL with a white wire to BDL of one of the other terminal cards. The card is powered by 24VDC. BS(+) and BS(-) are the 24VDC(+) and 24VDC(-) respectively. Terminate the BS+ with a brown wire to 24VDC



(+). Terminate the BS(-) screw with a blue wire to 24VDC (-).

To hook your door controls to the Water Wizard ECP, run three wires to both door controllers. In each controller, terminate one wire on the Door Controller Common. Terminate the other wires to the Door Controller Open contact and the Door Controller Close contact.

In the WW ECP, hook the wires to the appropriate screws on the “**TERM 2**” terminal strip. See the wiring diagram below:

BAY DOOR WIRING DIAGRAM

TERM 2	Wire Color	Door Control	SRT2-ROC08
#11	White/Yellow	Entrance Common	COM 0
#12	White/Blue	Entrance Open	#0
#13	Red/Black	Entrance Close	#2
#14	White/Yellow	Exit Common	COM 1
#15	Red/Yellow	Exit Open	#1
#16	Red/Blue	Exit Close	#3

Also when wiring the doors, you need to wire the close on temperature rise contact (open on temperature fall) to input #5 of the SRT2-ID16 in the WW ECP. When the temperature falls below the temperature set on the thermostat, the doors will close and the blowout feature is activated.

You can also wire the windy day switch to input #6 of the SRT2-ID16. When input #6 is on, the doors will close regardless of what the outside temperature is. This feature allows you to close the doors on windy days without activating the blowout feature, even though the temperature is above freezing. To wire the windy day switch, wire 24 VDC(-) to the common terminal of a switch. Then wire the switch leg terminal of the switch to #6 of the SRT2-ID16.

Included with the door package is a set of Banner Eyes. Install the banner eyes on the outside of the Exit door high enough to where the eyes will be blocked for at least two seconds. That means you must install the eyes at bumper height. Wire the Banner Eyes the same way the treadle and entrance eyes are wired. Terminate the DC power of the eyes to DC(+) (brown wire) and DC(-) (blue wire). Terminate the Normally Closed Input of the receiver eye wire (the white wire in the 4.4T cable) to Term #3 Screw #17 in the WW ECP. This screw is pre-wired to input #1 of the SRT2-ID16 in the ECP.



STEP 10: INSTALL THE PLUMBING FROM THE WATER SUPPLY TO THE PUMP STAND

The Water Wizard 6500 has a simple hook-up procedure. There is a 1" brass tee in the back of the cold-water tank, which serves as the cold soft water hookup. The ¾" hose on the bottom of the tee, installed at the factory, will feed all chemical hydrominders.

STEP 11: INSTALL THE ELECTRICAL FROM THE ELECTRICAL PANELS TO THE WATER WIZARD ELECTRICAL CONTROL PANEL

Run the electrical service for the Water Wizard into the Electrical Control Panel ("ECP") on either the side or the bottom of the cabinet. Do not put any holes in the top of the cabinet. Metal shavings could fall into a computer component, or water could leak through a hole in the top of the cabinet, damaging the computer and its components.

NOTE: If any holes are put in the top resulting in water damage or metal shavings falling into a computer component, causing a short, the warranty will be void.

Terminate the 100-amp 3Φ service for the Water Wizard into L1, L2, and L3 of the plastic safety switch in the upper right hand corner of the panel. The bottom of the switch is pre-wired to the 25 HP motor starter and to two breakers.

The single-phase breaker protects the Procon Pumps on the Pump Stand. The three-phase breaker protects the presoak heater and the motor on the gantry. Terminate the 120 VAC circuit into the auxiliary, normally open contact on the left side of the safety switch. Terminate the 120 VAC Neutral in the terminal block labeled "**120 VAC Neutral**". This circuit supplies voltage to the transformer, DC power supply, auto cashier, lights and computers.



WATER WIZARD 6500

WINTERIZATION

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Gantry & Rail Heat Wiring Diagram RH1.0
Winter Wizard w/ Gas or Electric Water Heater SchematicWWH.0



WINTERIZATION

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Winter Wizard Heater Kits

JCC 9 KW ELECTRIC SYSTEM :

- 1 EA. JCC WINTER WIZARD SYSTEM, PRE-PLUMBED & WIRED
- 1 EA. SUPPLY MANIFOLD
- 1 EA. 3/4" STREET ELBOW
- 1 EA. 3/4" HEX NIPPLE
- 1 EA. THERMOMETER, FOR TANK

GAS OR ELECTRIC "WATER HEATER" SYSTEMS :

- 1 EA. WATER HEATER, PER AKO
- 1 EA. EXPANSION TANK, PER AKO
- 1 EA. 1/8 HP CIRCULATION PUMP, 0011-F4
- 1 EA. FILL TANK W/ CAP & FILL ADAPTER
- 1 EA. FILL MANIFOLD
- 1 EA. PRE-WIRED JUNCTION BOX
- 3 EA 3/4" x 1" BUSHINGS
- 2 EA. 1/2" x 3/4" BUSHINGS
- 2 EA. 3/4" TEE
- 3 EA. 3/4" HEX NIPPLE
- 1 EA. 3/4" HEX COUPLING
- 1 EA. 3/4" HOSE BARB x 3/4" MPT
- 20 FT. 3/4" PUSH LOCK HOSE, BLUE



Winter Wizard Installation Kit

STANDARD KIT INCLUDES:

- 1 EA. INSTRUCTION BOOKLET
- 2 EA. RAIL HEAT TUBES , 30' 6"
- 2 EA. PVC COVERED CROSS TUBES
- 14 EA. RAIL HEAT HOLD DOWN CLIPS
- 1 EA. UNDER CARRIAGE BRIDGE PLATE
- 230 FT. ½" PUSH LOCK HOSE , BLACK
- 8 EA. ½" HOSE BARB x ½" MPT
- 1 EA. ½" FEMALE JIC SWIVEL x HOSE BARB
- 15 EA. BL – 17 CLAMPS
- 10 EA. BL – 23 CLAMPS
- 20 EA. #12 PHILLIPS HEAD SCREWS
- 20 EA. BLUE ANCHORS
- 10 EA. S.S. TECH SCREWS (3/8" HEX)
- 1 EA. RETURN MANIFOLD
- 1 EA. THERMOSTAT (THAT MEASURES AIR TEMP.)
- 1 EA. VINYL HOSE COVER (BETWEEN BOOM & WALL)

EXTENDED BAY KIT INCLUDES :

- 1 EA. STANDARD KIT (FROM ABOVE)
- 80 FT. ¾" PUSH LOCK HOSE , BLUE (FOR 1 BAY
EXTENSION)
- +40 FT. ¾" PUSH LOCK HOSE , BLUE (PER BAY OVER 1)
- 4 EA. ¾" HOSE BARB x ¾" MPT
- 1 EA. ¾" HEX COUPLING
- 1 EA. ¾" x 1" BUSHING



Heat Source Options

If your wash is equipped with floor heat, this system can be plumbed into your existing boiler. If your wash is not equipped with floor heat, there are three other options. We offer a 12kw, 20-gallon electric water heater, which requires 60 amps of 220 volt, single-phase electricity. This same size heater is also available in a natural gas model, if you have gas available at your wash. We also manufacture our own heater, specifically designed for this system, which requires 30 amps of 240 volt, 3-phase electricity. There are flow diagrams provided to aid in proper installation.

Winter Wizard Winterization Package

***Read all instructions and study all drawings before beginning installation.**

- 1.) Connect the hose provided to the heat exchangers and the heater/boiler circulation pump as shown in the flow diagram provided. It is important that the top heat exchanger is the last heat exchanger that the heated fluid flows through to achieve maximum performance.
- 2.) Install ½" rigid copper tubing down one side of each track using the hold down clips provided at every other rail mounting foot. Remove nut & washer; install clip & nut.
- 3.) You will have to cross the bay two times. Cross once at the under carriage spray bar and once at the treadle plate using the bridge plate provided to prevent vehicles from running over the cross pipe. Secure pipe with clamps, screws and anchors provided. Plumb into system, with hose, as shown in the flow diagram.
- 4.) Install the gantry hold down brackets provided.
- 5.) Move gantry manually up and down the track to assure clearance.
- 6.) Plumb into heat source in accordance with the flow diagram that applies to your installation.
- 7.) If you have an existing floor heat system you must replace the thermostat that measures floor temperature with the thermostat provided. (Which measures air temperature.)
- 8.) Fill System with 50/50 mix of anti-freeze and water.
- 9.) You are now ready to test for leaks. Increase the thermostat setting to current air temperature. This will start the heater/boiler and circulation pump. (Which measures air temperature.)
- 10.) Install top cover and hose boot at transition box. (Boot must be trimmed to fit.)



REVERSE OSMOSIS SYSTEMS

WATER WIZARD 6500

REVERSE OSMOSIS SYSTEMS

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REVERSE OSMOSIS SYSTEMS

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REVERSE OSMOSIS SYSTEMS

Sparkle Reverse Osmosis Unit

R.O. System Description

The Sparkle Reverse Osmosis (Spot Free Rinse System) is engineered with the best available components on the market to deliver low pressure, spot free water to the car wash bays. The system can be installed on any existing car wash, as well as, new installations. Years of trouble free service, with little maintenance, can be expected. The following equipment is included in your Sparkle Reverse Osmosis Pumping and Storage Unit.

1. Product Water Storage Tank
2. Blue Charcoal Filter
3. Chlorine Test Kit
4. 10' 3/4" Product Hose
5. R.O. Owner's and Installation Manual.

The following should be installed for the R.O. Unit by its appropriate installer:

1. 220 Volt Single-Phase electricity, ground and other electrical hook-ups as required by local Electrical Codes and City Ordinances.
2. 1/2" (Use 1" for 3200 GPD or Above Units) Water Supply Line. This line should be taken off of the existing water softener to provide softened water to the R.O. Unit.

NOTE: If the water supplied to the R.O. Unit is 50° F, then hot and cold water must be blended together to provide a consistent water temperature between 70° and 90° F.

3. 1/2" Drain Line.
4. A clean floor and working space for the R.O. Unit and Product Storage Tank.



REVERSE OSMOSIS SYSTEMS

Sparkle Reverse Osmosis Unit Equipment Installation

1. Position fiberglass tank in equipment room as close the Super Saver as possible.

NOTE: When installing tank, make sure that the area the tank is clean and free of dirt and debris, so as not to damage the Product Storage tank.

2. Place blue charcoal filter between softened water supply and R.O. unit. Hook-up incoming water into the inlet side then turn on water supply and allow the unit to flush with water for at least 10 minutes or until water that is coming out of filter outlet that is clean and clear. Turn water supply off.
3. Install a 1/2" hose from the outlet side of the charcoal filter to the inlet hook-up on the R.O. unit. This connecting point is located on the back of the R.O. unit behind the 0-100 psi pressure gauge.
4. On the back of the R.O. unit control panel is a blue 3/8" hose that attaches to the top of the product storage tank. This hose provides a route for the spot-free water to get from the R.O. unit to the storage tank.
5. On the back of the R.O. unit control panel is a red 3/8" hose that goes to the 1/2" drain provided for the unit.

NOTE: This water can be returned to the wash tank if desired.

6. Inside the R.O. unit control box is a 4-conductor cable coming from the computer. This control cable goes to the float switch that is located in the product storage tank. The proper connection sequence is as follows:

Red Lead ----- Lower Float Switch
Green Lead ----- Upper Float Switch
Black Lead ----- Upper and Lower Float
(See Appendix B)

7. Install 3/4" line between the outlet of the product storage tank (lower fitting) and the inlet side of the delivery pumps (elbow located on top of pump).



REVERSE OSMOSIS SYSTEMS

Sparkle Reverse Osmosis Unit Checkout Procedure

Before continuing installation, perform the following checks:

1. Turn on water supply valve and check for leaks of any kind. If any are found, turn off the valve, repair leak and retest. The water pressure should read between 20-60 psi, at the 0-100 psi gauge, depending on the city water pressure.
2. Perform chlorine test according to the instructions provided in the test kit. If any trace of yellow is found, re-check installation of charcoal filter for a reversed hook-up. Properly install charcoal filters, and retest. If the charcoal filter is properly installed and the chlorine test fails again then the charcoal filter is defective and must be replaced.

<<< CAUTION HIGH VOLTAGE >>>

3. Check electrical voltage at breaker and verify that 220 Volts single phase is provided to unit.
4. Check that drain hose has been connected from R.O. unit to drain.
5. Check to see if the "run" and "power" lights on the Omron computer are lit.



REVERSE OSMOSIS SYSTEMS

Reverse Osmosis Unit Turn-On Procedure

Now that the Sparkle Reverse Osmosis Unit is installed, Spot Free water can be produced. Turn power on to the R.O. unit and it should start to produce SF water (Product Water). There should be a supply of water going to the Product storage tank and a small amount of water coming out of the drain hose (Reject Water). The pressure gauge on the front of the R.O. control panel will indicate the product supply pump pressure. It should read between 130-195 psi. The unit should run for several minutes, allowing air to escape the system.

Do not make any adjustments until the unit has been turned on for about 10-15 minutes. This unit was factory run and tested and should not need any adjustments, but if needed, proceed as follows:

To adjust the amount of Product Water or Reject Water adjust the regulator. The regulator is located in the middle of the R.O. control panel, for the supply pump. When the regulator is increased (turned clockwise) there will be less flow indicated on the reject flow meter and more flow on the product flow meter.

NOTE: Never exceed 195 psi, or damage will occur to the R.O. Unit pump and membrane.

To properly set the ratio of Product Water to reject water, adjust the regulator starting out at about 100 psi and increase the pressure in 10-psi increments. You will notice that, even though you keep increasing the pressure, the product water does not increase (only the reject water decreases). At this point, by increasing the pressure, you are only working the membranes harder and harder, but yet not producing any more water. A lot of systems run typically at 150-170 psi.



REVERSE OSMOSIS SYSTEMS

Sparkle Reverse Osmosis Unit Ratings

Typical recovery rates and settings for a Sparkle R.O. System are as follows:

System Size	Product Water		Reject Water	
	Minimum GPM	Maximum GPM	Minimum GPM	Maximum GPM
500 GPD System	.2	.4	.8	1.0
1500 GPD System	.7	.9	1.4	1.5
3200 GPD System	1.6	2.6	3.0	3.5
4800 GPD System	2.5	3.0	4.0	4.5

Never exceed the above listed recovery rates or severe fouling will result and membrane warranty will be void. It is best and most economical to have a high rate of reject water, than to take a chance in damaging membranes by pushing the R.O. unit too hard.

If the unit is not producing the anticipated amount of product water, the following factors can usually be contributing to its failure:

- A. TDS (Total Dissolved Solids) above 300 PPM
- B. Water temperature is too cold
- C. Hard water

Important Note: Once the product tank has about 2-3' of water, you will need to prime the delivery pump. To do this, simply loosen the hose fitting on the discharge side of the pump, allowing water and air to flow through the pump until all air is purged from the line.

If there are any problems, questions, or concerns on setting up this unit contact the company, 1-800-999-9878 or 1-713-683-9878.



REVERSE OSMOSIS SYSTEMS

Sparkle Reverse Osmosis Unit Bay Delivery and Hook-Up

Now the R.O. Unit is producing Spot Free Water and it is time to hook-up the bay delivery system.

Install 3/8" ply-flow tubing from each solenoid on the R.O. Control Panel to the top of the 360 Degree boom in each bay. Install the brass check valves (provided) at the top of each boom so that the SF water will flow through the check valve, into the top of the boom, down the hose, and out the trigger gun or wand.

NOTE: This check valve must be installed. It prevents high pressure from backing up into the R.O. Unit.

Do this for each bay connecting the #1 solenoid to the #1 solenoid to the #1 Bay, the #2 solenoid to the #2 Bay, etc. If the unit is mounted on the Super Saver, then the factory has already pre-wired the low voltage.

Connect one conductor of a 2-conductor control cable from a 24 Volt Hot and the other conductor from a 24 Volt Common to terminals 1 and 2 on the R.O. Unit Control Box Terminal Strip. This hook up is for bay #1. Hook up each bay accordingly.

The rotary switch must be wired into the system, proving the 24 Volt hot to each bay when the selection is made according to the selection decal. Check the level of the poly-holding tank and verify that there is product water approximately 6" above the outlet fitting on the tank. Bleed the line between the delivery pump and the holding tank by loosening the hose fitting at the front end of the pump. When the air is purged out of the line and water is freely flowing re-tighten fitting snugly. The R.O. Unit is now ready for use.

Turn on a bay and there should be spot free water coming through the system. It is common for the SF water to take up to 60 Seconds before it comes out of the trigger gun or wand the first time. Continue to run each bay for several minutes to flush out all contaminants from the hoses and fittings. The pressure from the delivery pump is constant and un-adjustable. It should read from 150-190 PSI.

Again check for leaks and repair as needed. Close up the electrical panels and replace all covers.

Make sure the test switch located in front of the R.O. Unit control box is in the off position. This will allow the unit to automatically shut off when the fiberglass-holding tank is full. The test switch is used to by pass the tank switches so that the operator can verify that the system is working. The by-pass switch is not provided on the Super Saver unit; only the freestanding unit.



REVERSE OSMOSIS SYSTEMS

Automatic Hook-Up

You will need to run two wires from the R.O. Electrical Panel to the Water Wizard "Electrical Control Center". On "Term 2 24VAC", on the water wizard panel, you will find two terminals marked "Spot-Free". Connect one wire to each of these terminals. On the R.O. Electrical panel connect one wire to input # 010 on the OMRON computer and the other wire to 24 VOLT AC hot common on the output side of the OMRON computer. If you have two water wizards, use input #011 for the second one. All other wires are connected the same.

NOTE: With Money Manager you must wire per instructions inside Supersaver cabinet.

Computer Operation Description

Production

Computer receives a signal from upper float switch that tank is low on water. If signal is present over 10 seconds the computer will turn on water solenoid valve to production pump. After 10 seconds the computer then determines that if the water pressure is above 20 PSI, to turn on the production pump motor starter. If at any time the computer does not receive a signal from the pressure switch that water pressure is above 20 PSI, then the computer will flash output 107 and turn off the production pump.

Delivery

When the computer receives a 24V signal from any bays (inputs 4-11), it has a one second delay in turning on the delivery pump motor starter. If at anytime the computer receives a signal from low water cut off that the poly tank is empty the computer will shut down the delivery pump and flash output 106.

Power and the run light on the Omron computer must be on for the computer to function properly.

Reverse Osmosis Size

To determine what size your R.O. Unit is, simply measure the membranes mounted on the unit.

If the membrane is 2 ½" x 40" it is capable of producing 500 gallons per day.

If the membrane is 4"x40" the unit is capable of producing 1600 gallons per day.

If the membrane is (2) 4"x40" the unit is capable of producing 3200 gallons per day.

If the membrane is (3) 4"x40" the unit is capable of 4800 gallons per day and so on



REVERSE OSMOSIS SYSTEMS

Reverse Osmosis Parts List

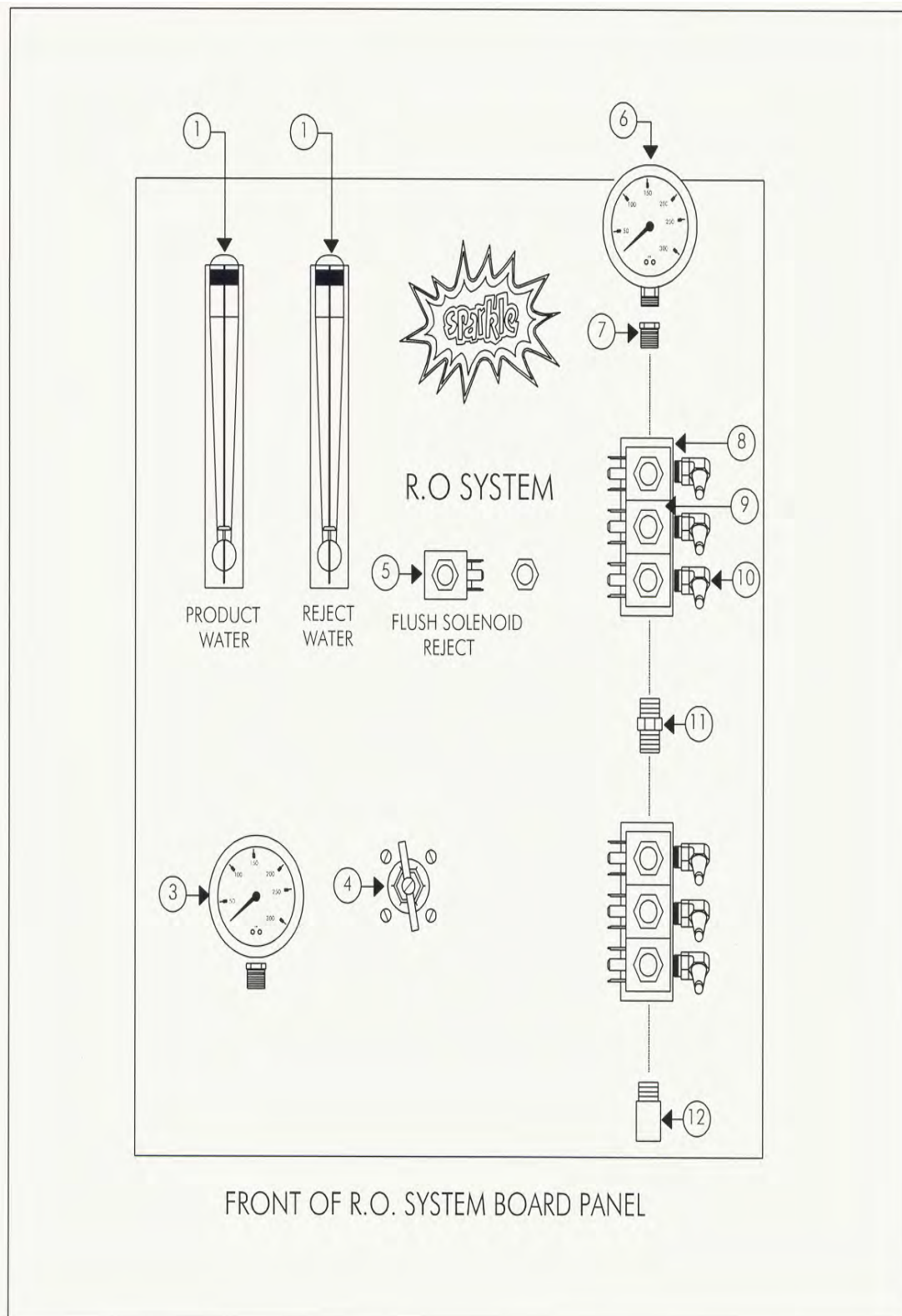
ITEM	PART #	DESCRIPTION
1	47030	.2-2.0 GPM Flow Meter
	47040	.1-1.0 GPM Flow Meter
	47044	.5-5.0 GPM Flow Meter
	47048	1.0-10.0 GPM Flow Meter
3	47010	0-300 PSI Panel-Mount Gauge
4	58020	Pressure Regulator
5	64070	24V ½ Solenoid Valve
6	47011	0-300 PSI Lower-Mount Pressure Gauge
8	64019	Two-Stage Solenoid
	64021	Three-Stage Solenoid
	64023	Four-Stage Solenoid
9	64026	24V Solenoid Coil
10		¼ MPT x 3/8 Poly Flow Tubing Fitting
11	22164	¼ HEX Nipple
12	22052	¼ ST ELL
13	22228	3/8 Hose Fitting Swivel
14		3/8 MP x 3/8 Flare X 90 °
15	22046	3/8 Elbow
16	22200	38 ST Tee
17	22102	3/8 x ½ Bushing
18	64002	½ Solenoid Valve
19	22216	½ MPT x 3/8 Flare
20	22218	½ MPT x ½ Hose Barb
22	34020	3/8 Check Valve
21		3/8 MPT x 3/8 Flare
22	222212	3/8 MP x 3/8 Hose Barb
23	22046	3/8 Elbow
24	22226	¼ Hose Barb Swivel
25		¼ FPT x ¼ Flare x 90°
26		¼ MPT x ¼ Flare x 90°
27	22088	¼ x 3/8 Bushing
28	22102	½ x 3/8 Bushing
29	22176	½ x 3/8 Bushing
30	62130	Reverse Osmosis Membrane AKA-500 2 ½" x 4
	62130-1	Reverse Osmosis Element for AKA-500
	62130-2	Reverse Osmosis Housing AKA-500
	62132	Reverse Osmosis Membrane AKA-1600 4"x 40
	62132-2	Reverse Osmosis Element for AKA-1600
31	22084	½ MPT x ½ FPT Coupling
32		½ MPT x ½ Flare x 90°
34	57002	Procon Pump For 500 GPD Reverse Osmosis
	57030	Procon Pump for 1600 GPD Reverse Osmosis



REVERSE OSMOSIS SYSTEMS

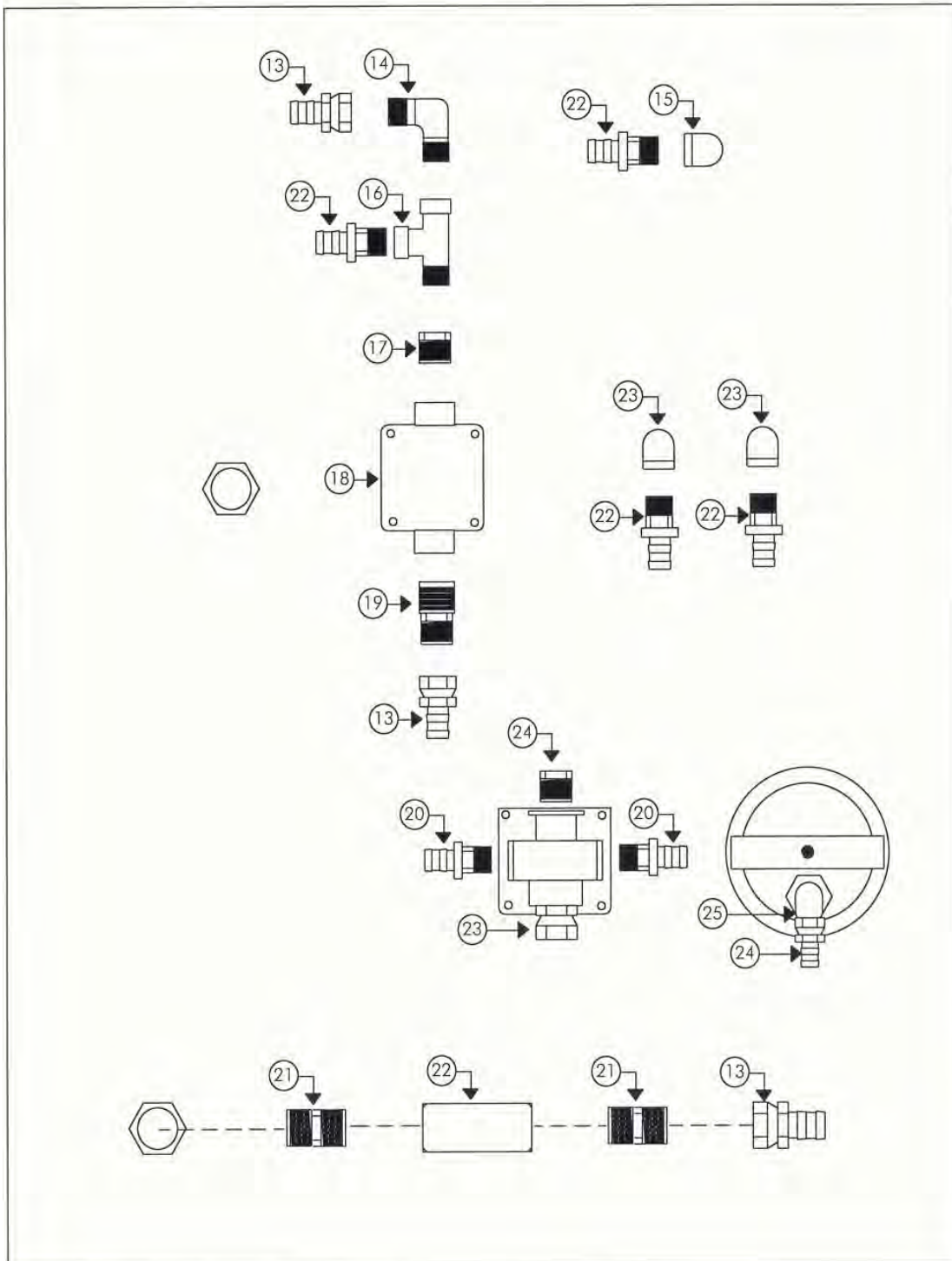
ITEM	PART #	DESCRIPTION
35	22056	½ ST Ell
37	22172	½ Hex Nipple
39	22166	3/8 x ¼ Hex Nipple
40		Pressure Switch Reverse Action 69WR5
41	66004	3/8 Filter Housing
	66034	¾ Filter
42	57050	PB-10 Pump
43	22108	¾ x ½ Bushing
NOT	33460	Omron Controller (may vary with unit size)
SHOWN	66054	2 Cubic Feet Charcoal Filter
	66064	Bag Charcoal 2 Cubic Feet

Drawing of Front of R.O. System Board Panel



Drawing of Back of R.O. System Board Panel

BACK OF R.O. SYSTEM BOARD PANEL





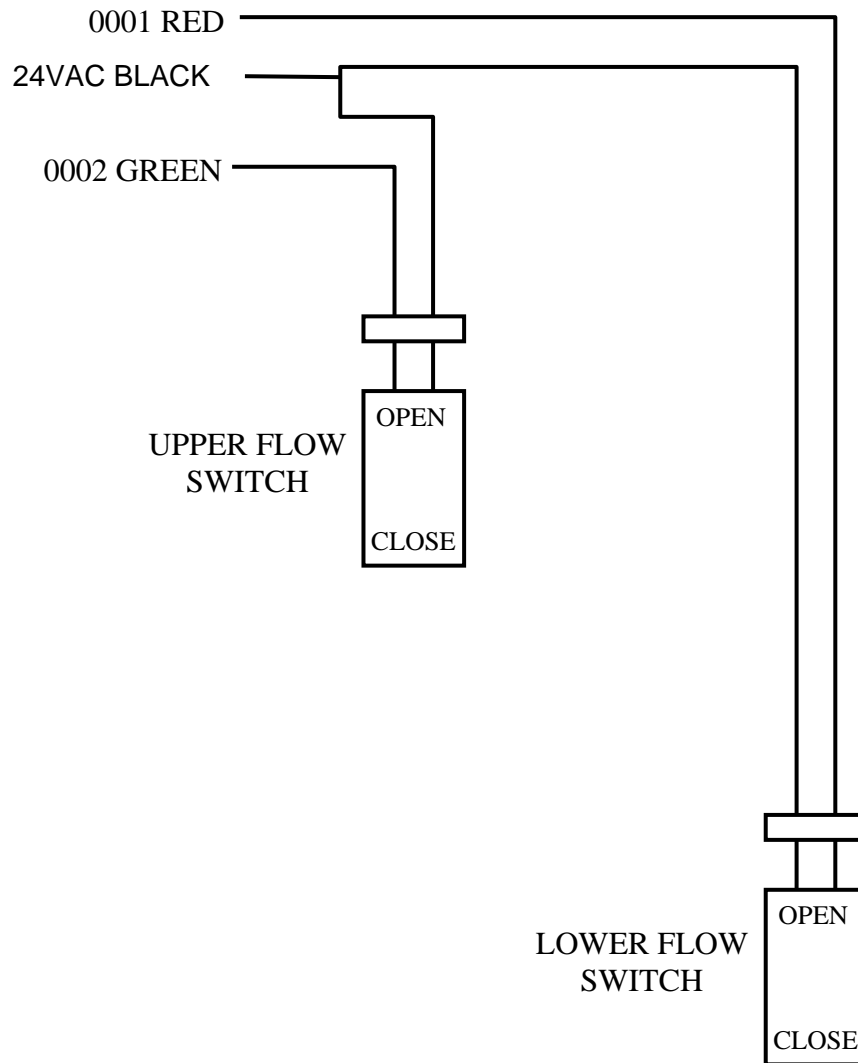
REVERSE OSMOSIS SYSTEMS

Trouble-Shooting Guide

NO.	INPUTS	LIGHTS	LIGHT OPERATION
0000	Water Pressure Switch	On	Turns off when pressure is low
0001	Low Water Switch	Off	Turns on when Tank Runs Empty
0002	Upper Water Switch	Off	Turns on When Tank is Low on Water
0003	Program for High TDS	Off	Changes Program to Flush More
0004	Bay 1 Input	Off	Turns on When Bay 1 is on SF
0005	Bay 2 Input	Off	Turns on When Bay 2 is on SF
0006	Bay 3 Input	Off	Turns on When Bay 3 is on S
0007	Bay 4 Input	Off	Turns on When Bay 4 is on S
0008	Bay 5 Input	Off	Turns on When Bay 5 is on S
0009	Bay 6 Input	Off	Turns on When Bay 6 is on S
0010	Bay 7 or Auto 1	Off	Turns on When Bay 7 is on S
0011	Bay 8 or Auto 2 Input	Off	Turns on When Bay 8 is on S
	OUTPUTS	LIGHTS	LIGHT OPERATION
100	Self Serve Delivery Pump	Off	Turns on When Bay 1-8 is on SF
101	Water Solenoid	Off	Turns on to Feed Production Pump
102	Production Pump	Off	Turns on Refill Tank
103	Flush Solenoid	Off	Turns on to Flush Membranes
104	Auto #1 Delivery Pump	Off	Turns on When Auto 1 Calls for SF
105	Auto #2 Delivery Pump	Off	Turns on When Auto 2 Calls for SF
106	Flashing Low Water Light	Off	Flashes When Tank is Empty
107	Flashing Low Press. Light	Off	Flashes When Water Pressure is Low



Float Switch Hook-Up



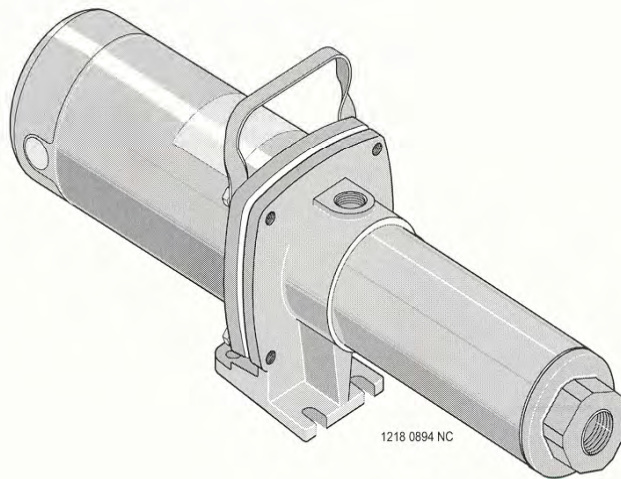


Sta-Rite High Pressure Booster Pump Manual

STA-RITE®
OWNER'S MANUAL

INSTALLATION AND OPERATING INSTRUCTIONS
REPAIR PARTS LIST

Signature 2000
High Pressure Booster Pump
60 Hz. 1/2 through 2 HP



STA-RITE INDUSTRIES, INC., DELAVAN, WISCONSIN 53115

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S327 (Rev. 4/27/01)



⚠ DANGER

⚠ WARNING

⚠ CAUTION

ELECTRICAL SAFETY

⚠ WARNING



Hazardous voltage. Can shock, burn, or cause death.

Ground pump before connecting to power supply.

⚠ Some models of pump are supplied with 3-connector grounding type cord. Connect only to properly grounded, GFCI protected outlet. Do not lift pump by electrical cord.

⚠ Pump is non-submersible. Keep motor dry at all times. Do not wash motor. Do not immerse. Protect motor from wet weather.

⚠ If using extension cord, use only UL approved indoor/outdoor,

3-wire, grounding type cord. Do not allow any part of cord or receptacle ends to sit in water or damp locations.

⚠ Unplug pump before servicing.

⚠ CAUTION Burn Hazard. Do not touch an operating motor. Modern motors are designed to operate at high temperatures. To avoid burns when servicing pump, allow it to cool for 20 minutes after shut-down before handling.

Follow local and/or national plumbing and electrical codes when installing.

⚠ WARNING Hazardous Pressure. DO NOT run the pump with discharge shutoff, as hose may burst or pump may be damaged due to high temperatures.

READ AND FOLLOW SAFETY INSTRUCTIONS!

This is the safety alert symbol. When you see this symbol on your pump or in this manual, look for one of the following signal words and be alert to the potential for personal injury:

DANGER warns about hazards that will cause serious personal injury, death or major property damage if ignored.

WARNING warns about hazards that can cause serious personal injury, death or major property damage if ignored.

CAUTION warns about hazards that will or can cause minor personal injury or property damage if ignored.

The word **NOTICE** indicates special instructions which are important but not related to hazards.

GENERAL SAFETY

To avoid risk of serious bodily injury and property damage, read safety instructions carefully before installing pump.

Do not allow pump or any system component to freeze. To do so may damage system and will void warranty.

⚠ WARNING Risk of electric shock. To avoid fatal shocks, proceed as follows if pump needs servicing.

A. Disconnect power to pump outlet box before pulling pump cord plug. After plug is pulled, let pump cool for 20 minutes before attempting to work on it.

B. Take extreme care when changing fuses. To reduced chance of fatal electrical shocks, DO NOT stand in water or put your finger in the fuse socket.

C. Ground electrical outlet box.

D. Use only Ground Fault Circuit Interrupter (GFCI) protected grounded outlet for cord plug.

Never run pump dry. Running pump dry can damage internal parts, overheat pump (which can cause burns to people handling or servicing pump), and will void warranty.

Do not pump chemicals or corrosive liquids with pump.

⚠ WARNING Hazardous Pressure.

A. Use high pressure reinforced type discharge hose ONLY. See parts list for available hose, nozzle and fittings. A high pressure relief valve is recommended.

B. DO NOT use garden hose with High Pressure Booster pump. Garden hose will not stand the discharge pressure produced and will fail.

C. High pressure discharge stream is dangerous. To avoid injury, DO NOT aim the discharge stream at any person or animal.

D. BE SURE that the pump suction pipe pressure plus the pump discharge pressure does not exceed the pressure rating of hose and fittings. See Table I for pump discharge pressure ratings.

INSPECT THE SHIPMENT

The high pressure booster pump has been carefully inspected and packaged to assure safe delivery. Inspect the pump and fittings and report to the carrier any items which are damaged or missing.

Model	HP	Phase	Avg. GPM
HP7C-02, HPS7C-01	1/2	1	7
HP7C3-02, HPS7C3-01	1/2	3	7
HP7D-02, HPS7D-01	3/4	1	7
HP7D3-02, HPS7D3-01	3/4	3	7
HP7E-02, HPS7E-01	1	1	7
HP7E3-02, HPS7E3-01	1	3	7
HP10C-02, HPS10C-01	1/2	1	10
HP10C3-02, HPS10C3-01	1/2	3	10
HP10D-02, HPS10D-01	3/4	1	10
HP10D3-02, HPS10D3-01	3/4	3	10
HP10E-02, HPS10E-01	1	1	10
HP10E3-02, HPS10E3-01	1	3	10
HP10F-02, HPS10F-01	1-1/2	1	10
HP10F3-02, HPS10F3-01	1-1/2	3	10
HP10G-02, HPS10G-01	2	1	10
HP10G3-02, HPS10G3-01	2	3	10
HP20E-01, HPS20E-01	1	1	20
HP20E3-01, HPS20E3-01	1	3	20
HP20F-01, HPS20F-01	1-1/2	1	20
HP20F3-01, HPS20F3-01	1-1/2	3	20
HP20G-01, HPS20G-01	2	1	20
HP20G3-01, HPS20G3-01	2	3	20

*The "S" in the Model Number indicates a stainless steel pump body, a stainless steel discharge assembly and stainless steel capscrews.

TABLE I - DISCHARGE PRESSURE

GPM	HP	No. of Stages	Discharge Pressure PSI at Rated Flow	Discharge Pressure PSI at No Flow
7	1/2	9	90	130
7	3/4	12	123	173
7	1	16	162	229
10	1/2	6	74	113
10	3/4	8	97	147
10	1	10	134	188
10	1-1/2	14	173	206
10	2	16	197	260
20	1	7	275	110
20	1-1/2	9	97	143
20	2	11	123	175

*For total discharge pressure, add this pressure to suction pipe pressure. For example, an HP7C pump taking suction from a 100 psi water service line will produce 130 + 100 = 230 psi total discharge pressure at 0 GPM flow. If suction pressure drops to 50 psi, discharge pressure will drop to 180 psi.

NOTE: Model numbers that include an "S" (HPS7C, HPS10D, etc) are identical to models listed above, except that they have a stainless steel suction, discharge assembly, and capscrews. Model numbers ending in 3 (HP7C3, HPS10C3, etc) have 3-phase motors.

INSTALLATION

The pump is designed to boost city water pressure or water pressure from a private water system. Use this high pressure stream to wash down milk parlors, barns, garages and driveways, or for fire protection.

The pump is portable with a convenient carrying handle. If an existing pressure water system is to be used as a water supply, it can be connected with available fittings and 3/4" or 1" high pressure hose to the pump inlet. A special heavy duty 3/4" or 1" suction hose with fittings is available as an accessory. If pump is permanently mounted on wall, use a 3/4" or 1" pipe or heavy-duty hose for suction line. 20 GPM models require one-inch discharge hose to reduce friction losses.

⚠ WARNING Hazardous pressure. Pump body may explode if pressures exceed rated limits. Maximum inlet pressure is 80 PSI. Maximum discharge pressure is 315 PSI. Warranty is void if these pressure limits are exceeded.

HIGH PRESSURE BOOSTER PUMP INSTALLATION INSTRUCTIONS

These instructions cover high pressure booster pump installations as shown below:

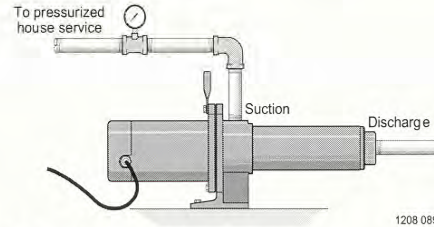


Figure 1 – Connection to house service.

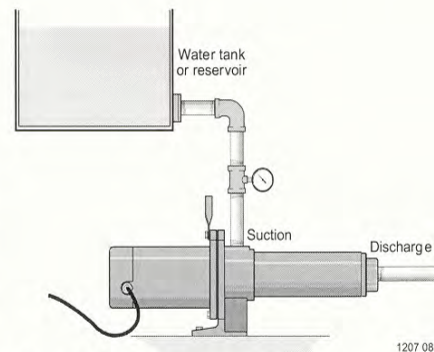
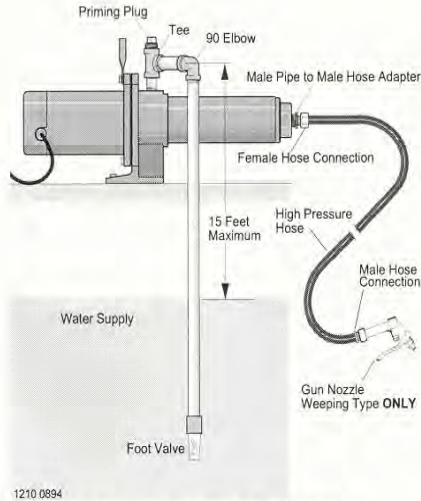
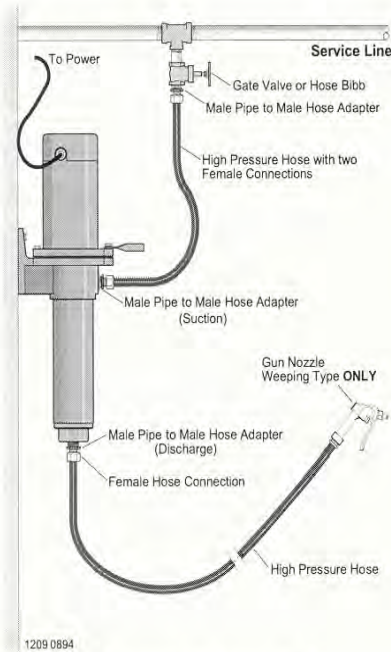


Figure 2 – Connection to water reservoir.



1210 0894
Figure 3 – Cistern or shallow well installation.



1209 0894
Figure 4 – Wall mounted to pressurized service line.

To reduce friction losses to a minimum, inlet (suction) line should be **short** and have as few elbows as possible.

Size the inlet according to the chart below:

Ave. GPM	Threaded Inlet Size	Recommended Inlet Line Size	Recommended Discharge Line Size
7	3/4" NPT	1"	1"
10	3/4" NPT	1"	1"
20	1" NPT	1-1/4"	1-1/4"

An inlet strainer will prevent suspended debris from clogging pump.

The internal running surfaces of the pump and seals require water lubrication for good, consistent operation. **Allowing pump to run dry will severely damage pump and seals.**

Install a pressure gauge in pump inlet line. Keep at least two pounds per square inch pressure (2 PSI) in inlet line whenever pump is operating. If this is not possible, consult customer service representative.

LUBRICATION

It is not necessary to lubricate pump or motor. The motor is equipped with sealed ball bearings, lubricated for the life of the bearing. The mechanical shaft seal in the pump is self-lubricating and requires no adjustment. Disassemble pump to replace seal (See "Maintenance", Pages 7 and 8).

OPERATION

NOTICE: Observe the following precautions when operating the pump:

1. **Keep the motor dry!** Do not direct stream from pump discharge onto the motor!
2. **⚠ WARNING Hazardous pressure.** Do not run the pump with discharge shutoff, as hose may burst or pump may be damaged due to high temperatures.
3. **Do not** use a standard trigger gun with this pump. Use only trigger guns with an automatic weeping feature. These are available as accessories and are provided with three nozzles. The smallest nozzle restricts the flow, allowing use of a smaller water source. The two larger nozzles are used if the water source will supply the pump's full capacity.
4. **Do not** run pump dry; to do so may damage the seal.
5. To avoid internal damage to pump, **Do not** operate with water temperature above 175 degrees F.

⚠ Disconnect power before working on pump, motor, pressure switch, or wiring.

Single Phase

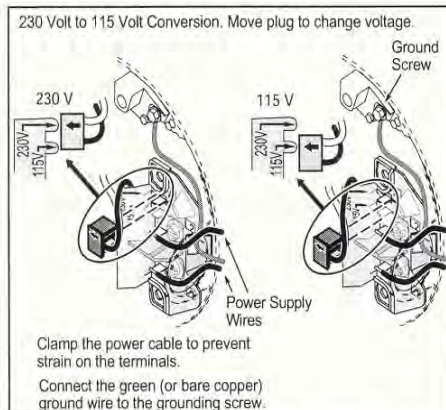


Figure 5: Motor wiring connection, Plug-in

Single Phase

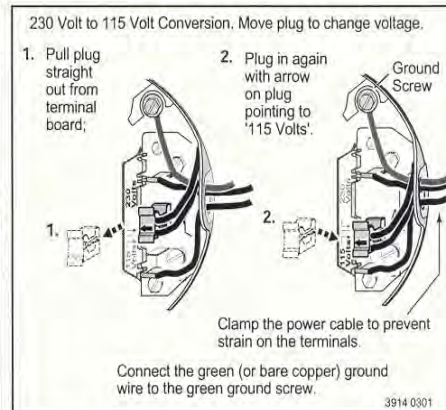


Figure 6: Motor wiring connection, Spade Connector

ELECTRICAL

- ⚠** Ground motor before connecting to electrical power supply.
- ⚠** Failure to ground motor can cause severe or fatal electrical shock hazard.
- ⚠** Explosion hazard. Do not ground to a gas supply line.
- ⚠** To avoid dangerous or fatal electrical shock, turn OFF power to motor before working on electrical connections.
- ⚠** Supply voltage must be within $\pm 10\%$ of nameplate voltage. Incorrect voltage can cause fire or serious damage to motor and voids warranty. If in doubt consult a licensed electrician.
- ⚠** Use wire size specified in Wiring Chart (Table II, Page 6). If possible, connect pump to a separate branch circuit with no other appliances on it.
- ⚠** Wire motor according to diagram on motor nameplate. If nameplate diagram differs from diagrams above, follow nameplate diagram.

For All 3-phase Motors: Follow the wiring diagram on the motor junction box or on the motor nameplate.

WIRING CONNECTIONS

1. Install, ground, wire and maintain this pump in compliance with the National Electrical Code (NEC) or the Canadian Electrical Code (CEC) and with all local codes and ordinances that apply. Consult your local building inspector for local information.
2. Make sure that the voltage, frequency and phase (single phase or three phase) of the power supply agree with that stamped on the motor nameplate. If

- in doubt, check with the power company.
3. Some models are equipped with three phase motors. Three phase motors require magnetic starters and can run in either direction, depending on how they are connected to the power supply.
- NOTICE:** Dual voltage motors are factory wired for 230 volts. If necessary, reconnect the motor for 115 volts, as shown. Do not alter the wiring in single voltage motors.
- Install, ground, wire, and maintain your pump in compliance with the National Electrical Code (NEC) or the Canadian Electrical Code (CEC), as applicable, and with all local codes and ordinances that apply. Consult your local building inspector for code information.
- NOTICE:** Clamp the power cable to prevent strain on the terminal screws.
- NOTICE:** Your Motor Terminal Board (under the motor end cover) looks like one of those shown above. Do not change motor wiring if line voltage is 230 volts. Connect power supply as shown for your supply voltage.

To Convert from 230 Volts to 115 Volts, Spade Connector type (see Figure 6).

1. Unplug the motor.
2. Loosen the two screws on the end of the motor. Gently pull the canopy from the motor.
NOTICE: Do not pull or jerk wires.
3. Connect the green (or bare copper) ground wire to the green ground screw first (see Figure 5). Use a solid copper wire at least as large as the power supply wires.
4. Move the white wire with black tracer from the "B" position to the "A" position on the terminal board.
5. Move the BLACK wire from the "A" position to the "L1" position on the terminal board.
6. Change is complete.



REVERSE OSMOSIS SYSTEMS

To Convert 230 Volts to 115 Volts, Plug-in type (see Figure 5).

1. Unplug the motor.
2. Loosen the two screws on the end of the motor. Gently pull the canopy from the motor.
NOTICE: Do not pull or jerk wires.
3. Connect the green (or bare copper) ground wire to the green ground screw first (see Figure 6). Use a solid copper wire at least as large as the power supply wires.
4. Pull the plug straight out from the terminal board, from 230 Volt socket (Figure 5).
5. Plug in again with arrow on plug pointing to 115 Volts.
6. Change is complete.

NOTICE: Some models are equipped with three phase motors. Three phase motors require magnetic starters and can run in either direction, depending on how they are connected to the power supply.

To Check For Proper Rotation – 3 Phase Motors

▲WARNING Risk of electrical shock.

1. Be sure power is disconnected to motor when working on electrical connections.
2. Remove the motor end cover, exposing motor shaft. Momentarily start pump. If hookup is correct, the shaft will rotate clockwise.
3. If rotation is not clockwise, reverse any two leads to the starter. The rotation will now be correct.

GROUNDING THE MOTOR

Ground the pump permanently using a wire of size and type specified by local or National Electrical Code.

Models (HP7C-01 and HP7D Series Only) with factory installed cord and plug:

▲WARNING Risk of electric shock. This equipment is only for use on 115V and is equipped with an approved 3-conductor cord and 3-prong, grounding-type plug. To reduce the risk of electric shock, be certain that it is connected to a properly grounded, grounding-type receptacle. Do not modify or remove plug. Make sure pump circuit meets National Electrical Code. To avoid dangerous electrical shock hazard, keep cord dry at all times.

Models without cord and plug:

1. Connect ground wire first. Connect the ground first, then to green grounding terminal provided under motor canopy (see Figure 5) identified as GRD. Make ground connection to this terminal. **Do not** connect motor to electrical power supply until unit is permanently grounded; otherwise serious or fatal electrical shock hazard may be caused.
2. For best ground connection, connect to a grounded lead in the service panel or to a metal underground water pipe or well casing at least 10 ft. long. If plastic pipe or insulated fittings are used, run ground wire directly to the metal well casing or use ground electrode furnished by the power company.

MAINTENANCE

Pump Disassembly

▲WARNING Hazardous voltage. Can shock, burn or cause death. Disconnect power to pump before servicing.

Tools required:

1. 7/16" open end wrench (2 required).
2. Flat blade screwdriver with insulated handle.
3. Work bench with vise recommended.
4. Pliers or similar tool.
5. Pipe wrench.

TABLE II - RECOMMENDED FUSING AND WIRING

Motor H.P.	Volts/Phase	Max. Load Amps	Branch Fuse Rating Amps	Wire Length			
				0'-50'	51-100'	101-200'	201-300'
				AWG Wire Size			
1/2	115/230/1	12.4/6.2	20/15	12/14	12/14	10/14	8/14
1/2	230/460/3	3.1/1.55	15/15	14/14	14/14	14/14	14/14
3/4	115/230/1	14.8/7.4	20/15	12/14	12/14	8/14	6/14
3/4	230/460/3	3.6/1.8	15/15	14/14	14/14	14/14	14/14
1	115/230/1	19.2/9.6	25/15	10/14	10/14	8/14	6/12
1	230/460/3	4.7/2.35	15/15	14/14	14/14	14/14	14/14
1-1/2	230/1	12.0	15	14	14	14	12
1-1/2	230/460/3	6.8/3.4	15/15	14/14	14/14	14/14	14/14
2	230/1	10.4	15	14	14	14	14
2	230/460/3	6.0/3.0	15/15	14/14	14/14	14/14	14/14

Impeller Stack Changeout (See Figure 7)

Remove pump from service and mount vertically in vise (if available) motor side down. Hold at center of motor. It may be desirable to wrap motor with a shop rag to protect outside surface.

Proceed as follows:

1. Attach pipe wrench to flats on discharge connection and turn clockwise to remove (left hand threads).
2. Remove screws holding motor canopy and remove canopy. Pull straight off as shown. Leave switch wires attached (if present).

⚠ WARNING Capacitor voltage may be hazardous. To discharge capacitor, hold insulated handle screwdriver **by the handle** and short capacitor terminals together. Do not touch metal screwdriver blade or capacitor terminals.

3. Unscrew capacitor clamp and remove capacitor. Do not disconnect capacitor wires. Slide 7/16" open end wrench in behind spring loaded centrifugal switch as

shown. Place on motor shaft flats to hold shaft stationary.

4. With one 7/16" wrench in place on motor shaft, place second wrench on shaft hex at pump end and unscrew impeller stack by turning counter-clockwise.
5. Once loose from motor shaft, hold shaft by snap ring using a pliers or similar tool, and pull stack from shell. You may have to apply a back and forth motion to break stack loose from shell.

To assemble with replacement impeller stack, keep pump in the vertical position, motor down, and reverse instructions 1 through 5.

Assembly hints:

- A. Apply a soapy water solution to suction and discharge O-Rings to ease seating of shell.
- B. Make sure mechanical shaft seal spring is in proper position on motor shaft.
- C. On three-phase models, apply Loctite No. 271 to motor shaft threads before reinstalling stack.

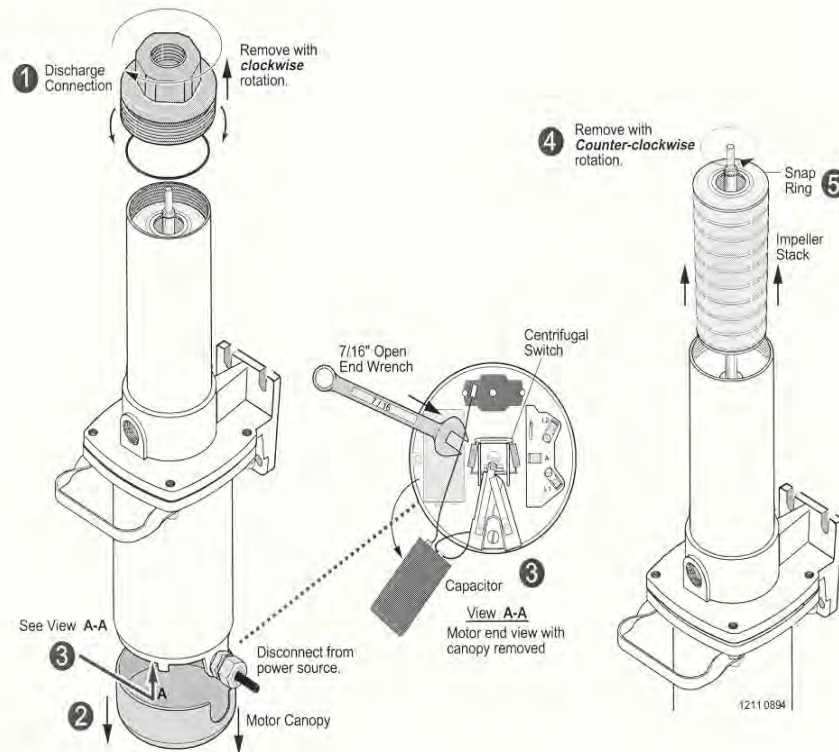


Figure 7 – Impeller stack changeout.

Mechanical Seal Changeout (refer to Figures 7 and 8)

This procedure is best completed with the pump held in a vertical position, motor down. First complete "Disassembly" instructions 1 through 5 under "Impeller Stack Changeout." (see Figure 7).

6. Remove 4 capscrews holding pump body to motor. Pump handle will come off with top capscrews.
7. Unscrew pump shell from pump body, turning clockwise (left hand threads).
8. Remove mechanical shaft seal spring and rotating half from motor shaft. Use care not to scratch motor shaft when removing rotating half.
9. Remove pump body from motor and place on flat surface, face down. Again, use care not to scratch motor shaft.
10. Use a screwdriver to push ceramic seat out from seal cavity as shown.
11. Installation of ceramic seat:
 - A. Turn pump body over so seal cavity is up; clean cavity thoroughly.
 - B. Clean polished surface of ceramic seat with a clean cloth.
 - C. Lubricate outside rubber surface of seat with soapy water. Place cardboard washer over

polished face of seat and press into seal cavity using a 3/4" socket or a piece of 3/4" standard pipe.

- D. Be sure polished surface of seat is free of dirt and has not been damaged by insertion. Remove excess soapy water. Dispose of cardboard washer.
12. Installation of rotating half and spring:
 - A. Reinstall pump body on motor using extreme caution not to hit ceramic portion of seal on motor shaft. Reattach pump body to motor using capscrews. Be sure to reinstall pump handle at this time.
 - B. Inspect shaft to make sure that it is clean.
 - C. Clean face of rotating half of seal with a clean cloth.
 - D. Lubricate inside diameter of rotating half with soapy water and slide onto motor shaft (sealing face first).
 - E. Place spring over motor shaft so it rests on rotating half.
 13. To complete reassembly from this point, reverse instructions 1 through 5 under "Impeller Stack Changeout."

NOTICE: Lubricate suction and discharge O-Rings with soapy water for easier installation of shell.

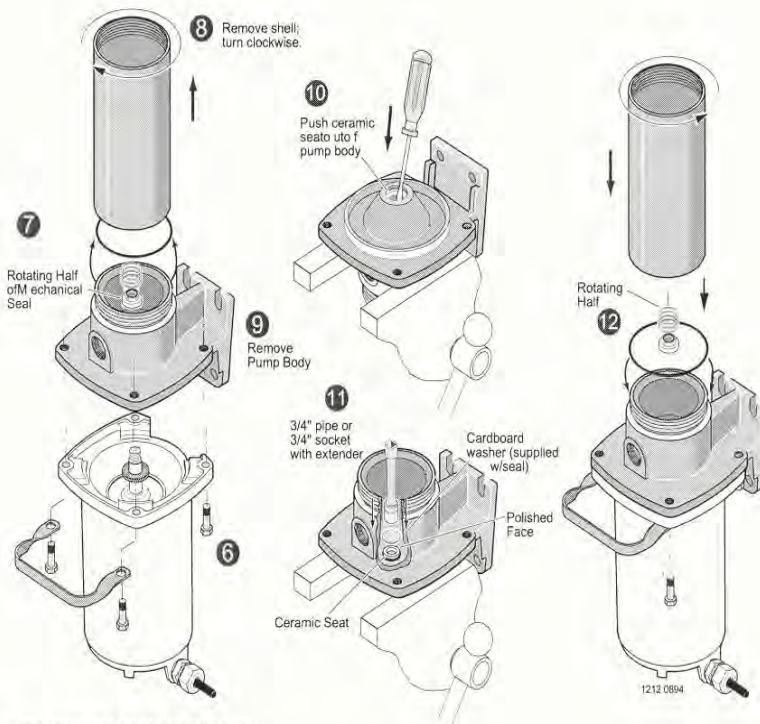


Figure 8 – Mechanical seal changeout.

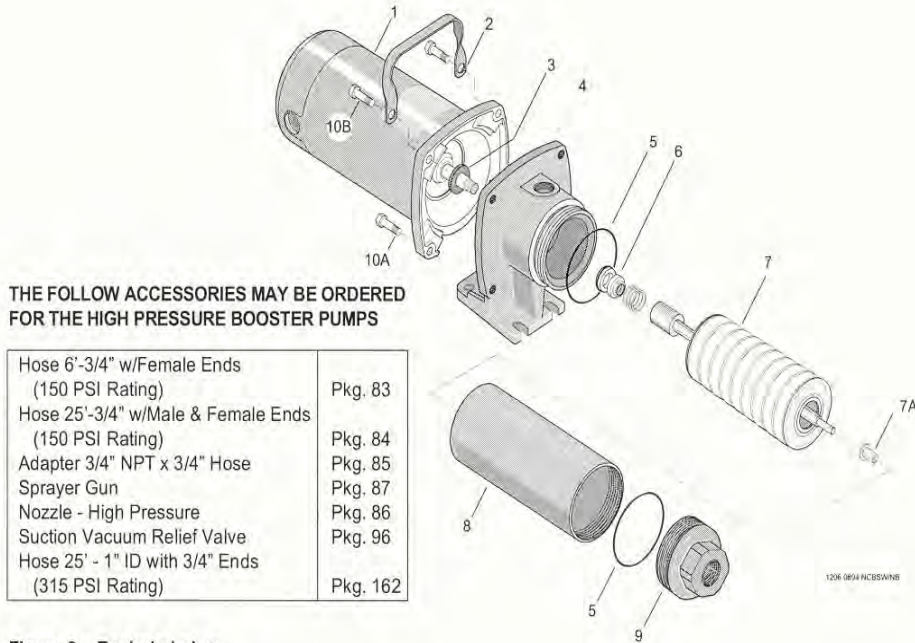
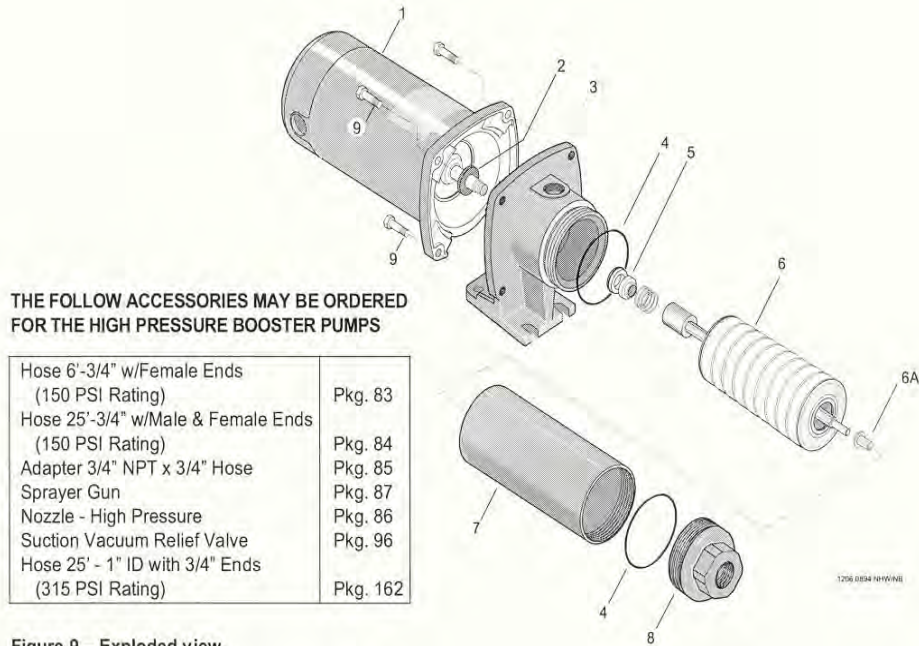


Figure 8 – Exploded view.

REPAIR PARTS LIST (See Page 11 for HP20 Series Repair Parts)

Key No.	Description	Qty.	HP7C-02	HP7D-02	HP7E-02	HP10F-02	HP10G-02
			HP7C3-02	HP7D3-02	HP7E3-02		HP10G3-02
			HP10C3-02	HP10D3-02	HP10E3-02	HP10F3-02	HP10G3-02
			1/2 HP	3/4 HP	1 HP	1-1/2 HP	2 HP
1	Motor - 115/230 Volt, 1 Phase	1	A100DHL	J218-955C	J218-601A	A100GSL	AE100G5L
1	Motor - 230/460 Volt, 3 Phase	1	AP100CH	AP100DL2	AP100EH	AP100FHP	AP100GH
2	Handle (†)	1	C54-21	C54-21	C54-21	—	—
3	Water Slinger	1	17351-0009	17351-0009	17351-0009	17351-0009	17351-0009
4	Pump Body	1	C2-85	C2-85	C2-85	C2-85	C2-85
5	O-Ring	2	U9-430	U9-430	U9-430	U9-430	U9-430
6	Shaft Seal Assembly	1	U9-118	U9-118	U9-118	U9-118	U9-118
7	Pump Stack (7 GPM Pump)	1	P325-422	P325-423	P325-424	—	—
7	Pump Stack (10 GPM Pump)	1	P325-425	P325-426	P325-439	P325-428	P325-429
7A	Nylatron Bearing (included with Key No. 8)	1	W31112	W31112	W31112	W31112	W31112
8	Pump Shell (7 GPM Pump)	1	P56-430SSL	P56-431SSL	P56-432SSL	—	—
8	Pump Shell (10 GPM Pump)	1	P56-460SSL	P56-461SSL	P56-469SSL	P56-452SSL	P56-432SSL
9	Discharge Assembly	1	C152-3	C152-3	C152-3	C152-3	C152-4
10A	Capscrew - 3/8 x 16 x 1-1/4**	2	U30-75ZP	U30-75ZP	U30-75ZP	U30-75ZP	U30-75ZP
10B	Capscrew - 3/8 x 16 x 1-1/2"	2	U30-76ZP	U30-76ZP	U30-76ZP	—	—
#	Cord Connector**	1	U71-7	U71-7	—	—	—
#	Cord**	1	U17-402	U17-1238	—	—	—

* All 10 GPM pumps use (4) U30-75ZP capscrews.
† Handle comes with HP7 series and HP10E series.
** Included with Model Numbers HP7C-01 and the HP7D Series Model Numbers.
Not Illustrated.



THE FOLLOW ACCESSORIES MAY BE ORDERED FOR THE HIGH PRESSURE BOOSTER PUMPS

Hose 6'-3/4" w/Female Ends (150 PSI Rating)	Pkg. 83
Hose 25'-3/4" w/Male & Female Ends (150 PSI Rating)	Pkg. 84
Adapter 3/4" NPT x 3/4" Hose	Pkg. 85
Sprayer Gun	Pkg. 87
Nozzle - High Pressure	Pkg. 86
Suction Vacuum Relief Valve	Pkg. 96
Hose 25' - 1" ID with 3/4" Ends (315 PSI Rating)	Pkg. 162

Figure 9 – Exploded view.

REPAIR PARTS LIST (See Page 11 for HPS20 Series Repair Parts)

Key No.	Description	Qty.	HPS7C-01	HPS7D-01	HPS7E-01	HPS10F-01	HPS10G-01
			HPS7C3-01	HPS7D3-01	HPS7E3-01		HPS10G3-01
			HPS10C-01	HPS10D-01	HPS10E-01	HPS10F3-01	HPS10G3-01
			HPS10C3-01	HPS10D3-01	HPS10E3-01		
			1/2 HP	3/4 HP	1HP	1-1/2 HP	2 HP
1	Motor - 115/230 Volt, 1 Phase	1	A100DHL	A100DHL	A100FLL	A100GSL	AE100G5L
1	Motor - 230/460, 3 Phase	1	AP100CH	AP100DL2	AP100EH	AP100FH	AP100GH
2	Water Slinger	1	17351-0009	17351-0009	17351-0009	17351-0009	17351-0009
3	Pump Body	1	C2-86SS	C2-86SS	C2-86SS	C2-86SS	C2-86SS
4	O-Ring	2	U9-430	U9-430	U9-430	U9-430	U9-430
5	Shaft Seal Assembly	1	U9-118	U9-118	U9-118	U9-118	U9-118
6	Pump Stack (7 GPM)	1	P325-422	P325-423	P325-424	-	-
6	Pump Stack (10 GPM)	1	P325-425	P325-426	P325-439	P325-428	P325-429
6A	Nylatron Bearing (included with Key No. 8)	1	W31112	W31112	W31112	W31112	W31112
7	Pump Shell (7GPM)	1	P56-430SSL	P56-431SSL	P56-432SSL	-	-
7	Pump Shell (10GPM)	1	P56-460SSL	P56-461SSL	P56-469SSL	P56-452SSL	P56-432SSL
8	Discharge Assembly	1	C152-4	C152-4	C152-4	C152-4	C152-4
9	Capscrew 3/8 x 16 x 1-1/4", S.S.	4	U30-75SS	U30-75SS	U30-75SS	U30-75SS	U30-75SS



REVERSE OSMOSIS SYSTEMS

REPAIR PARTS LIST

Key No.	Description	Qty.	HP20E-02 HP20E3-02 1 HP	HP20F-02 HP20F3-02 1-1/2 HP	HP20G-02 HP20G3-02 2 HP
1	Motor - 115/230 Volt, 1 Phase	1	J218-601A	A100GSL	AE100G5L
1	Motor - 230/460 Volt, 3 Phase	1	AP100EH	AP100FHP	AP100GH
2	Handle	1	C54-21	C54-21	C54-21
3	Water Slinger	1	17351-0009	17351-0009	17351-0009
4	Pump Body	1	C2-85A	C2-85A	C2-85A
5	O-Ring	2	U9-430	U9-430	U9-430
6	Shaft Seal Assembly	1	U9-118	U9-118	U9-118
7	Pump Stack	1	P325-336	P325-337	P325-421
7A	Nylatron Bearing (included with Key No. 8)	1	W31112	W31112	W31112
8	Pump Shell	1	P56-433SSL	P56-434SSL	P56-452SSL
9	Discharge Assembly	1	C152-3A	C152-3A	C152-3A
10A	Capscrew - 3/8 x 16 x 1-1/4"	2	U30-75ZP	U30-75ZP	U30-75ZP
10B	Capscrew - 3/8 x 16 x 1-1/2"	2	U30-76ZP	U30-76ZP	U30-76ZP

REPAIR PARTS LIST

Key No.	Description	Qty.	HPS20E-01 HPS20E3-01 1HP	HPS20F-01 HPS20F3-01 1-1/2 HP	HPS20G-01 HPS20G3-01 2 HP
1	Motor - 115/230 Volt, 1 Phase	1	J218-956C	A100GSL	AE100G5L
1	Motor - 230/460, 3 Phase	1	AP100EL2	AP100FH	AP100GH
2	Water Slinger	1	17351-0009	17351-0009	17351-0009
3	Pump Body	1	C2-86SSA	C2-86SSA	C2-86SSA
4	O-Ring	2	U9-430	U9-430	U9-430
5	Shaft Seal Assembly	1	U9-118	U9-118	U9-118
6	Pump Stack (HPS20/1 Phase)	1	P325-440	P325-431	P325-432
6	Pump Stack (HPS20/3 Phase)	1	P325-430	P325-431	P325-432
6A	Nylatron Bearing (included with Key No. 8)	1	W31112	W31112	W31112
7	Pump Shell (HPS20/1 Phase)	1	P56-470SSL	P56-434SSL	P56-452SSL
7	Pump Shell (HPS20/3 Phase)	1	P56-433SSL	P56-434SSL	P56-452SSL
8	Discharge Assembly	1	C152-4A	C152-4A	C152-4A
9	Capscrew 3/8 x 16 x 1-1/4"	2	U30-75ZP	U30-75ZP	U30-75ZP
9	Capscrew 3/8 x 16 x 1-1/2"	2	U30-76ZP	U30-76ZP	U30-76ZP

* The 1 and 2 HP pumps use (4) U40-75SS Capscrews.



REVERSE OSMOSIS SYSTEMS

LIMITED WARRANTY

Sta-Rite warrants to the original consumer of the products listed below, that they will be free from defects in material and workmanship for the Warranty Period from the date of original installation or manufacture as noted.

Product	Warranty Period
Water Systems Products – jet pumps, small centrifugal pumps, submersible pumps and related accessories	<i>whichever occurs first:</i> 1 year from date of original installation, or 2 years from date of manufacture
Con-Aire® Tanks	5 years from date of original installation
Epoxy-Line Tanks	3 years from date of original installation
Sump/Sewage/Effluent Products	1 year from date of original installation, or 2 years from date of manufacture

Our warranty will not apply to any product that has been subject to negligence, misapplication, improper installation or maintenance. In the event a three phase submersible motor is operated with single phase power through a phase converter, or if three-leg ambient compensated, extra-quick trip overload relays of recommended size are not used, our warranty is void.

Buyer's only remedy and Sta-Rite's only duty is to repair or replace defective products (at Sta-Rite's choice). Buyer agrees to pay all labor and shipping charges associated with this warranty and to request warranty service through the installing dealer as soon as a problem is discovered. If warranty service is requested more than 30 days after the Warranty Period has ended, it will not be honored.

STA-RITE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, OR CONTINGENT DAMAGES WHATSOEVER.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES, IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE WARRANTY PERIOD PROVIDED HEREIN.

Certain states do not permit the exclusion or limitation of incidental or consequential damages or the placing of limitations on the duration of an implied warranty, therefore, the limitations or exclusions herein may not apply. This warranty sets forth specific legal rights and obligations, however, additional rights may exist, which may vary from state to state.

Supersedes all previous publications.

Sta-Rite Industries, Inc. 293 Wright St., Delavan, WI 53115

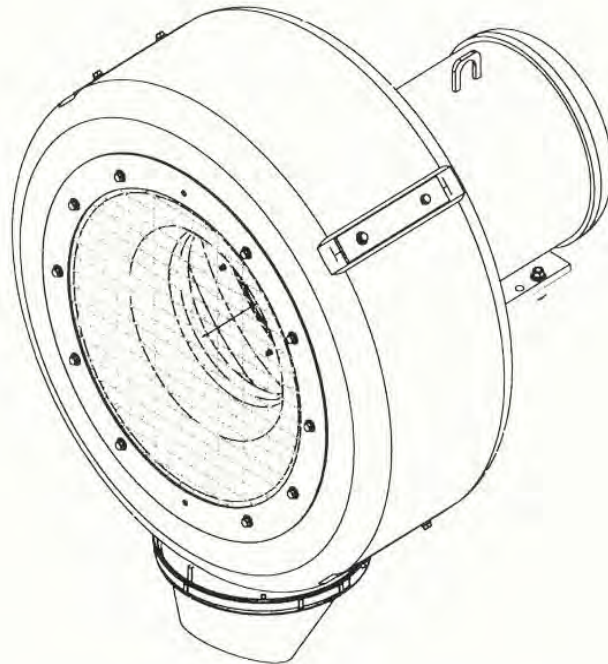
WATER WIZARD 6500

MAC NEIL BLOWERS

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INSTALLATION INSTRUCTIONS

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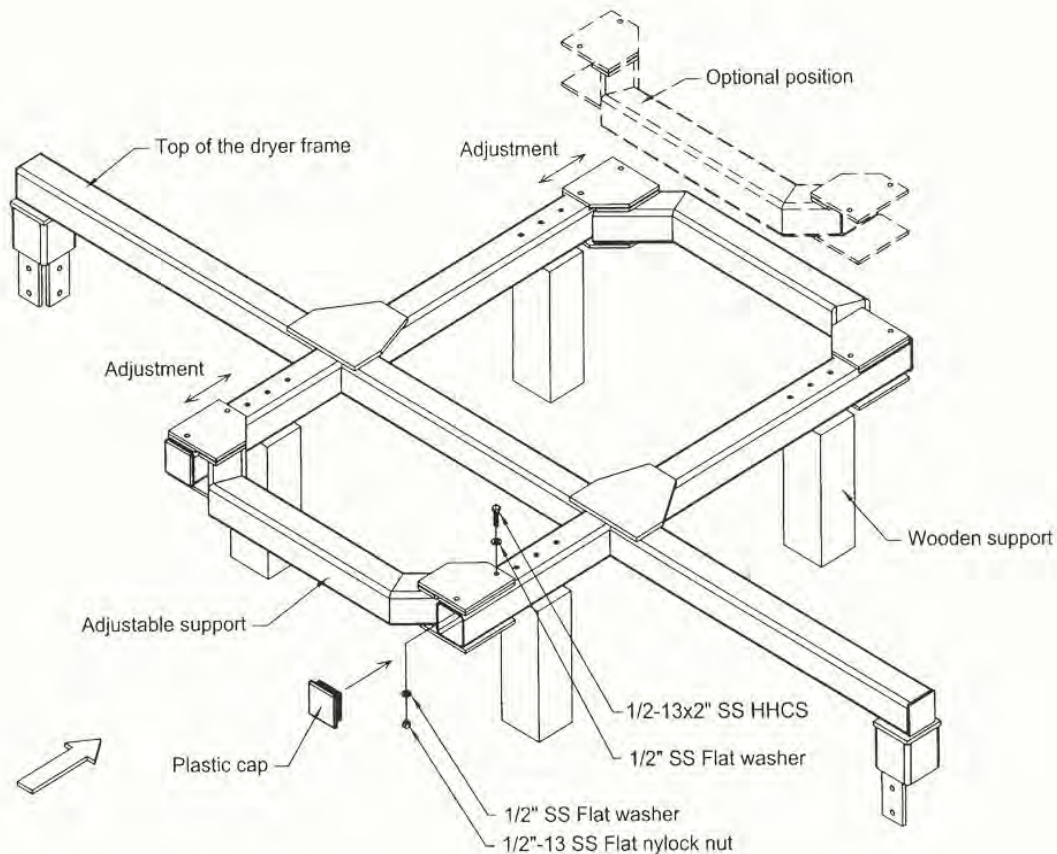
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Any damage to the pro-coated surfaces due to mishandling during setup and installation will automatically void pro-coat warranty.

RD300/RD400

Remove all skids with individual producers, cartons with nozzles and all frame sections from main crate. Place top part of the dryer frame on four wooden blocks or appropriate stands (see illustration below):

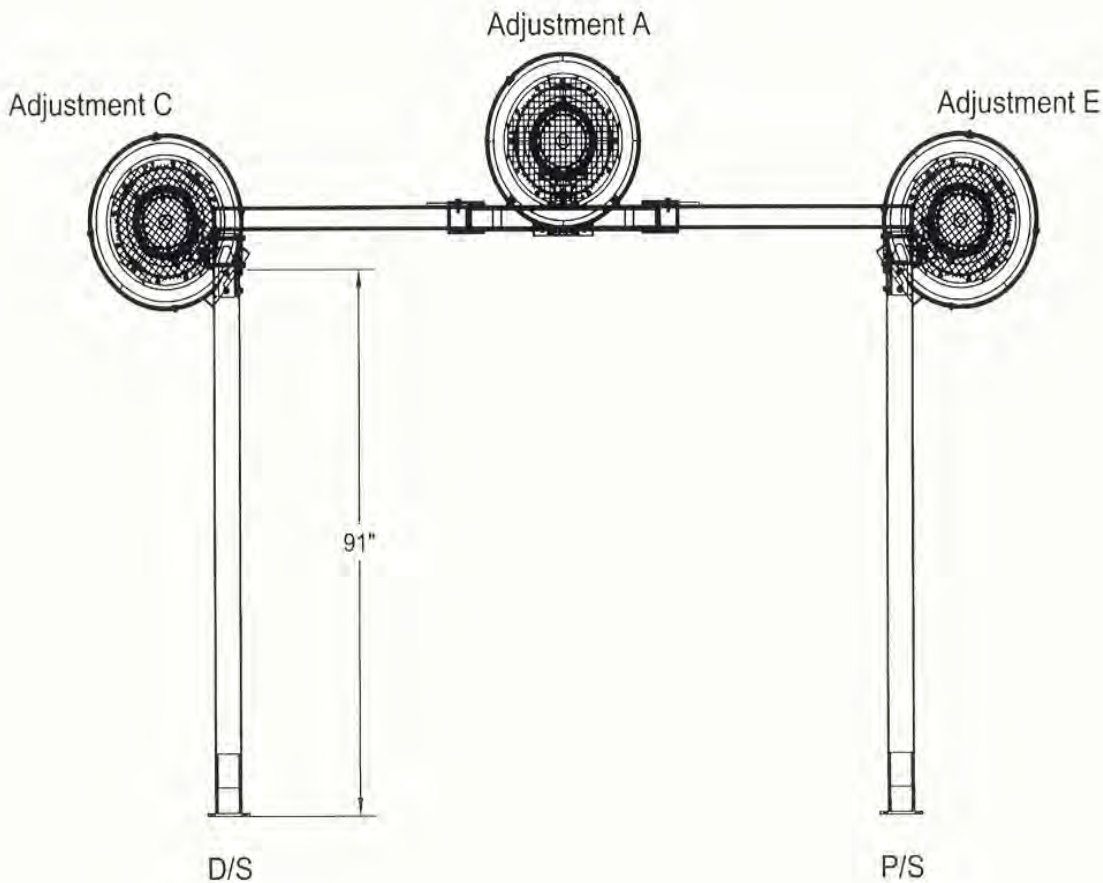
- a) remove plastic caps
- b) remove 1/2" fasteners, that attach support to the frame
- c) position adjustable support as shown on the equipment layout drawing
- d) fasten adjustable support to the frame and reinstall plastic caps



RECOMMENDED TOP FRAME LAYOUT

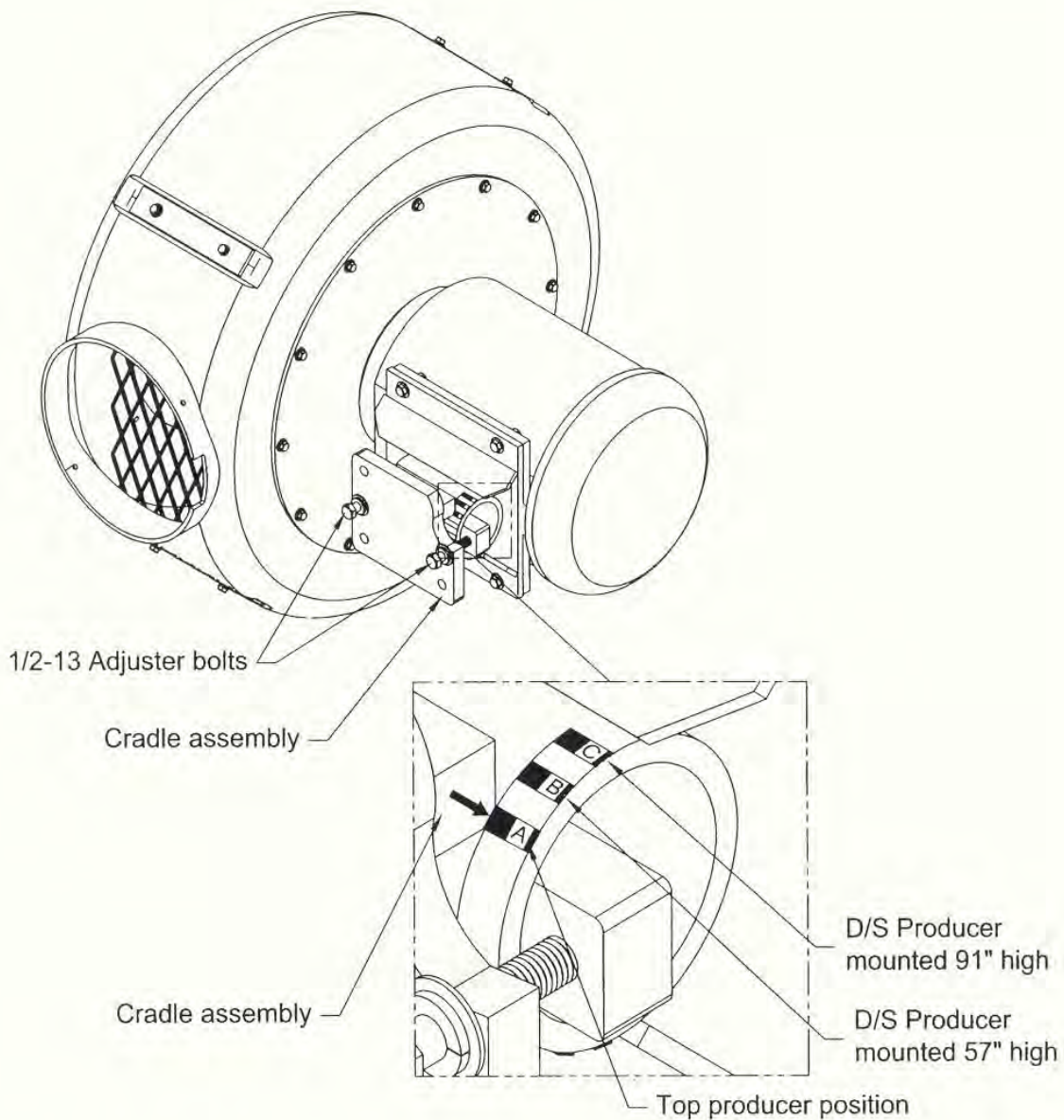
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Remove the producer from individual crate using sufficient lifting device. Each producer weighs approx. 200 lbs. When using the eye on the motor make sure that front of the housing is supported since it won't hold the balance. Do not install dryer nozzles until producers are fully installed on the dryer frame. All producers are the same and will accept smart or fixed nozzle. Adjust position of the motor prior to fastening the producer to the dryer frame. There are five adjustment positions located on the motor mount. Each adjustment corresponds to the location of the producer on the dryer frame - see diagram below for location and page 4 for details.



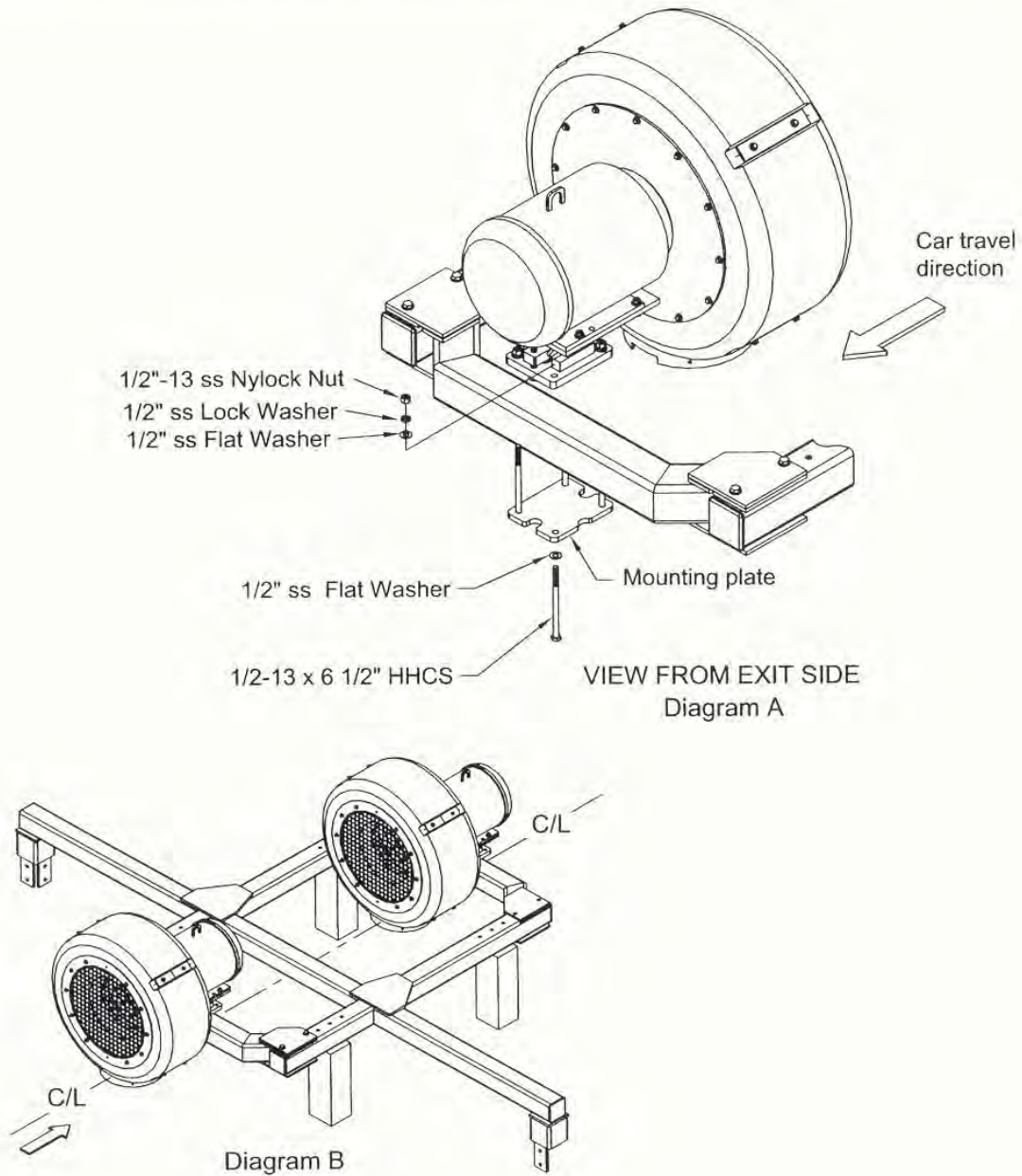
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To adjust the motor mount position, loosen 1/2-13 x 3" long bolts just enough to be able to move the cradle mount. Do not remove the bolts. Turn the cradle assembly until it lines up with proper mark and re-tighten the bolts.



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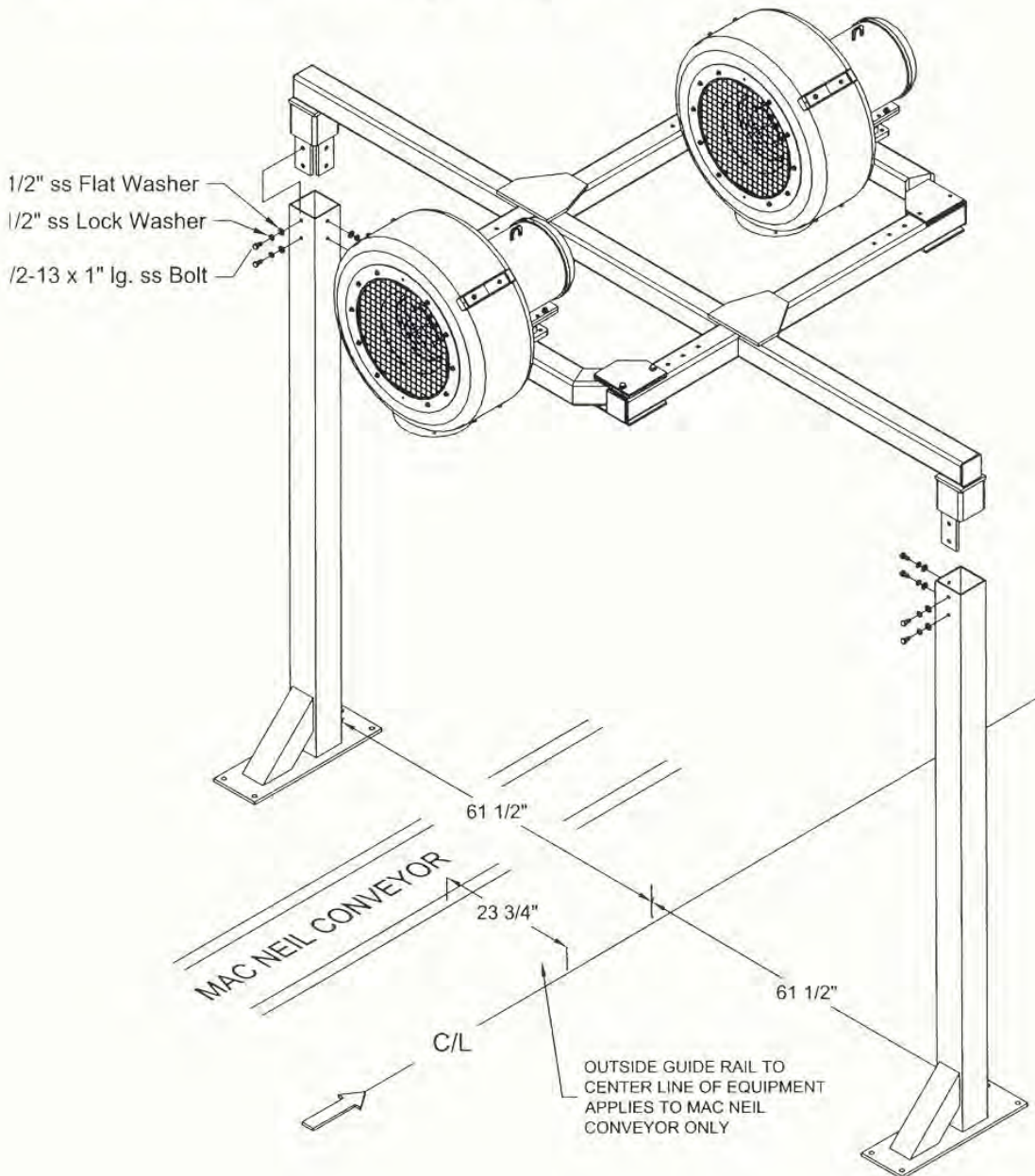
Position the producer in the center of the adjustable support as shown on Diagram B, and fasten it with the supplied hardware (see Diagram A for hardware specifications). In the hardware box you will find two different lengths of 1/2-13 mounting bolts. The 1/2-13 x 6 1/2" long bolts are used to mount the producers to the 4" square adjustable support, and the 1/2-13 x 7 1/2" long bolts are used to mount the producers to the 5" square post.



BLOWER

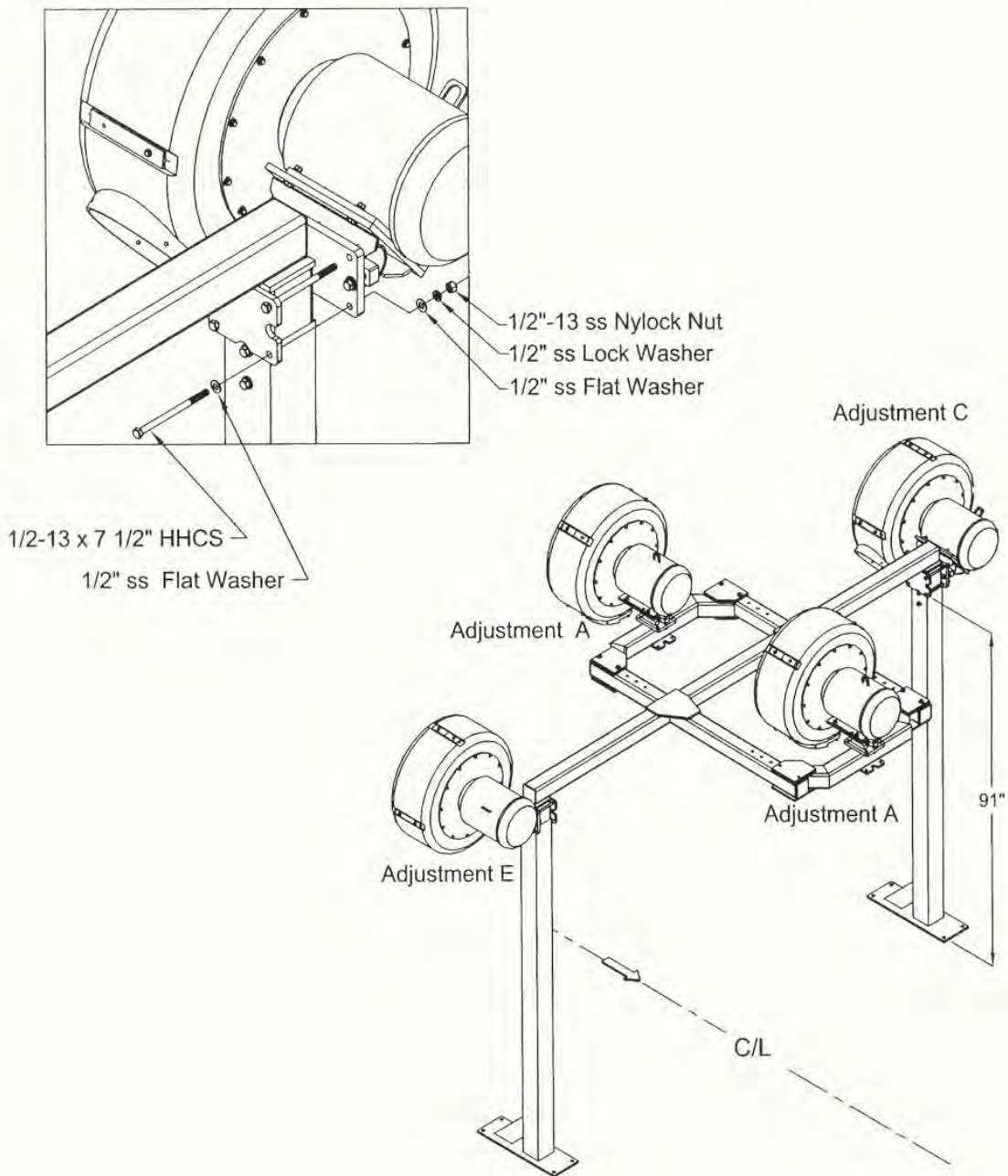
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Place wooden block between the top dryer frame and forklift to prevent powder coat damage. Secure the top frame to the forklift forks with safety belts. Move the frame in to the location specified on the installation layout drawing. Locate D/S and P/S posts. Lift the frame slightly above the dryer posts, and position the posts under the top of the dryer frame. Lower the frame into the posts and fasten it together using the supplied hardware as shown below. Adjust the position of the dryer and level the frame. Anchor both dryer posts to the floor with 3/8" X 2 3/8" long concrete anchor bolts. Do not remove the forklift before ensuring that the dryer frame is firmly secured to the floor.



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Mark the side post with masking tape at 91" from the floor.
 Lift the side producer until the bottom edge of the mounting plate meets with 91" mark.
 Fasten the producer with supplied hardware (please see diagram below for the list of hardware)



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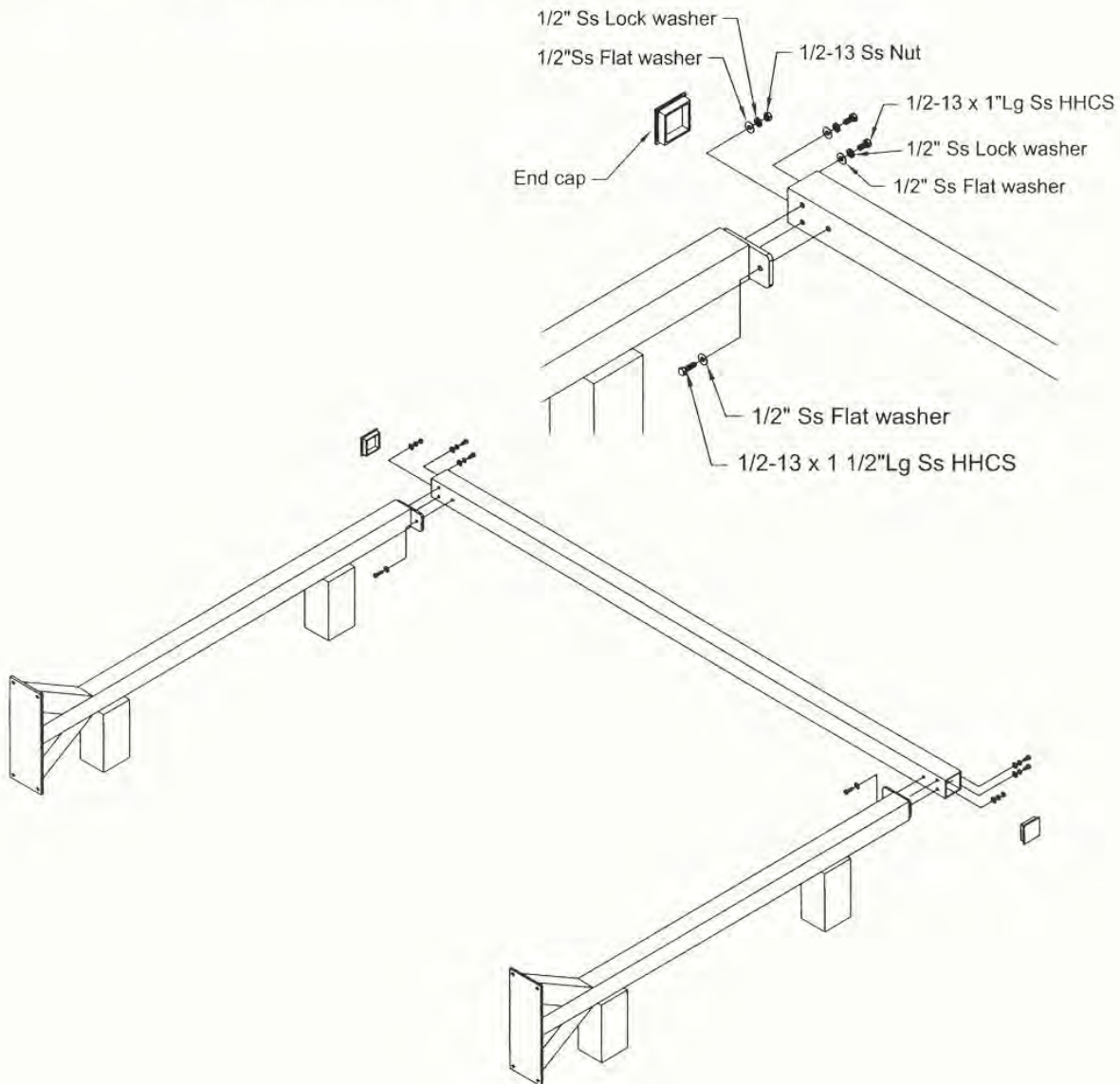
PRO-BUILD ARCH

Remove the Pro-Build Arch side posts and the cross beam from the crate and carry them into the wash bay close to the position indicated the equipment layout drawing. Identify D/S and P/S posts. Set them on a wooden blocks.

Attach dryer cross beam to the posts with supplied hardware shipped in the hardware box.

Follow diagram below for hardware specification and position.

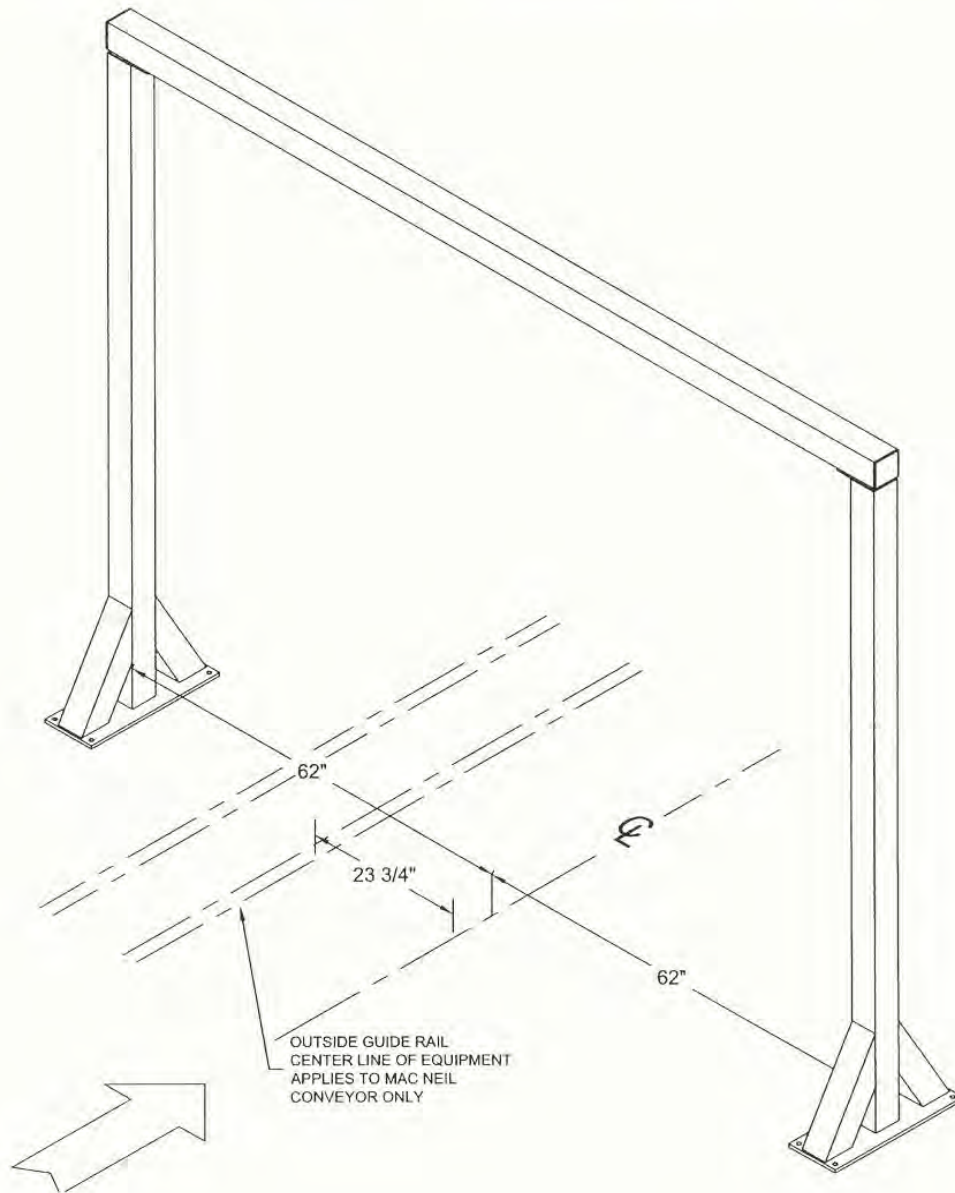
Install the end caps after assembling the frame.



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Lift the arch frame up. Adjust the location to match dimensions on the equipment layout drawing and the diagram below.

Level the arch frame and anchor both dryer posts to the floor with 3/8"x 2 3/8" long concrete anchor bolts. Make sure that the pro-build arch frame is firmly secured before installing the producers.



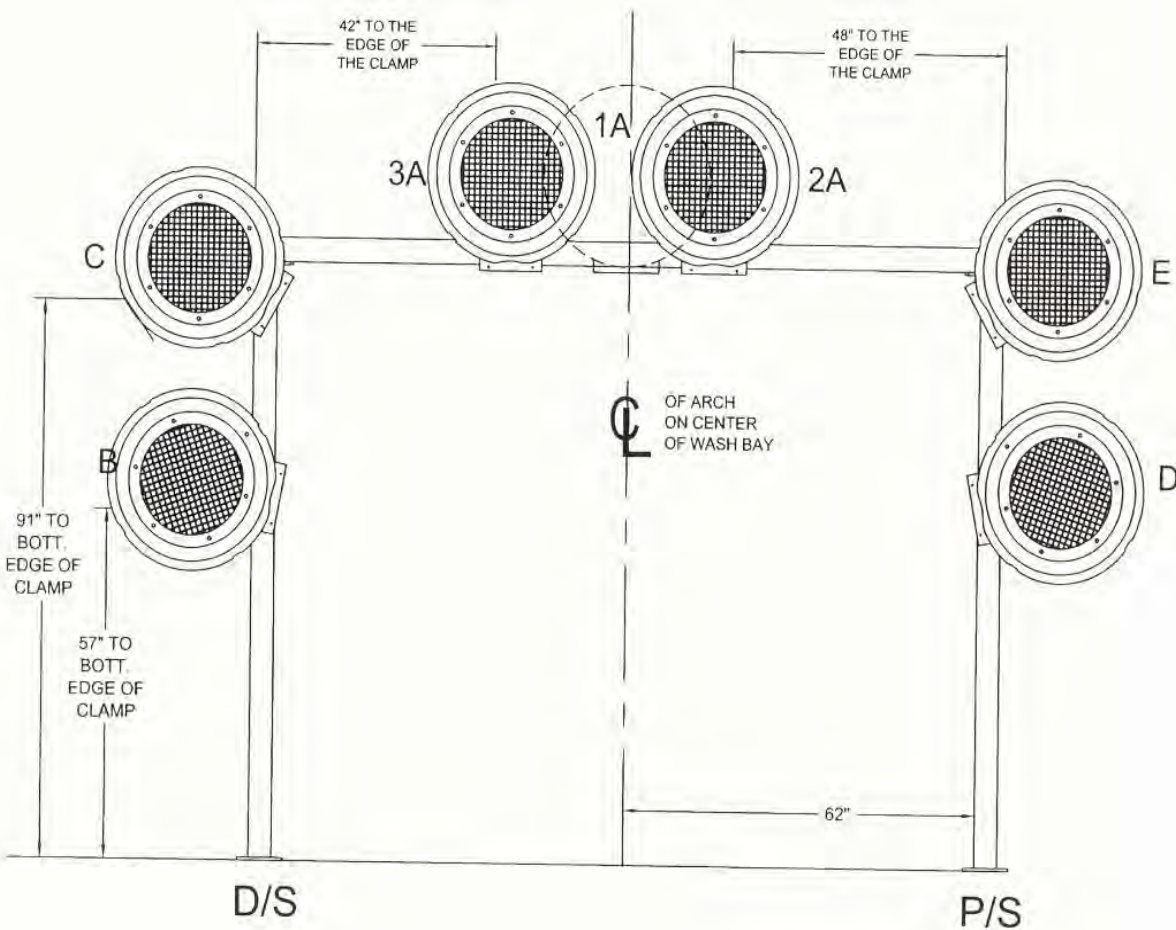
BLOWER

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Before installing the producer on to the Pro-Build Arch frame, please adjust the motor position according to the location on the frame. See page 4 for motor mount adjustment instructions.

Please see the list and the diagram below for the recommended positions of the producers on the Pro-Build Arch.

- POSITION B & D - Dries lower side of a vehicle. (For mirror drying use smart nozzle)
- POSITION C & E - On large vehicles dries sides from upper drip rails down, and on small vehicles dries from windows down.
- POSITION 1A - Dries top of a vehicle
- POSITION 2A - Dries top of a vehicle (passenger side) - dimension not to be less than 42" to the edge of the clamp.
- POSITION 3A - Dries top of a vehicle (driver side) - dimension not to be less than 36" to the edge of the clamp.



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RD200 BOOSTER DRYER

Lift the side post up. Adjust the location to match dimensions on the equipment layout drawing and the diagram below.

Level the post and anchor it to the floor with 3/8"x 2 3/8" long concrete anchor bolts.

Make sure that the posts are firmly secured before installing the producers.

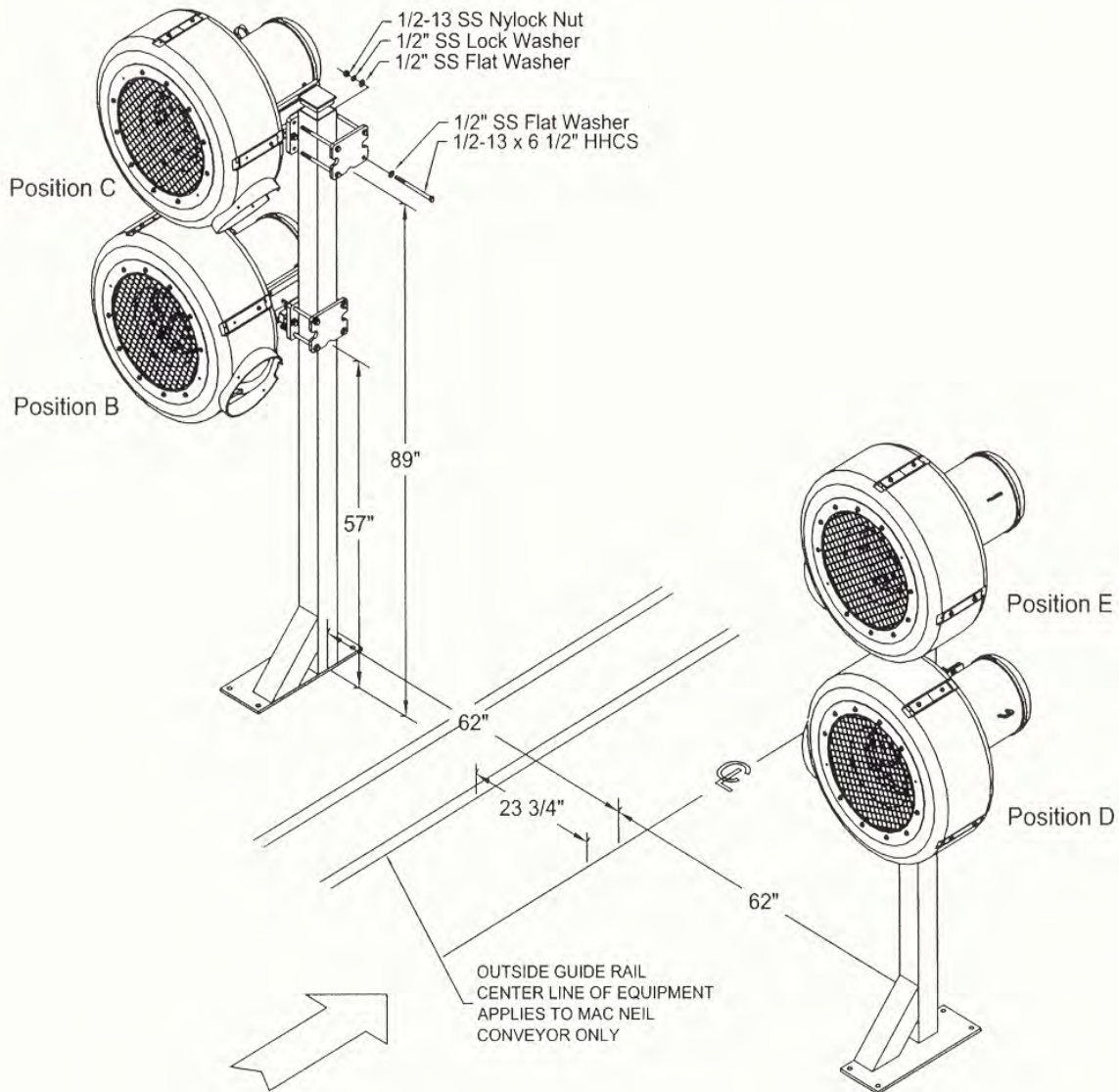
Please adjust the motor mounts according to location on the posts before installation (see page 4 for details).

Use the supplied hardware to mount the producer.

Please see diagram below for hardware specifications and recommended heights.

Position B & D - location for drying lower side of a vehicle (use smart nozzle for mirror drying).

Position C & E - location for drying sides from upper drip rails down on vans and from windows down on small cars.



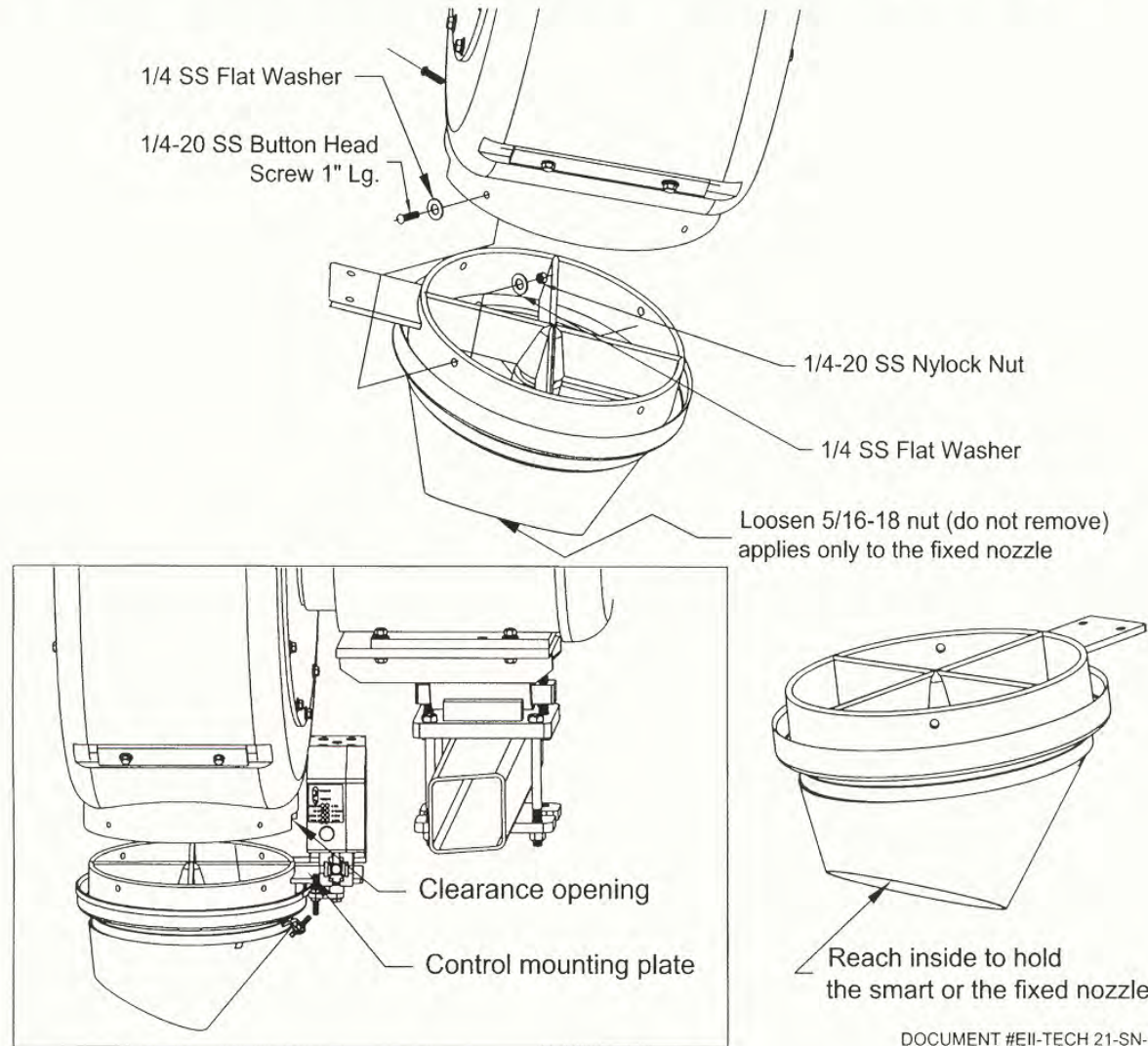
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FIXED / SMART NOZZLE INSTALLATION

Remove the nozzle from the cardboard box. Check the location of the nozzles on the dryer frame as per the dryer layout drawing. There are two types of smart nozzle assemblies DS & PS. They are clearly marked with a yellow decals located on a shipping cardboard box and on a nozzle assembly itself. It is very important to mount proper side smart nozzles on a designated side of the frame to prevent moisture buildup inside the control box. Any type of smart nozzle assembly can be mounted on the horizontal part of the frame.

When attaching the unit to the housing it is recommended to reach in through the outlet opening and grasp the center hub with the spokes between your fingers. Once the four mounting holes are lined up insert the 1/4-20 button head screws from the outside. Loosening the center 5/16-18 nylock nut in the fixed nozzle will allow the nozzle cone to rotate giving better access to install the nuts and the washers on the inside. After installing all the hardware and adjusting the fixed nozzle position (see page 13 for details), retighten the 5/16-16 nylock nuts.

When attaching the smart nozzle to the housing fit the control mounting plate into the clearance opening located at the back of the housing. Attach the nozzle with the supplied hardware. Hardware configuration is the same for the Smart and Fixed nozzle. The smart nozzle does not require position adjustment since it is done through programming.



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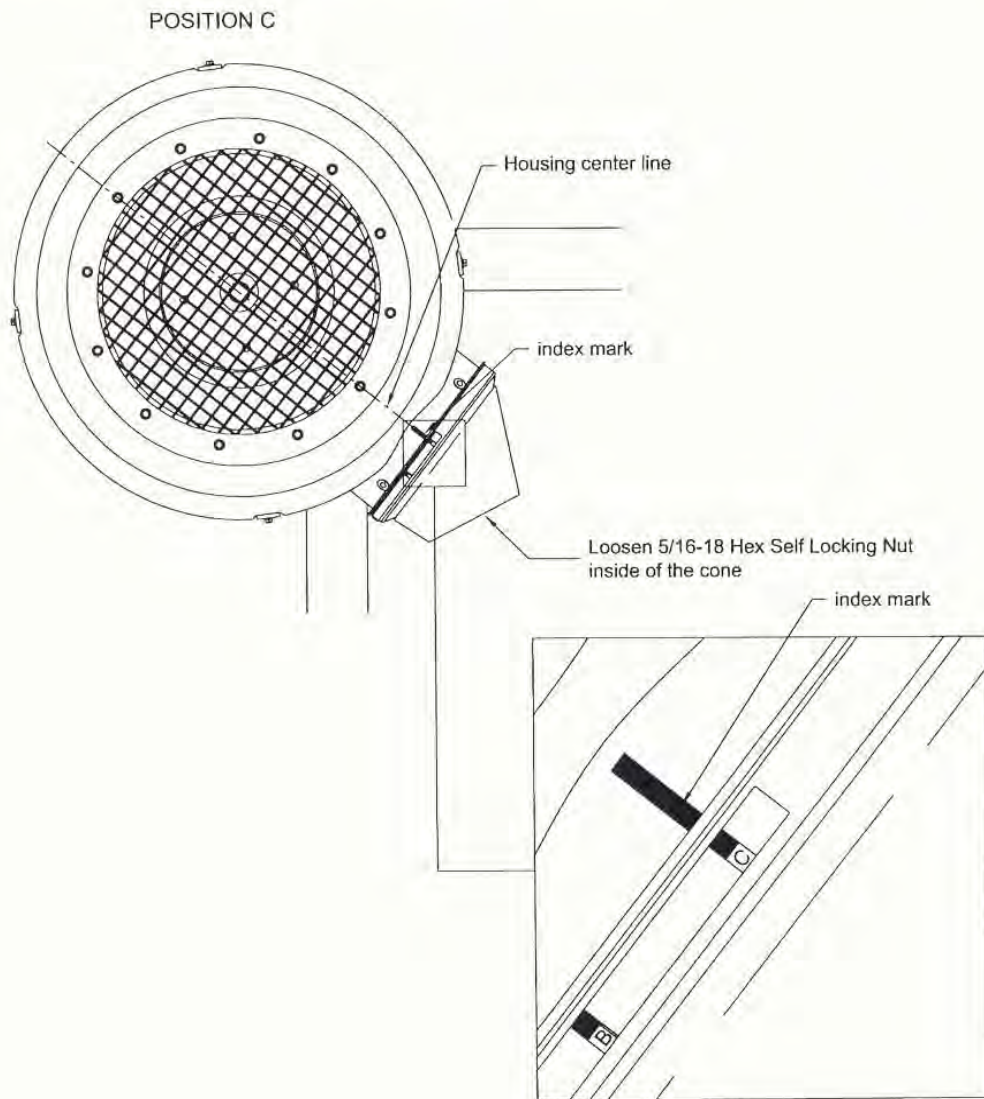
Fixed Nozzle Adjustment:

After the Fixed Nozzle has been attached to the Fan Housing, the air flow angle needs to be adjusted.

Every Fixed Nozzle has a positioning label attached to the rim. There are 5 positions marked on the label: A, B, C, D and E. Each position corresponds to the Producer location on the frame as per the diagram on page 10.

To adjust the nozzle angle loosen 5/16-18 Hex Self Locking Nut inside of the nozzle and turn the cone until proper mark on the label is lined-up with index mark on the housing (please see the diagram below for references). Some older models of the housing do not have an index mark. In that case the mark on the nozzle should be lined up with the front center line of the fan housing.

After adjusting the air flow angle tighten the 5/16-18 Hex Self Locking Nut.



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Electrical Connections for Tech 21 Producers

Each Tech 21 Producer comes with 10 HP electric motor which requires 3-phase electrical power supply.

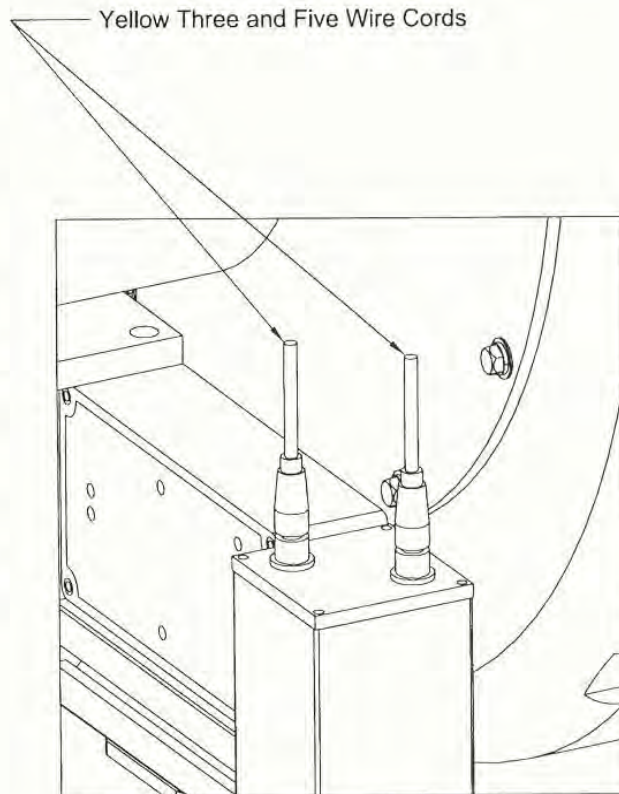
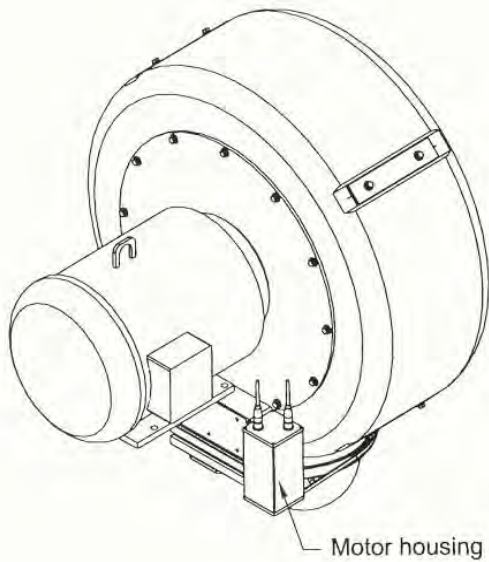
We recommend the following wire sizes for 10 HP Fan Motors (maximum 20 starts per hour):

Volt	Ampere	Wire Size
208 V	31 A	8 AWG
230 V	28 A	8 AWG
460 V	14 A	12 AWG
575 V	11 A	12 AWG

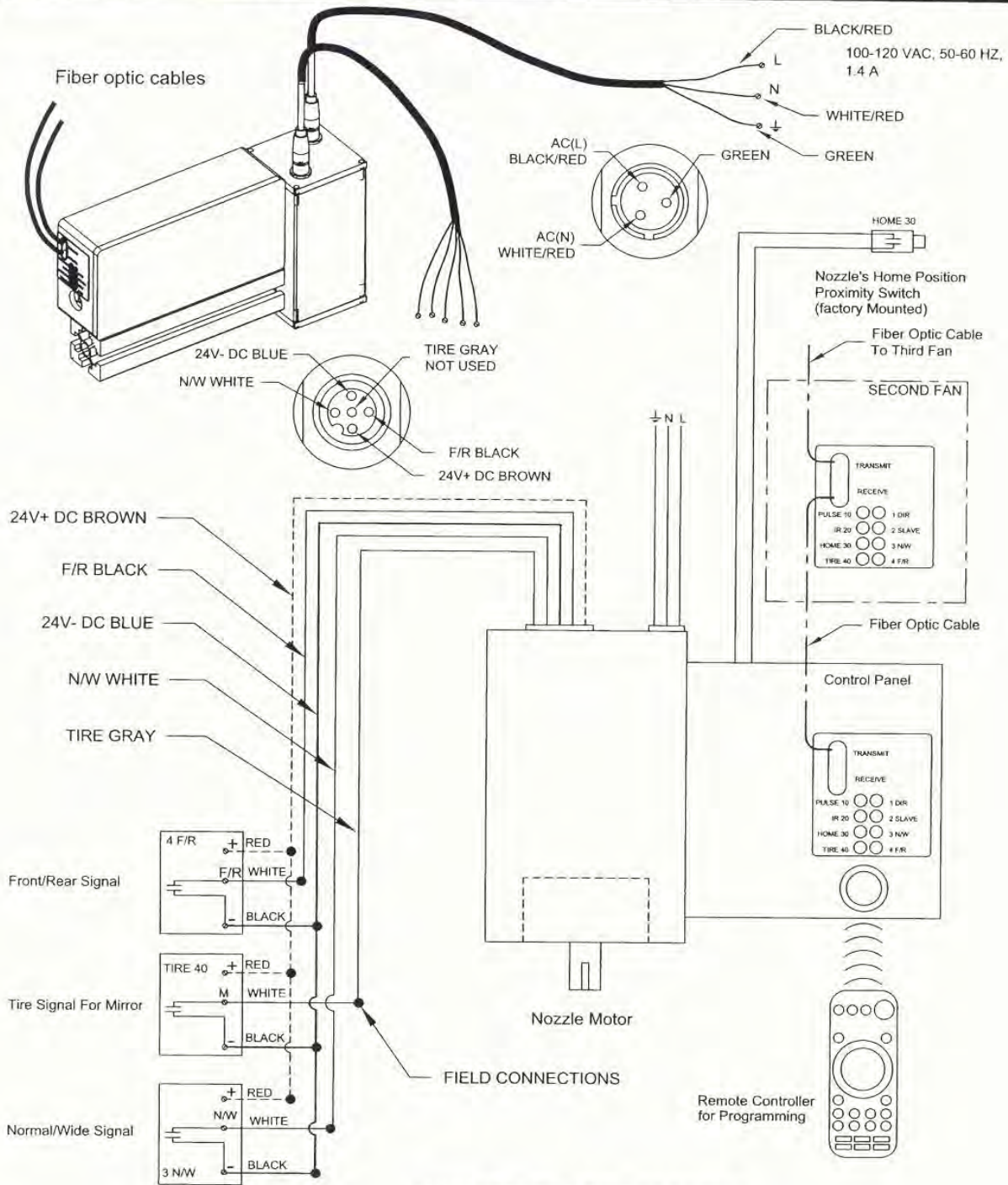
Electrical Connections for the Tech 21 Smart Nozzles

Each Tech 21 Smart Nozzle requires 1-phase 100/120 VAC, 50/60 Hz power supply. Use the Three Wire Yellow Cord, located on Smart Nozzle Motor Housing to Connect the power supply.

The Smart Nozzle must be connected to a Normally Open, dry contact relay on a tunnel controller or Photo-Eye. If you are using Macneil Vehicle Detector and Mirror Drying Detector, run the Five Wire Yellow Cord located on the motor housing of the Smart Nozzle to the Photo Eye Junction Box. To connect the Wires, see the wiring Diagram on page 15 of this document.



	<h1 style="margin: 0;">TECH21</h1> <p style="margin: 0;">JULY 2002</p> <p style="margin: 0;">DRYER INSTALLATION INSTRUCTIONS</p>	<p style="font-size: 2em; margin: 0;">15</p> <p style="font-size: 0.8em; margin: 0;">of</p> <p style="font-size: 2em; margin: 0;">17</p>
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SMART NOZZLE FIELD WIRING DIAGRAM

MAG NEIL WASH SYSTEMS LIMITED	TECH 21 JULY '2002 NOZZLE INSTALLATION INSTRUCTIONS	16 of 17
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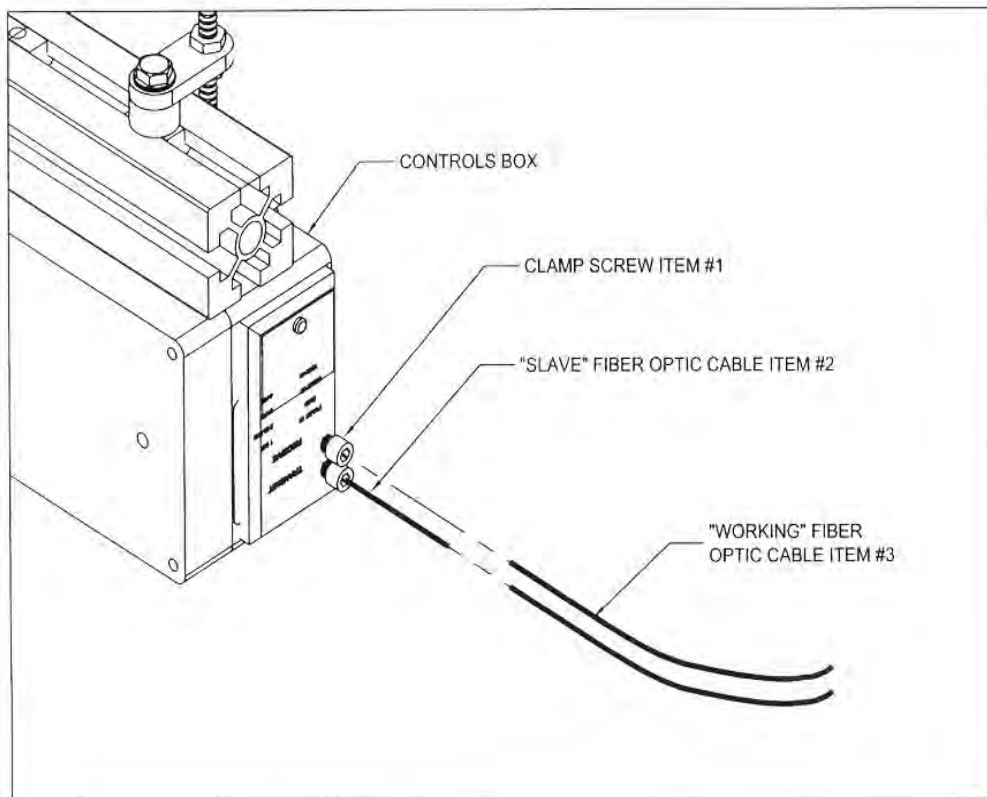
Fiber optic cable connections

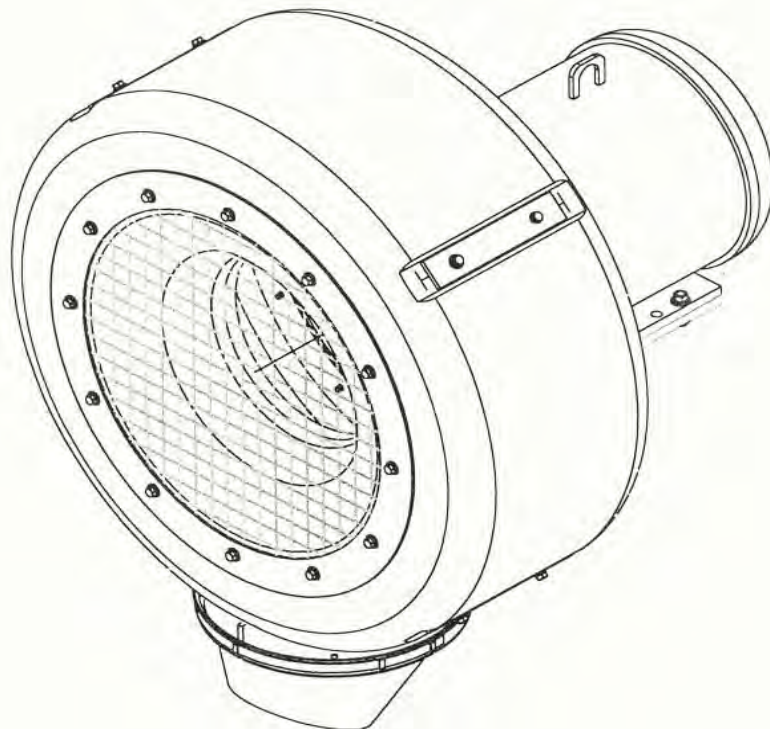
Each Tech 21 Smart Nozzle comes with 20 ft of fiber optic cable.

If there are two or more Smart Nozzles in the car wash tunnel which are less than 20 ft apart they should be synchronized, to achieve maximum drying capabilities. Only the first nozzle in the series requires Photo Eye connections, as the impulses from the Photo Eye Unit are sent to the following smart nozzles through fiber optic cables.

Fiber Optic Cable Termination Guide

- 1) Determine The Required Length Of Fiber Optic Cable Needed To Make The Connection Between Two Nozzles.
- 2) Trim The Cable To The Desired Length, Using A Sharp And Clean Razor Blade. Place The Cable On A Flat Surface And Roll The Cable Under The Razor Blade While Pressing Down On The Blade. This Method Will Give A Clean and Square Cut.
- 3) Loosen The Clamping Screw Item #1 (do not remove it as there is an O ring at the end of it) And Remove The "Slave" Fiber Optic Cable Item #2 And Discard It.
- 4) Insert The "Working" Fiber Optic Cable Item #3 (trimmed) End Into The Hole Of The Clamping Screw, Push It In Until It Bottoms Out. Finger Tighten The Clamping Screw So The Cable Will Not Move In Or Out.





**PROGRAMMING
INSTRUCTIONS
VI.08**

NOTE:

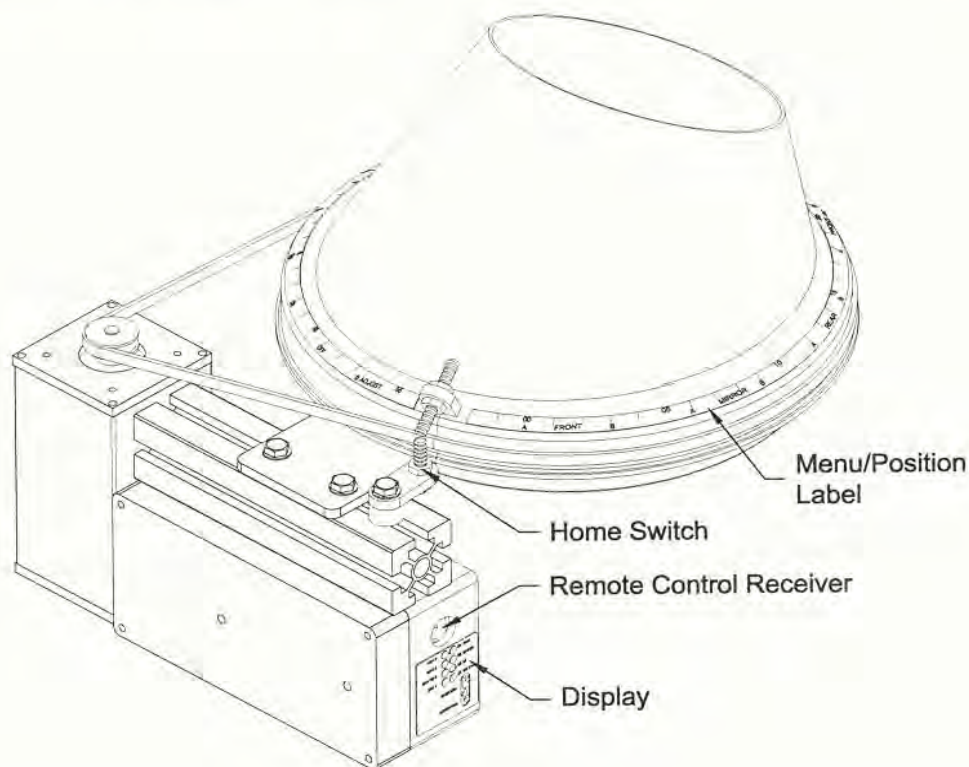
The Tech 21 is shipped from the Factory preprogrammed with default settings which should work in most situations with little modification.

These settings are listed on page 7 along with space to write your modified settings.

Tech 21 v1.08: Introduction to Programming

The Tech 21 is an intelligent vehicle drying system that can detect various aspects of the vehicle moving through the dryer arch. It detects the front of the car to start running when in idle mode. It detects the rear of the car so that it can turn around and dry the back window and bumper of the vehicle. It detects the front tire position so that Tech 21 nozzles mounted on the sides of the arch can turn and dry the mirrors. The Tech 21 has a WIDE vehicle input for wide or tall vehicles so that it can change its patterns to better dry larger vehicles.

All of this sounds complex, but it is relatively simple to program. This is done through a standard Radio Shack or RCA universal TV remote control. Only three of the buttons on the remote are actually used, the Power button for selecting options and for entering and exiting Program mode, and the Volume Up and Down buttons to move between options and positions, etc.



The Tech 21 is marked with a menu/position label on the base of the nozzle. This label displays positions 0 – 59 and 18 menu selections. To read this label, find the Home Switch which is mounted on the Control Box. This switch is the pointer used to determine which menu or position the nozzle is in.

There is also a set of lights on the side of the control box. These lights reflect the

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value shown on the menu/position label at the base of the nozzle. To read these values, add the numbers beside the lights that are on.

Next to the display, there is a round plug that covers the Remote Control Receiver. This plug must be removed to enter program mode. Please remember to replace this plug after you are finished programming the Tech 21.

When in program mode, if you get lost and are not sure if you are in the menu mode or in the position/delay programming mode, it is still possible to determine where you are. Simply press the Volume Up button once followed by the Volume Down button. If you are still in the menu mode, the nozzle will turn three spaces in each direction. If you are in the position/delay programming mode, the nozzle will only move one space in each direction.

There are three modes that are programmable in the Tech 21. FRONT, MIRROR and REAR. Each mode has two positions, A and B. It is these positions that the nozzle cycles back and forth between when running. Each mode has a second set of A and B positions for large vehicles (WIDE mode.)

REAR, MIRROR and WIDE modes also have delays that determine when the nozzle enters and exits these modes. All of the delay values, represent how many $\frac{3}{4}$ second intervals the function will be delayed for. These delays allow the sensors that detect the vehicle to be placed in a convenient location, so that the nozzles can have time to react.

To program FRONT mode you select position A or B in either WIDE mode (red positions on the menu/position label) or narrow mode (blue positions on the label.) Then you adjust them so that the nozzle's sweep will cover the dimensions of the vehicles.

Programming MIRROR mode is similar to programming FRONT mode, except you need to program the delays to determine when the nozzle enters MIRROR mode, and how long it stays there. The MIRROR ON delay determines how long after the front tire of the vehicle activates the tire detector the nozzle waits before entering MIRROR mode. The MIRROR OFF delay determines how long the nozzle will remain in MIRROR mode before it returns to FRONT mode. If you do not want a particular nozzle to enter MIRROR mode at all, you can turn it off by setting the MIRROR OFF delay to 0.

Programming REAR mode is the same as programming MIRROR mode. The REAR ON delay determines how long after the vehicle has left the FRONT/REAR sensor that the nozzle enters REAR mode. The REAR OFF delay determines how long the nozzle will stay in REAR mode. If you do not want a particular nozzle to enter REAR mode at all, you can turn it off by setting the REAR OFF delay to 0.

Once the positions and delays have been set for FRONT, MIRROR and REAR modes you need to program the delays for WIDE mode. WIDE mode functions the same as narrow mode, entering the FRONT, MIRROR and REAR modes as usual. The only difference is that it uses a wider set of positions to better dry larger vehicles. The WIDE ON delay determines how long after a large vehicle enters and exits the WIDE vehicle detector the nozzle waits before entering changing to or from WIDE mode. The WIDE OFF delay increases the amount of time the nozzle stays in WIDE mode after the vehicle exits the detector. To turn off WIDE mode all together, set the WIDE OFF delay to 29.

Tech 21 v1.08: Changing Program Values

To program the Tech 21:

1. Expose the Remote Control Receiver by removing the round plug next to the display on the Tech 21 Control Box.
2. Push and hold the Power button on a Radio Shack or RCA universal remote control, while pointing it at the Remote Control Receiver. The unit will then proceed to menu 0 or 'FRONT A.'
3. Use the Volume Up and Down buttons to move between the selections in the menu.
4. When you have selected the option you want to change, press the Power button again.
5. If you selected to change a position, the nozzle will move to that position. If you selected to change a delay, the nozzle will move so the menu/position label will indicate the number of $\frac{3}{4}$ second intervals in the delay. The delay/position number will also be indicated on the lights. Use the Volume up and down buttons to change this number to the desired value.
6. When you are done, press the Power button again, and the nozzle will resume normal operation.

NOTE 1: The "Tech 21 v1.08: Default Settings" page is an area where you can write down your new settings. Write these values in pencil because you may change them in the future.

NOTE 2: The nozzle must be powered up to Program the settings, but the fan does not need to be on.

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Tech 21 v1.08: Initial Setup

Rear Mode

If you do not want the nozzle to enter REAR mode at all, program the REAR OFF delay to 0 and skip this section.

1. Turn the MIRROR sensor away from the reflector so it can not detect tires. It's input light will stay on.
2. Send a car through the tunnel, and watch when the nozzle changes to REAR mode. If it is too early, you need to lengthen the REAR ON delay, if it is too late, you need to shorten it.
3. Program the REAR ON delay. Change the delay up or down as determined in the previous step.
4. Repeat steps 2 and 3 until the nozzle is entering REAR mode at the proper point on the car.
5. Send another car through the tunnel. Watch how long the nozzle stays in REAR mode. If it is too short, you need to increase the REAR OFF delay, if it is too long, you need to decrease it.
6. Program the REAR OFF delay. Change the delay up or down as determined in the previous step.
7. Repeat steps 5 and 6 until the nozzle is leaving REAR mode at the proper point on the vehicle.
8. Return the MIRROR sensor to its proper position pointing at its reflector.

Mirror Mode

If you do not want the nozzle to enter MIRROR mode at all, program the MIRROR OFF delay to 0 and skip this section.

1. Send a car through the tunnel. Watch where on the car the nozzle is pointing when it enters MIRROR mode. If it is too early, you need to lengthen the MIRROR ON delay, if it is too late, you need to shorten it.
2. Program the MIRROR ON delay. Change the delay up or down as determined in the previous step.
3. Repeat steps 1 and 2 until the nozzle is turning to MIRROR mode at the correct position on the vehicle.
4. Send another car through the tunnel. Watch how long the nozzle stays in MIRROR mode. If it is too short, you need to increase the MIRROR OFF delay, if it is too long, you need to decrease it.
5. Program the MIRROR OFF delay. Change the delay up or down as determined in the previous step.
6. Repeat steps 4 and 5 until the nozzle is exiting MIRROR mode at the correct position

on the vehicle.

Wide Mode

If you do not want the nozzle to enter WIDE mode at all, program the WIDE OFF delay to 29 and skip this section.

1. Send a pickup truck or van through the tunnel. Watch where on the truck the nozzle is pointing when it enters WIDE mode. If it is too early, the WIDE ON delay needs to be lengthened, if it is too late, it needs to be shortened.
2. Program the WIDE ON delay. Change the delay up or down as determined in the previous step.
3. Repeat steps 1 and 2 until the nozzle is entering WIDE mode at the correct position on the vehicle.
4. Send another truck or van through the wash. Watch how long the nozzle stays in WIDE mode. If it stops too soon, the WIDE OFF delay needs to be lengthened, if it is too late, it needs to be shortened. Note that the nozzle remains in wide mode for as long as the WIDE mode input was active. If you wish to extend the time that it stays in wide mode, increase the WIDE OFF delay. If you do not wish WIDE mode to activate at all, set the WIDE OFF delay to 29.
5. Program the WIDE OFF delay. Change the delay up or down as determined in the previous step.
6. Repeat steps 4 and 5 until the nozzle is exiting WIDE mode at the correct position on the vehicle.

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**Tech 21 v1.08:
Default Settings**

NOTE : to read the number from the Tech 21 Display, Add the values next to the lights that are on.

Narrow			Wide			Delays		
		User			User			User
Front A	48	_____	Front A	42	_____	Rear On	4	_____
Front B	2	_____	Front B	8	_____	Rear Off	4	_____
Mirror A	22	_____	Mirror A	18	_____	Mirror On	4	_____
Mirror B	28	_____	Mirror B	32	_____	Mirror Off	4	_____
Rear A	18	_____	Rear A	12	_____	Wide On	4	_____
Rear B	32	_____	Rear B	38	_____	Wide Off	4	_____

Offset

Display 1
Value 500

Tech 21 v1.08 Menu Values

These are the values displayed when selecting menu options.

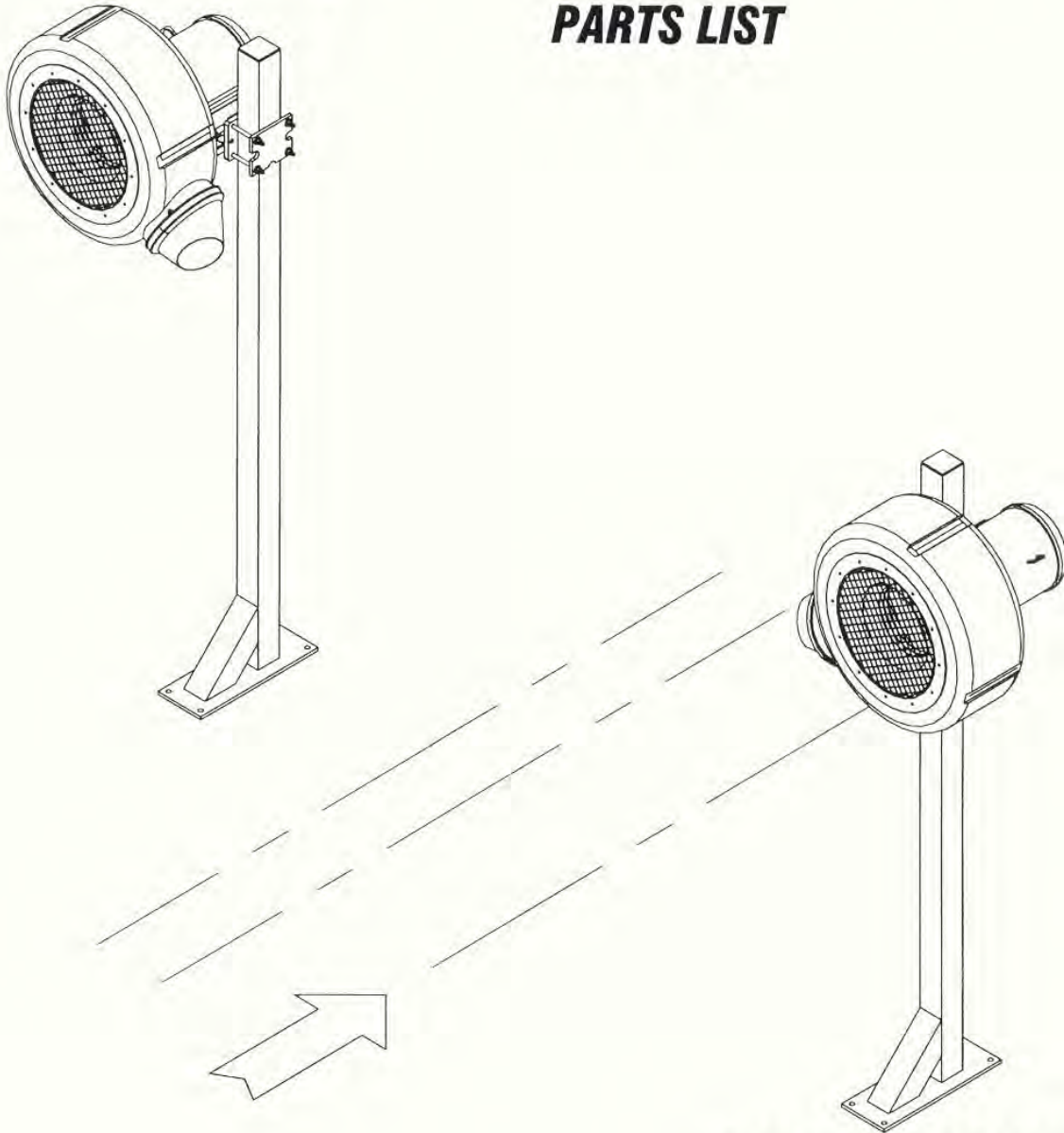
Narrow		Wide		Delays	
Front A	0	Front A	18	Rear On	36
Front B	3	Front B	21	Rear Off	39
Mirror A	6	Mirror A	24	Mirror On	42
Mirror B	9	Mirror B	27	Mirror Off	45
Rear A	12	Rear A	30	Wide On	48
Rear B	15	Rear B	33	Wide Off	51



**PARTS LIST NO.: EPL-RD200 REV."B"
JULY 2002**

RD-200 Tech 21 Dryer

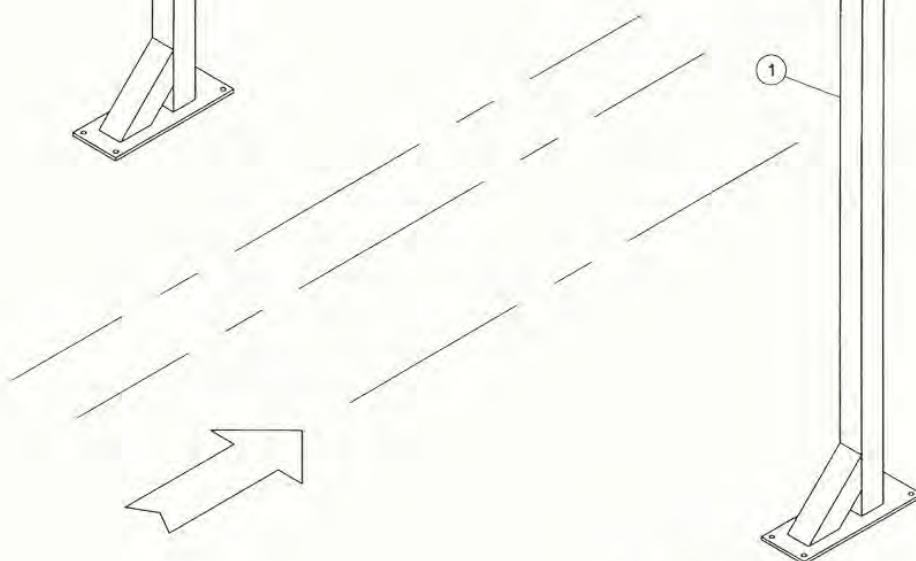
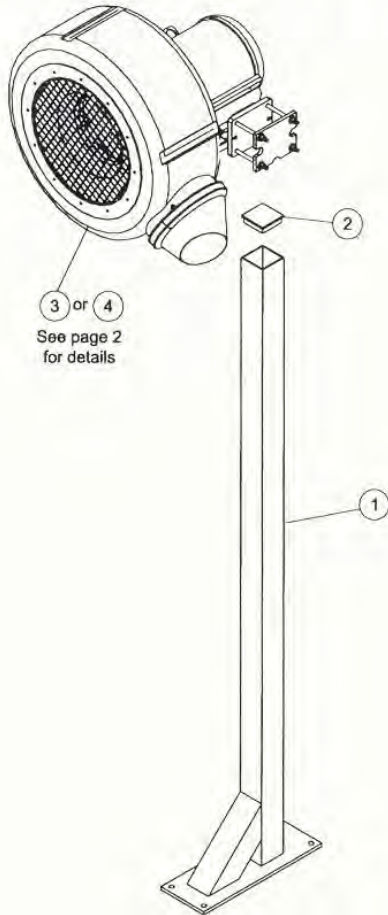
PARTS LIST



MACNEIL WASH SYS.

RD-200 Tech 21 Dryer

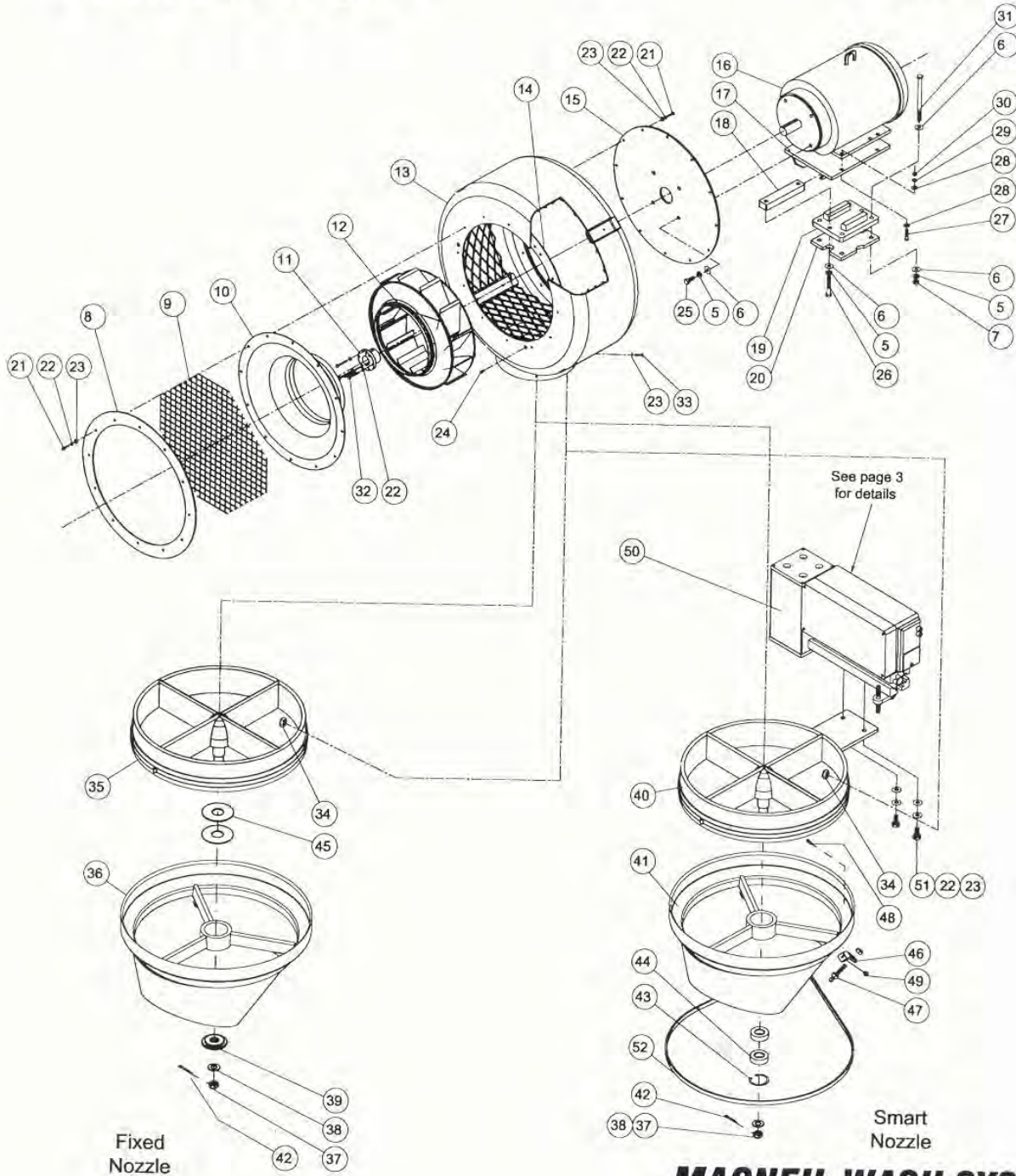
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MACNEIL WASH SYS.

RD-200 Tech 21 Dryer

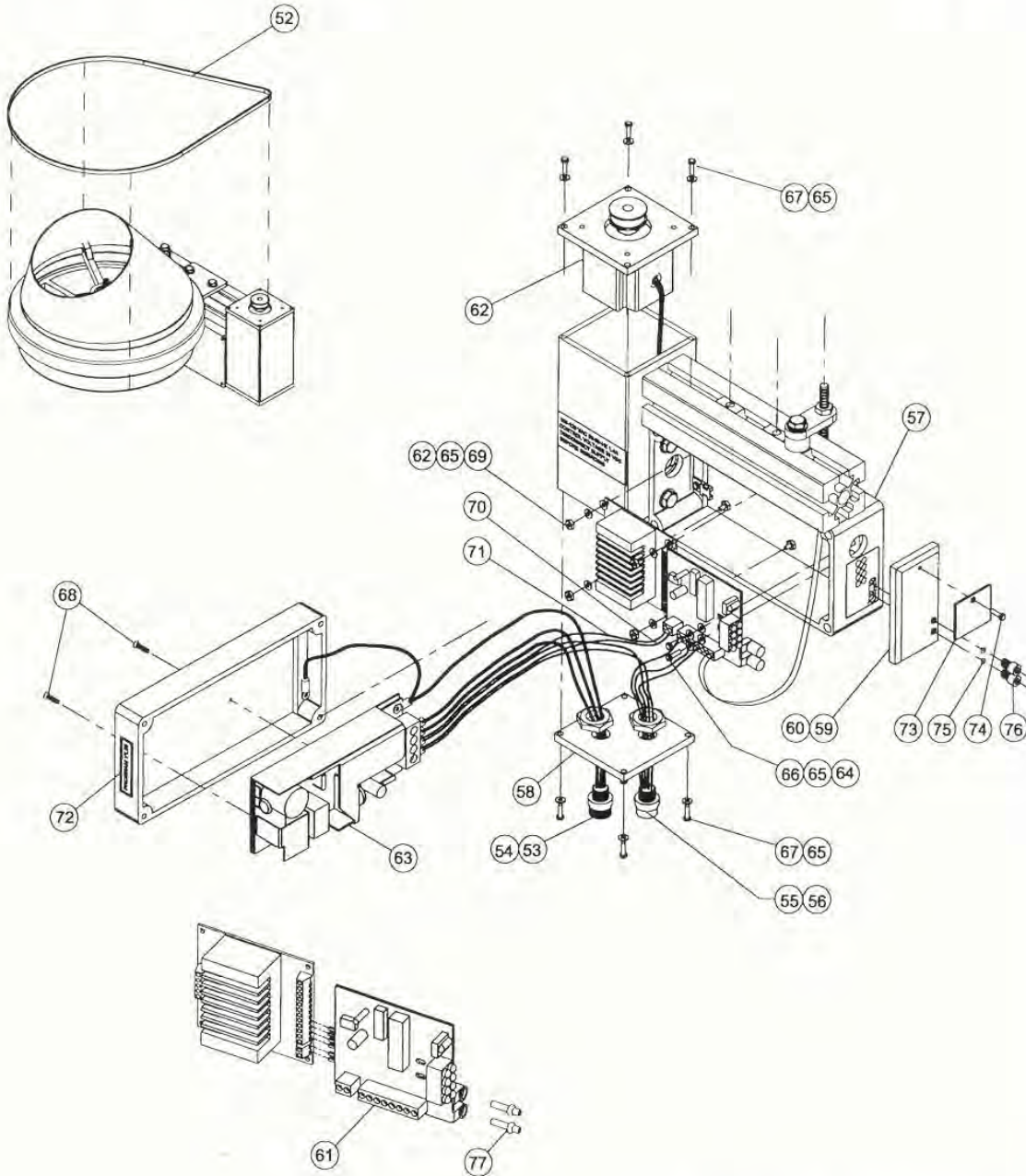
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RD-200 Tech 21 Dryer

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TECH-21 DRYER**

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
1	1	Side Booster Dryer Post Assembly	65-030-00-SG	
2	2	Tube End Cap	65-350-00-PP	
3a	1	Fan Ass'y 10HP-Fixed Noz. 230/460V-4" Post	65-7FN-230-04	
3b	1	Fan Ass'y 10HP-Fixed Noz. 575V-4" Post	65-7FN-575-04	
4a	1	Fan Ass'y 10HP-Smart Noz. 230/460V-4" Post	65-7SN-230-LH / RH	One Left, one Right
4b	1	Fan Ass'y 10HP-Smart Noz. 575V-4" Post	65-7SN-575-LH / RH	One Left, one Right
5	16	Washer SS Lock 1/2"	80-908-000-SI	
6	20	Washer SS Flat 1/2"	80-208-000-SI	
7	4	Nylock Nut SS 1/2"-13	85-008-000-SIC	
8	1	Fan Inlet Ring	65-700-10-PP	
9	1	Fan Inlet SS Wire Mesh	65-700-07-PP	
10	1	Fan Inlet Cone	65-700-04-PP	
11	1	QD Bushing Browning #SD 1-3/8"	65-716-02-PP	
12	1	Fan Wheel Assembly Complete	65-716-00-MP	
13	1	Fan Housing Assembly	65-714-00-MP	
14	2	Retaining Ring	65-714-01-MP	
15	1	Fan Back Plate	65-700-02-PP	
16a	1	Motor Electric 10HP 3PH 230/406V	70-700-00-PP	
16b	1	Motor Electric 10HP 3PH 575V	70-700-04-PP	
17	1	Pivot Assembly-Motor Mount	65-704-00-SG	
18	1	Clamping Bar-Motor Mount	65-700-14-ZN	
19	1	Clamp/Cradle Assembly-Motor Mount	65-703-00-SG	
20	1	Plate-Motor Mount Clamp	65-700-15-SG	
21	24	HHCS SS 1/4"-20 x 1"	82-504-016-SIC	
22	30	Washer SS Lock 1/4"	80-904-000-SI	
23	30	Washer SS Flat 1/4"	80-104-000-SI	
24	6	Screw SS Flat-Head Phl. 1/4"-20 x 5/8"	83-604-010-SIC	
25	4	HHCS SS 1/2"-13 x 1-1/4"	82-508-020-SIC	
26	2	HHCS PL 1/2"-13 x 3"	82-508-048-ZIC	
27	4	HHCS SS 3/8"-16 x 1-1/2"	82-506-024-SIC	
28	8	Washer SS Flat 3/8"	80-106-000-SI	
29	4	Washer SS Lock 3/8"	80-906-000-SI	
30	4	Nut SS Nylock 3/8"-16	85-006-000-SIC	
31	4	HHCS PL 1/2"-13 x 6-1/2" GR5	82-508-104-ZIC	
32	4	HHCS Full Thread 1/4"-20 x 1-3/4" LG. SS	82-604-028-SIC	
33	4	Screw SS Button-HD 1/4"-20 x 1"	83-204-016-SIC	
34	4	Nut SS Nylock 1/4"-20	85-004-000-SIC	
35	1	Fixed Bearing Wheel Assembly	65-744-00-MP	
36	1	Fixed Discharge Nozzle Assembly	65-780-20-MP	
37	1	Nylock Nut SS 5/16"-18	82-005-000-SIC	

MACNEIL WASH SYS.

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TECH-21 DRYER**

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
38	1	Washer SS Lock 5/16"	80-905-000-SI	
39	1	Hub Cap Fixed Nozzle	65-708-02-MP	
40	1	Smart Bearing Wheel Assembly	65-722-00-MP	
41	1	Smart Discharge Nozzle Assembly	65-780-30-MP	
42	1	Pin SS Cotter 5/64" X 1"	86-056-012-SI	
43	1	Retaining Ring (35000-01250)	65-706-03-PP	
44	2	Ball Bearings SS 6002-2RS	90-195-01-PP	
45	2	3/4" Flat Washer SS	80-512-000-SI	
46	1	Magnet Bracket	65-706-06-BK	
47	1	Magnet 57065-000 ND	65-718-11-PP	
48	1	#8-32 x 3/4" Pan HD Screw SS	83-508-012-SNC	
49	1	#8-32 Nylock Nut SS	85-008-320-SIC	
50	1	SN Drive & Control Assembly	65-718-00-MP	
51	2	HHCS 1/4-20 x 3/4" SS	82-504-012-SIC	
52	1	Drive Belt	65-718-05-PP	
53	1	Connector Male Recpt 3P (7R306A19A1201)	70-065-03-PP	
54	1	Str Single End Cord 3P (70300B01F1201)	70-065-04-PP	
55	1	Cnctr Female Recpt 5P (8R5A00A18A1201)	70-065-05-PP	
56	1	Str. Single End Cord 5P (805006B02M04)	70-065-06-PP	
57	1	Control and Motor Housing Assembly	65-717-00-MP	
58	1	End Plate - Motor Housing	65-760-01-MP	
59	1	Fiber Optic Terminal Plate	65-718-19-PP	
60	7.25	3M #4910 VHB Clr Adhesive Tape (Double Sided)	33-950-03-1CL	
61	1	Control Board Assembly	65-733-00-MP	
62	1	Servo Motor Pre-Assembly	65-728-00-MP	
63	1	S8E1-05024B Power Supply	70-654-00-MP	
64	6	Washer #4 Flat SS	80-104-000-SN	
65	14	Lock Washer #8 SS	80-908-000-SN	
66	2	Screw Pan HD Phl #4-40 x 1/4" SS	83-504-004-SNC	
67	8	Screw Pan HD Phl #8-32 x 3/4" SS	83-508-012-SNC	
68	2	Screw Flt HD Phl #4-40 x 3/8" SS	83-604-006-SNC	
69	4	Nut #4-40 SS	84-004-000-SNC	
70	14	Wire 22 Awg 19 Strnd 105C Blue	33-600-42-2BU	
71	14	Wire 22 Awg 19 Strnd 105C Brn	33-600-42-2BN	
72	1	Decal "Program 21 V1.08"	36-065-16-PP	
73	1	Fiber Optic Window Blind	65-718-20-PP	
74	1	Screw Pan HD Phl #8-32 x 1/4" SS	83-508-004-SNC	
75	2	O'-Ring Rubber AS-568A-004 Hercules	65-712-03-PP	
76	2	Thumb Screw (Machined) 1/4-28x3/8" SHCS SS	65-718-21-MP	
77	2	Terminal - Fiber Optic (Machined)	65-712-01-MP	

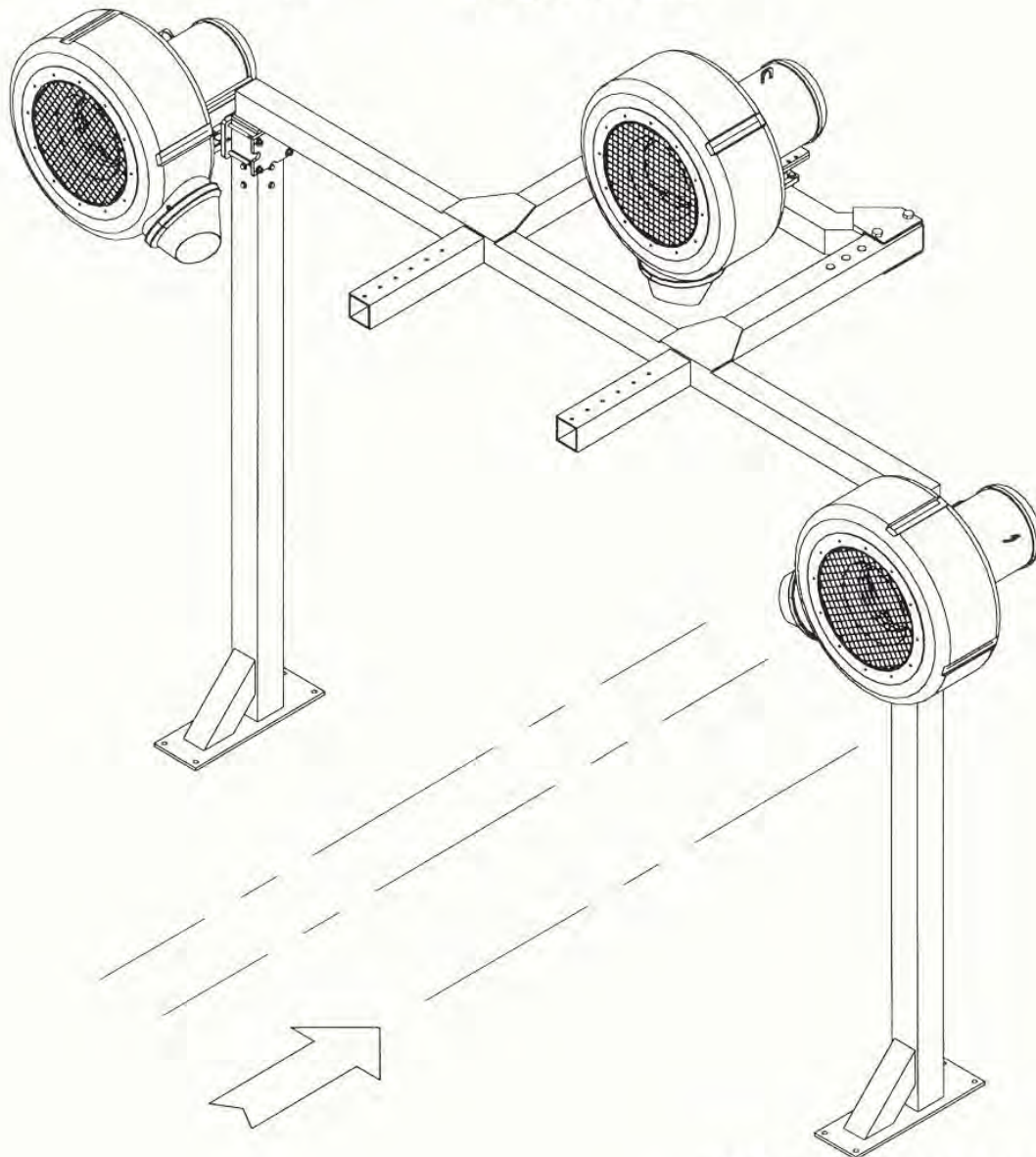
MACNEIL WASH SYS.



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RD-300 Tech 21 Dryer

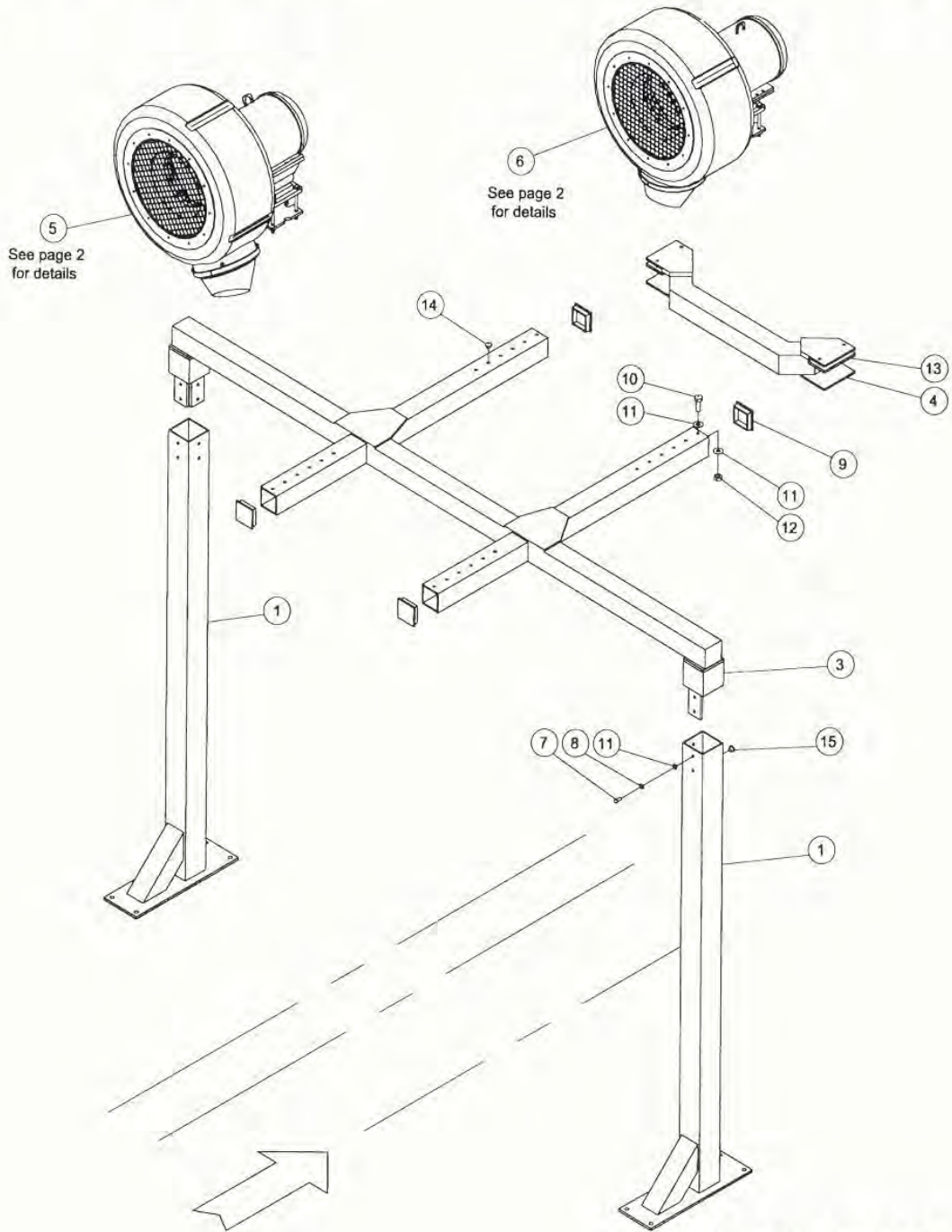
PARTS LIST



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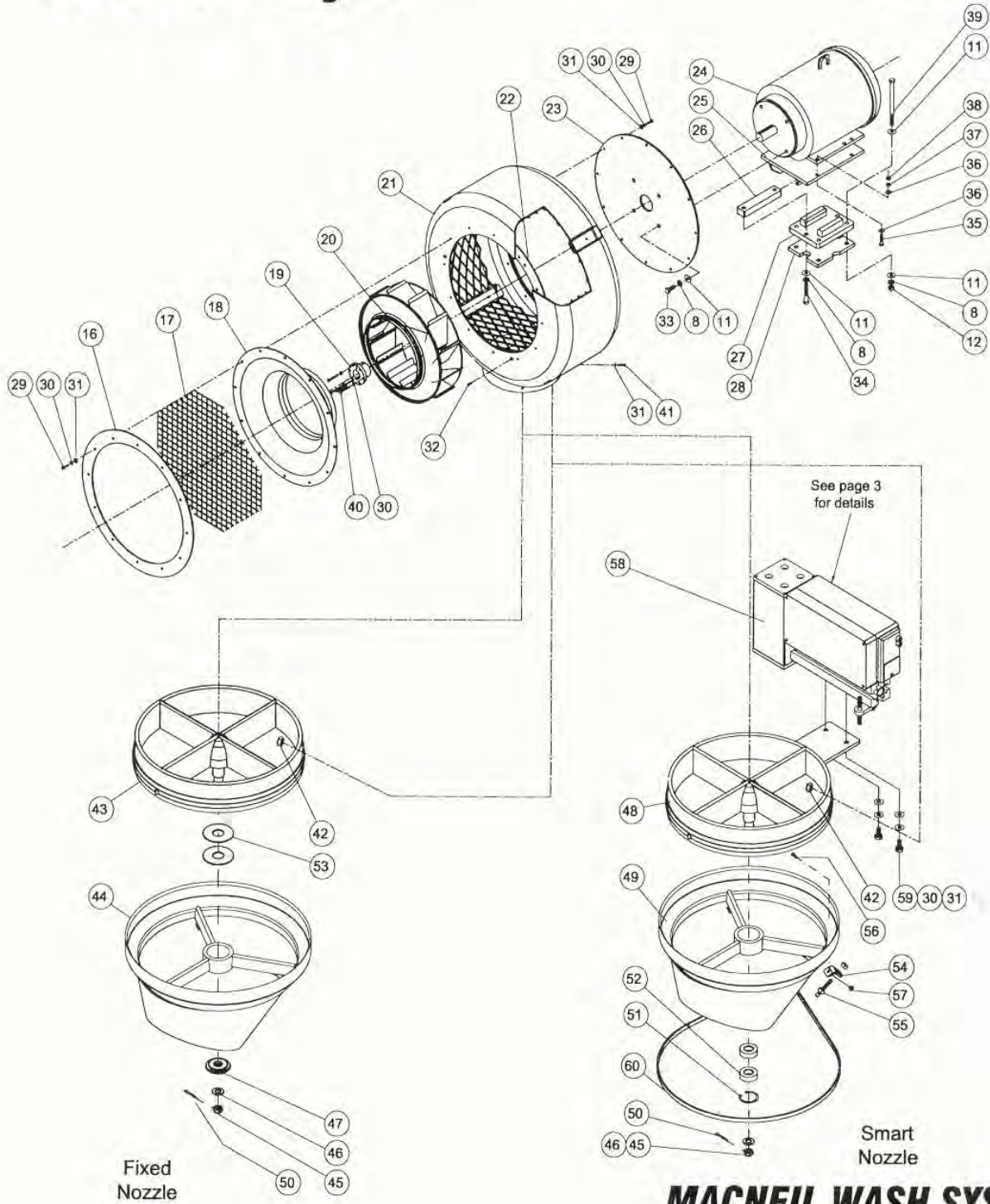
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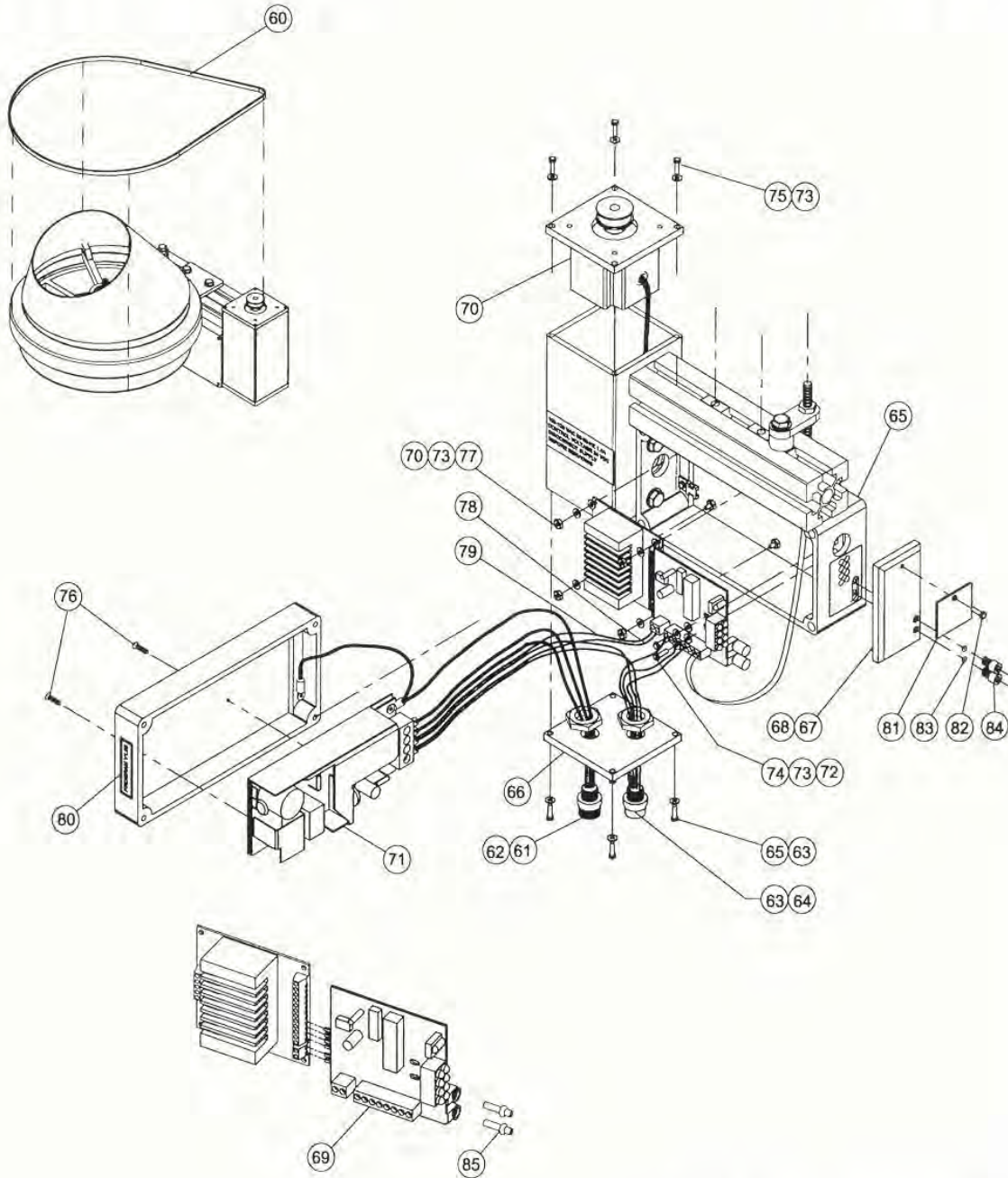
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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
1	2	Dryer Post	65-010-00-SG	
3	1	Dryer Bridge	65-050-00-MP	
4	1	Dryer Fan Support	65-100-00-MP	
5a	2	Fan Ass'y 10HP-Fixed Noz. 230/460V-4" Post	65-7FN-230-04	
5b	2	Fan Ass'y 10HP-Fixed Noz. 575V-4" Post	65-7FN-575-04	
6a	1	Fan Ass'y 10HP-Smart Noz. 230/460V-4" Post	65-7SN-230-LH	
6b	1	Fan Ass'y 10HP-Smart Noz. 575V-4" Post	65-7SN-575-LH	
7	8	HHCS 1/2-13 x 1 1/4" SS	82-508-020-SIC	
8	38	Washer SS Lock 1/2"	80-908-000-SI	
9	4	Tube End Cap	65-351-00-MP	
10	4	HHCS 1/2-13 x 2" SS	82-508-032-sic	
11	58	Washer SS Flat 1/2"	80-208-000-SI	
12	16	Nylock Nut SS 1/2"-13	85-008-000-SIC	
13	2	Anti Vibration Pad	65-015-00-MP	
14	18	Plug Button 9/16" Dia	90-055-09-PP	
15	4	Plug Button 5/8" Dia	90-055-10-PP	
16	3	Fan Inlet Ring	65-700-10-PP	
17	3	Fan Inlet SS Wire Mesh	65-700-07-PP	
18	3	Fan Inlet Cone	65-700-04-PP	
19	3	QD Bushing Browning #SD 1-3/8"	65-716-02-PP	
20	3	Fan Wheel Assembly Complete	65-716-00-MP	
21	3	Fan Housing Assembly	65-714-00-MP	
22	6	Retaining Ring	65-714-01-MP	
23	3	Fan Back Plate	65-700-02-PP	
24a	3	Motor Electric 10HP 3PH 230/406V	70-700-00-PP	
24b	3	Motor Electric 10HP 3PH 575V	70-700-04-PP	
25	3	Pivot Assembly-Motor Mount	65-704-00-SG	
26	3	Clamping Bar-Motor Mount	65-700-14-ZN	
27	3	Clamp/Cradle Assembly-Motor Mount	65-703-00-SG	
28	3	Plate-Motor Mount Clamp	65-700-15-SG	
29	72	HHCS SS 1/4"-20 x 1"	82-504-016-SIC	
30	89	Washer SS Lock 1/4"	80-904-000-SI	
31	101	Washer SS Flat 1/4"	80-104-000-SI	
32	18	Screw SS Flat-Head Phl 1/4"-20 x 5/8"	83-604-010-SIC	
33	24	HHCS SS 1/2"-13 x 1-1/4"	82-508-020-SIC	
34	6	HHCS PL 1/2"-13 x 3"	82-508-048-ZIC	
35	12	HHCS SS 3/8"-16 x 1-1/2"	82-506-024-SIC	

MACNEIL WASH SYS.

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**RD-300
TECH-21 DRYER**

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
36	25	Washer SS Flat 3/8"	80-106-000-SI	
37	12	Washer SS Lock 3/8"	80-906-000-SI	
38	12	Nut SS Nylock 3/8"-16	85-006-000-SIC	
39	4	HHCS PL 1/2"-13 x 6-1/2" GR5	82-508-104-ZIC	
40	12	HHCS Full Thread 1/4"-20 x 1-3/4" LG. SS	82-604-028-SIC	
41	12	Screw SS Button-HD 1/4"-20 x 1"	83-204-016-SIC	
42	12	Nut SS Nylock 1/4"-20	85-004-000-SIC	
43	2	Fixed Bearing Wheel Assembly	65-744-00-MP	
44	2	Fixed Discharge Nozzle Assembly	65-780-20-MP	
45	2	Nylock Nut SS 5/16"-18	82-005-000-SIC	
46	2	Washer SS Lock 5/16"	80-905-000-SI	
47	2	Hub Cap Fixed Nozzle	65-708-02-MP	
48	1	Smart Bearing Wheel Assembly	65-722-00-MP	
49	1	Smart Discharge Nozzle Assembly	65-780-30-MP	
50	1	Pin SS Cotter 5/64" X 1"	86-056-012-SI	
51	1	Retaining Ring (35000-01250)	65-706-03-PP	
52	2	Ball Bearings SS 6002-2RS	90-195-01-PP	
53	2	3/4" Flat Washer SS	80-512-000-SI	
54	1	Magnet Bracket	65-706-06-BK	
55	1	Magnet 57065-000 ND	65-718-11-PP	
56	1	#8-32 x 3/4" Pan HD Screw SS	83-508-012-SNC	
57	1	#8-32 Nylock Nut SS	85-008-320-SIC	
58	1	SN Drive & Control Assembly	65-718-00-MP	
59	2	HHCS 1/4-20 x 3/4" SS	82-504-012-SIC	
60	1	Drive Belt	65-718-05-PP	
61	1	Connector Male Recpt 3P (7R306A19A1201)	70-065-03-PP	
62	1	Str Single End Cord 3P (70300B01F1201)	70-065-04-PP	
63	1	Cnctr Female Recpt 5P (8R5A00A18A1201)	70-065-05-PP	
64	1	Str. Single End Cord 5P (805006B02M04)	70-065-06-PP	
65	1	Control and Motor Housing Assembly	65-717-00-MP	
66	1	End Plate - Motor Housing	65-760-01-MP	
67	1	Fiber Optic Terminal Plate	65-718-19-PP	
68	7.25	3M #4910 VHB Clr Adhesive Tape (Double Sided)	33-950-03-1CL	
69	1	Control Board Assembly	65-733-00-MP	
70	1	Servo Motor Pre-Assembly	65-728-00-MP	

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
71	1	S8E1-05024B Power Supply	70-654-00-MP	
72	6	Washer #4 Flat SS	80-104-000-SN	
73	14	Lock Washer #8 SS	80-908-000-SN	
74	2	Screw Pan HD Phl #4-40 x 1/4" SS	83-504-004-SNC	
75	8	Screw Pan HD Phl #8-32 x 3/4" SS	83-508-012-SNC	
76	2	Screw Flt HD Phl #4-40 x 3/8" SS	83-604-006-SNC	
77	4	Nut #4-40 SS	84-004-000-SNC	
78	14	Wire 22 Awg 19 Strnd 105C Blue	33-600-42-2BU	
79	14	Wire 22 Awg 19 Strnd 105C Brn	33-600-42-2BN	
80	1	Decal "Program 21 V1.08"	36-065-16-PP	
81	1	Fiber Optic Window Blind	65-718-20-PP	
82	1	Screw Pan HD Phl #8-32 x 1/4" SS	83-508-004-SNC	
83	2	O'-Ring Rubber AS-568A-004 Hercules	65-712-03-PP	
84	2	Thumb Screw (Machined) 1/4-28x3/8" SHCS SS	65-718-21-MP	
85	2	Terminal - Fiber Optic (Machined)	65-712-01-MP	

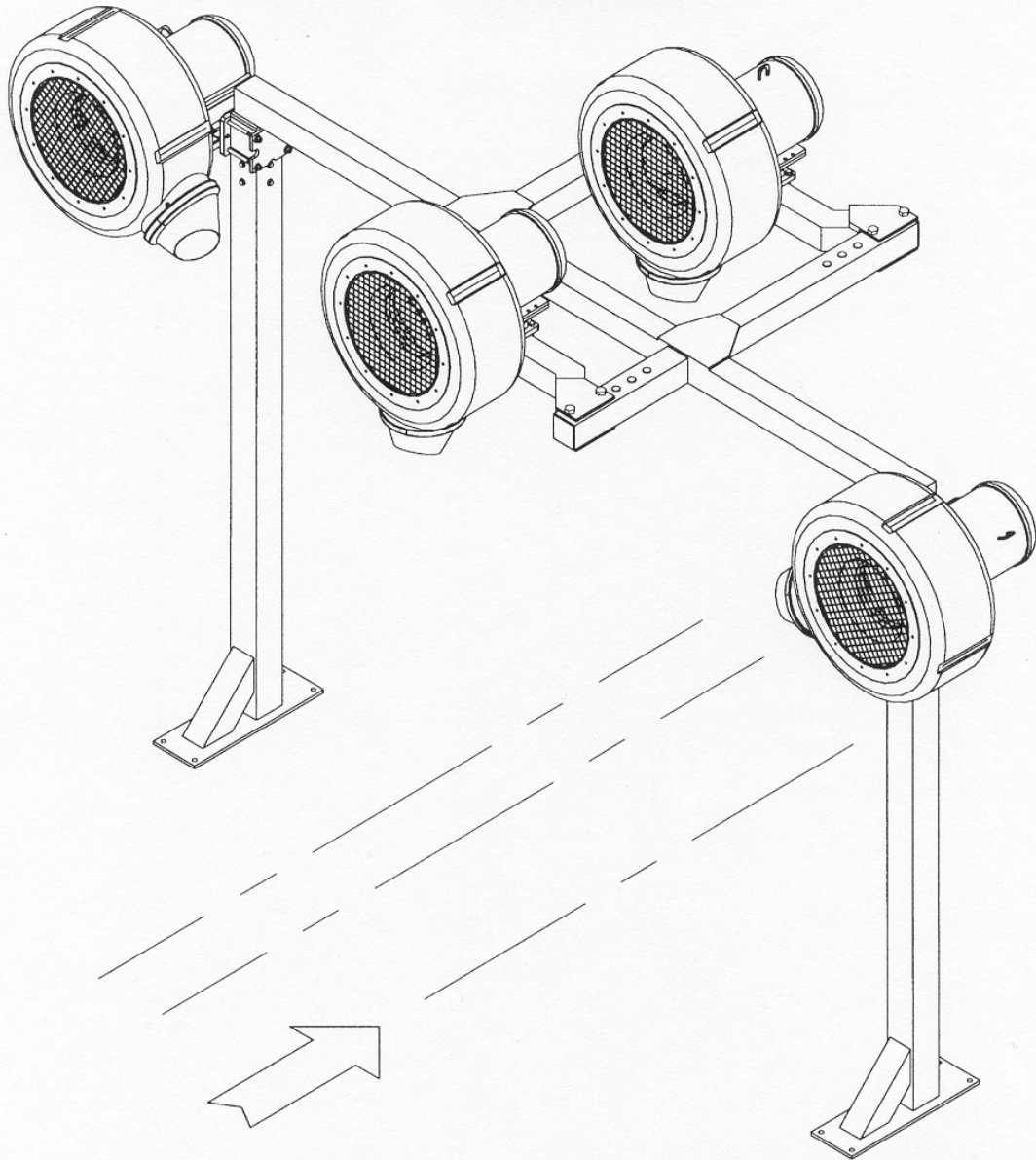
MACNEIL WASH SYS.



**PARTS LIST NO.: EPL-RD400 REV."B"
JULY 2002**

RD-400 Tech 21 Dryer

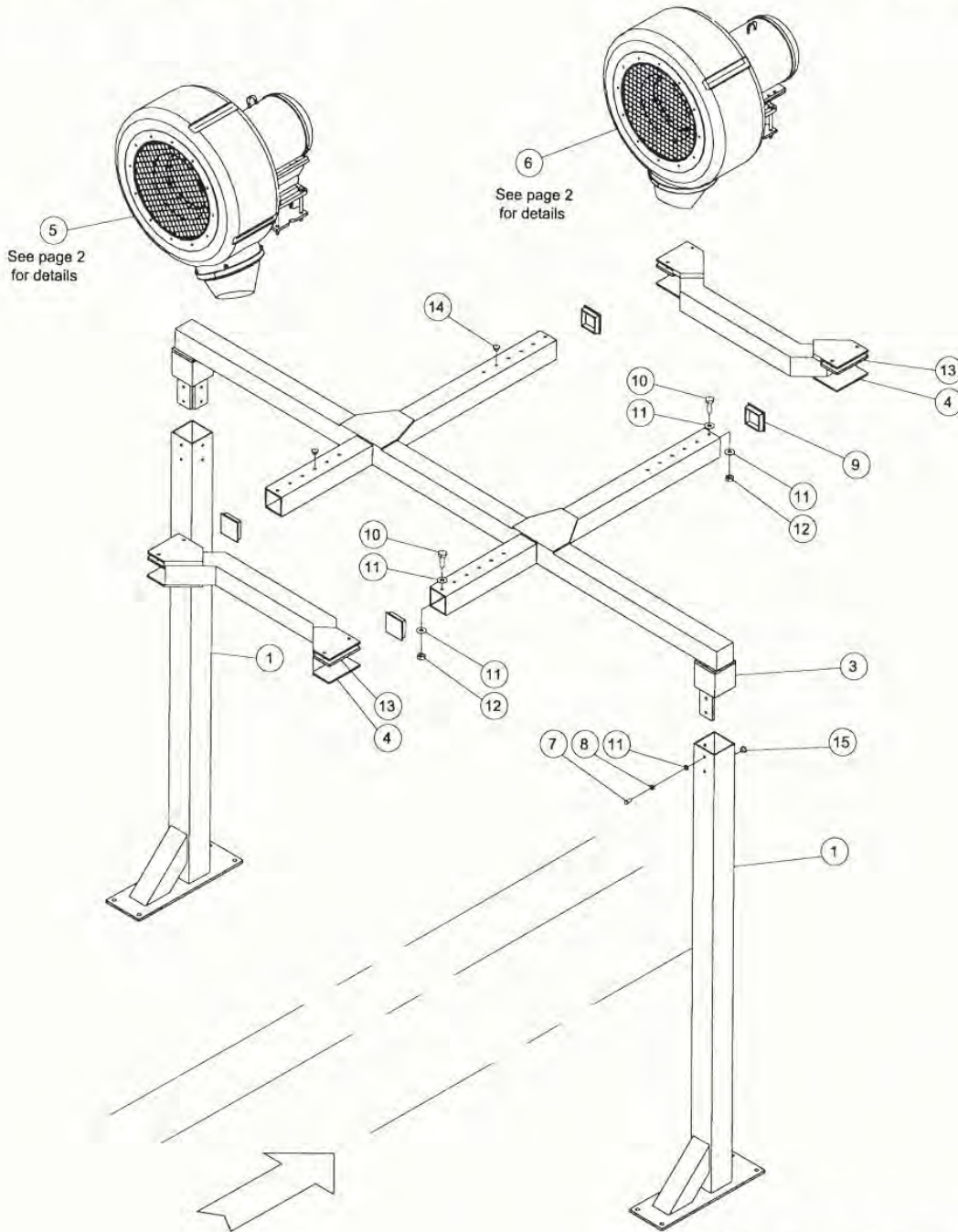
PARTS LIST



MACNEIL WASH SYS.

RD-400 Tech 21 Dryer

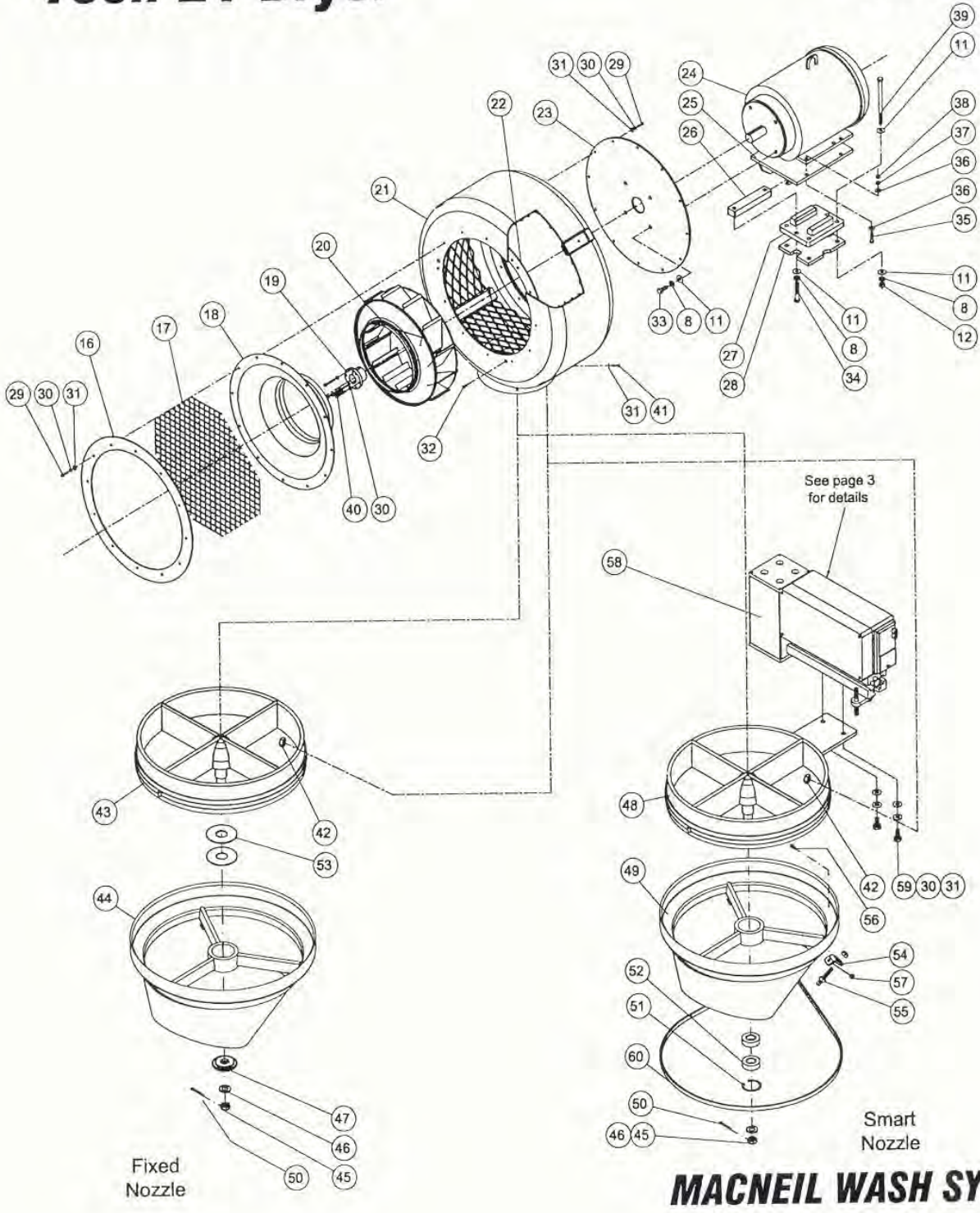
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MAGNEIL WASH SYS.

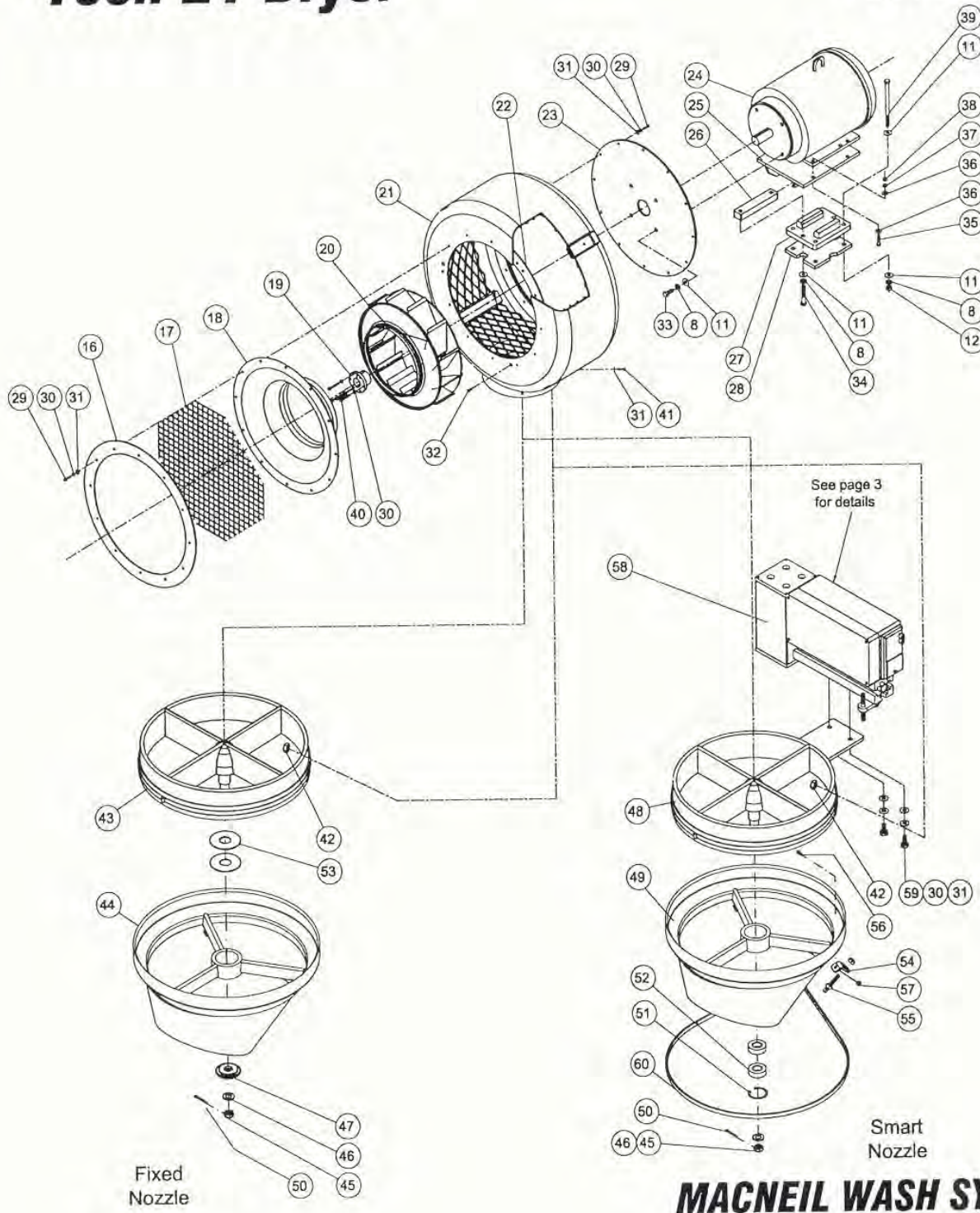
RD-400 Tech 21 Dryer

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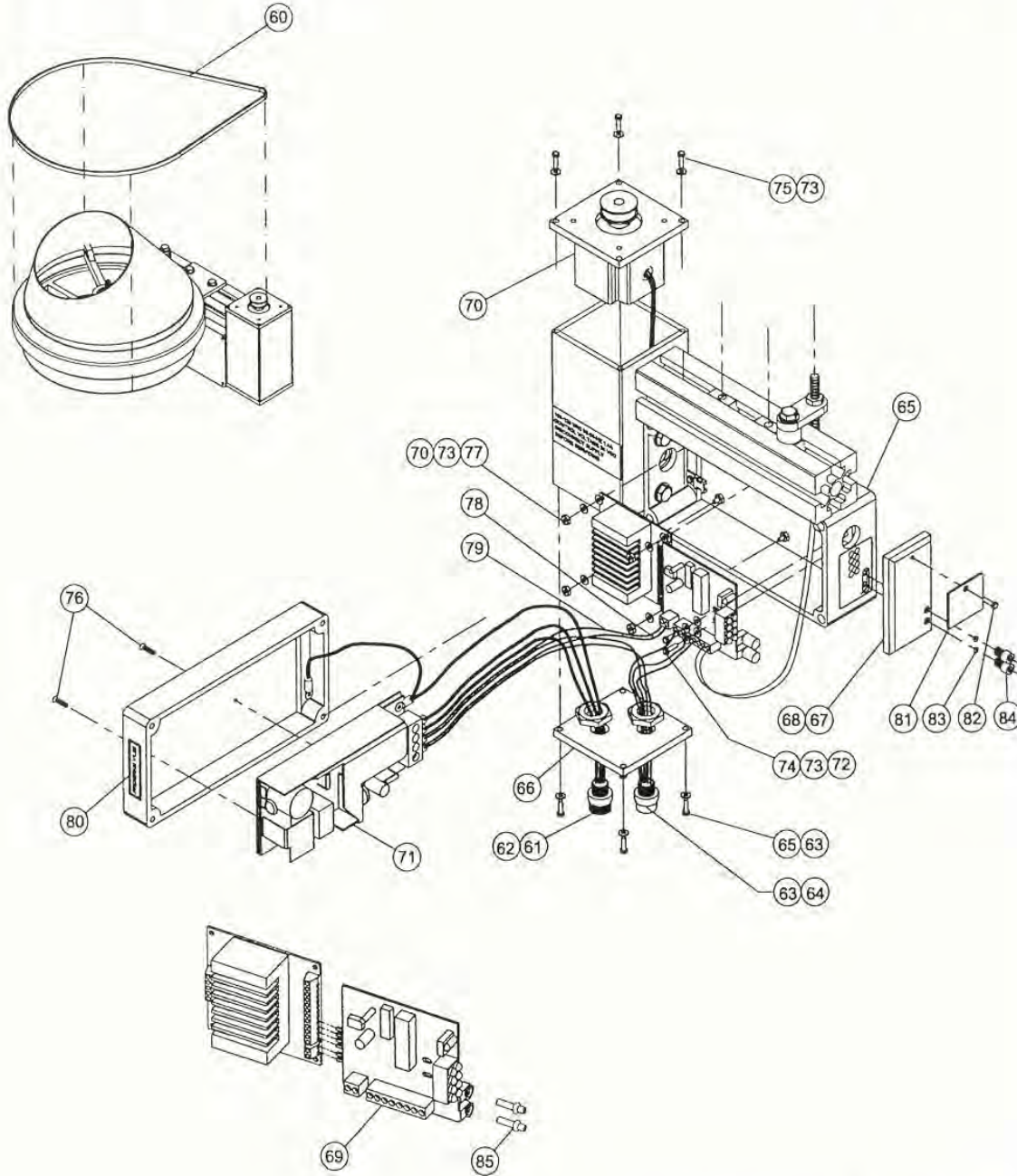
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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
1	2	Dryer Post	65-010-00-SG	
3	1	Dryer Bridge	65-050-00-SG	
4	2	Dryer Fan Support	65-100-00-SG	
5a	3	Fan Ass'y 10HP-Fixed Noz. 230/460V-4" Post	65-7FN-230-04	
5b	3	Fan Ass'y 10HP-Fixed Noz. 575V-4" Post	65-7FN-575-04	
6a	1	Fan Ass'y 10HP-Smart Noz. 230/460V-4" Post	65-7SN-230-LH	
6b	1	Fan Ass'y 10HP-Smart Noz. 575V-4" Post	65-7SN-575-LH	
7	8	HHCS 1/2-13 x 1 1/4" SS	82-508-020-SIC	
8	48	Washer SS Lock 1/2"	80-908-000-SI	
9	4	Tube End Cap	65-351-00-MP	
10	8	HHCS 1/2-13 x 2" SS	82-508-032-sic	
11	88	Washer SS Flat 1/2"	80-208-000-SI	
12	24	Nylock Nut SS 1/2"-13	85-008-000-SIC	
13	4	Anti Vibration Pad	65-015-00-MP	
14	12	Plug Button 9/16" Dia	90-055-09-PP	
15	4	Plug Button 5/8" Dia	90-055-10-PP	
16	4	Fan Inlet Ring	65-700-10-PP	
17	4	Fan Inlet SS Wire Mesh	65-700-07-PP	
18	4	Fan Inlet Cone	65-700-04-PP	
19	4	QD Bushing Browning #SD 1-3/8"	65-716-02-PP	
20	4	Fan Wheel Assembly Complete	65-716-00-MP	
21	4	Fan Housing Assembly	65-714-00-MP	
22	8	Retaining Ring	65-714-01-MP	
23	4	Fan Back Plate	65-700-02-PP	
24a	4	Motor Electric 10HP 3PH 230/406V	70-700-00-PP	
24b	4	Motor Electric 10HP 3PH 575V	70-700-04-PP	
25	4	Pivot Assembly-Motor Mount	65-704-00-SG	
26	4	Clamping Bar-Motor Mount	65-700-14-ZN	
27	4	Clamp/Cradle Assembly-Motor Mount	65-703-00-SG	
28	4	Plate-Motor Mount Clamp	65-700-15-SG	
29	96	HHCS SS 1/4"-20 x 1"	82-504-016-SIC	
30	117	Washer SS Lock 1/4"	80-904-000-SI	
31	133	Washer SS Flat 1/4"	80-104-000-SI	
32	24	Screw SS Flat-Head Phl. 1/4"-20 x 5/8"	83-604-010-SIC	
33	32	HHCS SS 1/2"-13 x 1-1/4"	82-508-020-SIC	
34	8	HHCS PL 1/2"-13 x 3"	82-508-048-ZIC	
35	16	HHCS SS 3/8"-16 x 1-1/2"	82-506-024-SIC	

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
36	33	Washer SS Flat 3/8"	80-106-000-SI	
37	16	Washer SS Lock 3/8"	80-906-000-SI	
38	16	Nut SS Nylock 3/8"-16	85-006-000-SIC	
39	8	HHCS PL 1/2"-13 x 6-1/2" GR5	82-508-104-ZIC	
40	16	HHCS Full Thread 1/4"-20 x 1-3/4" LG SS	82-604-028-SIC	
41	16	Screw SS Button-HD 1/4"-20 x 1"	83-204-016-SIC	
42	16	Nut SS Nylock 1/4"-20	85-004-000-SIC	
43	3	Fixed Bearing Wheel Assembly	65-744-00-MP	
44	3	Fixed Discharge Nozzle Assembly	65-780-20-MP	
45	3	Nylock Nut SS 5/16"-18	82-005-000-SIC	
46	3	Washer SS Lock 5/16"	80-905-000-SI	
47	1	Hub Cap Fixed Nozzle	65-708-02-MP	
48	1	Smart Bearing Wheel Assembly	65-722-00-MP	
49	1	Smart Discharge Nozzle Assembly	65-780-30-MP	
50	1	Pin SS Cotter 5/64" X 1"	86-056-012-SI	
51	1	Retaining Ring (35000-01250)	65-706-03-PP	
52	2	Ball Bearings SS 6002-2RS	90-195-01-PP	
53	2	3/4" Flat Washer SS	80-512-000-SI	
54	1	Magnet Bracket	65-706-06-BK	
55	1	Magnet 57065-000 ND	65-718-11-PP	
56	1	#8-32 x 3/4" Pan HD Screw SS	83-508-012-SNC	
57	1	#8-32 Nylock Nut SS	85-008-320-SIC	
58	1	SN Drive & Control Assembly	65-718-00-MP	
59	2	HHCS 1/4-20 x 3/4" SS	82-504-012-SIC	
60	1	Drive Belt	65-718-05-PP	
61	1	Connector Male Recpt 3P (7R306A19A1201)	70-065-03-PP	
62	1	Str Single End Cord 3P (70300B01F1201)	70-065-04-PP	
63	1	Cnctr Female Recpt 5P (8R5A00A18A1201)	70-065-05-PP	
64	1	Str. Single End Cord 5P (805006B02M04)	70-065-06-PP	
65	1	Control and Motor Housing Assembly	65-717-00-MP	
66	1	End Plate - Motor Housing	65-760-01-MP	
67	1	Fiber Optic Terminal Plate	65-718-19-PP	
68	7.25	3M #4910 VHB Clr Adhesive Tape (Double Sided)	33-950-03-1CL	
69	1	Control Board Assembly	65-733-00-MP	
70	1	Servo Motor Pre-Assembly	65-728-00-MP	

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
71	1	S8E1-05024B Power Supply	70-654-00-MP	
72	6	Washer #4 Flat SS	80-104-000-SN	
73	14	Lock Washer #8 SS	80-908-000-SN	
74	2	Screw Pan HD Phl #4-40 x 1/4" SS	83-504-004-SNC	
75	8	Screw Pan HD Phl #8-32 x 3/4" SS	83-508-012-SNC	
76	2	Screw Flt HD Phl #4-40 x 3/8" SS	83-604-006-SNC	
77	4	Nut #4-40 SS	84-004-000-SNC	
78	14	Wire 22 Awg 19 Strnd 105C Blue	33-600-42-2BU	
79	14	Wire 22 Awg 19 Strnd 105C Brn	33-600-42-2BN	
80	1	Decal "Program 21 V1.08"	36-065-16-PP	
81	1	Fiber Optic Window Blind	65-718-20-PP	
82	1	Screw Pan HD Phl #8-32 x 1/4" SS	83-508-004-SNC	
83	2	O'-Ring Rubber AS-568A-004 Hercules	65-712-03-PP	
84	2	Thumb Screw (Machined) 1/4-28x3/8" SHCS SS	65-718-21-MP	
85	2	Terminal - Fiber Optic (Machined)	65-712-01-MP	

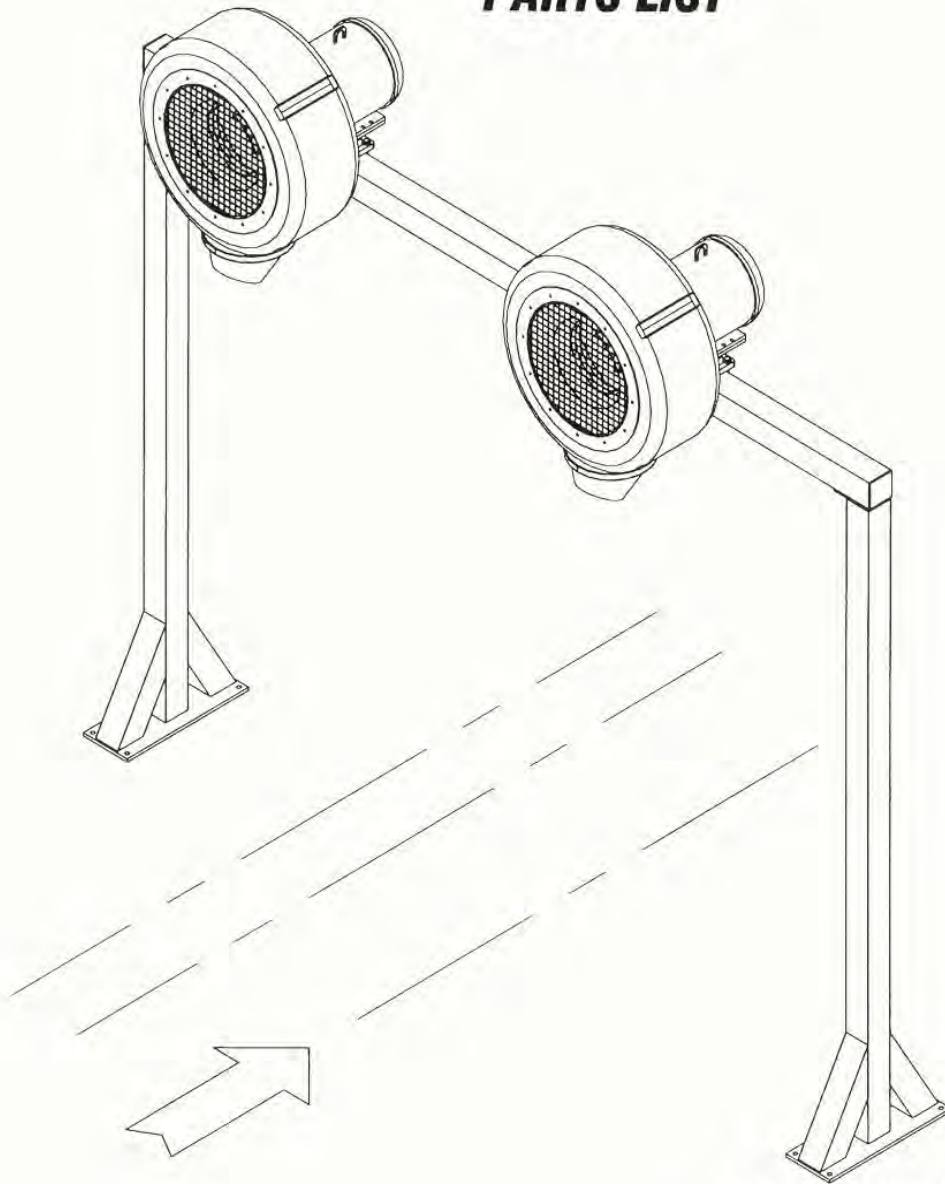
MACNEIL WASH SYS.



**PARTS LIST NO.: EPL-PTECH21 REV."B"
JULY 2002**

PRO-BUILD Tech 21 Dryer

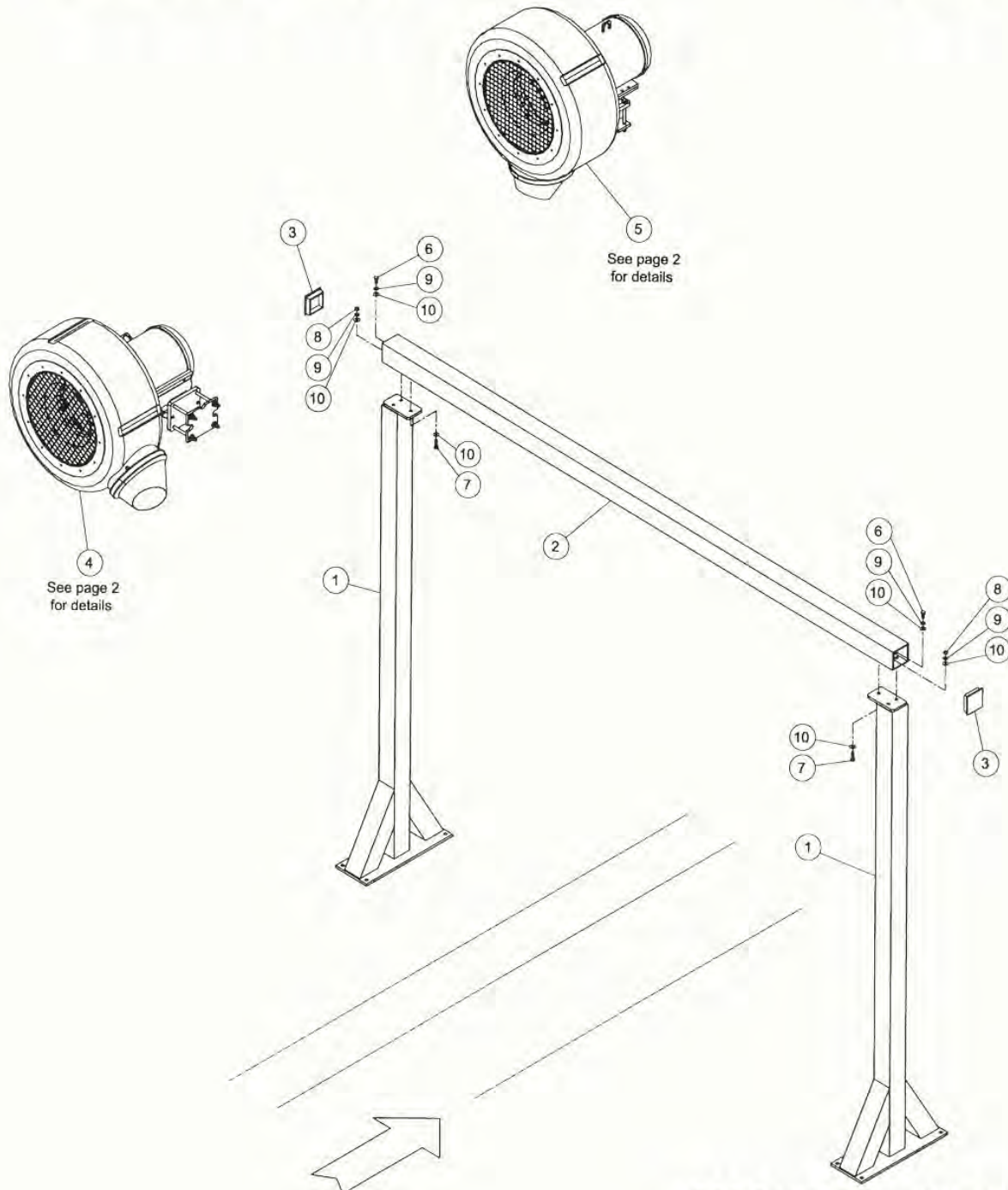
PARTS LIST



MACNEIL WASH SYS.

PRO-BUILD Tech 21 Dryer

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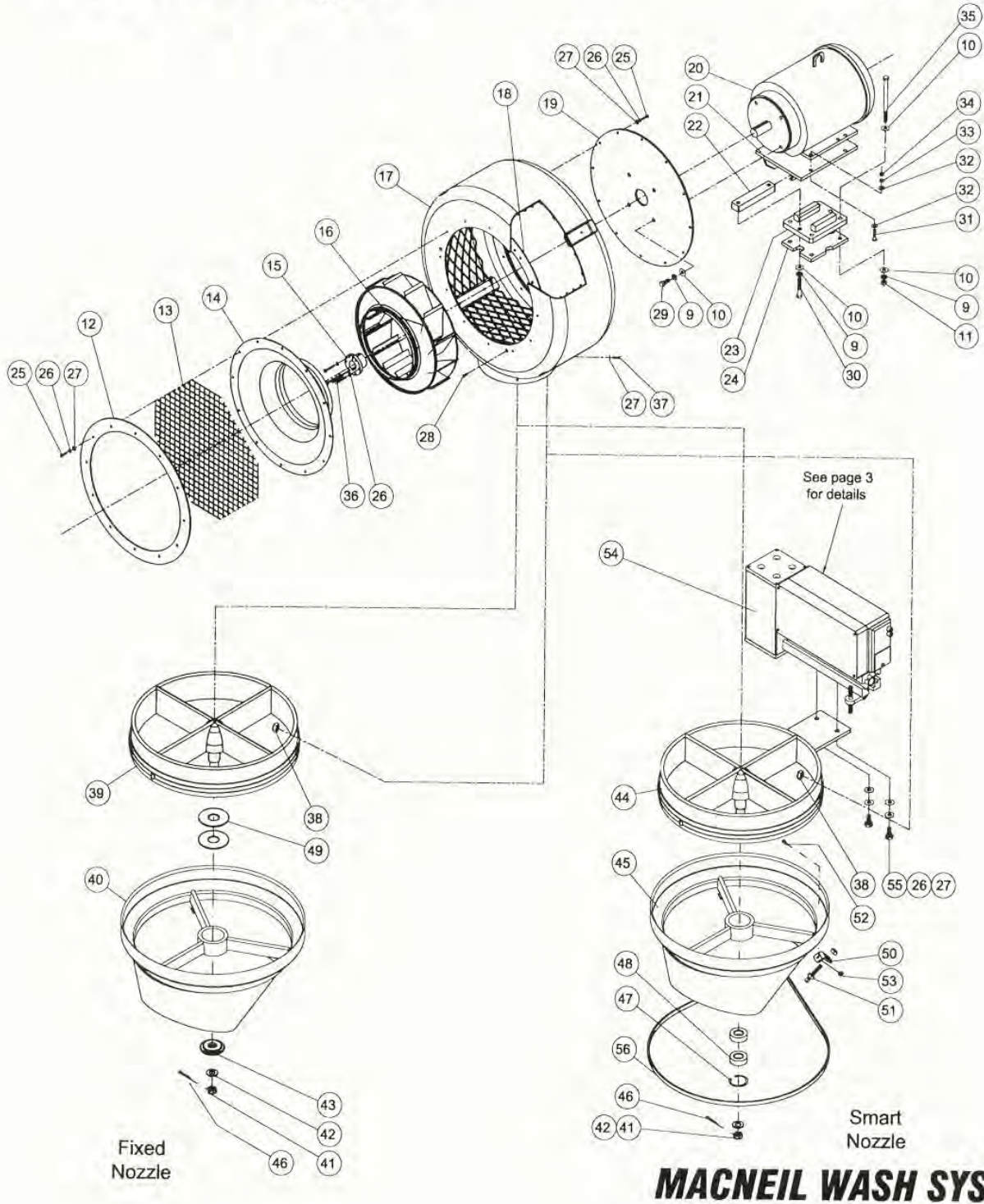


MAGNEIL WASH SYS.

BLOWER

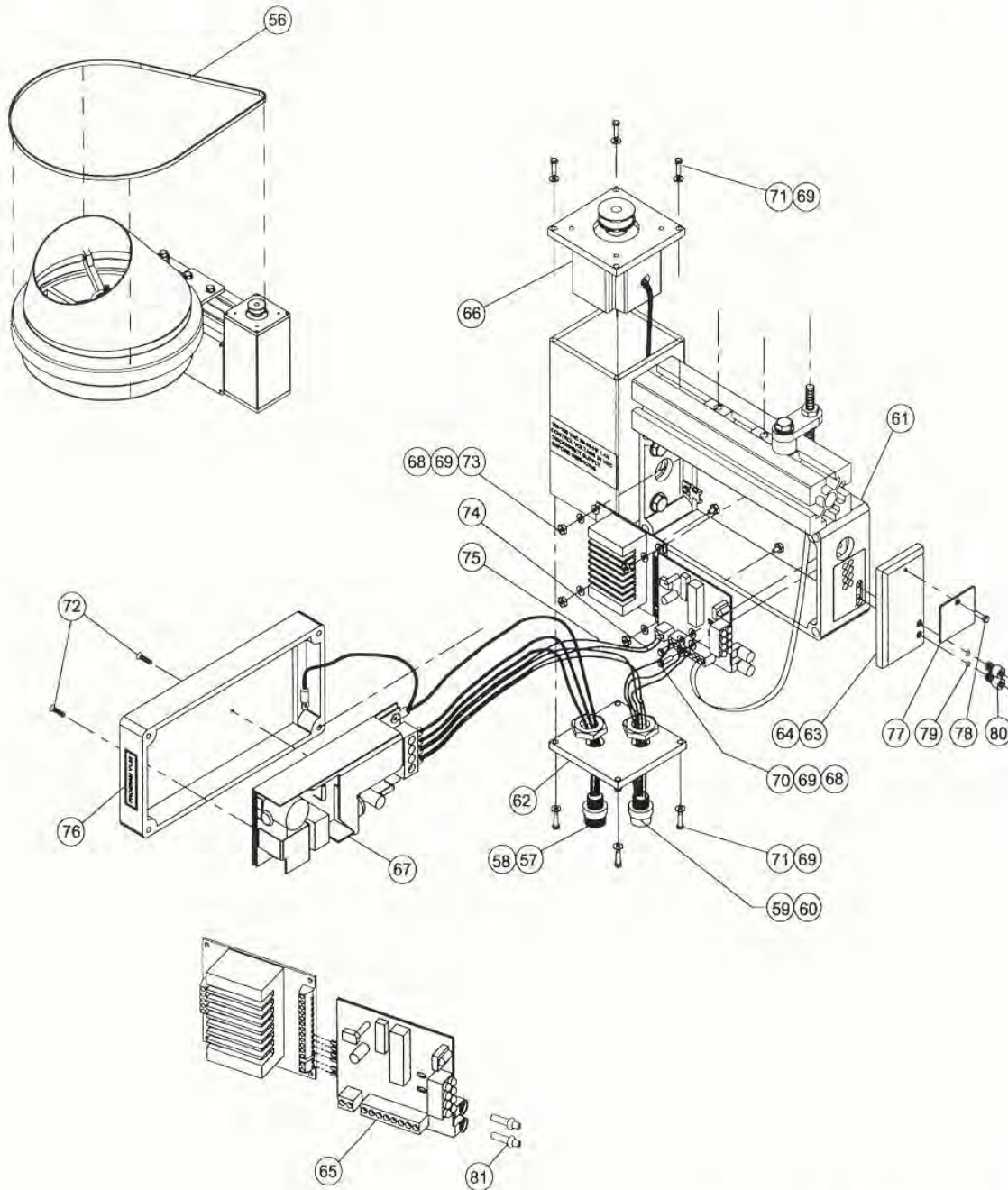
PRO-BUILD Tech 21 Dryer

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TECH-21 DRYER**

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
1	2	Side Post Assembly	65-210-00-SG	
2	1	Top Beam Assembly	65-211-00-SG	
3	2	Tube End Cap	65-353-00-PP	
4a	1	Fan Ass'y 10HP-Fixed Noz. 230/460V-4" Post	65-7FN-230-04	
4b	1	Fan Ass'y 10HP-Fixed Noz. 575V-4" Post	65-7FN-575-04	
5a	1	Fan Ass'y 10HP-Smart Noz. 230/460V-4" Post	65-7SN-230-LH	
5b	1	Fan Ass'y 10HP-Smart Noz. 575V-4" Post	65-7SN-575-LH	
6	4	HHCS 1/2"-13 x 1" LG SS	82-508-016-SIC	
7	2	HHCS 1/2"-13 x 1-1/2" LG SS	82-508-024-SIC	
8	2	Nut SS 1/2"-13	84-008-000-SIC	
9	16	Washer SS Lock 1/2"	80-908-000-SI	
10	20	Washer SS Flat 1/2"	80-208-000-SI	
11	4	Nylock Nut SS 1/2"-13	85-008-000-SIC	
12	1	Fan Inlet Ring	65-700-10-PP	
13	1	Fan Inlet SS Wire Mesh	65-700-07-PP	
14	1	Fan Inlet Cone	65-700-04-PP	
15	1	QD Bushing Browning #SD 1-3/8"	65-716-02-PP	
16	1	Fan Wheel Assembly Complete	65-716-00-MP	
17	1	Fan Housing Assembly	65-714-00-MP	
18	2	Retaining Ring	65-714-01-MP	
19	1	Fan Back Plate	65-700-02-PP	
20a	1	Motor Electric 10HP 3PH 230/406V	70-700-00-PP	
20b	1	Motor Electric 10HP 3PH 575V	70-700-04-PP	
21	1	Pivot Assembly-Motor Mount	65-704-00-SG	
22	1	Clamping Bar-Motor Mount	65-700-14-ZN	
23	1	Clamp/Cradle Assembly-Motor Mount	65-703-00-SG	
24	1	Plate-Motor Mount Clamp	65-700-15-SG	
25	24	HHCS SS 1/4"-20 x 1"	82-504-016-SIC	
26	30	Washer SS Lock 1/4"	80-904-000-SI	
27	30	Washer SS Flat 1/4"	80-104-000-SI	
28	6	Screw SS Flat-Head PhL 1/4"-20 x 5/8"	83-604-010-SIC	
29	4	HHCS SS 1/2"-13 x 1-1/4"	82-508-020-SIC	
30	2	HHCS PL 1/2"-13 x 3"	82-508-048-ZIC	
31	4	HHCS SS 3/8"-16 x 1-1/2"	82-506-024-SIC	
32	8	Washer SS Flat 3/8"	80-106-000-SI	
33	4	Washer SS Lock 3/8"	80-906-000-SI	
34	4	Nut SS Nylock 3/8"-16	85-006-000-SIC	
35	4	HHCS PL 1/2"-13 x 6-1/2" GR5	82-508-104-ZIC	

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Item no.	Req'd	Description	Part no.	Remarks
36	4	HHCS Full Thread 1/4"-20 x 1-3/4" LG. SS	82-604-028-SIC	
37	4	Screw SS Button-HD 1/4"-20 x 1"	83-204-016-SIC	
38	4	Nut SS Nylock 1/4"-20	85-004-000-SIC	
39	1	Fixed Bearing Wheel Assembly	65-744-00-MP	
40	1	Fixed Discharge Nozzle Assembly	65-780-20-MP	
41	1	Nylock Nut SS 5/16"-18	82-005-000-SIC	
42	1	Washer SS Lock 5/16"	80-905-000-SI	
43	1	Hub Cap Fixed Nozzle	65-708-02-MP	
44	1	Smart Bearing Wheel Assembly	65-722-00-MP	
45	1	Smart Discharge Nozzle Assembly	65-780-30-MP	
46	1	Pin SS Cotter 5/64" X 1"	86-056-012-SI	
47	1	Retaining Ring (35000-01250)	65-706-03-PP	
48	2	Ball Bearings SS 6002-2RS	90-195-01-PP	
49	2	3/4" Flat Washer SS	80-512-000-SI	
50	1	Magnet Bracket	65-706-06-BK	
51	1	Magnet 57065-000 ND	65-718-11-PP	
52	1	#8-32 x 3/4" Pan HD Screw SS	83-508-012-SNC	
53	1	#8-32 Nylock Nut SS	85-008-320-SIC	
54	1	SN Drive & Control Assembly	65-718-00-MP	
55	2	HHCS 1/4-20 x 3/4" SS	82-504-012-SIC	
56	1	Drive Belt	65-718-05-PP	
57	1	Connector Male Recpt 3P (7R306A19A1201)	70-065-03-PP	
58	1	Str Single End Cord 3P (70300B01F1201)	70-065-04-PP	
59	1	Cnctr Female Recpt 5P (8R5A00A18A1201)	70-065-05-PP	
60	1	Str. Single End Cord 5P (805006B02M04)	70-065-06-PP	
61	1	Control and Motor Housing Assembly	65-717-00-MP	
62	1	End Plate - Motor Housing	65-760-01-MP	
63	1	Fiber Optic Terminal Plate	65-718-19-PP	
64	7.25	3M #4910 VHB Clr Adhesive Tape (Double Sided)	33-950-03-1CL	
65	1	Control Board Assembly	65-733-00-MP	
66	1	Servo Motor Pre-Assembly	65-728-00-MP	
67	1	S8E1-05024B Power Supply	70-654-00-MP	
68	6	Washer #4 Flat SS	80-104-000-SN	
69	14	Lock Washer #8 SS	80-908-000-SN	
70	2	Screw Pan HD Phl #4-40 x 1/4" SS	83-504-004-SNC	

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TECH-21 DRYER**

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
71	8	Screw Pan HD Phl #8-32 x 3/4" SS	83-508-012-SNC	
72	2	Screw Flt HD Phl #4-40 x 3/8" SS	83-604-006-SNC	
73	4	Nut #4-40 SS	84-004-000-SNC	
74	14	Wire 22 Awg 19 Strnd 105C Blue	33-600-42-2BU	
75	14	Wire 22 Awg 19 Strnd 105C Brn	33-600-42-2BN	
76	1	Decal "Program 21 V1.08"	36-065-16-PP	
77	1	Fiber Optic Window Blind	65-718-20-PP	
78	1	Screw Pan HD Phl #8-32 x 1/4" SS	83-508-004-SNC	
79	2	O'-Ring Rubber AS-568A-004 Hercules	65-712-03-PP	
80	2	Thumb Screw (Machined) 1/4-28x3/8" SHCS SS	65-718-21-MP	
81	2	Terminal - Fiber Optic (Machined)	65-712-01-MP	

MACNEIL WASH SYS.



**PARTS LIST NO.: EPL-DRYER-JCC-SMART REV."B"
JULY 2002**

Jim Coleman Producer with Smart Nozzle

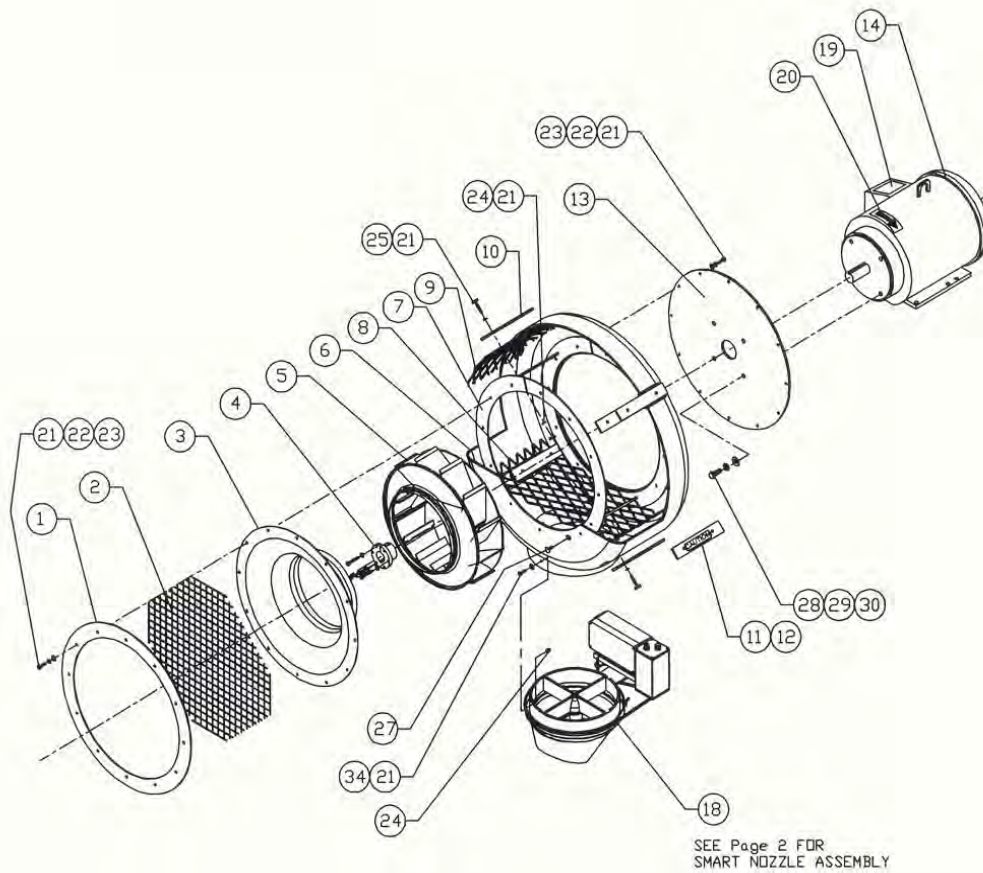
PARTS LIST



MACNEIL WASH SYS.

**Jim Coleman
Producer with
Smart Nozzle**

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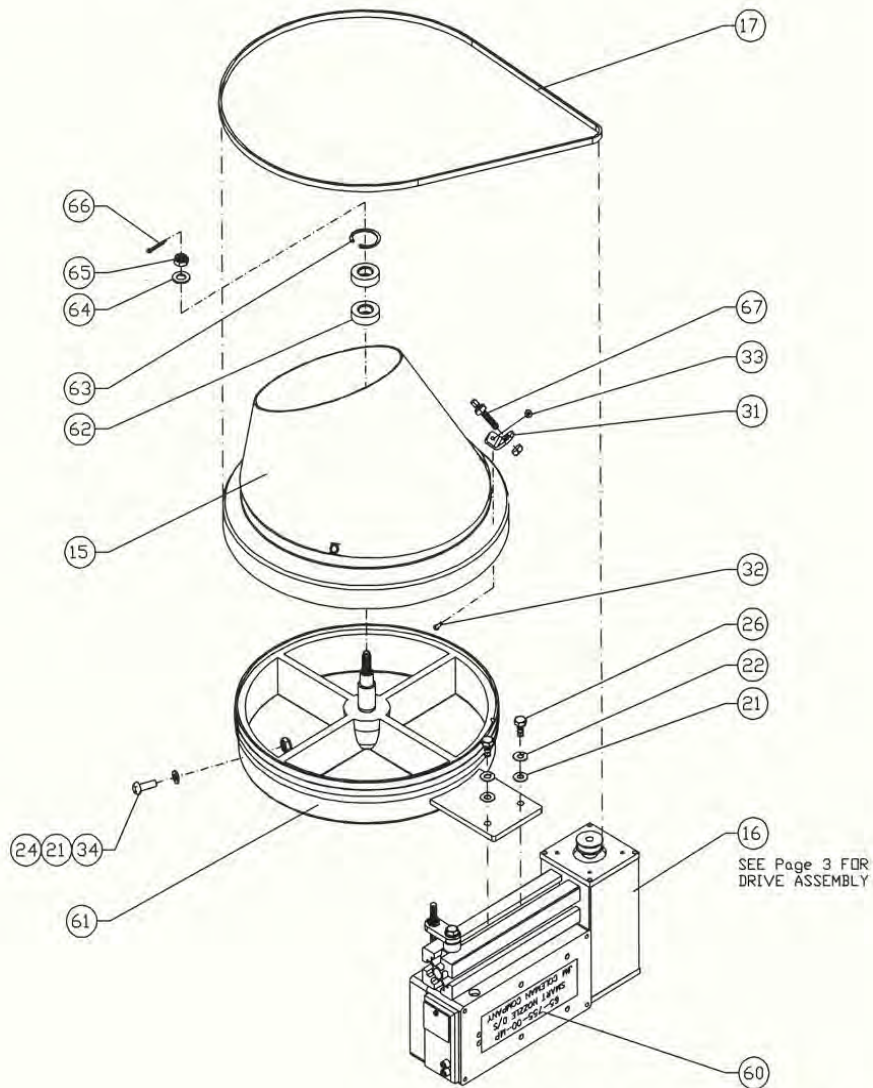


MACNEIL WASH SYS.

**Jim Coleman
Producer with
Smart Nozzle**

NOZZLE ASSEMBLY (65-755-00-MP)

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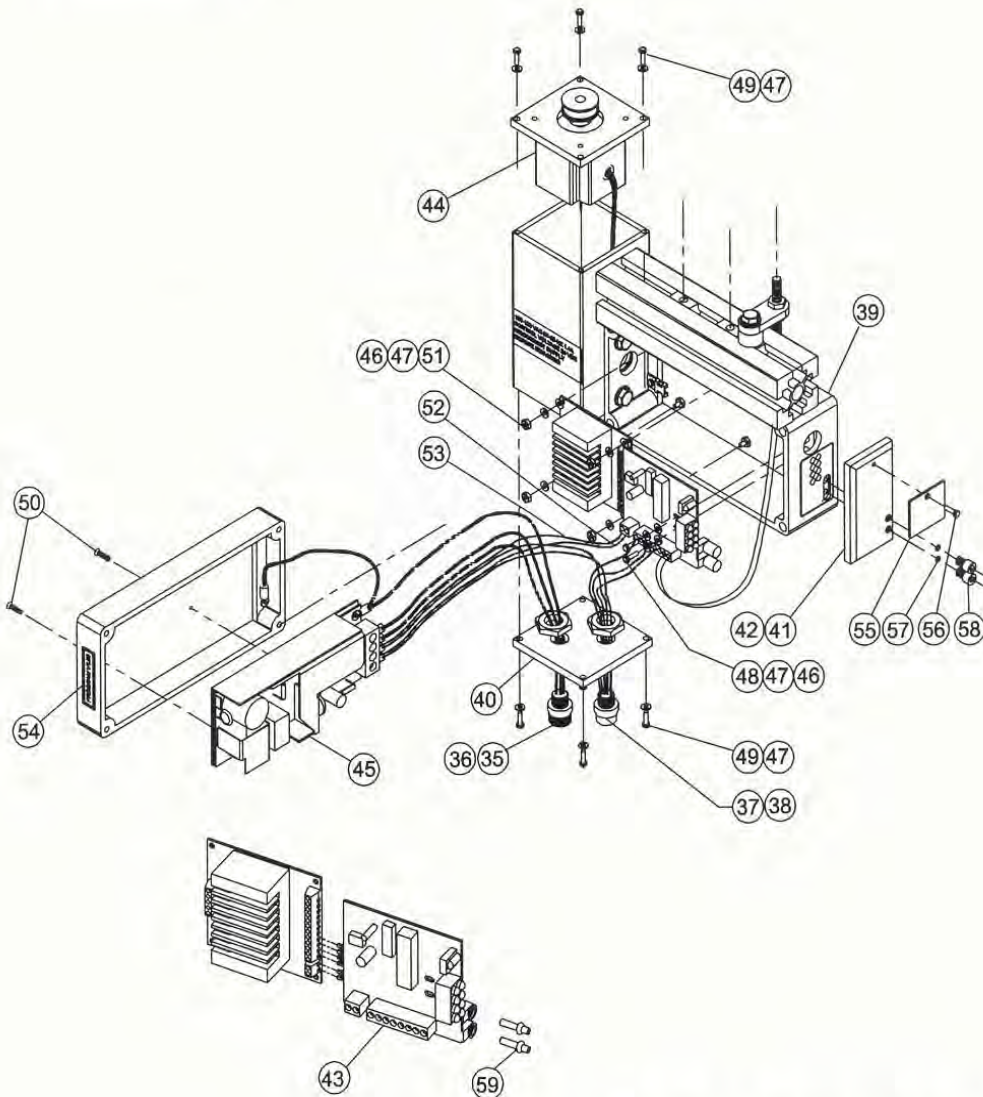


MACNEIL WASH SYS.

**Jim Coleman
Producer with
Smart Nozzle**

**SN DRIVE & CONTROL ASSEMBLY
(65-760-00-MP)**

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MACNEIL WASH SYS.

*Jim Coleman
Producer with Smart Nozzle*

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<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
36	1	Str Single End Cord 3P (70300B01F1201)	70-065-04-PP	
37	1	Cnctr Female Recpt 5P (8R5A00A18A1201)	70-065-05-PP	
38	1	Str. Single End Cord 5P (805006B02M04)	70-065-06-PP	
39	1	Control and Motor Housing Assembly	65-717-00-MP	
40	1	End Plate - Motor Housing	65-760-01-MP	
41	1	Fiber Optic Terminal Plate	65-718-19-PP	
42	7.25	3M #4910 VHB Clr Adhesive Tape (Double Sided)	33-950-03-1CL	
43	1	Control Board Assembly	65-733-00-MP	
44	1	Servo Motor Pre-Assembly	65-728-00-MP	
45	1	S8E1-05024B Power Supply	70-654-00-MP	
46	6	Washer #4 Flat SS	80-104-000-SN	
47	14	Lock Washer #8 SS	80-908-000-SN	
48	2	Screw Pan HD Phl #4-40 x 1/4" SS	83-504-004-SNC	
49	8	Screw Pan HD Phl #8-32 x 3/4" SS	83-508-012-SNC	
50	2	Screw Flt HD Phl #4-40 x 3/8" SS	83-604-006-SNC	
51	4	Nut #4-40 SS	84-004-000-SNC	
52	14	Wire 22 Awg 19 Strnd 105C Blue	33-600-42-2BU	
53	14	Wire 22 Awg 19 Strnd 105C Brn	33-600-42-2BN	
54	1	Decal "Program 21 V1.08"	36-065-16-PP	
55	1	Fiber Optic Window Blind	65-718-20-PP	
56	1	Screw Pan HD Phl #8-32 x 1/4" SS	83-508-004-SNC	
57	2	O'-Ring Rubber AS-568A-004 Hercules	65-712-03-PP	
58	2	Thumb Screw (Machined) 1/4-28x3/8" SHCS SS	65-718-21-MP	
59	2	Terminal - Fiber Optic (Machined)	65-712-01-MP	
60	1	Jim Coleman Company Decal (65-755-00-MP)	36-065-26-PP	
61	1	Nozzle Wheel Assembly	65-722-00-MP	
62	2	Ball Bearing SS 6002-2RS	90-195-01-PP	
63	1	Retaining Ring (35000-01250)	65-706-03-PP	
64	1	3/8" Flat Washer SS	80-106-000-SI	
65	1	3/8-16 Thin Nylock Nut SS	85-056-001-SIC	
66	1	5/64 x 3/4" Cotter Pin SS	86-056-012-SI	
67	1	Magnet 57065-000 ND	65-718-11-PP	

MACNEIL WASH SYS.



**PARTS LIST NO.: EPL-DRYER-JCC-FIXED REV."B"
JULY 2002**

Jim Coleman Producer with Fixed Nozzle

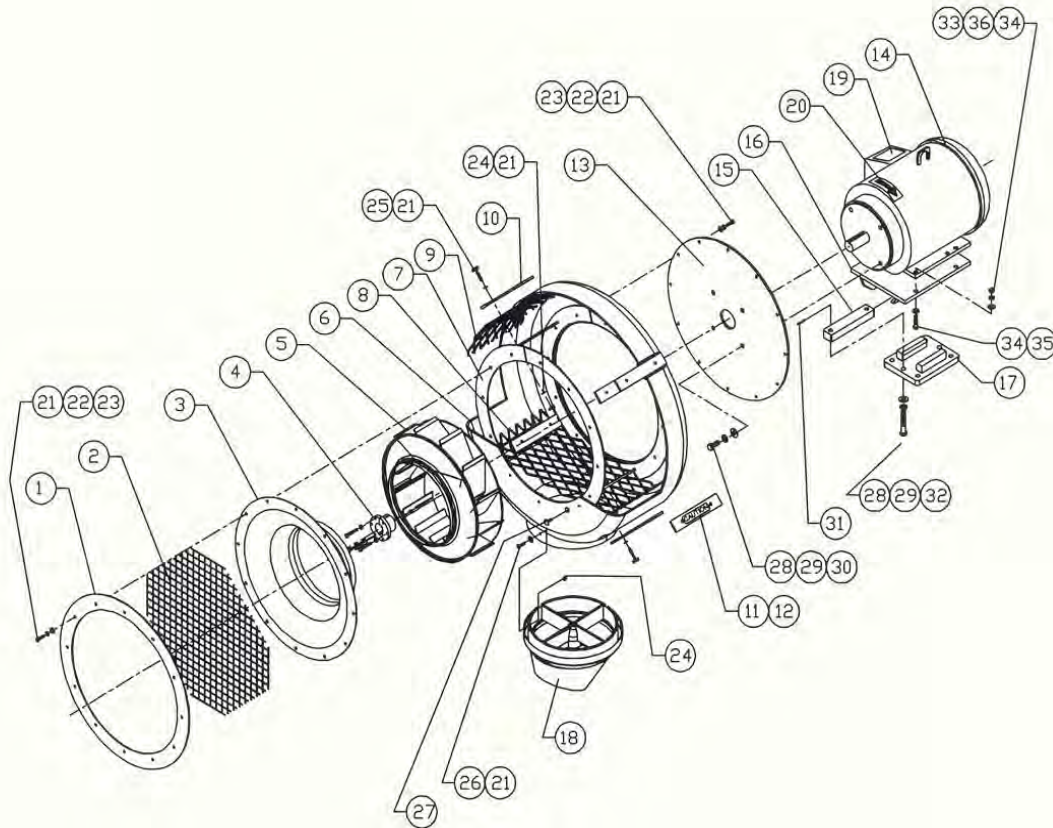
PARTS LIST



MACNEIL WASH SYS.

**Jim Coleman
Producer with
Fixed Nozzle**

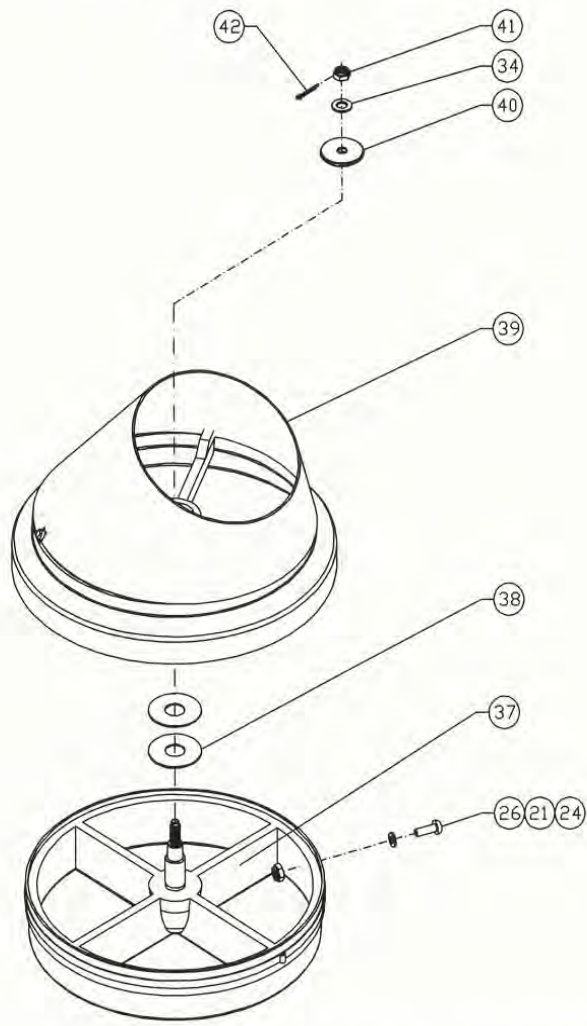
**REV. "B"
JULY 2002
Page #1**



MACNEIL WASH SYS.

**Jim Coleman
Producer with
Fixed Nozzle
NOZZLE ASSEMBLY (65-725-00-MP)**

**REV. "B"
JULY 2002
Page #2**



MACNEIL WASH SYS.

Jim Coleman
Producer with Fixed Nozzle

REV. "B"

'JULY 2002

PAGE#4

<i>Item no.</i>	<i>Req'd</i>	<i>Description</i>	<i>Part no.</i>	<i>Remarks</i>
36	4	3/8" Lock Washer SS	80-906-000-SI	
37	1	Nozzle Wheel Assembly	65-744-00-MP	
38	2	3/4" Flat Washer SS	80-512-000-SI	
39	1	Discharge Cone Assembly	65-780-20-MP	
40	1	Hub Cap - Fixed Nozzle	65-708-02-MP	
41	1	3/8-16 Nylock Nut SS - Thin	85-006-001-SIC	
42	1	5/64 x 3/4" Cotter Pin SS	86-056-012-SI	

MACNEIL WASH SYS.

BLOWER

SMART NOZZLE SETTINGS FOR ON-BOARD BLOWERS

<u>NARROW</u>		<u>MIRROR</u>		<u>WIDE</u>		<u>DELAYS</u>	
FRONT A	42	MIRROR A	2	FRONT W, A	12	REAR OFF	0
FRONT B	57	MIRROR B	37	FRONT W, B	27	MIRROR ON	0
						MIRROR OFF	9
						WIDE ON	0
						WIDE OFF	0

SMART NOZZLE SETTINGS FOR FREE-STANDING BLOWERS

<u>NARROW</u>		<u>WIDE</u>		<u>DELAYS</u>	
FRONT A	42	FRONT A	12	REAR OFF	0
FRONT B	57	FRONT B	27	MIRROR OFF	0
				WIDE ON	4
				WIDE OFF	0

NOTE: THE ABOVE NARROW AND WIDE SETTINGS MAY NEED TO BE SLIGHTLY ADJUSTED DUE TO THE POSITIONING OF THE “HOME” PROXIMITY SWITCH ON THE SMART NOZZLE TO ACHIEVE A SYMETRICAL SWEEPING PATTERN.



JIM COLEMAN COMPANY, INC.

World Class Manufacturing in Car Wash Equipment

FREE STANDING BLOWER CHECKLIST			
QTY	DESCRIPTION	SHIPPED	B/O
1	BLOWER FRAME		
1	MACNEIL BLOWER, SMART		
1	MACNEIL BLOWER, RIGHT FIXED		
1	MACNEIL BLOWER, LEFT FIXED		
1	ADDITIONAL ADJUSTABLE MOUNT		
3	MOTOR MOUNT CLAMP, PLATE		
1	BLOWER ELECTRICAL CONTROL PANEL		
2	EYE STANDS		
1	BANNER, RECEIVER EYE		
1	BANNER, TRANSMITTER EYE		
1	TURCK CABLE, 4.4T-10		
1	TURCK CABLE, 4T-4		
8	1/2" ANCHOR BOLTS		
4	1/2" X 7" S.S. BOLTS		
12	1/2" X 7.5" S.S. BOLTS		
32	1/2" S.S. FLAT WASHERS		
16	1/2" S.S. NYLON LOCKNUTS		
12	5/16" BLUE ANCHORS W/ SCREWS		
1	BAY LAYOUT DIAGRAM		
1	ELECTRICAL SCHEMATIC		

SIGNATURE: _____ DATE: _____



WATER WIZARD 6500

SYSTEM START-UP

Do Not Turn on Power

- Step 1 Flush water line before filling the water tanks on the Water Wizard. Connect Water Line and fill. Rinse Tank. Check to make sure water is clean with no cloudy residue. If the water is cloudy or dirty, continue to flush lines.
- Step 2 Fill Hyper Concentrate Stainless Steel Tank with Turtle Wax chemicals. Turn on water at the hydrominder one at a time making sure chemical is drawn up into chemical tank.
- Step 3 Before installing the tips in the undercarriage bar and connecting the 1" high-pressure hose to the gantry, you need to flush the lines. To do this, follow the steps below.
- Step 4 Turn on the air compressor.
- Step 5 Turn off the Electrical Disconnect Switch on Gantry. Turn on Electrical Disconnect Switch on Electrical Control Panel ("ECP") inside Equipment Room. The Operator Interface Panel should come on.
- Step 6 Press the "Test Screen Button". Turn on Presoak for about 2-3 minutes to flush line and get product to the Gantry. Turn on Tire Cleaner for about two (2) minutes. Turn on High Pressure Soap to flush lines then turn off and connect 1" line in Top Solenoid Box. Continue to test services until you test all functions that apply to your machine.
- Step 7 Turn on Toggle Switch located inside the panel mounted on the Gantry. Turn on power at Electrical Disconnect Switch located on Gantry. Check the rotation of the drive Motors. Depressing the Drive Reverse Switch should cause the unit to travel away from home position. If not, then have a qualified electrician change the incoming 3-phase power to correct rotation.

Press the Boom Down Switch and the Top Boom should lower. Test all the test switches for proper operation.



SYSTEM START-UP

- Step 8** Move the unit up and down the track by pressing the Drive Forward and Drive Reverse Switches. Make sure the Prox Switches are set properly to read the Home and Exit Targets.
- Step 9** You are now ready to test the unit on a car. Pull vehicle into bay and place in park position with front wheel on stop station. Press the Cycle 1 button on the Electrical Panel and watch the Water Wizard go through the wash process. Check for leaks and correct as needed. Once completed, press cycle 2 Button and monitor wash process. Repeat the same procedure for Cycle 3 and 4. Only after washing several vehicles should you need to adjust the different chemicals that are being applied to the car.

Test the Water Wizard many times to make sure it is functioning properly. Check all Prox Switch settings to make sure there is a gap of at least 1/8" and not more than 3/8".

APPROXIMATE CHEMICAL USAGE CHART		
PASS	TURTLE WAX CHEMICAL	GALLONS
Rocker Panel	Water	15.50
Pre-Soak	HP 16/5	3.17
White Wall Cleaner	White Wall Cleaner 78/5	.45
Tri Color Wax	Poly Triple Shine Foaming Wax (Red) 20/5	.43
Tri Color Wax	Poly Triple Shine Foaming Wax (Blue) 21/5	.43
Tri Color Wax	Poly Triple Shine Foaming Wax (Gold) 22/5	.43
Spot Free - 2 Pass	Filtered Water	8.00



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WATER WIZARD

 **NOTE: Please make note of the instructions for loading the memory modules below!**

Instructions for loading OMRON and Red Lion memory module

RED LION

1. Turn off power to the display. Plug in the memory card.
2. Turn on power to display. Wait for display to load program from memory card. (Observe text – LOADING CF).
3. After program is loaded, turn off power and remove card from display. Turn power back on.

OMRON

1. Turn off power to PLC. Open cover plate on CJM1M-CPU22 PLC module. Turn on DIP SW 7. (push switch to left position). Insert memory card into slot.
2. Turn on power to PLC. Wait for “busy” light to extinguish (about 5 to 10 seconds). Turn off power to PLC. Remove memory card. Turn off DIP SW 7 (push switch to right position).
3. Turn on power to PLC.
4. Perform a “Wheel Test”. This test can be accessed in the “F7 Tech Menu” of the Red Lion Interface Panel. This test will allow the PLC to store the length of your track in its memory. This **MUST** be done to assure proper operation of the Water Wizard.
5. Next you will need to “Initialize Gantry Counts”. This function can be accessed in the “F8 Site Data” menu. Once you have entered into this Sub-Menu, press the arrow key below the words “Start Init?” that is displayed. “Working” will be displayed for several seconds then it will return to “Start Init?”. This functions sets the adjustable Gantry Counters to the Factory Settings.
6. You are now ready to wash cars. Test wash several vehicles to be sure of proper operation.

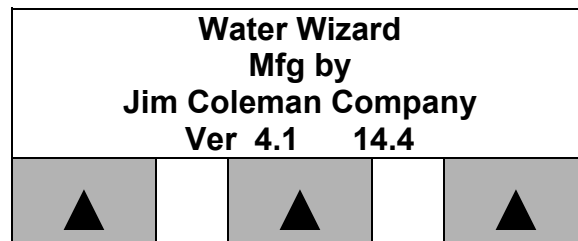


Operator Interface Panel

The Red Lion Operator Interface Panel is mounted on the door of the electrical control panel of the Water Wizard. The interface panel is called a human-machine interface (HMI). HMI's are tools for us, as humans, to be able to change settings on the machine, which, in this case, is the SRM1 Programmable Logic Controller (PLC).

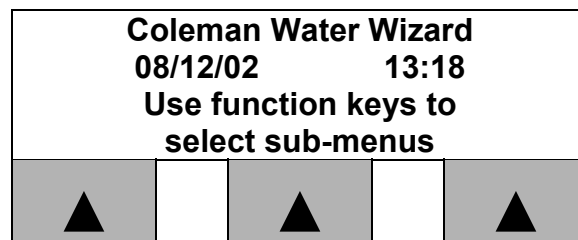
Income levels, recipes, timers, counters, etc., are stored in the memory of the PLC inside the WATER WIZARD ECP. With the Red Lion HMI, you can view the income levels, perform tests on the car wash functions, and make various changes to recipes, timers, and other memory locations in the PLC. The Red Lion is not necessary for the car wash to function. In fact, if you disconnected the Red Lion, the car wash would continue to operate.

The PLC and Red Lion have independent programs stored in their own internal memory. When the car wash is first powered up with the main disconnect switch of the ECP, the Red Lion will display the following screen for approximately 5 to 6 seconds:



JCC developed the programs for the Red Lion and the SRM1. The two numbers at the bottom of the screen represent the version numbers of your unit. The first number (i.e. 4.1) represents the current version stored in the Red Lion. The second number represents the current version stored on the SRM1. To find out if you have the latest version, call Jim Coleman Company.

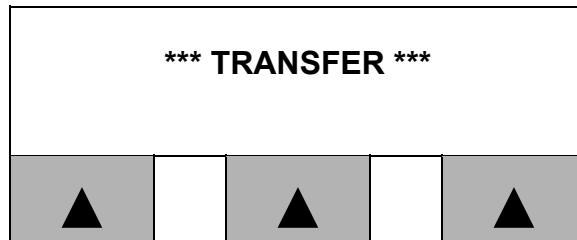
After the 5 to 6 seconds have expired, the LED Display will default to the following screen:



If the Red Lion is showing the screen on the previous page, and you wish to know which version numbers are stored on your machine, press the "**◀PREV**" button.

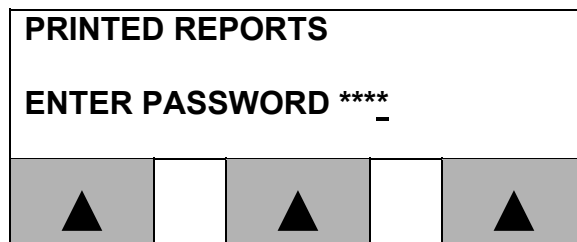
Printing Income Reports

This function is for car washes with the optional printer. To access this option, ensure the Sub-Menu screen with the date and time is displayed. Then, press the “**MUTE**” key once. If you press “**MUTE**” twice, you will put the Red Lion in the transfer mode, and you will get the following screen:

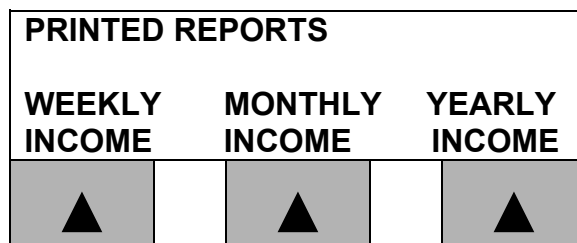


If this happens, simply turn off the main power switch and turn it back on, or disconnect the 24VDC power from the back of the Red Lion, then plug it back in. This is the 2-pin connector in the back of the Red Lion with a blue wire in pin one and a brown wire in pin two. This connector will have three pins on the newer models. Pin three is not used.

Once you press the “**MUTE**” key, the following screen will appear:



After entering the password, the following screen will appear:



Press the button below the report you wish to print.



Sub-Menus

The Operator Interface Panel has eight different Sub-Menus or function keys to choose from on the lower left side of the device. The following is a list of the Sub-Menus:

Select Recipe	Change Prices
Change Recipe	Service Screen
Income Monitoring	Test Screen
Operation	Change Setting

Select Recipe

The WATER WIZARD Automatic has been designed to meet a wide range of customer demands and comes complete with twenty (20) different standard recipes. You can choose up to four recipes to use with your car wash. These recipes are designed to select desired functions for the gantry to perform and/or chemicals to apply to the automobile during each pass. A recipe can have a 4, 6, 8 or 10 pass wash.

A pass is defined as movement from one end of the vehicle to the other. At the beginning of each pass, you can set a boom down timer to allow the boom to go down for the specified amount of time, then back up. If this timer is set to zero, the boom will not come down.

Once the gantry has reached the opposite end of the vehicle, the pass is completed. The next pass starts when the boom comes down or the gantry starts to move in the opposite direction. One exception to the boom down rule is in pass one. Pass one has a rear pre-soak option, which allows the boom to come down at the rear of the car during pass one. Then when pass two starts; the boom may come down in back of the car a second time if pass two boom down timer is not equal to zero.

The 20 pre-programmed recipe breakdown is as follows:

- 6 Pre-programmed Recipes for a 10 Pass Wash Package
- 6 Pre-Programmed Recipes for an 8 Pass Wash Package
- 5 Pre-Programmed Recipes for a 6 Pass Wash Package
- 3 Pre-Programmed Recipes for a 4 Pass Wash Package

You have the option of making up to 20 custom recipes and storing them in the PLC. However, due to the limitations of the Automatic Cashier and other equipment, only four recipes may be selected for use at any one time. We select four pre-programmed recipes at the factory before the unit is shipped. See the “**RECIPES**” section of this manual for details.



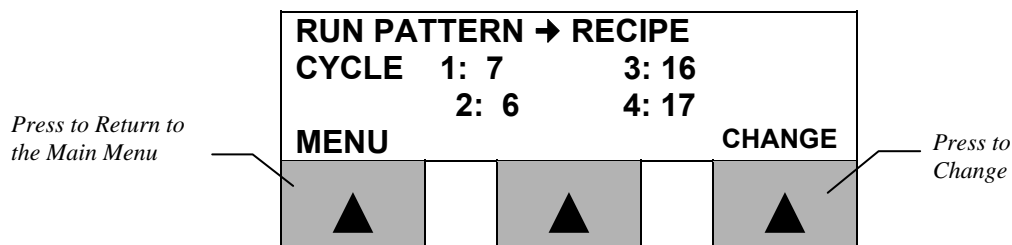
OPERATOR INTERFACE PANEL

You may change the recipes stored for use by following the step-by-step procedure explained below.

Step 1 - Select four recipes from the twenty recipes that have been pre-programmed into your system. (*The Auto Cashier only allows you to choose four wash packages to run*). Write those numbers below for future reference.

Recipe 1 _____ Recipe 2 _____ Recipe 3 _____ Recipe 4 _____

Step 2 - Press the “**Select Recipe**” Button. The monitor will display the following message:



The numbers by each of the cycles in the above screen are the numbers for the recipes selected by default for each cycle at the factory. To change the recipe number for one or more of the cycles, press the “▲” button located directly below the “**Change**” option. The cursor defaults to the recipe number listed by Cycle 1. Press “**✓Enter**” until the cursor is under the recipe number of the cycle you want to change. Enter the number of the recipe you want for that cycle, or press “**Raise**” or “**Lower**” until you have the number you want. Once you have the number you want, press “**✓Enter**”. Always remember to press “**✓Enter**” to save your changes. After making all necessary changes, press the key under “**Return**” to verify the changes you made were saved. Press “**Exit**” to return to the main menu.



Change Recipes

The WATER WIZARD comes complete with twenty (20) pre-programmed recipes to meet a broad range of climates and customer demands. Although JCC has given a great deal of thought into designing the pre-programmed recipes, you have the option to enter custom programs to meet your specific requirements

WARNING!

TO AVOID PROBLEMS WITH YOUR RECIPE CONFIGURATION, HAVE AN EXPERIENCED TECHNICIAN DESIGN AND ENTER YOUR CUSTOM RECIPES. IF AT ALL POSSIBLE, USE THE PRE-PROGRAMMED RECIPES DESIGNED BY JIM COLEMAN COMPANY.

As explained under “**Select Recipes**”, you have the option of selecting up to four different recipes to use with the four cycle switches of the auto cashier. Each recipe selected can have four, six, eight or ten passes with the following functions available for selection on each pass:

00	Rocker Panel
01	Tire Cleaner
02	Pre-Soak
03	HP Soap
04	HP Rinse
05	HP Wax
06	Tri-Color Wax
07	Spot Free Rinse
08	Med Pressure/Rear Presoak
09	Undercarriage / Bug Pass
10	Low pH Presoak
11	Blower
12	End of Wash
13	Slow Speed
14	Reclaim Water
15	Presoak Dwell/Drying Agent
Boom Down Time: 0:00	

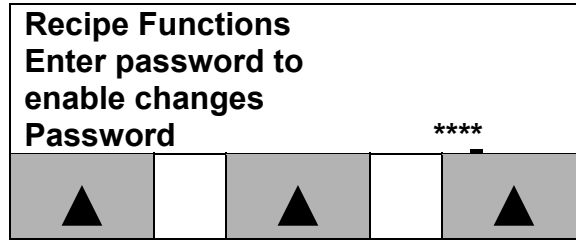
You may find yourself in the situation where the pre-programmed recipes do not fit your needs. In this case, you will need to create a custom recipe. To do so, follow the step-by-step procedure explained below:

Step 1 – Find a Pre-programmed Recipe Close to your Needs

Search through the “**RECIPES**” section of the owner’s manual. Find a pre-programmed recipe which is similar to your wash.

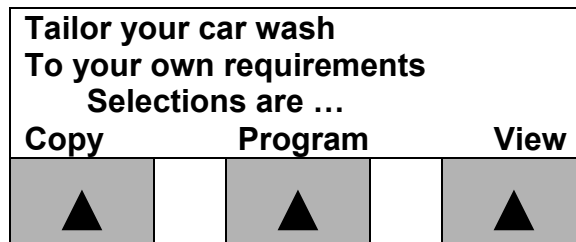
Step 2 – Select Change Recipes

To customize the recipe, press the “**Change Recipe**” button. The following screen will appear:



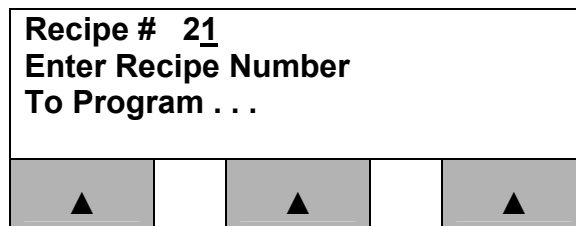
Enter your Password, then press “**✓Enter**”. (The password defaults to “**1234**” from the factory. To change the password, see the section on “**Change Settings**”).

The following screen will appear:



Step 3 – Select the Recipe Number to Modify

Press the button under “**Program**”. The Red Lion will display the following screen:



The recipe number defaults to the last recipe viewed or modified. Use the number keypad to enter a new recipe number to view or modify. Recipe numbers ‘0’ through ‘19’ are pre-programmed recipes, which cannot be modified. To create or modify a recipe, select a number between ‘20’ and ‘39’.



OPERATOR INTERFACE PANEL

NOTE: To make the modification simple, select a recipe from the factory recipes that is close to what you want. Select that number on the above screen, then press the “✓ENTER” key.

The following Screen will appear:

Recipe #21		Pass 1	
GO TO REAR OF CAR			
01 Tire Cleaner		On	
Scroll		Toggle	
▲		▲	▲

Tire Cleaner is turned on in pass 1. To turn it off, press this button

The screen defaults to the first pass of the car wash. To see what is selected on the first pass, scroll through each of the functions available for that pass by pressing the button under “**Scroll**”.

As you scroll through the functions, you will see the options available in the same order as the table below:

00	Rocker Panel
01	Tire Cleaner
02	Pre-Soak
03	HP Soap
04	HP Rinse
05	HP Wax
06	Tri-Color Wax
07	Spot Free Rinse
08	Med Pressure/Rear Presoak
09	Undercarriage / Bug Pass
10	Low pH Presoak
11	Blower
12	End of Wash
13	Slow Speed
14	Reclaim Water
15	Presoak Dwell/Drying Agent
Boom Down Time: 0:00	

Not all of the above functions are available on every pass. For example, “**Undercarriage**” is available for selection on the first pass only. So, when you scroll through the options for any pass other than pass 1, the option for “**Undercarriage**” will not appear



OPERATOR INTERFACE PANEL

Above the word **“Toggle”** the Red Lion displays the current state of the option for the pass. **“On”** means the option is enabled for that pass. **“Off”** means the option is disabled for that pass. To change the state of the option, press the button below the word **“Toggle”**. The state will then change from **“Off”** to **“On”** or from **“On”** to **“Off”**.

NOTE: When changing the main function for the pass, ensure you toggle off the old function for that pass. For example, if **“HP Rinse”** is toggled on for a particular pass, and you want to change it to **“Tri-foam”**, toggle **“HP Rinse”** off and toggle **“Tri-foam”** on.

Each pass has a **“Boom Down Time”** which allows you to change the distance the boom will come down in front or back of the car. The **“Boom Down Time”** is the last option of each pass as you scroll through the options. If you wish to adjust the **“Boom Down Time”**, press the **“RAISE”** button to raise the boom down time in 1/10TH second increments and the **“LOWER”** button to lower the boom down time in 1/10TH second increments. Another method to change the boom down timer is to enter the number with the number pad, then press **“√ENTER”**.

To access passes 2 through 10, press the **“NEXT”** button, which is located by the **“7”** on the number pad. The pass number appears on the upper right of the display and will say **“Pass #”**, where # is the number of the pass being displayed. To go back to the previous pass, press the **“PREVIOUS”** button.

Step 4 – Saving the Recipe

Once programming is complete and you have created a new recipe, **SAVE YOUR RECIPE.**

To save your recipe, press **“EXIT”** one time. The following screen will appear:

TAILOR YOUR CAR WASH TO YOUR OWN REQUIREMENTS SELECTIONS ARE		
COPY	PROGRAM	VIEW
▲	▲	▲



Step 5 – Copy

Press the key under “**COPY**” in the above screen. The following screen will appear:

Save Recipe				
From Recipe ##				
To Recipe ##				
				Save
▲		▲		▲

The number by “**To Recipe ##**” defaults to the last recipe saved. Enter the number for the recipe where you want to store your recipe (numbered 20 through 39) using the number keypad or the “**RAISE**” and “**LOWER**” keys.

Press the “**✓ENTER**” key. Press the Key under “**Save**”. After selecting “**Save**” the following screen will appear.

Please Verify Copy				
From Recipe ##				
To Recipe ##				
No		Yes		
▲		▲		▲

This screen allows you to verify the location where you will save your recipe. If the numbers are different, you did not press “**✓Enter**” in the previous screen. If the number by “**To Recipe**” is incorrect, press the key under “**No**”. This will put you back into the previous screen and allow you to re-enter the number.

When the Recipe number is correct, press the key under “**Yes**”. After pressing yes the word “**Saved**” will appear on the screen as displayed below:

Please Verify Copy				
From Recipe ##				
To Recipe ##				
No		Saved	Yes	
▲		▲		▲

You can verify your recipe by pressing “**EXIT**” two times. Select “**CHANGE RECIPES**” and use the “**VIEW**” option to ensure the selected options on each pass are correct. Enter the recipe number you want to verify followed by the “**✓Enter**” key. If you do not do this, the PLC will not Follow the instructions as explained in the previous part of this section.



OPERATOR INTERFACE PANEL

Income Monitoring

This selection allows the user to view income records for the Water Wizard.

Select the **“INCOME MONITORING”** Button. The following screen will appear:

Income Records				
Enter password to				
View records				
Password: ****				
▲		▲		▲

Enter the password, then press **“✓ENTER”**. The following screen will be displayed:

Income Records			
1:	0.00	3	0.00
2	0.00	4	0.00
Total		\$	0.00
▲		▲	▲

This screen reflects the total income for the automatic as well as a breakdown for each cycle selected by customers throughout the day (from 12:01 am to 12:00 am the next evening).

*NOTE: Press the **“RAISE”** and **“LOWER”** keys (located at the left of your ten digit keypad) to display income for Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Best Day.*

Press **“NEXT”** to view **“INCOME: This Month”**

This screen reflects the total income for the automatic as well as a breakdown for each recipe chosen on a monthly basis.

*NOTE: Press the **“RAISE”** and **“LOWER”** keys (located at the left of your ten digit keypad) to display income for each month January through December.*



OPERATOR INTERFACE PANEL

Press **“NEXT”** to view **“INCOME: Current Year”**

This screen reflects the total income for the automatic as well as a breakdown for each recipe chosen on a yearly basis.

*NOTE: Press the **“Raise”** and **“LOWER”** keys (located at the left of your ten digit keypad) to display income for each year starting with 1998.*

Operation

The purpose of the Operation Option is to display the current operation of the WATER WIZARD as well as the specific wash cycle and pass the customer is currently utilizing. It will also display the function the pass is performing. See screen below:

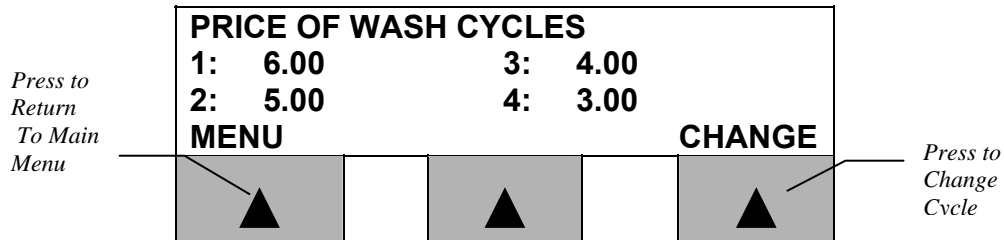
OPERATION SCREEN				
WASH #	1	PASS #	1	
PRESOAK				
▲		▲		▲

The above screen is an example of a car wash. As you can see, the current wash is cycle one. The current pass is pass one, and the function is presoak.



Change Prices

This option allows the operator to change the prices of each cycle. Press “Change Prices” button - the following display will appear



Press the “▲” button located directly below Change Option. The menu will display the prices entered for each cycle. If changes are necessary, press the “**Change**” button, you may advance through the cycles by pressing “**NEXT**” or “**✓ENTER**” until you reach the desired cycle. The cursor defaults to “**Cycle 1**”. Enter the desired price by using the numbers on the keypad or the “**RAISE**” and “**LOWER**” keys. After you entered the price you want, press “**✓ENTER**”. The cursor automatically advances to Cycle 2. Repeat these steps through Cycle 4. Always remember to press “**✓ENTER**” after each new selection. After making all necessary price changes press “**✓ENTER**” and then “**RETURN**”. If the displayed prices are correct, choose “**MENU**” to return to main screen.




OPERATOR INTERFACE PANEL

Service Screen

There are a total of nine screens associated with this function. With this option, you can view or modify times set for certain timers used in the program. You can also view the current state (on or off) of each of the sensors and inputs on the automatic. The timer values can be modified, but the state of each of the sensors cannot. . To get to the next screen, press “**NEXT**”, to go back to previous screens, press “**PREV**”.

When you select “**SERVICE SCREEN**”, the following screen will be displayed:

SERVICE SCREEN		
BLOWER TIME	#	45. <u>0</u>
DWELL TIMER	1	05. <u>0</u>
DWELL TIMER	2	05. <u>0</u>



The value for each of the timers can be modified. To do this, identify the timer with the last zero underlined. The underline means the timer is in the edit mode. If you wish to modify a timer other than the top timer of the screen, press the “**✓ENTER**” button until the desired timer is in the edit mode. Enter the new value for the timer using the numeric keypad or “**RAISE**” and “**LOWER**” keys. Once you have entered the correct time, press “**✓ENTER**”.

Each timer on this screen is explained below:

Blower Timer (Factory set at 45 Sec):

This sets the length of time the freestanding blower stays on. The amount of time set on this timer has no effect on the length of time of the car wash.

Dwell Timer #1 (Factory set at 5 Sec):

This timer sets the length of time the unit will wait at the back of the car (end of pass one) allowing the presoak to soak in. You can set this timer from zero to ten seconds.




Dwell Timer #2 (Factory set at 5 Sec):

This timer sets the length of time the unit will set at the front of the car (end of pass 2) waiting for the presoak to soak in. You can set this timer from zero to ten seconds.



OPERATOR INTERFACE PANEL

Press “**NEXT**” to go to the next screen. The monitor will display the following:

DRIVE OFF TIMER	90.0
ENTRANCE TIMER	120.0
UNDERCARRIAGE TIMER	20.0
LAST PASS BOOM TIMER	4.0
	
	

Use the same procedure as previously explained to modify these timers. Each timer is explained below:

Drive Off Timer (Factory set at 90 Sec):

If a customer drives off of the stop station during the wash process, the WATER WIZARD will wait the number of seconds displayed. If the customer never gets back on the treadle plate before this timer times out, the WATER WIZARD resets the auto cashier.

Entrance Timer (Factory set at 120 Sec):

Once a customer deposits money into the auto cashier, the WATER WIZARD will wait the number of seconds set on the timer to allow customer to enter the bay. If the customer does not enter the bay in two minutes, the WATER WIZARD will reset the Auto Cashier. This prevents a customer from depositing money into auto cashier and never entering bay and tying up Water Wizard.

Undercarriage Timer (Factory set at 20 Sec):

This sets the length of timer the undercarriage wash will run.

Last Pass Boom Down Timer (Factory set at 4.0 Sec):

This timer allows the owner to have the boom come down and back up on the last pass of the car wash. For example, the last pass may be one pass of spot-free. The boom will come down in the rear of the car, then go to the front of the car. If the last pass boom down timer is greater than zero, the boom will come down in front of the car with spot-free, go back up, then the gantry will return to the home position. If this timer is set, the boom will come down after the last pass of all four cycles of the Water Wizard.



OPERATOR INTERFACE PANEL

Press "NEXT" to display the last set of timers:

TRIPLE SHINE DWELL	00.0			
BLOWER DELAY	00.0			
UNDERCAR REAR				
WHEEL TIMER	04.0			
▲		▲		▲

These timers are explained below:

Triple Shine Dwell Timer (Factory set at 0 Sec):

Allows the owner to set a delay to allow the chemicals to get a good flow before the gantry begins to move.

Blower Delay Timer (Factory set at 0 Sec):

Allows the owner to set a delay for the free standing blowers giving the gantry time to go home and the exit light to come on before the blowers turn on.

Undercarriage Rear Wheel Timer (Factory set at 4.0 Sec):

Allows the owner to set a delay for the undercarriage to shut off after the rear wheel of the vehicle blocks the entrance eye. This timer can be set anywhere from 0.1 to 10.0 seconds.

In the next section, the screens are not modifiable, but are for troubleshooting purposes. They display the various inputs used by the car wash to tell the owner if he is getting the proper inputs for the car wash to operate properly.



OPERATOR INTERFACE PANEL

Input Signals

By viewing the next screens, the owner can decide which inputs are giving the CPU a signal that will prevent the car wash from operating properly. Each of the next screens shows a list of those inputs and their proper state with no car in the bay:

SERVICE SCREEN				
EYE ON GANTRY				ON
EYE ON TOP ARM				ON
PROX UPPER ARM				ON
▲		▲		▲

PROX LOWER ARM				OFF
PROX AT HOME				ON
PROX END O TRACK				OFF
COUNTING PROX				OFF or ON
▲		▲		▲

EYE ON TREADLE				OFF
EMERGENCY SWITCH				ON
RESET SWITCH				OFF
ENTRANCE EYE				OFF
▲		▲		▲

FREEZE THERMO				OFF or ON
PRESOAK TANK				OK
WATER TANK				OK
WAX TANK				OK
▲		▲		▲

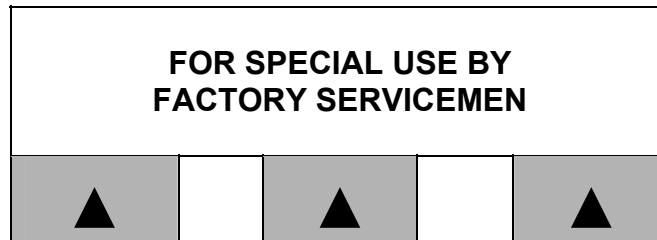
TIRE CLEANER				OK
AIR SOLENOID PROX				ON
HEIGHT DET EYE				ON
HEIGHT DET PROX				OFF
▲		▲		▲



OPERATOR INTERFACE PANEL

For the car wash to operate properly, the chemical and water tanks must show “OK”, the eyes and prox switches must show the correct inputs. If you have any questions, call Jim Coleman Company at (713)683-9878 or (800)999-9878

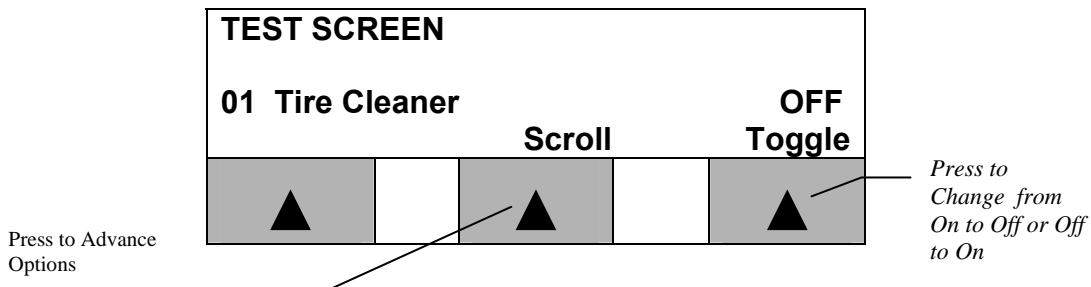
The next screen is for Jim Coleman Co. authorized service technician, and will not be explained in any detail:



Press “EXIT” to go back to the main menu.

TEST SCREEN

This option is specifically designed to assist the service department. Begin by selecting “Test Screen”. The following screen will appear:

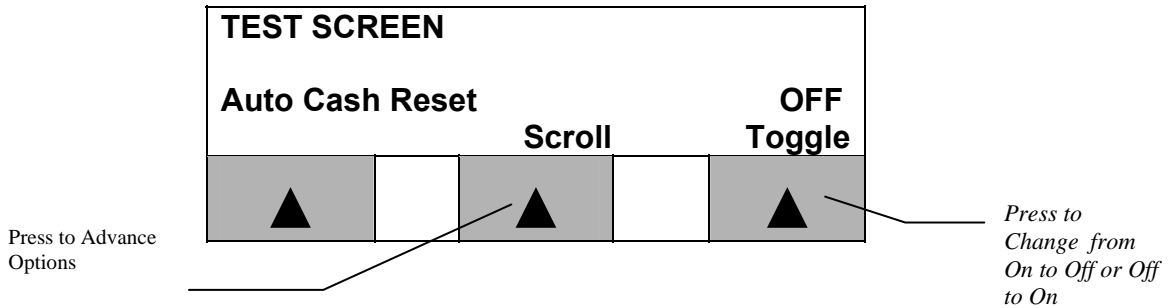


The following table contains all of the options available for this test screen:

02	PRE-SOAK	ON
03	HP Soap	OFF
04	HP Rinse	OFF
05	HP Wax	OFF
06	Tri-Color Wax	OFF
07	Spot Free Rinse	OFF
08	Med Pressure	OFF
09	Undercarriage	OFF
10	Low pH Presoak	OFF
11	Blower	OFF
12	Reclaim Water	OFF
13	Rocker Panel	OFF
14	Air Purge Freeze	OFF

For Example: To test the Pre-Soak, advance to the Pre-Soak Option. Press the toggle button to turn Pre-Soak On. The WATER WIZARD will turn on Pre-Soak and it will remain on to allow you to make adjustments. Pre-Soak will remain on until this field is turned off.

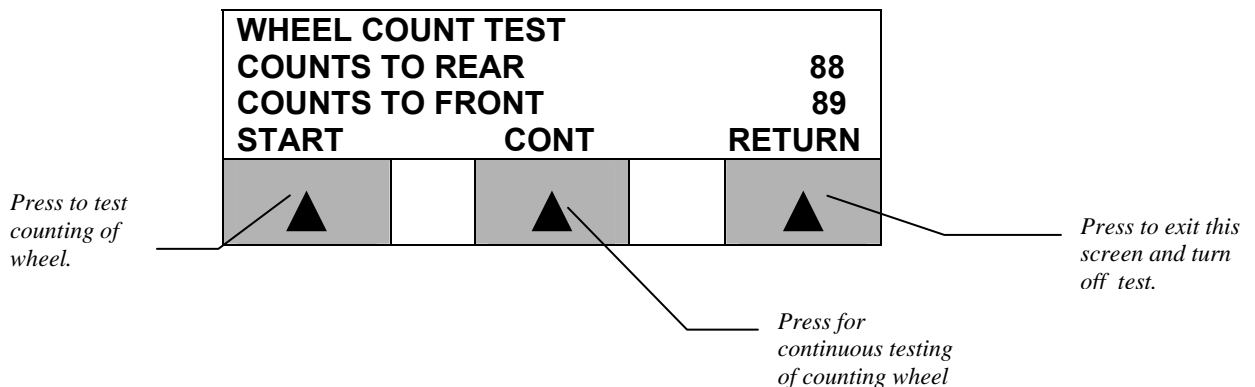
Press “**NEXT**” to go to the next screen. The monitor will display the following:



This test screen works the same as the previous test screen. The following table lists all of the options available with this test screen:

Stop Light	ON	<i>For Example: To test the Stop Light, advance to the Stop Light Option. Press the toggle button to turn Pre-Soak On. The WATER WIZARD will turn on Pre-Soak and it will remain on to allow you to make adjustments. The stop light will remain on until this field is turned off.</i>
Enter Light	OFF	
Back Up Light	OFF	
Presoak Light	OFF	
Bottom Blast Lt	OFF	
Clear Coat Light	OFF	
Triple Shine LT	OFF	
Spot Free Light	OFF	
Exit Light	OFF	
Please Wait Lt	OFF	
Air Sol Blower	OFF	
Open Ent Door	OFF	
Close Ent Door	OFF	
Open Exit Door	OFF	
Close Exit Door	OFF	

With the next screen you can conduct a wheel count test to ensure the counting prox on the gantry is functioning properly. Press “**NEXT**” to advance to the next screen:





OPERATOR INTERFACE PANEL

When you press “START”, the gantry will travel from the home prox to the end of track prox and back one time. “COUNTS TO REAR” shows the number of pulses the counting prox detected on the counting wheel from the home prox to the end of track prox. “COUNTS TO FRONT” shows the number of pulses it detected going to the front. When operating properly, the count to rear and count to front should not differ by more than one or two counts.

The “CONT” option is a continuous test where the gantry continually travels back and forth until you press “RETURN” or the reset button by the cycle switches on the WATER WIZARD electrical panel door. During this test, each pass to the rear of the track adds to the total number of “COUNTS TO REAR”. Likewise, each pass to the front adds counts to “COUNTS TO FRONT”.

The “CONT” test will better detect if there is a problem with the wheel count. The wheel count could be off one or two on the first pass. However, on subsequent passes, the count may become off by several counts. This means there is a problem with the counting prox, or the counting wheel may be slipping.

WHEEL COUNT OF THE LAST TEN CARS.

Press “NEXT” to go to the next screen:

Count	Front	Rear
Car 01	06	60
Car 02	07	66
Scroll		
▲	▲	▲

Press to test counting of wheel.

Press to exit this screen and turn off test.

This screen shows the wheel count in the front and rear of the last ten cars washed by the Water Wizard. To see the other eight cars, press the button under “**Scroll**”.

Current Car Count

Press “NEXT” to go to the next screen.

COUNTING WHEEL		
PRESENT COUNT		33
FRONT OF CAR	6	0
REAR OF CAR	62	68
▲	▲	▲



OPERATOR INTERFACE PANEL

This screen displays the current count of the car being washed. The first number at the front/rear of the car represents the count when the eyes see the front/rear of the car. The second number at the front/rear of the car represents the number of counts for the gantry to move away from the car before the boom will come down.

Total Number of Car Washes

Press “**NEXT**” to go to the next screen.

TOTAL NUMBER OF CAR WASHES ____				
▲		▲		▲

This represents the sum of all four cycles of car washes performed by the Water Wizard. This is an accumulative number and cannot be reset. It begins counting from the first day of installation.

Change Setting

This option allows the user to change Password, Set Clock and enter a Phone # for optional automatic dial-out feature.

To change the Current Settings, enter the password. The default password for the system is **1234**. Press “**✓ENTER**”. The following screen will appear:

Owner Settings				
Enter password				**** _
▲		▲		▲

Enter the password, then press “**✓ENTER**” to advance to the next screen:

Owner Settings				
P'Word Change		Set Clock		Enter Phone #
▲		▲		▲

Select Desired Function: _____



OPERATOR INTERFACE PANEL

On the above screen, you have three options available:

1. Password change
2. Set Clock
3. Enter Phone #

These functions are explained in the next part of this section.

1. **P'Word Change:** When you select this option the following screen will be displayed:

Enter New Password				
OLD 1234				
NEW 123 <u>4</u>				
RETURN				
▲		▲		▲

The “**NEW**” password defaults to the edit mode. The cursor will default to the new password selection under the 4 of the password. Enter your new password (from 1 to 4 digits), then press the “**✓ENTER**” button. Press “**RETURN**” to return to the main menu.

2. **Set Clock:** When you select this option, the current date and time will be displayed, as shown in the following screen:

09/01/01 11:09:07				
EDIT				
▲		▲		▲

If changes are necessary - Press “▲” button located directly below Edit Option. One of the two following screens will appear (depending on how you edit the date and time):

<u>09</u>/01/01 11:09:07				
EDIT		SAVE		RAISE
▲		▲		▲



OPERATOR INTERFACE PANEL

09/01/01 11:09:07				
SAVE		RAISE		LOWER
▲		▲		▲

The cursor will default to the month - enter the correct month using the ten digit keypad or the “**RAISE**” and “**LOWER**” keys (under the LED or by the keypad), then press “**✓ENTER**”. The cursor will then advance to the day selection – enter the correct day of the month using the keypad or the “**RAISE**” and “**LOWER**” keys, then press “**✓ENTER**”. Continue this action until all fields are properly entered. You may also advance through the desired fields by pressing the “**Next**” button.

Once you have entered the correct date and time, press the key under “**SAVE**” to save your changes.

- 3. Enter Phone #:** This option allows you to enter up to three phone numbers for the paging option. See the screen below:

#1	=	0-	0-000-000			
SITE NUMBER		#	000			
TIME DELAY		#	00 SECS			
			SAVE			
▲		▲		▲		

The #1 in the upper left corner means this is the first of the three phone numbers you are entering.

The long distance code defaults to the edit mode. If the number is long distance, enter 1, then press “**✓ENTER**”. If it is not long distance, leave this value at zero and press “**✓ENTER**”.

Once you press the “**✓ENTER**” key, the area code part of the phone number is in the edit mode. If required to dial the area code in your area, enter the area code

After you enter the area code, enter the remaining seven digits of the phone



OPERATOR INTERFACE PANEL

number. Press “✓ENTER”.

This will put your cursor on the “**SITE NUMBER**”. If you have more than one WATER WIZARD Car Wash with paging, you can give each car wash a unique site number. In this manner you will know which car wash has the error. Enter the site number, then press “✓ENTER”

This will put your cursor on the “**TIME DELAY**”. The time delay is how many seconds the computer waits after dialing before sending out the message. If your pager has an operator that answers the phone then you need to set the time delay to 18 - 20 seconds. If no operator answers the phone the correct time is 14-16 seconds.

After entering in all the correct information press save to save all of your information you entered. This will put you back to the “**Owner Settings**” screen.

Owner Settings		
P'Word Change	Set Clock	Enter Phone #
▲	▲	▲

Press the “**NEXT**” key.

Test Switches		
Cycle Switches	OFF Toggle	
▲	▲	

This function allows the owner to turn on or turn off the 4 cycle switches on the door. If you do not want your attendant to give away free washes - turn the test switches to “Off”

Press the “**NEXT**” key.

Wheel Count to flip on board		
Blowers early On Board Blowers	0.00 OFF Toggle	
▲	▲	



OPERATOR INTERFACE PANEL

This function allows the owner to select On Board Blowers if the blowers are mounted on the gantry. If the unit has On Board Blowers this option should be toggled on.

Press **“NEXT”**.

Unitec Auto Cashier?				
				OFF
				Toggle
▲		▲		▲

Toggle this bit on if the car wash uses a Unitec Auto Cashier. This will enable the functions, which enable the **“Auto Cashier Reset”** output signals used by Unitec Auto Cashiers.

Press **“NEXT”**.

Pager Test	Site 01
Time Delay	14 Sec.
Dialed	7136839878
Test 1ST	
▲	▲

Press the **“▲”** key below **“Test 1ST”**. This will test the 1st phone number for the modem and paging capability. To test the second, and third phone numbers, press **“NEXT”** key to access the screens for each phone number. The screen will say **“Test 2ND”**, and **“Test 3RD”** respectively. You can test each phone number you have entered in.

When you press the **“▲”** key the modem will dial out and send a message to your pager.

Site #	Hour	Min	Error Code
01	08	30	00

Error Codes

The error codes are as follows:



Error Code #:	Description:
00	Test
01	Presoak Tank Empty
02	Tire Cleaner Tank Empty
03	Water Tank Empty
04	Wax Tank Empty
05	Emergency Stop Station Was Pressed
06	Customer did not get on Treadle in 2 Min
07	Unit Failed to Complete Wash in 10 Min
08	Drive Motor Tripped Out
09	Top Boom Motor Tripped Out
10	Oscillating Motor Tripped Out
11	Auto Cashier is Out of Service This error requires special wiring between the Auto Cashier and the SRT2-ROC16 input card in the equipment room ECP. Talk to JCC about how to hook up the feature.
12	Drive Motor has Run too Long If the drive motor runs for more than 2 minutes then the Red Lion will display this error message. The program disables the auto cashier.
13	Top Boom motor has Run too Long If the top boom motor runs for more than 20 seconds then the Red Lion will display this error message. The program disables the auto cashier.
14	Bill Changer # 1 is out of order This error requires special wiring between the Bill Changer #1 and the SRT2-ID16 input card in the equipment room ECP. Talk to JCC about how to hook up the feature.



- 15 Bill Changer # 2 is out of order**
This error requires special wiring between the Bill Changer #2 and the SRT2-ROC16 input card in the equipment room ECP. Talk to JCC about how to hook up the feature.
- 16 Top Boom Did Not Come Down**
The program looks at the top boom prox to see if its signal goes off after the top boom motor has run for 2.2 seconds. If the signal stays on after 2.2 seconds, the top boom is hung up or jammed. If this error occurs, the program disables the Auto Cashier.
- 17 Top Prox needs to be replaced**
If the top prox is on and the height Adjustment Prox is on then the Red Lion displays this message, and the program disables the Auto Cashier.
- 18 Auto Height Prox needs to be replaced**
The program looks at the height adjustment Prox during the first second of the wash. The program tests this prox to see that the Prox is off. If the Prox is on then the Red Lion displays the error code. The program disables the height adjustment feature of the unit, but does not disable the Auto Cashier.
- 19 Lower Boom Prox needs to be replaced**
The program tests the Lower Boom Prox during the first second of the wash to see if it is on. If the Lower Prox is on then the Red Lion will display this error message, and the program disables the Auto Cashier.
- 20 Home Prox needs to be replaced**
The program tests this prox during the first second of the wash. The program looks to see if it is off. The home prox should be on at this time under normal operation. If the prox is off, the Red Lion will display this error message, but the program will not disable the Auto Cashier.
- 21 End of Track Prox needs to be replaced**
The program tests this prox during the first second of the wash. The program looks to see if it is off. If the prox is on then the Red Lion displays the message, and the program disables the auto cashier.



- 22 Auto Height Adjustment eyes needs to be replaced**
The program tests the eyes to see if they are on during the first second of the wash then we also test the eyes of the beginning of Pass 2. When the boom drops at the back of the can the boom blocks the eyes for a second. The program checks to see if the eyes go off when the boom blocks them. If the eyes do not pass both of these tests, then we do not adjust to the height of the vehicle and we do display the error code. The program does not disable the Auto Cashier.
- 23 Air Solenoid Prox needs to be replaced**
The program tests the air solenoid prox during the first second of the wash to make sure that it is on. If the prox is not on, the Red Lion will display the error message, but the program will not disable the Auto Cashier.
- 24 The Brake of the Top Boom has slipped**
The program checks to see if the Top Prox becomes uncovered for more than .5 seconds, when the gantry is moving down the track. If the Top Prox goes off for more than .5 seconds, the Red Lion displays this error, and the program disables the Auto Cashier.



WATER WIZARD PROGRAM DIAGNOSTICS

ERROR CODE	NORMAL AT HOME CONDITION	DIAGNOSTIC TEST DURING 1 ST SECOND OF WASH CYCLE	DIAGNOSTIC TEST ON EVERY PASS	DIAGNOSTIC TEST ON PASS 2	RAN TOO LONG	DISABLE AUTO CASHIER
12					✓	YES
13					✓	YES
16						NO
17	ON		✓			YES
18	OFF	✓				NO
19	OFF	✓				YES
20	ON	✓				NO
21	OFF	✓				YES
22	ON	✓		✓		NO
23	ON	✓				NO
24			✓			YES



OPERATOR INTERFACE PANEL

The next two screens are to select circulating presoak for units with that option. The first screen is for High PH presoak, and the second is for Low PH presoak.

CIRCULATING PRESOAK				
HIGH PH			OFF Toggle	
▲		▲		▲

CIRCULATING PRESOAK				
LOW PH			OFF Toggle	
▲		▲		▲

The last two screens are to select reclaim water for units with that option. The first screen is for reclaim or cold water with the UNDERCARRIAGE, and the second is for reclaim or cold water with the ROCKER PANEL.

RECLAIM/COLD WATER SOLENOID UNDERCARRIAGE				
			OFF Toggle	
▲		▲		▲

RECLAIM/COLD WATER SOLENOID ROCKER PANEL				
			OFF Toggle	
▲		▲		▲



ATTENTION

All Water Wizards built after October 1, 2001 with the version software 13.6 or higher will have the following changes made.

Water Wizard with the On Board Blower will have the following recipes loaded in the operating systems:

Cycle 1	Recipe 0	Ten Pass with Blower
Cycle 2	Recipe 6	8 Pass with Blower
Cycle 3	Recipe 16	6 Pass
Cycle 4	Recipe 17	4 Pass

Water Wizard without blower will have the following recipes loaded into the operating system.

Cycle 1	Recipe 7	8 Pass with triple shine
Cycle 2	Recipe 6	6 Pass
Cycle 3	Recipe 16	6 Pass
Cycle 4	Recipe 17	4 Pass



RECIPE MENU

Recipe # 0
10 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak/ Presoak Dwell/ Tire Cleaner/ Rear Presoak
	2	Presoak / Rocker Panels
	3	High Pressure Soap/ Bug Pass/ Slow Speed
	4	High Pressure Rinse
	5	Triple Shine Wax
	6	High Pressure Rinse
	7	High Pressure Clear Coat Protectant
	8	Spot Free Rinse
	9	Blower/Slow Speed
	10	Blower/ Slow Speed

Recipe # 1
10 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak And Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Soap / Slow Speed
	5	High Pressure Rinse / Bug Pass
	6	Tri Color Wax
	7	High Pressure Clear Coat Protectant
	8	High Pressure Rinse
	9	Spot Free Rinse
	10	Spot Free Rinse



RECIPE MENU

Recipe # 2
10 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Soap / Slow Speed
	5	High Pressure Rinse / Bug Pass
	6	Tri Color Wax
	7	High Pressure Clear Coat Protectant
	8	Medium Pressure Rinse
	9	Spot Free Rinse
	10	Spot Free Rinse

Recipe # 3
10 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Soap / Slow Speed
	5	High Pressure Rinse / Bug Pass
	6	Tri Color Wax
	7	High Pressure Clear Coat Protectant
	8	Medium Pressure Rinse
	9	Spot Free Rinse
	10	Spot Free Rinse



RECIPE MENU

Recipe # 4
10 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Soap / Slow Speed
	5	High Pressure Rinse / Bug Pass
	6	High Pressure Clear Coat Protectant
	7	High Pressure Clear Coat Protectant
	8	High Pressure Rinse
	9	Spot Free Rinse
	10	Spot Free Rinse

Recipe # 5
10 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Soak / Slow Speed
	5	High Pressure Rinse / Bug Pass
	6	High Pressure Rinse
	7	High Pressure Clear Coat Protectant
	8	Medium Pressure Rinse
	9	Spot Free Rinse
	10	Spot Free Rinse



RECIPE MENU

Recipe # 6

8 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner/Rear Presoak/Pressure Dwell
	2	Presoak / Rocker Panel
	3	High Pressure Wash / Bug Wash / Slow Speed
	4	High Pressure Rinse
	5	High Pressure Wax
	6	Spot Free Rinse
	7	Blower / Slow Speed
	8	Blower/ Slow Speed

Recipe # 7

8 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner/Rear Presoak/Presoak Dwell
	2	Presoak / Rocker Panel
	3	High Pressure Wash/ Slow Speed
	4	High Pressure Rinse
	5	Triple Shine Wax
	6	High Pressure Wax
	7	High Pressure Rinse
	8	Spot Free Rinse



RECIPE MENU

Recipe # 8

8 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Rinse / Slow Speed
	5	Tri Color Wax
	6	High Pressure Clear Coat Protectant
	7	Spot Free Rinse
	8	Spot Free Rinse

Recipe # 9

8 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Rinse / Slow Speed
	5	Tri Color Wax
	6	High Pressure Clear Coat Protectant
	7	Spot Free Rinse
	8	Spot Free Rinse



RECIPE MENU

Recipe # 10
8 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Rinse / Slow Speed
	5	High Pressure Clear Coat Protectant / Bug Pass
	6	High Pressure Rinse
	7	Spot Free Rinse
	8	Spot Free Rinse

Recipe # 11
8 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Rinse / Slow Speed
	5	High Pressure Clear Coat Protectant / Bug Pass
	6	Medium Pressure Rinse
	7	Spot Free Rinse
	8	Spot Free Rinse



RECIPE MENU

Recipe # 12

6 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner/ Rear Presoak/ Presoak Dwell
	2	Presoak / Rocker Panel
	3	High Pressure Wash/ Bug Wash/ Slow Speed
	4	High Pressure Wax
	5	High Pressure Clear Coat Protectant/ Bug Pass
	6	Spot Free Rinse

Recipe # 13

6 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak / Presoak Dwell
	3	Rocker Panel
	4	High Pressure Rinse / Slow Speed
	5	High Pressure Clear Coat Protectant/ Bug Pass
	6	Spot Free Rinse



RECIPE MENU

Recipe # 14
6 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak
	2	Presoak And Rocker Panel / Presoak Dwell
	3	High Pressure Soap / Bug Pass / Slow Speed
	4	High Pressure Rinse
	5	Spot Free Rinse
	6	Spot Free Rinse

Recipe # 15
6 Pass Wash

Undercarriage Yes No
Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner
	2	Presoak & Rocker Panel / Presoak Dwell
	3	High Pressure Rinse / Bug Pass / Slow Speed
	4	High Pressure Clear Coat Protectant
	5	Spot Free Rinse
	6	Spot Free Rinse



RECIPE MENU

Recipe # 16

6 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak/ Rear Presoak/ Presoak Dwell
	2	Rocker Panel
	3	High Pressure Wash / Slow Speed / Bug Pass
	4	High Pressure Rinse
	5	High Pressure Rinse
	6	Spot Free Rinse

Recipe # 17

4 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak / Rear Presoak/ Presoak Dwell
	2	High Pressure Rinse / Slow Speed
	3	High Pressure Rinse / Bug Pass
	4	Spot Free Rinse



RECIPE MENU

Recipe # 18
4 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner / Presoak Dwell
	2	High Pressure Rinse / Slow Speed
	3	High Pressure Rinse / Bug Pass
	4	Spot Free Rinse

Recipe # 19
4 Pass Wash

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	Presoak & Tire Cleaner / Presoak Dwell
	2	High Pressure Rinse / Slow Speed
	3	High Pressure Clear Coat Protectant / Bug Pass
	4	Spot Free Rinse



RECIPE MENU

Custom Recipe # 20

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Custom Recipe # 21

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	



RECIPE MENU

Custom Recipe # 22

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Custom Recipe # 23

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	



RECIPE MENU

Custom Recipe # 24

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Custom Recipe # 25

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	



RECIPE MENU

Custom Recipe # 26

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Custom Recipe # 27

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	



RECIPE MENU

Custom Recipe # 28

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Custom Recipe # 29

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	



RECIPE MENU

Custom Recipe # 30

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Custom Recipe # 31

___ **Pass Wash**

Undercarriage Yes No

Blower Free Standing Yes No

Pass:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	



Water Wizard 6500
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WATER WIZARD 6500

Identification of Components

Name of Components

Proxes

1. Home Prox
2. End of Track Prox
3. Top Boom Prox
4. Air Solenoid Prox
5. Height Adjustment Prox
6. Lower Boom Prox
7. Wheel Counting Prox

Eyes

1. Telco eyes that measure Length of Vehicle
2. Boom Safety Eye
3. Height Adjustment Eye



Normal Operation

Under normal operation the Water Wizard will perform the following functions (*we have used Pre-programmed Recipe #13 as an example*):

1. Customer drives up to the money acceptor, selects wash, and deposits money or if applicable, enters a code. The money acceptor sends a 24-volt DC electronic signal for the corresponding wash recipe to the Water Wizard to begin operation.
2. Once the Water Wizard receives a signal the following will happen
 - a. “Enter Now” sign at the entrance of the wash bay will illuminate
 - b. “Drive forward” sign in the wash bay will illuminate.
 - c. The Entrance Timer will start.
 - d. The Overall Wash Timer will start. (This is set at 10 minutes)
3. As the customer drives forward, the vehicles front tires break the beam of the entrance optics turning on the Undercarriage wash cycle (if selected in the recipe). The undercarriage will stay on for the length of time set by the undercarriage timer or until the vehicle reaches the designated stop station (treadle switch). There is also an additional timer that will shut off the undercarriage. Once the rear vehicle tires have passed the entrance optics, it starts a timer (under car Rear Wheel Timer) that will shut off the undercarriage. This is usually set for 3 – 4 seconds.
4. In the event the customer drives past the treadle switch, and far enough toward the exit end of the wash bay to break the gantry optics, the back up light will illuminate instructing the customer to back up until the customer once again triggers the treadle switch optic, which causes the STOP light to illuminate.
5. Once the vehicle is on the treadle switch, the following will happen:
 - a. “Drive Forward” sign will turn off
 - b. “Stop” sign will illuminate.
 - c. “Please Wait” light will come on.
 - d. The Entrance timer will reset.
 - e. The Omron PLC will run a series of tests on the eyes and proxes.
 - f. If any of the eyes or proxes fails a test, the proper error code will be displayed on the operator interface (Red Lion) and printer.



NORMAL OPERATION

6. The Water Wizard has a four second delay before the presoak function begins. *This is there to ensure the vehicle is stopped before receiving its wash and allow time for presoak delivery to be pressurized.*
7. Definition of a Pass. Each pass begins with the Boom at Home position. The Boom will go down and then back up. *The distance the boom travels downward is determined by the boom down timer.* This is settable for each individual pass. The gantry will *then* travel to the opposite end of the vehicle.
8. Pass #1 – The Following will Happen:
 - a. The Presoak Light will illuminate.
 - b. The Presoak pump starts up and sprays presoak out through the top and side nozzles.
 - c. The Top Boom will go down based upon the setting of the boom down timer.
 - d. The Top Boom will rise back up into its Home position.
 - e. The Tire Cleaner pump will start up and spray Tire Cleaner out the tips to cover the tires and lower Rocker panels.
 - f. The Gantry will start to travel down the track toward the back of the vehicle.
 - g. The Counting Wheel is counting as the gantry moves down the track.
 - h. The Telco eyes are looking for the front of the car. When the Telco eye sees the front of the vehicle it signals the Omron PLC to store the wheel count.
 - i. The Height adjustment eyes are looking for the Height of the vehicle.
 - j. The Telco eyes also look for the rear of the vehicle. When the Telco eye sees the rear of the vehicle it signals the Omron PLC to store the wheel count.
 - k. At the rear of the vehicle Pass 2 is started unless Rear Presoak is turned on.
 - l. If Rear Presoak is turned on, the Top Boom will travel down the rear of the car and then rise back up into the home position.
 - m. If Presoak Dwell is turned on, the gantry will wait the number of seconds set on Dwell timer #1



NORMAL OPERATION

9. Pass #2 begins when the Water Wizard sees the back of the vehicle. The following will happen:
 - a. The Top Boom will travel down based upon the setting of the boom drop timer.
 - b. The Top Boom must block the Height adjustment eyes when the boom travels down.
 - c. The Boom will rise back up into its home position.
 - d. The Gantry will travel back to the front of the vehicle based upon the wheel count. The wheel counts that were collected in pass 1 are now used in the remaining passes. A Count of 5 or 6 (depending on what is selected in the program) is added to the actual wheel count that is collected in Pass1. This allows the Top Boom to be 18 to 24 inches away from the vehicle. Each wheel count is equal to 2.5 inches.
 - e. The Height adjustment eyes *will again look* for the height of the vehicle.
 - f. Presoak will continue to spray from the tips.
 - g. If Presoak Dwell is turned on, the gantry will wait the number of seconds set on Dwell Timer #2

10. Pass #3 begins at the front of the car. In this pass, the following will happen:
 - a. The Presoak light turns off and the Rocker Panel light will illuminate.
 - b. The High Pressure Cat Pump turns on and sprays water from the lower rocker panel spray bar.
 - c. During the rocker panel pass the boom does not lower because the Boom timer is set to zero.
 - d. The gantry will travel to the rear of the car based upon the wheel count.

11. Pass #4 begins at the rear of the car
 - a. The Rocker Panel Light will turn off and the Rinse light will illuminate.
 - b. The Cat Pump will turn on, spraying water from the top and side nozzles.
 - c. The Top Boom will travel down, based upon the setting of the boom *down* timer.
 - d. The Top boom will rise up to the Home position if it's a tall vehicle or rise up only to the Height adjustment prox if it's a short vehicle.
 - e. The Top Boom will spray High Pressure rinse while raising or lowering.
 - f. The gantry travels toward the front at a slow speed because the slow speed option is selected in the recipe applying a high-pressure rinse.



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12. Pass #5 begins at the front of the car.
 - a. The Rinse light will turn off and the Clear Coat Protectant light will illuminate.
 - b. The Cat Pump will continue to run and spray Clear Coat Protectant over the car.
 - c. The top Boom will travel down based upon the setting of the boom *down* timer.
 - d. Since Bug Pass is turned on the top boom will lower and raise again for a double pass (Bug Pass)
 - e. The Top boom will rise up to the Home position if it's a tall vehicle or rise up only to the Height adjustment prox if it's a short vehicle.
 - f. The Gantry will travel to the rear of the vehicle applying High Pressure Clear Coat Protectant.

13. Pass #6 begins at the rear of the vehicle.
 - a. The Spot Free Rinse pump will turn on and spray Spot Free rinse water out of the tips
 - b. The Top Boom will travel down based upon the setting of the boom *down* timer.
 - c. The Top boom will rise up to the Home position.
 - d. The Gantry will travel to the front of the vehicle applying Spot Free Rinse.
 - e. When the gantry reaches the front of the vehicle, the arm will travel down based upon the last pass boom down timer.
 - f. The Top Boom will rise up to its Home position.
 - g. This pass completes the wash, and the gantry returns to the home position.

14. The “*Stop*” sign turns off and the “*Exit Slowly*” sign illuminates. When the vehicle passes through the eyes on the gantry completely the Water Wizard will send a 3 second signal to reset the auto cashier allowing the next customer to enter. Also the Omron PLC is reset so it can wash a different size vehicle with a different wash package.



NORMAL OPERATION

The following conditions have to be on for the Water Wizard to function.

Eye on Treadle Switch	On	Input 0	Channel 0100
Emergency Stop Station	On	Input 2	Channel 0100
Eye on Gantry	On	Input 0	Channel 0000
Eye on Top Boom Arm	On	Input 2	Channel 0000
Prox on Upper Boom Arm	On	Input 3	Channel 0000
Prox on Home	On	Input 5	Channel 0000

The following Tank Floats should also be on for proper operation

Tire Cleaner	OK	Input 8	Channel 100
Foaming Conditioner	OK	Input 9	Channel 100
Presoak	OK	Input 14	Channel 100
Water Tank	OK	Input 15	Channel 100

Safety Features of the Water Wizard

- The Top Boom Arm will not come down if the Gantry Eye or the Top Boom Arm Eye is blocked. This prevents the Arm from coming down on a vehicle.
- The Gantry will not move unless the Top Boom Prox or Height Adjustment Prox is closed.
- The Height Adjustment eye measures the height of the vehicle in Pass 1 and Pass 2. Also to make sure that the eyes are working correctly the Height adjustment eye has to be blocked by the top boom on Pass 2. The top boom will only adjust to the height of the vehicle in pass 3, 4 and 5.
- The Telco Eyes measure the length of the vehicle in Pass 1 only because this Pass is Low Pressure presoak and the eyes perform more reliable in a low water spray application. After Pass 1 the Telco eyes become safety eyes for the top boom.

Proximity Switches

Prox's should be set to have no more than ¼ inch clearance from prox target. Care should also be taken to not allow the face of the prox to come in contact with prox target.

Prox o-ring fitted, screw on electrical connections, should be filled with electrical grease to keep moisture out.



Wheel Count

Located on the gantry is a rubber wheel that applies pressure to the track. This Rubber Wheel has a 5-position Stainless Steel target connected to it so that every revolution of the wheel will give 5 counts to the Omron PLC. Each count is equal to 2 ½ inches. The Counting wheel is used to keep track of the length of the vehicle. When the gantry moves down the track the counting wheel is continuously sending electrical pulses to the PLC. The PLC receives a signal from the Telco eyes where the front or rear of a vehicle is. The PLC stores the count of the counting wheel so that the gantry will be able to return back to the Front or Rear of the vehicle without the use of the eyes. Inside the PLC is a number that is added to the wheel count to keep the Top Boom from being too close to the vehicle. This Number is factory set to be 6 (approximately 15 inches). This number can be changed by Factory trained service men. The Number can be changed to allow the Top Boom to be closer or farther away from the vehicle. The Omron PLC will accept a count from 3 to 9. Normally the setting of 5 or 6 is the best for over performance. Remember that a setting too close will not clean a car any better and will risk hitting a vehicle. If you are having a problem with the wheel counting prox there are several methods to help you solve the problem utilizing the Operator Interface Panel. Using the Test Screen function:

- a. You may test the Wheel Counting Prox and wheel.
- b. You may test for 1 cycle or multiple cycles.
- c. You may view the Wheel count for the vehicle you are washing.
- d. You may view the Wheel count for the last 10 vehicles you washed.

Error Codes

Please look in the Owners Manual under Operator Interface Panel page 44 for a full list of error codes and their descriptions. The Omron PLC is constantly monitoring the status of the operation of the Water Wizard and will report all errors as soon as they are detected. The Omron does some of the tests in the first second of the wash cycle and other tests as the unit is washing the vehicle. Depending on the type of test that the Water Wizard fails the Omron PLC will shut down the unit and page out and print the error code. All error codes will be displayed on the Graphic interface panel and logged into the error memory. You can access the error memory on the Graphic interface by pressing the Alarm Button.



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The error codes are as follows:

Error Code #:	Description:
00	Test
01	Presoak Tank Empty
02	Tire Cleaner Tank Empty
03	Water Tank Empty
04	Wax Tank Empty
05	Emergency Stop Station Was Pressed
06	Customer did not get on Treadle in 2 Min
07	Unit Failed to Complete Wash in 10 Min
08	Drive Motor Tripped Out
09	Top Boom Motor Tripped Out
10	Oscillating Motor Tripped Out
11	Auto Cashier is Out of Service This error requires special wiring between the Auto Cashier and the SRT2-ROC16 input card in the equipment room ECP. Talk to JCC about how to hook up the feature.
12	Drive Motor has Run too Long If the drive motor runs for more than 2 minutes, the Red Lion will display this error message. The program disables the auto Cashier.
13	Top Boom motor has Run too Long If the top boom motor runs for more than 20 seconds, the Red Lion will display this error message. The program disables the auto cashier.



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- 14 Bill Changer # 1 is out of order**
This error requires special wiring between the Bill Changer #1 and the SRT2-ID16 input card in the equipment room ECP. Talk to JCC about how to hook up the feature.
- 15 Bill Changer # 2 is out of order**
This error requires special wiring between the Bill Changer #2 and the SRT2-ROC16 input card in the equipment room ECP. Talk to JCC about how to hook up the feature.
- 16 Top Boom Did Not Come Down**
The program looks at the top boom prox to see if its signal goes off after the top boom motor has run for 2.2 seconds. If the signal stays on after 2.2 seconds, the top boom is hung up or jammed. If this error occurs, the program disables the Auto Cashier.
- 17 Top Prox needs to be replaced**
If the top prox is on and the height Adjustment Prox is on, the Red Lion displays this error message, and the program disables the Auto Cashier.
- 18 Auto Height Prox needs to be replaced**
The program looks at the height adjustment Prox during the first second of the wash. The program tests this prox to see that the Prox is off. If the Prox is on, the Red Lion displays the error code. The program disables the height adjustment feature of the unit, but does not disable the Auto Cashier.
- 19 Lower Boom Prox needs to be replaced**
The program tests the Lower Boom Prox during the first second of the wash to see if it is on. If the Lower Prox is on, the Red Lion will display this error message, and the program disables the Auto Cashier.
- 20 Home Prox needs to be replaced**
The program tests this prox during the first second of the wash. The program looks to see if it is off. The home prox should be on at this time under normal operation. If the prox is off, the Red Lion will display this error message, but the program will not disable the Auto Cashier



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- 21 End of Track Prox needs to be replaced**
The program tests this prox during the first second of the wash. The program looks to see if it is off. If the prox is on, the Red Lion displays the message, and the program disables the auto cashier.
- 22 Auto Height Adjustment eyes needs to be replaced**
The program tests the eyes to see if they are on during the first second of the wash. We then test the eyes of the beginning of Pass 2. When the boom drops at the back of the can, the boom blocks the eyes for a second. The program checks to see if the eyes do go off when the boom blocks them. If the eyes do not pass both of these tests, we do not adjust to the height of the vehicle and we do display the error code. The program does not disable the Auto Cashier.
- 23 Air Solenoid Prox needs to be replaced**
The program tests the air solenoid prox during the first second of the wash to make sure that it is on. If the prox is not on, the Red Lion will display the error message, but the program will not disable the Auto Cashier.
- 24 The Brake of the Top Boom has slipped**
The program checks to see if the Top Prox becomes uncovered for more than .5 seconds, when the gantry is moving down the track. If the Top Prox goes off for more than .5 seconds, the Red Lion displays this error, and the program disables the Auto Cashier.



NORMAL OPERATION

WATER WIZARD PROGRAM DIAGNOSTICS

NORMAL AT HOME CONDITION	DIAGNOSTIC TEST DURING 1 ST SECOND OF WASH CYCLE	DIAGNOSTIC TEST ON EVERY PASS	DIAGNOSTIC TEST ON PASS 2	RAN TOO LONG	DISABLE AUTO CASHIER
				✓	YES
				✓	YES
					NO
ON		✓			YES
OFF	✓				NO
OFF	✓				YES
ON	✓				NO
OFF	✓				YES
ON	✓				NO
ON	✓				NO
ON	✓				NO
		✓			YES



Questions/Answers

- Q) How will I know if a fault occurs?
A) A fault will be recorded on the Operator Interface Panel. The system stores the last 10 faults in sequence. If pager system is applicable, the system will contact your digital pager and will indicate the time, date, location, and by error, code the nature of the fault. There are 23 different error codes listed in your manual.
- Q) Will the unit wash cars without the gantry optics operational?
A) Yes, the system will wash the full length of the gantry track using the home position and end of track position proxs' to control gantry movements.
- Q) What is the ideal temperature for the Presoak water?
A) 130 degrees Fahrenheit. Water temperature above that can cause damage to the Procon pumps, Hydrominders, and electric motors.
- Q) Will the top boom come down even if the gantry eyes are not working?
A) No; however, the unit will continue to wash cars as mentioned above, but the boom will not come down.
- Q) I have just changed spray nozzles and now my unit is leaving stripe marks during the wash process. What is causing this?
A) The nozzles must be on a 10-15 degree slant when installed in the wash wand. This forms a wider wash pattern and gives maximum coverage.



WATER WIZARD

TROUBLE SHOOTING

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NOTES	Error! Bookmark not defined.



Presoak Tank Empty

This indicates that there is a problem causing a low water level in the presoak tank. If this happens input #14 on Channel 100 will be off. You can check this by looking at the screen on the graphic display. Press the exit key to exit the error message, then press the Service Screen button and press the Next Key until it shows the **Presoak Tank Low**. Now when you make the repair the screen will show **Presoak Tank OK**. The Auto cashier will be shut down and displaying a message Car Wash out of Service and the Water Wizard will not start or wash a car until the problem is found and repaired.

1. Open lid on Chemical tank and check level of presoak in the tank. The level should be about 12" deep.
 - A. If the level is low then check the incoming water pressure. Incoming water pressure should be between 20-80 psi. .
 - B. If you have adequate water supply then check the operation of the Hydrominder. Make sure the float on the Hydrominder moves up and down freely and is not rubbing against any hoses. See the Hydrominder trouble shooting section of the owner's manual for more details.
2. If the level of Presoak is about 12" deep then the problem is an Electrical one and then follow the following steps:
 - A. When the Float switch floats up it closes a contact inside the switch and allows electricity to flow to the input card allowing the light to come on.
 - B. Check the Float Switch for proper operation and make sure it moves freely
 - C. Check to see if you are getting 24vDC to the float switch
 - D. Check the wiring between the float switch and the input card.
3. Once you resolve the problem and now receive power on the #14 input terminal the screen will show **Presoak Tank OK** you will need to press the reset switch on the front of the Electrical control panel to put the machine back into service.
 - A. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Tire Cleaner Tank Empty

This indicates that there is a problem causing a low water level in the Water tank. If this happens input #8 on Channel 100 will be off. You can check this by looking at the screen on the graphic display. Press the exit key to exit the error message, then press the Service Screen button and press the Next Key until it shows the **Tire Cleaner Tank Low**. Now when you make the repair the screen will show **Tire Cleaner Tank OK**.

4. Open lid on Chemical tank and check level of water in the tank. The level should be about 12" deep.
 - A. If the level is low then check the incoming water pressure. Incoming water pressure should be between 20-80 psi. .
 - B. If you have adequate water supply then check the operation of the Hydrominder. Make sure the float on the Hydrominder moves up and down freely and is not rubbing against any hoses. See the Hydrominder trouble shooting section of the owner's manual for more details.
5. If the level of Water is about 12" deep then the problem is an Electrical one and then follow the following steps:
 - A. When the Float switch floats up it closes a contact inside the switch and allows electricity to flow to the input card allowing the light to come on.
 - B. Check the Float Switch for proper operation and make sure it moves freely
 - C. Check to see if you are getting 24vDC to the float switch
 - D. Check the wiring between the float switch and the input card.
6. Once you resolve the problem and now receive power on the # 8 input terminal the screen will show **Tire Cleaner Tank OK** you will need to press the reset switch on the front of the Electrical control panel to put the machine back into service.
 - A. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Water Tank Empty

This indicates that there is a problem causing a low water level in the Water tank. If this happens input #15 on Channel 100 will be off. You can check this by looking at the screen on the graphic display. Press the exit key to exit the error message, then press the Service Screen button and press the Next Key until it shows the **Water Tank Low**. Now when you make the repair the screen will show **Water Tank OK**. The Auto cashier will be shut down and displaying a message Car Wash out of Service and the Water Wizard will not start or wash a car until the problem is found and repaired.

7. Open lid on Water tank and check level of water in the tank. The level should be about 24" deep.
 - A. If the level is low then check the incoming water pressure. Incoming water pressure should be between 20-80 psi. .
 - B. If you have adequate water supply then check the operation of the Hydrominder. Make sure the float on the Hydrominder moves up and down freely and is not rubbing against any hoses. See the Hydrominder trouble shooting section of the owner's manual for more details.
8. If the level of Water is about 24" deep then the problem is an Electrical one and then follow the following steps:
 - A. When the Float switch floats up it closes a contact inside the switch and allows electricity to flow to the input card allowing the light to come on.
 - B. Check the Float Switch for proper operation and make sure it moves freely
 - C. Check to see if you are getting 24vDC to the float switch
 - D. Check the wiring between the float switch and the input card.
9. Once you resolve the problem and now receive power on the #15 input terminal the screen will show **Water Tank OK** you will need to press the reset switch on the front of the Electrical control panel to put the machine back into service.
 - A. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Wax Tank Empty

This indicates that there is a problem causing a low water level in the Water tank. If this happens input #9 on Channel 100 will be off. You can check this by looking at the screen on the graphic display. Press the exit key to exit the error message, then press the Service Screen button and press the Next Key until it shows the **Wax Tank Low**. Now when you make the repair the screen will show **Wax Tank OK**.

10. Open lid on Chemical tank and check level of all three wax tanks. The level should be about 12" deep.
 - A. If the level is low then check the incoming water pressure. Incoming water pressure should be between 20-80 psi. .
 - B. If you have adequate water supply then check the operation of the Hydrominder. Make sure the float on the Hydrominder moves up and down freely and is not rubbing against any hoses. See the Hydrominder trouble shooting section of the owner's manual for more details.
11. If the level of Wax is about 12" deep then the problem is an Electrical one and then follow the following steps:
 - A. When the Float switch floats up it closes a contact inside the switch and allows electricity to flow to the input card allowing the light to come on.
 - B. Check the Float Switches for proper operation and make sure it moves freely. All three Triple Shine tanks have floats and they are wired in series so that all three floats have to be closed to allow the Triple shine Procon pumps to turn on.
 - C. Check to see if you are getting 24vDC to the float switch
 - D. Check the wiring between the float switch and the input card.
12. Once you resolve the problem and now receive power on the # 9 input terminal the screen will show **Wax Tank OK** you will need to press the reset switch on the front of the Electrical control panel to put the machine back into service.
 - A. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Emergency Stop Station was pressed

This indicates that someone has pressed the Emergency Stop Station. The Water Wizard will be shut down and the Auto Cashier will display Car Wash out of Service. Find out who and why was the Emergency stop Station was pressed. This code will disappear when the Emergency Stop Station is pulled back out.

13. Go to the Graphic display screen and press the exit key to clear the screen of this error code. It is important to find out why the button was pressed to correct the real problem with the unit. If pulling out on the Emergency Stop Station did not correct the problem then follow the steps below
 - A. This indicates that we do not have power to the #2 input on Channel 1. The Gantry will not wash a vehicle unless we have power to the #2 input.
 - B. Press the service Screen Button and the press Next until you See Emergency Station Off.
 - C. Trace out the wiring to the Emergency Stop Station to determine the problem. Once you have power to Input #2 on Channel 1 the service screen will show Emergency Station ON
 - D. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - E. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Unit failed to complete wash in 10 minutes

This indicates that the unit failed to complete the wash in less than 10 minutes. The program monitors how long the unit is washing a vehicle. If the wash process takes longer than 10 minutes this code will appear. You will need to check the operation of the complete wash cycle to determine the cause of this code. Below are some causes of this code.

- F. Gantry hanging up on the track and not moving at normal speed.
- G. All passes in the Recipe set to slow speed.
- H. End of Track prox failure causing the Gantry to get stuck at rear of the vehicle.
- I. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Drive Motor Tripped out

This indicates that there is a problem with the Electronic drive that caused it to trip out. If this happens input #5 on Channel 2 will be on. **Do not press the reset button.** The Auto cashier will be shut down and displaying a message Car Wash out of Service and the Water Wizard will not start or wash a car until the problem is found and repaired.

14. Go to the Gantry and open the Electrical Control Panel.
 - A. Look at the Electronic drive for the Drive Motors and write down the Error code displayed. The Electronic Drive on the far left is the correct drive for the drive motors. This error code is very important. If the Error code is not shown it is recorded in the memory of the drive.
 - B. The Error code will tell you why the drive is tripped out. See the Owners manual on the Electronic drive to determine the explanation of the error.
 - C. One of the common errors on the Electronic drive is over voltage. If this is your error code then please check the incoming voltage to see if it meets the requirements of the Water Wizard. The voltage should be 200 –250 volts. If your voltage does not fall within these limits then the problem could be incoming power.
15. If the Electronic Drive is tripped out due to too high amperage draw then follow the following steps:
 - A. Disconnect the motor leads from the Electronic drive.
 - B. Check each motor separately with a Megohmmeter Tester. If the motor tests below 15 Megs then you need to replace the motor. If you do not have a Megohmmeter Tester one is available from Jim Coleman Company.
16. Once you resolve the problem do the following:
 - A. Close the Electrical Control door and re-install the side covers
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service. The reset switch on the Electrical Control panel resets all 3 Electronic Drives.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Top Boom Motor Tripped out

This indicates that there is a problem with the Electronic drive that caused it to trip out. If this happens input #7 on Channel 2 will be on. **Do not press the reset button.** The Auto cashier will be shut down and displaying a message Car Wash out of Service and the Water Wizard will not start or wash a car until the problem is found and repaired.

17. Go to the Gantry and open the Electrical Control Panel.
 - A. Look at the Electronic drive for the Top Boom Motor and write down the Error code displayed. The Electronic Drive on the far right is the correct drive for the Top Boom motor. This error code is very important. If the Error code is not shown it is recorded in the memory of the drive.
 - B. The Error code will tell you why the drive is tripped out. See the Owners manual on the Electronic drive to determine the explanation of the error.
 - C. One of the common errors on the Electronic drive is over voltage. If this is your error code then please check the incoming voltage to see if it meets the requirements of the Water Wizard. The voltage should be 200 –250 volts. If your voltage does not fall within these limits then the problem could be incoming power.
18. If the Electronic Drive is tripped out due to too high amperage draw then follow the following steps:
 - A. Disconnect the motor leads from the Electronic drive.
 - B. Check the motor with a Megohmeter Tester. If the motor tests below 15 Megs then you need to replace the motor. If you do not have a Megohmeter Tester one is available from Jim Coleman Company.
19. Once you resolve the problem do the following:
 - A. Close the Electrical Control door and reinstall the side covers
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service. The reset switch on the Electrical Control panel resets all 3 Electronic Drives.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Oscillating Motor Tripped out

This indicates that there is a problem with the Electronic drive that caused it to trip out. If this happens input #6 on Channel 2 will be on. **Do not press the reset button.** The Auto cashier will be shut down and displaying a message Car Wash out of Service and the Water Wizard will not start or wash a car until the problem is found and repaired.

20. Go to the Gantry and open the Electrical Control Panel.
 - A. Look at the Electronic drive for the Oscillating Motors and write down the Error code displayed. The Electronic Drive in the center is the correct drive for the Oscillating motors. This error code is very important. If the Error code is not shown it is recorded in the memory of the drive.
 - B. The Error code will tell you why the drive is tripped out. See the Owners manual on the Electronic drive to determine the explanation of the error.
 - C. One of the common errors on the Electronic drive is over voltage. If this is your error code then please check the incoming voltage to see if it meets the requirements of the Water Wizard. The voltage should be 200 –250 volts. If your voltage does not fall within these limits then the problem could be incoming power.
21. If the Electronic Drive is tripped out due to too high amperage draw then follow the following steps:
 - A. Disconnect the motor leads from the Electronic drive.
 - B. Check each motor separately with a Megohmmeter Tester. If the motor tests below 15 Megs then you need to replace the motor. If you do not have a Megohmmeter Tester one is available from Jim Coleman Company.
22. Once you resolve the problem do the following:
 - A. Close the Electrical Control door and reinstall the side covers
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service. The reset switch on the Electrical Control panel resets all 3 Electronic Drives.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Drive Motor has run too long

This indicates that there is a problem with the gantry moving up and down the track. The Omron computer monitors how long the drive motors runs. Under normal conditions the drive motor can move the gantry from one end of the track to the other end within 30-45 seconds. This error code only shows up if the drive motors runs for more than 2 minutes in the same direction. The Gantry hanging up on the track normally causes this code.

23. Go to the Gantry and open the Electrical Control Panel. Observe where the Gantry is located on the track. Look to see if the Gantry is at the Home position. Flip the toggle switch to the Manual Mode and press the Drive Motor switch to move the Gantry up and down the track. Does the Gantry move up and down the track smoothly? Can you see any items that are keeping the Gantry from rolling smoothly down the track?

- A. Check to see if there is any Anchor Bolts that hold down the track that could possibly be too tall and cause the gantry to hang up.
- B. If the Gantry was not at home then the problem is usually located close to the location of where the Gantry was located.
- C. Check the Home and End of Track Prox for proper operation. If the Home prox is not sending a signal that the Gantry is at home then the Drive motor will continue to run causing this error.
- D. Check the Home and End of Track Targets. Make sure the Home Prox sees the home target properly.

24. If the Gantry will not move then the problem could be the following:

- A. Drive Motor on one side or another not running.
- B. Check the Wheel Bearings to see if they are operating smoothly
- C. Check the Gear Box on the Drive Motors.
- D. Check the Love Joy Couplings connecting the gearbox to the drive wheel.
- E. Check the 230 volt 3 phase power going to the Electronic Drives

25. Once you resolve the problem and the Gantry moves freely up and down the track do the following:

- A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
- B. Press the Exit key on the Graphic Interface to clear the error code.
- C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
- D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Top Boom Run Too Long

This indicates that there is a problem with the Top Boom moving up and down. The Omron computer monitors how long the Top Boom motor runs. Under normal conditions the Top Boom motor can lower the boom within 10 seconds. This error code only shows up if the Top Boom motor runs for more than 20 Seconds in the same direction. The Top Boom hanging up on the guide rail or a tangled belt normally causes this code.

26. Go to the Gantry and open the Electrical Control Panel. Observe where the Top Boom is located. Look to see if the Boom is at the Home position. Flip the toggle switch to the Manual Mode and press the Top Boom lower switch to move the Boom down. Does the Boom move down the track smoothly? Can you see any items that are keeping the Boom from moving smoothly.

- A. Check to see if the Top Boom is bent or has suffered damage?
- B. Check the side bearing to make sure the bearings guide the boom up and down the shaft smoothly.
- C. If the Boom was not at home then the problem is usually located close to the location of where the Boom was located.
- D. Check the Prox's to make sure the boom is not hanging up on one of them.

27. If the Top Boom will not move then the problem could be the following:

- A. Top Boom Motor not running.
- B. Check the Top Bearings to see if they are operating smoothly
- C. Check the Gear Box on the Top Boom Motor.
- D. Check the Love Joy Couplings connecting the gearbox to the drive shaft
- E. Check the 230 volt 3 phase power going to the Electronic Drives

28. Once you resolve the problem and the Top Boom moves freely up and down then do the following:

- A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
- B. Press the Exit key on the Graphic Interface to clear the error code.
- C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
- D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Top Boom did not come down

This indicates that there is a problem with the Top Boom lowering at the front or rear of the vehicle. The Omron computer looks at the Top Boom Prox to make sure it goes off after the Top Boom motor has run for 2.2 seconds. If the Top Boom is hung up at the Home position then when the Top Boom Motor turns on the belt will unwind for only 2.2 seconds. Once the Omron sees this condition then the Omron will rewind the belt for 2.2 seconds and display this code.

29. Go to the Gantry and open the Electrical Control Panel. Observe where the Top Boom is located. Look to see if the Top Boom is at the Home position. Look at the belts to see if they are tangled up. Flip the toggle switch to the Manual Mode and press the Top Boom lower switch to move the Top Boom down. Does the Top Boom move up and down smoothly? Can you see any items that are keeping the Top Boom from Raising or Lowering smoothly?

- A. Check the belts to see if there is any thing keeping them from winding up on the pulley properly.
- B. This code is normally caused by freezing conditions and Ice is keeping the boom from lowering properly.

30. If the Top Boom will not move then the problem could be the following:

- A. Top Boom Motor not running.
- B. Check the Drive Shaft Bearings to see if they are operating smoothly
- C. Check the Gear Box on the Top Boom Motor.
- D. Check the Love Joy Couplings connecting the gearbox to the drive shaft.

31. Once you resolve the problem and the Top Boom moves freely up and down do the following:

- A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
- B. Press the Exit key on the Graphic Interface to clear the error code.
- C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
- D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Top Boom Prox needs to be replaced

This indicates that there is a problem with the Top Boom prox. The Omron computer looks at the Top Boom Prox to make sure it is off when the Height Adjustment prox is on. This error indicates that the Top Boom Prox is sending a signal all the time to Input #3 on Channel 0. Press the exit key on the display screen and then press the Service screen and press Next until you see the Top Prox ON.

32. Go to the Gantry and open the Electrical Control Panel. Flip the toggle switch to the Manual Mode and press the Top Boom lower switch to move the Top Boom down. Does the Top Boom Prox light go out on the Prox when it is no longer covered by the boom?
 - A. Visually Check the Prox to see if there is any damage to the Yellow plastic face. If the Yellow face is damaged then replace the Prox.
 - B. Test the prox by raising and lowering the boom several times watching the light on the prox and the screen inside the equipment room.
 - C. When you lower the boom and the Prox light goes out then look at the screen and see if the display shows the top Prox off. If the screen still shows the prox is on then the problem is the wiring between the prox and the Omron Input card.
 - D. A defective Prox cable could cause this error.

33. Once you resolve the problem and the Top Boom Prox comes on when covered and goes out when uncovered do the following:
 - A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.

Air Solenoid Prox needs to be replaced



TROUBLESHOOTING

This indicates that there is a problem with the Air Solenoid prox. The Omron computer looks at the Air Solenoid Prox to make sure it is on during the first second when the wash process starts. This error indicates that the Air Solenoid Prox is not sending a signal to Input #1 on Channel 0. The Water Wizard will continue to wash cars with this error but the boom will not tilt properly. If this prox fails the boom could drag against the side of the Boom pocket when the boom is being raised. Press the exit key on the display screen and then press the Service screen and press Next until you see the Air Solenoid Prox ON.

34. Go to the Gantry and open the Electrical Control Panel. Now remove the side Passenger side cover to expose the locations of the Prox's. Is the light on the Air Solenoid Prox on?
 - A. Visually Check the Prox to see if there is any damage to the Yellow plastic face. If the Yellow face is damaged then replace the Prox.
 - B. Flip the toggle switch to the Manual Mode and press the Boom lower switch to move the Boom down.
 - C. Test the prox by moving the Boom several times over the Air Solenoid Prox watching the light on the prox and the screen inside the equipment room. The light on the prox should come on when covered by the target and it should go out when uncovered by the target. There should be about $\frac{1}{4}$ gap between the prox and the boom. The Prox should never rub against the boom.
 - D. A defective Prox cable could cause this error.

35. Once you resolve the problem and the Air Solenoid Prox comes on when covered and goes out when uncovered do the following:
 - A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.

Lower Boom Prox needs to be replaced



TROUBLESHOOTING

This indicates that there is a problem with the Lower Boom prox. The Omron computer looks at the Lower Boom Prox to make sure it is off during the first second when the wash process starts. This error indicates that the Lower Boom Prox is sending a signal all the time to Input #4 on Channel 0. Press the exit key on the display screen and then press the Service screen and press Next until you see the Lower Boom Prox ON.

36. Go to the Gantry and open the Electrical Control Panel. Now remove the side Passenger side cover to expose the locations of the Prox's. Is the light on the Lower Boom Prox on?
 - A. Visually Check the Prox to see if there is any damage to the Yellow plastic face. If the Yellow face is damaged then replace the Prox.
 - B. Flip the toggle switch to the Manual Mode and press the Top Boom lower switch to move the Top Boom down.
 - C. Test the prox by raising and lowering the boom several times watching the light on the prox and the screen inside the equipment room. The light on the prox should come on when covered by the Boom and it should go out when uncovered by the Boom.
 - D. When you lower the boom and the Prox light goes on then look at the screen and see if the display shows the Lower Boom Prox on.
 - E. A defective Prox cable could cause this error.

37. Once you resolve the problem and the Lower Boom Prox comes on when covered and goes out when uncovered do the following:
 - A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.

Home Prox needs to be replaced



TROUBLESHOOTING

This indicates that there is a problem with the Home prox. The Omron computer looks at the Home Prox to make sure it is on during the first second when the wash process starts. This error indicates that the Home Prox is not sending a signal to Input #5 on Channel 0. Press the exit key on the display screen and then press the Service screen and press Next until you see the Home Prox ON.

38. Go to the Gantry and open the Electrical Control Panel. Now remove the side Passenger side cover to expose the locations of the Prox's. Is the Prox over the Home Target? Is the light on the Home Prox on?
- A. Visually Check the Prox to see if there is any damage to the Yellow plastic face. If the Yellow face is damaged then replace the Prox.
 - B. Flip the toggle switch to the Manual Mode and press the Drive switch to move the Gantry up and down the track.
 - C. Test the prox by moving the Gantry several times over the Home target watching the light on the prox and the screen inside the equipment room. The light on the prox should come on when covered by the target and it should go out when uncovered by the target. There should be about $\frac{1}{4}$ gap between the prox and the target. The Prox should never rub against the target.
 - D. Check the Home target to make sure it is mounted securely to the floor and it is at the proper height to be within $\frac{1}{4}$ " of the prox.
 - E. A defective Prox cable could cause this error.
39. Once you resolve the problem and the Home Prox comes on when covered and goes out when uncovered do the following:
- A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.

End of Track Prox needs to be replaced

This indicates that there is a problem with the End of Track prox. The Omron computer looks at the End of Track Prox to make sure it is off during the first second when the wash process starts. This error indicates that the End of Track



TROUBLESHOOTING

Prox is sending a signal to Input #6 on Channel 0. Press the exit key on the display screen and then press the Service screen and press Next until you see the End of Track Prox ON.

40. Go to the Gantry and open the Electrical Control Panel. Now remove the side Passenger side cover to expose the locations of the Prox's. Is the light on the End of Track Prox on?
 - A. Visually Check the Prox to see if there is any damage to the Yellow plastic face. If the Yellow face is damaged then replace the Prox.
 - B. Flip the toggle switch to the Manual Mode and press the Drive switch to move the Gantry up and down the track.
 - C. Test the prox by moving the Gantry several times over the End of Track target watching the light on the prox and the screen inside the equipment room. The light on the prox should come on when covered by the target and it should go out when uncovered by the target. There should be about $\frac{1}{4}$ gap between the prox and the target. The Prox should never rub against the target.
 - D. Check the End of Track target to make sure it is mounted securely to the floor and it is at the proper height to be within $\frac{1}{4}$ " of the prox.
 - E. A defective Prox cable could cause this error.

41. Once you resolve the problem and the End of Track Prox comes on when covered and goes out when uncovered do the following:
 - A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.

Auto Height Eyes needs to be replaced



TROUBLESHOOTING

This indicates that there is a problem with the Auto Height Eyes. The Program tests the Auto Height Eyes in the first second of the wash process to see if they are on. Then the Program tests the Eyes at the beginning of Pass 2. When the boom drops at the back of the car in Pass 2 it blocks the eyes for a second. The program checks to see if the eyes go off when the boom blocks them. If the eyes do not pass both of these tests, then we do not adjust to the height of the car and we do display this code. We do not shut down the Auto Cashier with this error code. However once this error code is displayed we do not adjust to the height of cars until it is reset. One common cause of this code is that one of the recipes do not allow the boom to travel down at the back of the car in pass 2 at least 4 seconds.

42. Go to the Gantry and open the Electrical Control Panel. Now remove the side Passenger side cover and driver side cover to expose the locations of the Eyes.
 - A. With a soft cloth clean the face of the eyes.
 - B. Block the eyes with something solid and see if the eyes go off. You can check this by looking at the screen on the graphic display. Press the exit key to exit the error message, then press the Service Screen button and press the Next Key until it shows the Height Adjustment Eyes On
 - C. You can also check the eyes by looking at the light on Input #0 on channel 2. The light will be on when the eyes are not blocked and the light will go out when you block the eyes.
 - D. A defective Eye cable could cause this error.
 - E. You can remove the Auto Height Eyes and the Water Wizard will operate without this eye but will not adjust to the height of shorter cars.
 - F. If you can find any thing mechanically or Electrically wrong with the Height Adjustment Eyes then double check the recipes. Check each recipe to make sure they have boom down time in pass 2 of at least 4 seconds.

43. Once you resolve the problem and Test the Auto Height Eyes and they work reliably do the following:
 - A. Close the Electrical Control door and reinstall the side covers
 - B. Press the Exit key on the Graphic Interface to clear the error code.
 - C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
 - D. Watch the Water Wizard wash several cars to make sure the unit is operating properly and safely.



Top Boom Brake has slipped

This indicates that there is a problem with the Top Boom Brake slipping. The program checks to see if the top boom prox becomes uncovered for more than .5 seconds when the gantry is moving down the track. If the Top Prox goes off for more that .5 seconds we display this code and shut down the Auto Cashier. Under normal conditions the Top Boom prox should never go off when the gantry is moving down the track.

44. Go to the Gantry and open the Electrical Control Panel. Observe where the Top Boom is located. Look to see if the Boom is at the Home position. Is the boom hanging down 2 – 3 inches? Flip the toggle switch to the Manual Mode and press the Top Boom lower switch to move the Boom down. Does the Boom move down the track smoothly?

- A. Check the brake on the top boom motor.
- B. If the Brake is bad or defective do not replace the brake. Instead call Jim Coleman Company and order a ½ hp replacement motor with a 50 to 1 gearbox.
- C. Check the Top Boom Prox to make sure that it is properly adjusted. A faulty Top Boom Prox could cause this error.
- D. If your Water Wizard was built after January 1 2002 it will not have a top boom brake.

45. If the Top Boom will not move then the problem could be the following:

- A. Top Boom Motor not running.
- B. Check the Top Bearings to see if they are operating smoothly
- C. Check the Gear Box and brake on the Top Boom Motor.
- D. Check the Love Joy Couplings connecting the gearbox to the drive shaft
- E. Check the 230 volt 3 phase power going to the Electronic Drives

46. Once you resolve the problem and the Top Boom moves freely up and down then do the following:

- A. Flip the toggle switch back to the Normal position and close the Electrical Control door.
- B. Press the Exit key on the Graphic Interface to clear the error code.
- C. Press the Reset switch on the front of the Electrical control panel to put the machine back into service.
- D. Watch the Water Wizard wash several cars to make sure the boom is not slipping down when the Gantry is moving.



WATER WIZARD 6500

TROUBLESHOOTING

The Water Wizard is programmed to handle and solve various situations that it may from time to time encounter.

***Problem:* Customer deposits money into auto cashier but never drives into bay.**

Result: The Water Wizard will reset the auto cashier after the entrance timer times out (usually 2-3 minutes, but is adjustable on graphic interface). Now Water Wizard is ready to wash another car. The graphic display will time and date stamp when this problem occurs and display on screen.

***Problem:* Customer deposits money into auto cashier but never positions properly on treadle switch.**

Result: The Water Wizard will reset the auto cashier after the entrance timer times out (usually 2-3 minutes, but is adjustable on graphic interface). Now Water Wizard is ready to wash another car. The graphic display will time and date stamp when this problem occurs and display on screen.

***Problem:* Customer deposits money into auto cashier but drives into bay and positions rear tire on stop station as opposed to the front tire.**

Result: The Water Wizard will not start up and the back up light will illuminate. If the customer does not back up then the Water Wizard will reset the auto cashier after the entrance timer times out (usually 2-3 minutes, but is adjustable on graphic interface). Now Water Wizard is ready to wash another car. The graphic display will time and date stamp when this problem occurs and display on screen.



TROUBLESHOOTING

Problem: Customer deposits money into auto cashier and drives into bay and stops on the designated stop station - the Water Wizard starts the wash operation - but the customer gets off stop station during the wash process.

Result: If the wash process has begun and customer leaves stop station during wash process, the first thing the Water Wizard does is to raise the boom to the upright position. Then the Water Wizard will wait for the customer to return back to stop station. The Water Wizard will wait for the allotted time as programmed on the "Drive Off Timer" selection (usually 30 seconds). If the customer gets back on the stop station before the timer runs out then the Water Wizard will start wherever it left off in the wash process. If the customer does not get back on the stop station before the drive off timer runs out then the Water Wizard will return to the home position and reset the auto cashier.

Problem: Customer deposits money into auto cashier but does not select wash vend and drives into wash bay.

Result: The Water Wizard will not begin operation because it never received a proper signal from the auto cashier.

Problem: Customer has snow plow on front of vehicle and drives into Water Wizard for a wash.

Result: If the customer gets on stop station and front eyes are blocked on Water Wizard then the unit will not start. If front eyes are not blocked the Water Wizard will wash vehicle normally.

Problem: Customer is towing a trailer and tries to wash.

Result: The eyes will see the trailer it is towing and the top bar will not lower itself at back of vehicle.

Problem: Vehicle is too long to wash.

Result: The Water Wizard will wash the vehicle but the top bar will not lower itself at the rear of the vehicle. The Water Wizard will advance through all cycles of the program just not lowering the top boom arm at rear of vehicle.



TROUBLESHOOTING

Problem: Water Wizard Eyes are not functioning properly.

Result: The Water Wizard cannot operate or wash a vehicle if the eyes are not functioning.

Problem: Water Wizard Eyes work properly but counting prox is not counting.

Result: The Water Wizard will advance to the end of track and not finish wash cycle. It will reset itself after 8 minutes and print out a malfunction report.

Eyes – Wiring Diagram

TELCO EYES	
WIRE COLOR	DESCRIPTION
Red/Black	Transmitter
Yellow/Silver	Receiver

BANNER EYES	
WIRE COLOR	DESCRIPTION
Blue, Black, Brown, White	Receiver
Blue, Black Brown	Transmit

Problem: Water Wizard washes a car but does not size the vehicle and it advances from end of the track to the other end of the track.

Result: The counting prox is not counting properly. Run wheel count test and correct problem

PROX CABLE LOCATION	#	PROX #
Upper Boom Prox	4t-6	1
Tilt Prox	4t-6	2
Lower Boom Prox	4t-4	3
Home Prox	4t-4	4
End Of Track Prox	4t-2	5
Counting Prox	4t-2	6
Auto Height Prox	4t-6	7



TROUBLESHOOTING

LOW PRESSURE CABINET			
TERMINAL STRIP	WIRE COLOR	SOLENOID	ROC16
1	White	Neutral	
2	White	Neutral	
3	Tan	Pre-Soak (Top)	#7
4	Orange	Pre-Soak (Side)	#8
5	Purple	Tire Clean	#5
6	Black	Tri Foam Conditioner	#11
7	Yellow	Air Purge	#14
8	Gray	Tilt Forward	#12
9	Red	Tilt Back	#13
10	Green	Ground	



TROUBLESHOOTING

**WATER WIZARD TROUBLESHOOTING
AUTOMATIC SERIAL # _____**

Date: _____

Customer: _____

Automatic Location: _____

Installation Problems: _____

	Front	Rear
Count Test #1	_____	_____
Count Test #2	_____	_____
Count Test #3	_____	_____
Count Test #4	_____	_____

Wash
Prices: _____

Wash
Names: _____

Wash Cycles & Description:

Cycle #1: _____

Cycle #2: _____

Cycle #3: _____

Cycle #4: _____



WATER WIZARD[®]

MAINTENANCE PROGRAM OUTLINE

Regular lubrication is the easiest, least expensive prevention maintenance. Read Water Wizard Service Manual for proper material specifications and adjustment settings. **USE ONLY LITHIUM BASED WATERPROOF GREASE.** Failure to follow the greasing and lubrication procedure will void warranty.

Bi-Weekly

- Check all spray tips for obstruction
- Check all soap and chemical levels in the tanks
- Drain water from the air compressor
- Check hoses for rubbing or cracking
- Check ¾" boom swivel for leaks
- Pick up and remove all debris from the bay floor
- Grease bearings on the drive wheels (8 ea.) – Use waterproof grease only.
- Clean the Telco eyes on gantry with a soft cloth (4ea)
- Clean the eyes on the stop and entrance stations (4ea)
- Clean eyes on height adjustment (if applicable)
- Observe the unit washing a vehicle and check for proper operation
- Grease the Boom Shaft Bearings (6ea)
- Inspect the Pulley & Boom Belts
- Tighten Allen Screws on Oscillating Shaft Collars
- Check the Lovejoy Couplings on the Boom & Drive
- Check 10 Position Sign and replace bulbs as necessary
- Check 2 position sign and replace bulbs as necessary
- Check Water Softener hardness
- Check all Proximity Switches for proper adjustments
- Check Cashier Operation
- Wheel Count Test Front ____ Rear ____

Monthly

- Grease the boom arm bearing on unit (2ea)
- Grease the boom arm bearing on wall (2ea)
- Grease the water swivel on top boom arm (use just a small amount of grease)
- Titrate Presoak

Check oil level on large Cat pump using sight glass located at the back of the pump

Semi-Annual (Every 6 months)

- Change the oil in large Cat Pump every 6 months or every 20,000 vehicles
- Check and clean all strainers inside the chemical tanks
- Check and replace as needed all Hydrominder hoses
- Check all Hydrominder foot valves

The Baldor Gear Boxes on the Water Wizard are sealed and have a pressure compensation chamber. Therefore, there is no need for periodic oil changes. Replace the oil only when the Gear Box must be disassembled for other maintenance. We recommend using Mobil SNC 634 Synthetic Oil.



Bi-Weekly Maintenance Checklist

Date: _____

4	X	FUNCTION	COMMENTS
_____	_____	Grease Boom Shaft Bearings (6ea)	_____
_____	_____	Grease Bearings on Drive Wheels (8ea)	_____
_____	_____	Clean Telco Eyes on Gantry (4ea)	_____
_____	_____	Clean Eyes on Entrance & Stop Station (4ea)	_____
_____	_____	Observe Water Wizard wash a vehicle and check for proper operation	_____
_____	_____	Clean Auto Height Eyes (if applicable)	_____
_____	_____	Check all spray tips for obstruction	_____
_____	_____	Check all soap and chemical levels in Tank	_____
_____	_____	Drain Water from Air Compressor	_____
_____	_____	Check Swivels for leaking	_____
_____	_____	Check Hoses for rubbing or cracking	_____
_____	_____	Check Lovejoy Coupling on Boom & Drive	_____
_____	_____	Inspect Pulleys and Boom Belts	_____
_____	_____	Tighten Allen Screws on Oscillating Shaft Collars	_____
_____	_____	Inspect Jam Nut on Boom Air Cylinder (if applicable)	_____
_____	_____	Wheel Count Test Front _____ Rear _____	_____

Notes: _____

Alarm Codes & Date: _____

Car Count on Water Wizard: _____

Unit checked by: _____



Monthly Maintenance Checklist

Date: _____

4	X	FUNCTION	COMMENTS
_____	_____	Grease Bearings on Top Boom Shaft (6ea)	_____
_____	_____	Grease Bearing on Boom Arm on Unit (2ea)	_____
_____	_____	Grease Bearing on Boom Arm on Wall (2ea)	_____
_____	_____	Grease Water Swivel on Top Boom Shaft <i>(use a very small amount)</i>	_____
_____	_____	Titrate Pre-Soak	_____
_____	_____	Check oil level on large Cat Pump, oil plunger wicks	_____
_____	_____	Check All Proximity Switches for proper adjustments	_____
_____	_____	Observe Water Wizard wash a vehicle	_____
_____	_____	Does everything look normal	_____
_____	_____	Unit rolling smoothly up and down track	_____
_____	_____	Any unusual noises	_____
_____	_____	Proper Presoak Coverage	_____
_____	_____	Any nozzles plugged	_____
_____	_____	Check soap and wash levels	_____
_____	_____	Check Cashier Operation	_____
_____	_____	Check Air Compressor & Drain Tank	_____
_____	_____	Check Operation of all Prox Switches	_____
_____	_____	Check all light packages for burned out bulbs	_____
_____	_____	Check Water Softener for proper operation	_____

Notes:

Alarm Codes & Date: _____

Car Count on Water Wizard: _____

Unit checked by: _____



Semi-Annual Maintenance Checklist

Date: _____

4	X	FUNCTION	COMMENTS
_____	_____	Change oil in large Cat Pump every 6 months or every 20,000 vehicles	_____
_____	_____	Check and clean all strainers inside chemical tanks	_____
_____	_____	Check and replace as needed all Hydrominder hoses	_____
_____	_____	Check all Hydrominder foot valves	_____
_____	_____	Grease Bearings on Top Boom Shaft (6ea)	_____
_____	_____	Observe Water Wizard wash a vehicle	_____
_____	_____	Does everything look normal	_____
_____	_____	Unit rolling smoothly up and down track	_____
_____	_____	Any unusual noises	_____
_____	_____	Proper Presoak Coverage	_____
_____	_____	Any nozzles plugged	_____
_____	_____	Check soap and wash levels	_____

Notes:

Alarm Codes & Date: _____

Car Count on Water Wizard: _____

Unit checked by: _____



WATER WIZARD 6500

PUMP STAND

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Pump Stand

The Water Wizard (WW) pump stand is constructed of 2" stainless steel tubing. Each leg has a specially machined 1¼" stainless steel leveling bolt in it so that the unit can be leveled and bolted to the floor.

In the middle of the pump stand you will find a Cat Pump model #3535, which is capable of pumping 35 gallons per minute. Driving the pump are 3 V belts connected to a 25 HP Baldor motor.

On top of the pump frame is a chemical tank and a cold-water rinse tank. The chemical tank will hold the diluted chemical that will eventually be pumped out to the gantry.

Each of the tanks has a red float switch for checking the level of the chemical or water. These float switches give four signals to the SRT2-ID16 in the ECP.

They are:

- Input #8: Low level on tire cleaner
- Input #9: Low level on foaming conditioner tanks (wax)
- Input #14: Low level on pre-soak tank
- Input #15: Low level on water tank

The pre-soak float switches for regular pre-soak and low ph presoak (if installed) are hooked together. If either of these switches does not work, input #14 (pre-soak) will not work. The wax and the three switches for the tri-color wax are hooked together. If any of the wax or foaming conditioner switches do not work, input #9, foaming conditioner tanks will not work. If the car wash does not receive an input from #8, #9, #14, or #15 of the SRT2-ID16, the car wash will shut down, and the Auto Cashier will say "Car Wash Out of Service".

There are up to four solenoids installed on the pump stand. Two solenoids are mounted in the back with hoses coming from the wax tank and the pre-soak tank (if installed). These solenoids are used for HP Wax and HP Soap respectively. Two more solenoids are located under the Proton Pumps. One solenoid is for medium pressure. Its hose goes into the water tank on the pump stand. The other solenoid is for undercarriage. It is hooked to the undercarriage bar in the bay.



Pump Stand Wire Color Chart

FLOATS & SOLENOIDS				
TERMINAL STRIP	COLOR	FUNCTION	ID16	ROC16
1	Red	Medium Pressure		3
2	Gray	Undercarriage		2
3	Brown	High Pressure Soap		0
4	Pink	High Pressure Wax		1
5	Tan	Pre-Soak Float	14	
6	Purple	White-Wall Float	8	
7	Black	Wax Float	9	
8	Orange	Cold Water Float	15	
9	Blue	24 Volt Dc (-)		
10	White	Neutral		
11	Green	Ground		

The WW pump stand comes standard with a hydrominder in every chemical tank, so there is no mixing of chemicals.

The cold-water tank also uses a hydrominder to fill the tank with clean water. To pump low pressure chemical to the gantry, the WW uses Procon pumps directly driven by a 230V 3electric motor.



Dema Valves

Mounted on the bottom center of the frame are two DEMA solenoid valves. One valve is a 454P DEMA, which will open when undercarriage is called for. The other DEMA is a 453P DEMA, which will open to dump water back in cold-water tank, creating medium pressure rinse.

Refer to the section under the tab labeled "GANTRY" for the Spec Sheet of the DEMA valves.



Hydrominders

These are mechanical water valves that operate with a diaphragm and a weight. When these valves call for water due to the level in the tank, it creates suction on the eductor tube. There is a 3/4" vinyl tube coming from the eductor to the hyper concentrate chemicals. Suction is produced by water filling the tank. The chemicals will be sucked up the hose and diluted with water. There are small colored tips that can be screwed into the eductor body; each tip has a different hole in the end, which will change the chemical dilution. Refer to chemical manufacturer for proper dilutions and tip color.

Turtle Wax Chemical Tip Chart

Chemical	Turtle Wax #	Water Tip	Chemical Tip	Dilution
Frictionless Detergent	HP 16/5	None	Yellow	90:1
Citrus Prep Presoak (Low pH)	HP 86/5	None	Yellow	90:1
Super Foaming Sealer Wax	HP 73/5	None	Green	378:1
Poly Triple Shine	HP 20/5; 21/5; 22/5	Red	Purple	472:1
Tire Cleaner	HP 78/5	None	Tan	42:1



HydroMinder Water Valves Models 502, 503, 570 & 571

PACKAGE CONTAINS:

- | | |
|---|------------------------------|
| 1. Water valve assembly | 3. Float with chain |
| 2. Bracket for mounting (Models 502 and 570 only) | 4. Product information sheet |

THANK YOU FOR YOUR INTEREST IN OUR PRODUCTS

Hydro Systems manufactures quality chemical proportioners. Please use this equipment carefully and observe all warnings and cautions.

	NOTE
WEAR	protective clothing and eyewear when dispensing chemicals or other materials.
ALWAYS	observe safety and handling instructions of the chemical manufacturers.
ALWAYS	direct discharge away from you or other persons or into approved containers.
ALWAYS	dispense cleaners and chemicals in accordance with manufacturer's instructions. Exercise CAUTION
CLEAN	equipment after each use in accordance with instruction sheet.
WEAR	equipment after each use to maintain proper operation.
ALWAYS	protective clothing and eyewear when working in the vicinity of all chemicals, filling or emptying equipment or changing metering tips.
ATTACH	re-assemble equipment according to instruction procedures. Be sure all components are firmly screwed or latched into position.
	only to tap water outlets (85 PSI maximum).

INSTALLATION:

- Mount the unit in a level position on the side of a reservoir. If unit is supplied with a bracket, it may be repositioned or removed as necessary. (Retrofit mounting bracket for model 503: Part #5030-K. Retrofit bracket for model 571: Part #106.)
- Adjust chain length to position float at the desired highest level of water. NOTE: The high volume HydroMinder Water Valves, models 570 and 571, are designed to shut off slowly to help reduce water hammer. Be sure to take this into account when setting the high water level to prevent inadvertent tank overflow. Position the float so that the water discharge does not cause turbulence around the float. It may be necessary to baffle the float from the discharge, or to connect a hose to the HydroMinder discharge fitting so that water is discharged under the water level in the tank.
- For models 502 and 503, install minimum ½-inch water inlet between unit and water supply. Models 570 and 571 should be hard plumbed with minimum 1-inch pipe. Minimum 15 PSID pressure is required for proper operation of the water valves. See flow chart for further information. Larger water lines may be used. They should be plumbed directly into the black valve.

Approx. Flow Rates for Models 502 and 503 (GPM)			
PSID	Inlet:	½" ID	¾" ID or larger
30		5.8	6.0
40		6.8	9.4
50		7.7	
65		8.7	

Approx. Flow Rates for Models 570 and 571 (GPM)		
PSID	Inlet:	1" ID or larger
10		13.0
20		25.8
35		44.0
40+	Subject to building water system constraints	

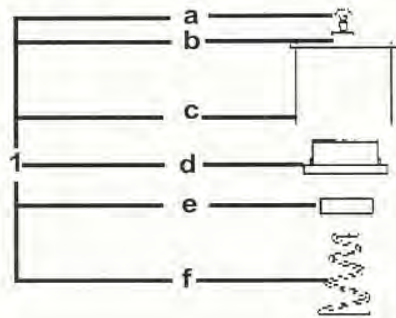
OPERATION:

Turn water source to valve on. If using Model 502, open water supply inlet ball valve. When the solution in the reservoir reaches the level set by the float, the magnetic valve on the HydroMinder will close. This will stop the water flow. When withdrawal from the reservoir causes the level to drop more than 1½ inches, the valve will open and the reservoir will be refilled to the previous level. This cycle will be repeated automatically as long as the water supply is on. The shut-off valve on the 502 and any water source control valves should be **fully closed** when reservoir is drained or when the unit is not in use.

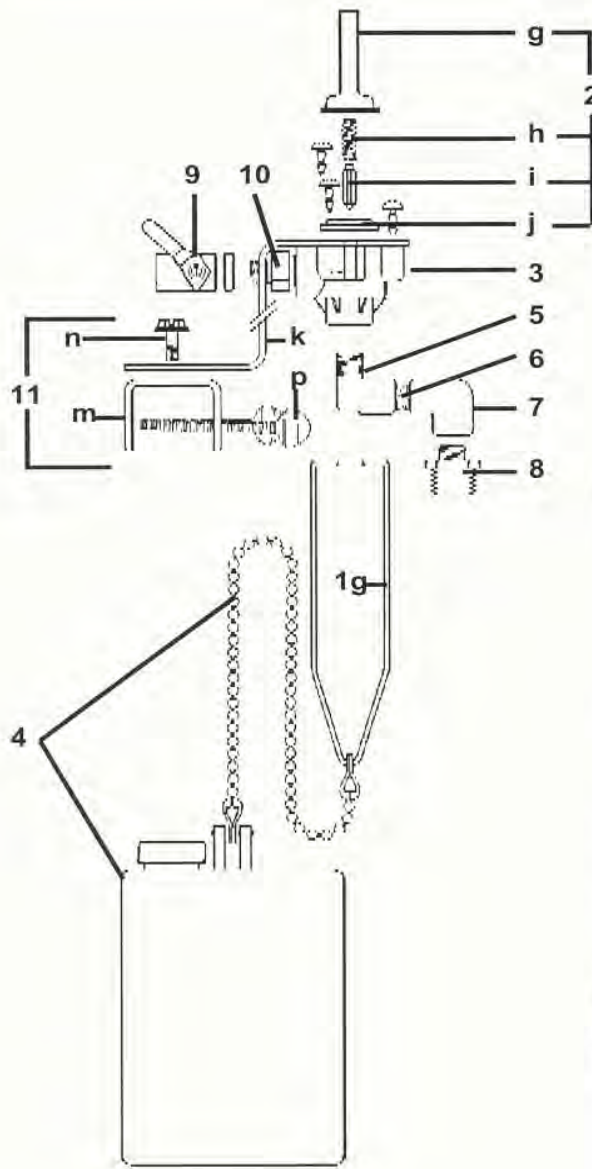
TROUBLESHOOTING:

PROBLEM	CAUSE	SOLUTION
1. No discharge	a. No water b. Defective magnetic valve assembly c. Excessive water pressure	a. Open water inlet valve (applies only to 502) b. Replace assembly c. Install regulator if pressure exceeds 85 PSI
2. Failure of unit to turn off	a. Valve parts dirty or defective b. Magnet spring too short c. Clogged valve orifice d. Water pressure too high e. Diaphragm stretched	a. Clean or replace* b. Replace spring c. Clean or replace d. Install regulator if pressure exceeds 85 PSI e. Replace
* Hard water may cause build-up of mineral deposits in water valve. Remove deposits by soaking the valve parts in a deliming solution.		

HydroMinder Water Valve Models 502 & 503: Parts Diagram and List



(Model 502 shown)

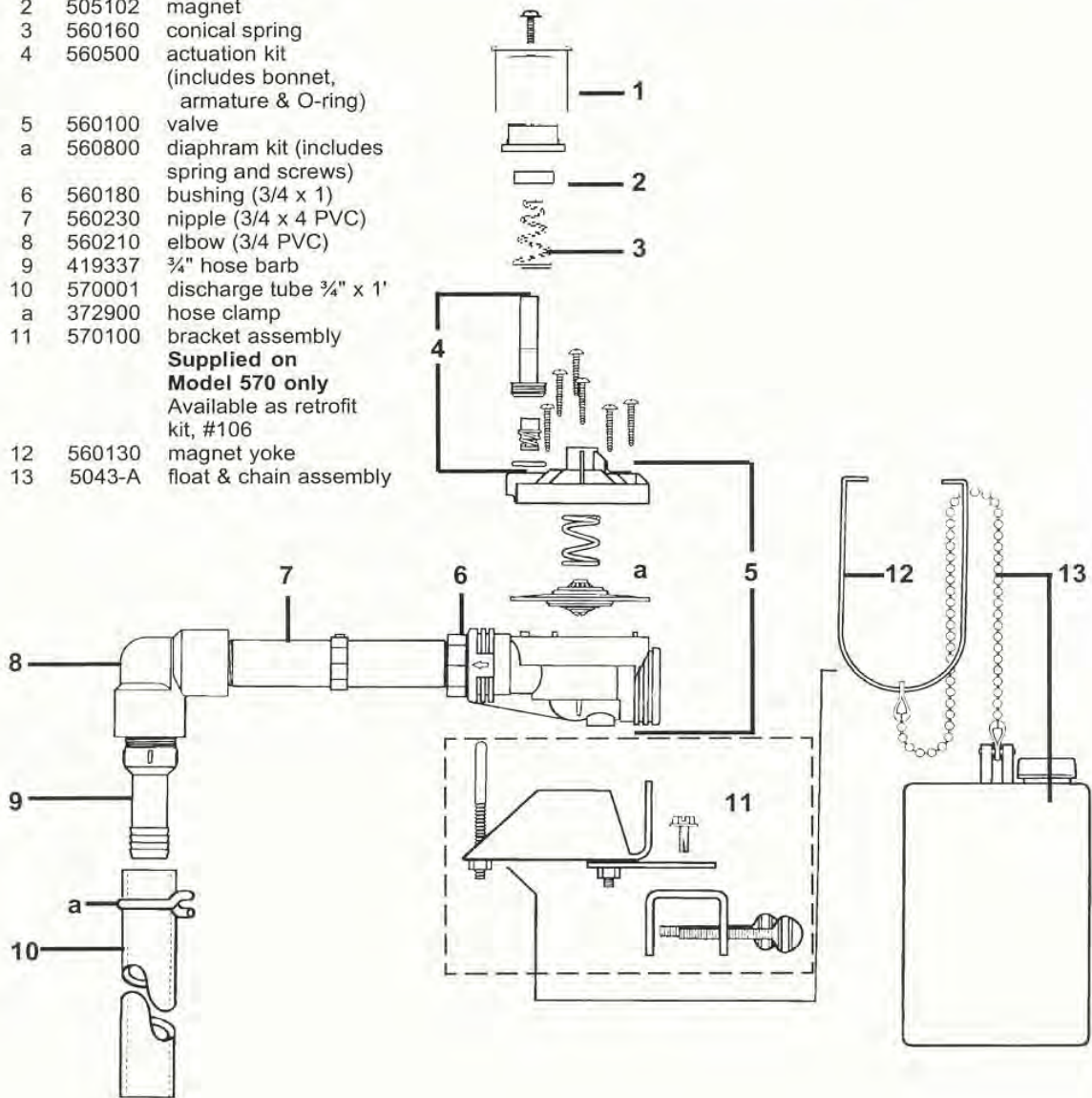


Key	Part No.	Description
1	5051-K	magnet parts kit
	a.	screw
	b.	washer
	c.	magnet cover
	d.	magnet cap
	e.	magnet
	f.	magnet spring
	g.	magnet yoke
2	6655-K	valve parts kit
	g.	valve guide assembly
	h.	armature spring
	i.	armature
	j.	diaphragm
3	520000	water valve body
4	5043-A	float & chain assembly
	507200	bead chain only
	505600	elbow (male x female)
	519000	close nipple
	506000	elbow (female x female)
8	351500	barb, 1/4" MPT x 1/2"
MODEL 502 ONLY:		
9	502000	ball valve
10	360900	nipple
11	5030-K	mounting bracket kit
	(specify model 502)	k. Z-bracket
		m. U-clamp
		n. screw
		p. thumbscrew

HydroMinder High Volume Water Valve Models 570 & 571: Parts Diagram and List

Key	Part No.	Description
1	560170	magnet cap
2	505102	magnet
3	560160	conical spring
4	560500	actuation kit (includes bonnet, armature & O-ring)
5	560100	valve
a	560800	diaphragm kit (includes spring and screws)
6	560180	bushing (3/4 x 1)
7	560230	nipple (3/4 x 4 PVC)
8	560210	elbow (3/4 PVC)
9	419337	3/4" hose barb
10	570001	discharge tube 3/4" x 1'
a	372900	hose clamp
11	570100	bracket assembly
<p>Supplied on Model 570 only Available as retrofit kit, #106</p>		
12	560130	magnet yoke
13	5043-A	float & chain assembly

(Model 570 shown)





Hydro[®]

A **DOVER** RESOURCES COMPANY

Hydro Systems

3798 Round Bottom Road, Cincinnati, OH 45244 U.S.A. • Phone: (513) 271-8800 • Fax: (513) 271-0160 •
www.hydrosystemsco.com

10072155 Rev. A
7/99



HydroMinder Model 507

Package Contains:

1. Proportioner
2. Float with chain
3. Suction tube with foot valve -- 9 ft.
4. Discharge tube -- 2 ft.
5. Metering tip kit (14 tips)
6. Production information sheet

THANK YOU FOR YOUR INTEREST IN OUR PRODUCTS

Please use this equipment carefully and observe all warnings and cautions.

NOTE

WEAR	protective clothing and eyewear when dispensing chemicals or other materials.
ALWAYS	observe safety and handling instructions of the chemical manufacturers.
ALWAYS	direct discharge away from you or other persons or into approved containers.
ALWAYS	dispense cleaners and chemicals in accordance with manufacturer's instructions. Exercise CAUTION when maintaining your equipment.
KEEP	equipment clean for proper operation.
WEAR	protective clothing and eyewear when working in the vicinity of all chemicals, filling or emptying equipment or changing metering tips.
ALWAYS	re-assemble equipment according to instruction procedures. Be sure all components are firmly screwed or latched into position.
ATTACH	only to tap water outlets (85 PSI maximum).

Through proper care and maintenance, this equipment will serve your toughest cleaning jobs.

Installation:

1. Select a metering tip (see next three sections) and insert it into the suction stub on the eductor body.
2. Attach the end of the discharge tube with the clamp and flooding ring to the discharge barb on the eductor. Since the proportioner does not have a siphon breaker, you may want to drill a small hole (1/8" or 1/4" ID) in the discharge tube, above the highest solution level and below the discharge end of the eductor. This will allow the discharge tube to drain after each cycle.
3. Mount the unit in a level position on the side of the reservoir.
4. Insert the foot valve end of the suction tube into the concentrate container. (The level of the concentrate must be below the level of the eductor, or the proportioner will continue to siphon concentrate after it is turned "off".)
5. Slide the open end of the suction tube over the suction stub.
6. Adjust the bead chain length to position the float at the desired level of solution. To prevent foaming, be certain that the solution level will always be above the point of discharge. Be sure float mechanism is not hampered by water turbulence caused by discharging solution. It may be necessary to baffle the float from the discharge in order for the unit to work properly.
2. Install a minimum 1/2-inch ID water hose between the inlet threads and the water spigot. Minimum water pressure required to properly operate the proportioner is 25 PSI (flowing).

Measurement of Concentration:

You can determine the dispensed water-to-product ratio for any metering tip size and product viscosity. All that is required is to operate the primed dispenser for a minute or so and note two things: the amount of dispensed water/product mixture, and the amount of concentrate used in preparation of the solution dispensed. The water-to-product ratio is then calculated as follows:

$$\text{Dilution (X)} = \frac{\text{Amount of Mixed Solution} - \text{Amount of Concentrate Drawn}}{\text{Amount of Concentrate Drawn}}$$

Dilution ratio, then, equals X parts water to one part concentrate (X:1). If the test does not yield the desired ratio, choose a different tip and repeat the test. Alternative methods to this test are 1) pH (using litmus paper), and 2) titration. Contact your concentrate supplier for further information on these alternative methods and the materials required to perform them.



APPROXIMATE DILUTIONS AT 40 PSI FOR WATER-THIN PRODUCTS (1.0 CP)			
Tip Color	Orifice Size	(Std. Drill Number)	Ratio
No Tip	.187	(3/16)	4:1
Grey	.128	(30)	5:1
Black	.098	(40)	6:1
Beige	.070	(50)	8:1
Red	.052	(55)	17:1
White	.043	(57)	23:1
Blue	.040	(60)	25:1
Tan	.035	(65)	36:1
Green	.028	(70)	48:1
Orange	.025	(72)	64:1
Brown.02	3	(74)	75:1
Yellow	.020	(76)	90:1
Purple	.014	(79)	120:1
Pink	.010	(87)	240:1

Metering Tip Selection:

The final concentration of the dispensed liquid is related to both the size of the metering tip opening (orifice) and the viscosity of the liquid being siphoned. If product viscosity is noticeably greater than that of water, consult the procedure for Measurement of Concentration on the first page to achieve your desired water-to-product ratio. For water-thin products, use the chart at right as a guideline. Because such factors as inlet water pressure and temperature can affect dilution ratios, the figures listed below are only approximate. Test the actual dilution you are achieving using the Measurement of Concentration procedure for best results. Two undrilled, clear tips are supplied for drilling sizes not listed.

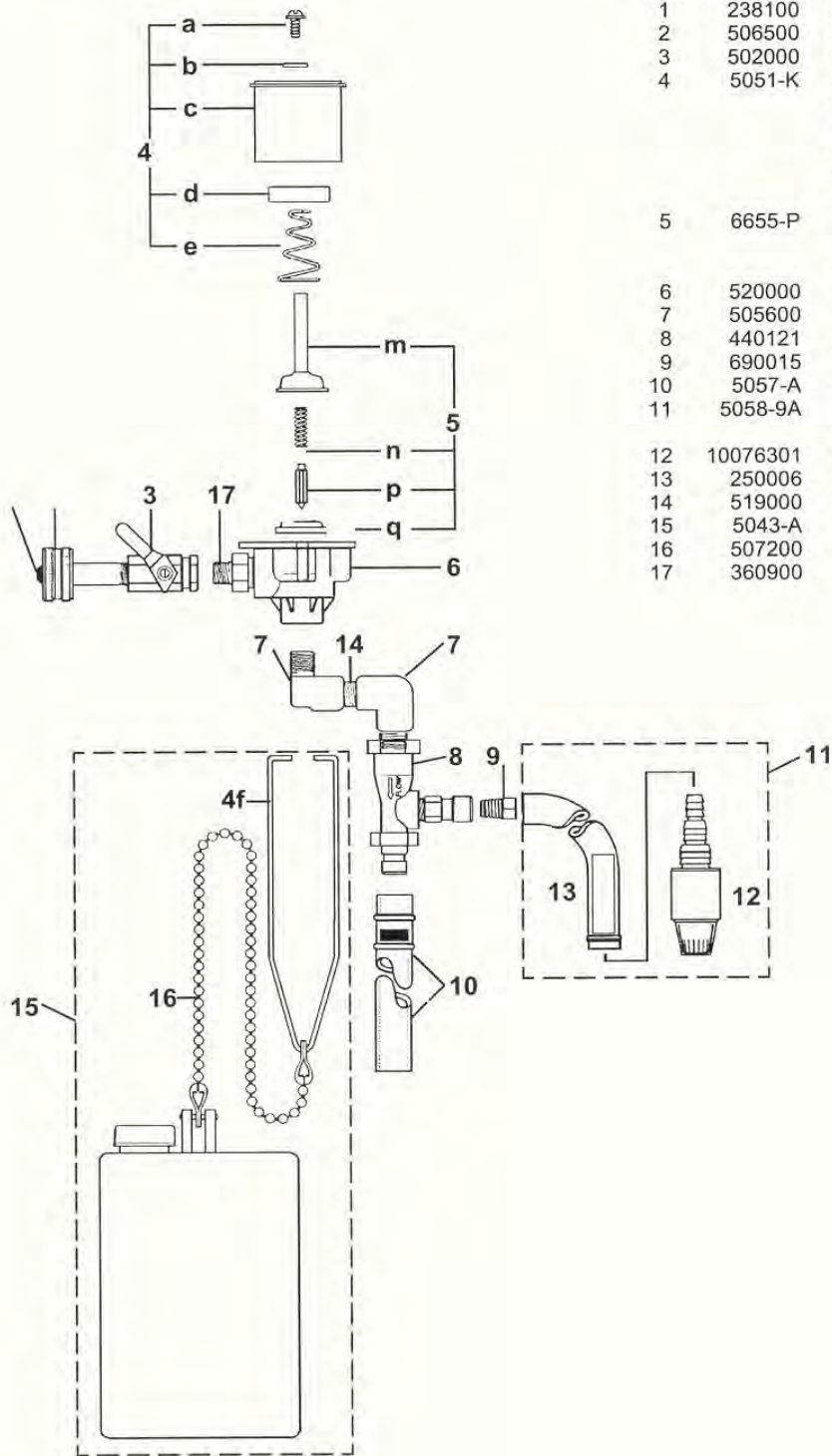
Operation:

Open the water supply ball valve. When the solution in the reservoir reaches the level set by the float, the valve will close. This will stop the water flow and siphoning of concentrate. When withdrawal of solution from the reservoir causes the level to drop more than 1-1/2 inches, the valve will open, and the reservoir will be refilled to the previous, pre-set level. This cycle will be repeated automatically until the supply of concentrate is depleted. The ball valve should be **fully closed** when changing metering tips or concentrate container, when reservoir is drained, or when the unit is not in use.

Troubleshooting:

Problem	Probable Cause	Remedy
1. No discharge	a. No water b. Defective magnetic valve assembly c. Excessive water pressure	a. Open water inlet b. Replace assembly c. Install regulator if pressure exceeds 85 PSI
2. No concentrate draw	a. Clogged foot valve b. Metering tip or eductor clogged c. Low water pressure d. Discharge tube or flooding ring not in place	a. Clean or replace foot valve b. Clean* or replace c. Minimum 25 PSI flowing required d. Check position: Replace discharge tube if flooding ring is missing.
3. Failure of unit to turn off	a. Valve parts dirty or defective b. Magnet spring too short c. Clogged valve orifice	a. Clean or replace b. Replace c. Clean or replace
4. Backflow into concentrate	a. Diluted solution being siphoned into container b. Water being siphoned into container	a. Replace or repair foot valve b. Replace eductor
* In hard water areas, scale may form at the discharge of the eductor. This scale may be removed by soaking the eductor in a descaling solution or by running the descaling solution through the system. If descaling solution is eductored through the system, flush the unit by educting water only before returning the system to regular use.		

Parts Diagram/List



KEY	PART NO.	DESCRIPTION
1	238100	strainer washer
2	506500	hose swivel
3	502000	ball valve
4	5051-K	magnet parts kit: a. screw, b. washer, c. magnet cover, d. magnet assembly, e. magnet spring, f. magnet yoke (not shown: magnet cap -- above magnet, under cover)
5	6655-P	valve parts kit: m.valve guide ("bonnet"), n. armature spring, p. armature, q. diaphragm
6	520000	water valve body
7	505600	street elbow
8	440121	eductor assembly
9	690015	metering tip (kit)
10	5057-A	discharge tube assembly
11	5058-9A	suction tube assembly (includes 12 & 13)
12	10076301	foot valve, Viton
13	250006	ceramic weight
14	519000	nipple
15	5043-A	float assembly (includes chain)
16	507200	bead chain
17	360900	nipple



Hydro Systems Company
3798 Round Bottom Rd., Cincinnati, OH 45244 USA • Phone: (513) 271-8800 • Fax: (513) 271-0160



Cat Pumps

The Water Wizard uses a Cat 3535 for high-pressure functions. This pump is a plunger pump. Unlike piston pumps, there are no pistons to wear out, giving the operator many more months of trouble-free operating, although piston pumps do not require as much maintenance.

There are valves and seals which will need replacing, depending on the hours of operation. Do not run the pump dry, as it can cause damage to seals and ceramic plungers. Refer to Cat pump owner's manual for oil changing and periodic maintenance.



PUMP STAND

GENERAL PUMP A member of the Interpump Group

YU5221

Trapped Pressure Unloader Valve



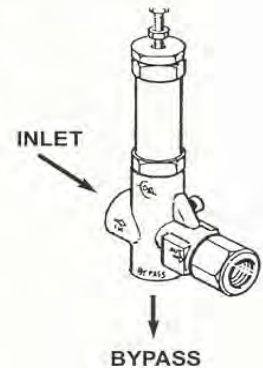
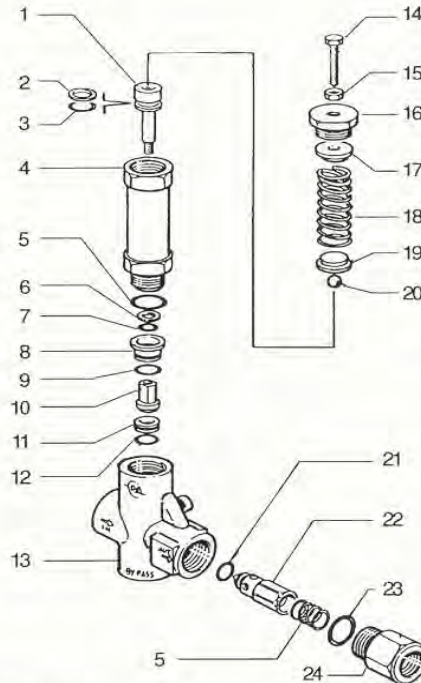
General Pump recommends using a safety relief device in conjunction with this unloader valve when installed on a positive displacement pump. A safety relief device is mandatory on systems operating above 5000 PSI. General Pump is not liable and assumes no responsibility for this valve when used in a customer's high pressure system.

SPECIFICATIONS

Part Number	YU5221
Maximum Volume	52.5 GPM
Maximum Discharge Pressure	2175 PSI
Maximum Temperature	194°F
Port Sizes	1" - 1 1/2" NPT-F
Dimensions	8.5 x 5.0 x 1.75 in.
Weight	4.5 lb.
Material	Brass, Stainless Steel, Buna-N.

PARTS LIST

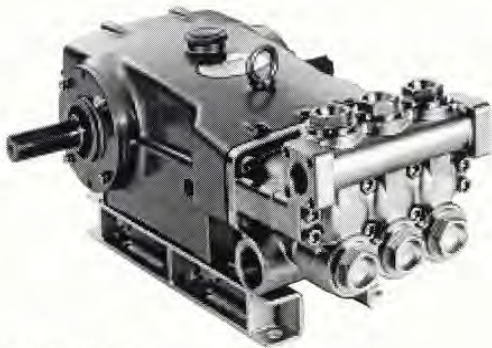
No.	Part No.	Description	Kit	Qty.
1.	Y60500451	Piston, M8	*	1
2.	Y10408100	Back-up Ring, .867 x .622	*	1
3.	Y10323700	O-Ring, .609 x .139	*	1
4.	Y60500931	Piston Housing	*	1
5.	Y60501351	Spring, 1.14 x .052	*	1
6.	Y10323400	O-Ring, .421 x .139	*	1
7.	Y10408000	Back-up Ring, .717 x .473	*	1
8.	Y60501031	Bushing, Reduction	*	1
9.	Y10319501	O-Ring, .799 x .104	*	1
10.	Y60500351	Valve	*	1
11.	Y60500251	Seat, Valve	*	1
12.	Y10307201	O-Ring, .799 x .070	*	1
13.	Y60500135	Body, Valve, 1" BSPP	*	1
14.	Y60501161	Screw, M10 x 1.65	*	1
15.	Y11462900	Nut, M10	*	1
16.	Y60500831	Cap, M10	*	1
17.	Y60500731	Load Plate, Adjustment	*	1
18.	Y60500661	Spring, .237 x 2.44	*	1
19.	Y60500531	Load Plate, Ball	*	1
20.	Y14746100	Ball, 13/32"	*	1
21.	Y10331400	O-Ring, .475 x .210	*	1
22.	Y60501231	Check Valve	*	1
23.	Y10320601	O-Ring, 1.11 x .104	*	2
24.	Y60501431	Fitting, 1" NPT-F	*	1
25.	Y60502122	Handwheel, M10	*	1
* YKITU5221		Repair Kit (Y60.5016.24)		



GENERAL PUMP 1174 NORTHLAND DRIVE • MENDOTA HEIGHTS, MN 55120
 PHONE: (651)454-6500 • FAX: (651)454-4524 • e-mail: sales@gpcompanies.com • www.generalpump.com

300469 Rev. B
11-00





35 Frame Plunger Pump

Standard Brass Model

3535

Stainless Steel Model

3531

Nickel Aluminum Bronze Model

3537

FEATURES

Superior Design

- Triplex plunger design gives smoother liquid flow.
- V-Packings are completely lubricated and cooled by the liquid being pumped.
- Inlet and discharge valve assemblies interchange for easier maintenance.
- Lubricated Lo-Pressure Seals provide double protection against external leakage.
- Oil bath crankcase assures optimum lubrication.
- Close tolerance concentricity of the ceramic plunger maximizes seal life.

Quality Materials

- All stainless steel valves are heat treated and seats are roller burnished for a positive seal and extended valve life.
- Forged Brass, 316 Stainless Steel or Nickel Aluminum Bronze manifolds for strength and corrosion resistance.
- Special concentric, high density, polished, graphite impregnated, solid ceramic plungers are abrasion resistant and result in extended seal life.
- Specially formulated, CAT PUMP exclusive, V-Packings offer unmatched performance and seal life.
- Die cast aluminum crankcase provides high strength, minimum weight and precision tolerance control.
- Chrome-moly crankshaft gives unmatched strength and surface hardness.
- Oversized crankshaft bearings with greater loading capacity means longer bearing life.

Easy Maintenance

- Wet-end is easily serviced without entering crankcase, requiring less time and effort.
- Valve assemblies are accessible without disturbing piping, for quick service.
- Preset packings mean no packing gland adjustment is necessary, reducing maintenance costs.

SPECIFICATIONS

	U.S. Measure	Metric Measure
Flow.....	36 GPM	(136 L/M)
Pressure Range.....	100 to 1200 PSI	(7 to 85 BAR)
Maximum Inlet Pressure	Flooded to 70 PSI	(Flooded to 4.9 BAR)
RPM	800 RPM	(800 RPM)
Bore.....	1.575"	(40 mm)
Stroke.....	1.890"	(48 mm)
Crankcase Capacity.....	4.2 Qts.	(4 L)
Maximum Fluid Temperature	160°F	(71°C)
Inlet Ports (2)	1-1/2" NPT	(1-1/2 NPT)
Discharge Ports (2).....	1" NPT	(1" NPT)
Pulley Mounting	Either Side	(Either Side)
Shaft Diameter	1.378"	(35 mm)
Weight.....	139 lbs.	(63 kg)
Dimensions.....	24.15 x 18.11 x 9.33"	(613.5 x 460 x 237 mm)

HORSEPOWER REQUIREMENTS

FLOW		PRESSURE			RPM	DRIVE
		PSI 800	PSI 1000	PSI 1200		
U.S. GPM	L/M	BAR 55	BAR 70	BAR 85		Consult CAT PUMPS for Pump and Motor Pulley Sizes
36	136	19.8	24.7	29.7	800	
30	114	16.5	20.6	24.7	667	
25	95	13.7	17.2	20.6	556	

See complete Drive Packages [Incls: Pulleys, Belts, Hubs, Key] Tech Bulletin 03.

DETERMINING THE PUMP R.P.M.	$\frac{\text{Rated G.P.M.}}{\text{Rated R.P.M.}}$	=	$\frac{\text{"Desired" G.P.M.}}{\text{"Desired" R.P.M.}}$
DETERMINING THE REQUIRED H.P.	$\frac{\text{GPM} \times \text{PSI}}{1460}$	=	Electric Brake H. P. Required
DETERMINING MOTOR PULLEY SIZE	$\frac{\text{Motor Pulley O.D.}}{\text{Pump R.P.M.}}$	=	$\frac{\text{Pump Pulley O.D.}}{\text{Motor R.P.M.}}$

Note: Consult engine manufacturer when using gas or diesel engine. Refer to pump Service Manual for important Inlet Condition Check-List, Start-up Procedure, Tech Bulletins and Pump Maintenance information.

"Customer confidence is our greatest asset"

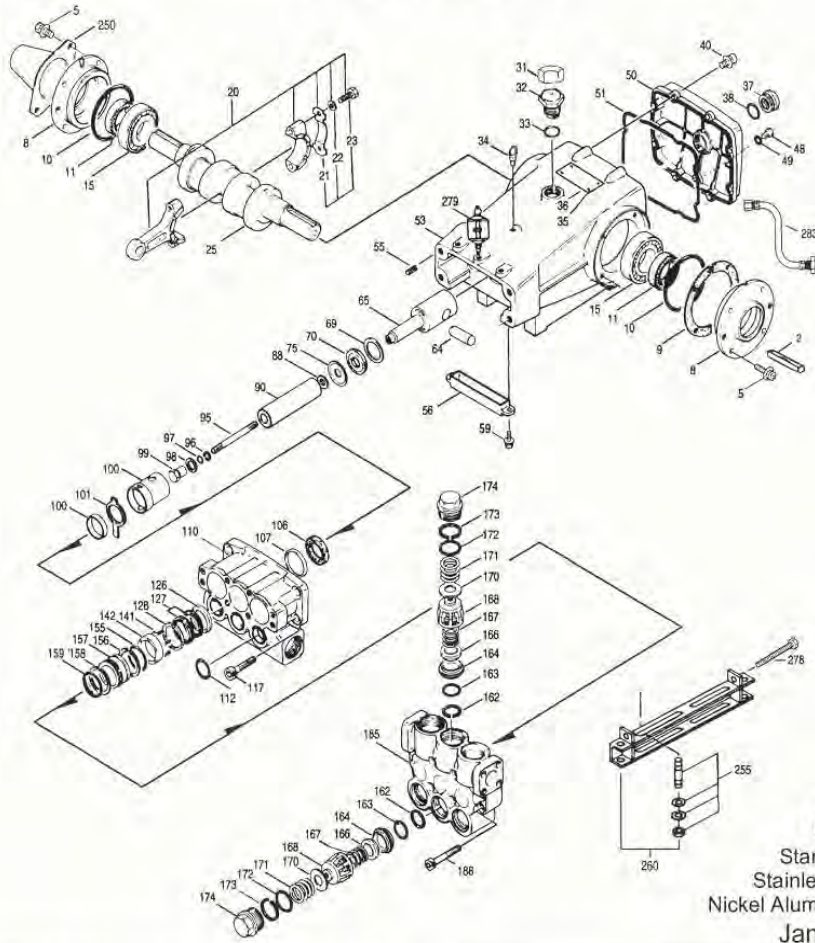


PUMP STAND

PARTS LIST

ITEM	PART NUMBER		DESCRIPTION		QTY		
	3535	MATL	3531	MATL	3537	MATL	
2	30055	STL	30055	STL	30055	STL	Key (M10x6x32) 1
5	34021	STL	34021	STL	34021	STL	Key (M10x8x70) 1
8	118824	S	118824	S	118824	S	Screw, Sems HHC (M8x25) 8
9	44542	AL	44542	AL	44542	AL	Cover, Bearing 2
10	701138	F	701138	F	701138	F	Cover, Bearing (Use w/701137,39,40,45,47) 2
11	44543	FBR	44543	FBR	44543	FBR	Shim, Split Bearing Cover 4
15	12398	NBR	12398	NBR	12398	NBR	O-Ring, Bearing Cover - 70D 2
20	13296	NBR	13296	NBR	13296	NBR	Seal, Oil, Crankshaft 2
21	29326	STL	29326	STL	29326	STL	Bearing 2
22	46611	HS	46611	HS	46611	HS	Rod, Connecting Assy (Incls: 44941,43641,88155) 3
23	44940	STZP	44940	STZP	44940	STZP	Locking Washer (M10) 3
25	43641	STL	43641	STL	43641	STL	Washer (M10) 6
26	88155	STL	88155	STL	88155	STL	Screw, HH (M10x60F) 3
27	29325	FCM	29325	FCM	29325	FCM	Crankshaft, Dual End 1
31	828710		828710		828710		Protector, Oil Cap 7
32	43211		43211		43211		Cap, Oil Filler 1
33	14177	NBR	14177	NBR	14177	NBR	O-Ring, Oil Filler Cap - 70D 1
34	44319	STZP	44319	STZP	44319	STZP	Bolt, Eye (M12x1.75) 1
35	701145	AL	701145	AL	701145	AL	Rivet, Serial Plate (Use w/701137,38,39,40,47) 4
36	701147	AL	701147	AL	701147	AL	Name Plate (Use w/701137,38,39,40,45) 7
37	92241		92241		92241		Gauge, Oil, Bubble 1
38	44428	NBR	44428	NBR	44428	NBR	Gasket, Flat 1
40	118824	S	118824	S	118824	S	Screw, Sems HHC (M8x25) 8
48	25625	STCP	25625	STCP	25625	STCP	Plug, Drain (1/4"x11) 1
49	23170	NBR	23170	NBR	23170	NBR	O-Ring, Drain Plug 1
50	45936	AL	45936	AL	45936	AL	Cover, Crankcase 1
51	701139	F	701139	F	701139	F	Cover, Crankcase (Use w/701137,38,40,45,47) 1
53	16612	NBR	16612	NBR	16612	NBR	O-Ring, Crankcase Cover - 70D 1
55	44559	AL	44559	AL	44559	AL	Crankcase 1
56	701137	F	701137	F	701137	F	Crankcase (Use w/701138,39,40,45,47) 1
57	27488	S	27488	S	27488	S	Pins, Guide 2
58	27790	POP	27790	POP	27790	POP	Pan, Oil 1
59	19933	S	19933	S	19933	S	Washer (M6) 2
64	15849	S	15849	S	15849	S	Lockwasher, Split (M6) 2
65	89618	S	89618	S	89618	S	Screw, HH (M6x10) 2
66	92538	S	92538	S	92538	S	Screw, Sems HHC (M6x16) 2
67	43864	S	43864	S	43864	S	Pin, Rist 3
68	45116	SSZZ	45116	SSZZ	45116	SSZZ	Rod, Plunger 3
69	29338	S	29338	S	29338	S	Washer, Oil Seal 3
70	100488	NBR	100488	NBR	100488	NBR	Seal, Oil, Crankcase 3
75	44739	FPM	44739	FPM	44739	FPM	Seal, Oil, Crankcase 3
88	43865	S	43865	S	43865	S	Slinger, Barrier 3
90	45676	SS	45676	SS	45676	SS	Washer, Keyhole (M16) 3
95	43921	CC	43921	CC	43921	CC	Plunger (M40x145) 3
96	89778	SS	89778	SS	89778	SS	Stud, Plunger Retainer (M10x135) 3
97	20189	PTFE	20189	PTFE	20189	PTFE	Back-up-Ring, Plunger Retainer 3
98	11345	NBR	11345	NBR	11345	NBR	O-Ring, Plunger Retainer - 70D 3
99	11375	FPM	11375	FPM	11375	FPM	O-Ring, Plunger Retainer 3
100	701490	EPDM	701490	EPDM	701490	EPDM	O-Ring, Plunger Retainer 3
101	44085	SS	44085	SS	44085	SS	Gasket, Retainer 3
102	44084	SS	44084	SS	44084	SS	Retainer, Plunger (M10) 3
103	814279	PVDF	814279	PVDF	814279	PVDF	Retainer, Seal, 2 Pc. 3
104	44112		44112		44112		Wick, Long Tab 3
105	44113	NBR	44113	NBR	44113	NBR	Seal, LPS w/SS-Spg 3
106	44740	FPM	44740	FPM	44740	FPM	Seal, LPS w/SS-Spg 3
107	46955	EPDM	46955	EPDM	46955	EPDM	Seal, LPS w/SS-Spg 3
108	43925	BB	45381	SS	44115	NAB	Spacer, Lo-Pressure Seal 3
109	46392	FBB	45365	SS	45124	N	Manifold, Inlet 1
110	11379	NBR	11379	NBR	11379	NBR	O-Ring, Inlet Manifold - 70D 3
111	14183	FPM	14183	FPM	14183	FPM	O-Ring, Inlet Manifold 3
112	701491	EPDM	701491	EPDM	701491	EPDM	O-Ring, Inlet Manifold 3
113	44585	S	44585	S	44585	S	Screw, HSH (M14x40) 4
114	43926	BB	48391	D	48391	D	Adapter, Female 3
115	44609	STG	44609	STG	44609	STG	Adapter Female 3
116	44741	SFG	44741	SFG	44741	SFG	V-Packing 6
117	44609	STG	44609	STG	44609	STG	V-Packing 6
118	43928	BB	45368	SS	45368	SS	V-Packing (Alternate-EPDM) 6
119	45113	SS	45113	SS	45113	SS	Adapter, Male 3
120	46352	BB	45382	SS	45382	SS	Springs, Coil 6/18
121	18697	NBR	18697	NBR	18697	NBR	Spacer, w/Coil Springs 3
122	20137	FPM	20137	FPM	20137	FPM	O-Ring, V-Packing-Spacer - 70D 3
123	701492	EPDM	701492	EPDM	701492	EPDM	O-Ring, V-Packing-Spacer 3
124	48362	D	48362	D	48362	D	O-Ring, V-Packing-Spacer 3
125	45369	SS	45369	SS	45369	SS	Back-up-Ring, Spacer 3
126	48362	D	48362	D	48362	D	Spacer, V-Packing 3
127	18697	NBR	18697	NBR	18697	NBR	Back-up-Ring, V-Packing-Spacer 3
128	20137	FPM	20137	FPM	20137	FPM	O-Ring, V-Packing-Spacer - 70D 3
129	701492	EPDM	701492	EPDM	701492	EPDM	O-Ring, V-Packing-Spacer - 70D 3
130	48363	D	48363	D	48363	D	O-Ring, V-Packing-Spacer 3
131	26142	NBR	26142	NBR	26142	NBR	Back-up-Ring, Valve Seat 6
132	14330	FPM	14330	FPM	14330	FPM	O-Ring, Seat 6
133	701493	EPDM	701493	EPDM	701493	EPDM	O-Ring, Seat 6
134	44727	S	44612	SS	44612	SS	O-Ring, Seat 6
135	43932	S	44108	SS	44108	SS	Seat, Stepped 6
136	44109	SS	44109	SS	44109	SS	Valve 6
137	44728	PVDF	44728	PVDF	44728	PVDF	Spring 6
138	44729	SS	44729	SS	44729	SS	Retainer, Spring 6
139	44644	SS	44644	SS	44644	SS	Washer, Spring Retainer 6
140	89827	NBR	89827	NBR	89827	NBR	Coil Spring (70kg), Valve Plug 6
141	11747	FPM	11747	FPM	11747	FPM	O-Ring, Valve Plug - 90D 6
142	701494	EPDM	701494	EPDM	701494	EPDM	O-Ring, Valve Plug - 90D 6

EXPLODED VIEW



Models
Standard - 3535
Stainless Steel - 3531
Nickel Aluminum Bronze - 3537
January 2000

	3535	MATL	3531	MATL	3537	MATL		
173	48364	D	48364	D	48364	D	Back-up-Ring, Valve Plug	6
174	46444	FBB	48419	SSNP	44643	NAB	Plug, Valve	6
● 185	46394	FBB	46326	SS	46335	NAB	Manifold, Discharge	1 ●
188	89981	S	89981	S	89981	S	Screw, HSH (M12x70)	8
● 250	44516	NY	44516	NY	44516	NY	Protector, Shaft w/2 89283 screws (Included with pump)	1
● 255	701140	F	701140	F	701140	F	Protector, Shaft (Use w/701137,38,39,45,47)	1
● 260	34039	SS	34039	SS	34039	SS	Kit, Stud Mount	1
● 260	92674	STZP	92674	STZP	92674	STZP	Mounting, Box Assy	1
● 275	—	—	—	—	—	—	Pulley, Hub & Key [See Drive Packages, Tech Bulletin 03]	1
● 278	80540	ZP	80540	ZP	80540	ZP	Screw, HH (M12x100) (Rail Adjusting Screw)	1
● 279	30278	STZP	30278	STZP	30278	STZP	Oiler (1 oz.)	3 ●
281	30967		30967		30967		Glass, Oiler	3
282	10069		10069		10069		Gasket, Oiler	3
● 283	34334		34334		34334		Kit, Oil Drain	1
● 290	6104		6104		6104		Gasket, Liquid (1 oz.)	1
● 299	814821	FBB	814544	SS	814522	NAB	Complete Head	1 ●
300	31040	NBR	31040	NBR	31040	NBR	Kit, Seal (Incls: 97, 106, 112, 127, 155, 156, 158, 159)	1
	33055	FPM	33055	FPM	33055	FPM	Kit, Seal (Incls: 97, 106, 112, 127, 155, 156, 158, 159)	1
	◆ 33262	EPDM	◆ 33262	EPDM	◆ 33262	EPDM	Kit, Seal (Incls: 97, 106, 112, 127, 155, 156, 158, 159)	1
310	34235	NBR	34017	NBR	34017	NBR	Kit, Valve (Incls: 162, 163, 164, 166, 167, 168, 170, 172, 173)	2
	31255	FPM	31255	FPM	31255	FPM	Kit, Valve (Incls: 162, 163, 164, 166, 167, 168, 170, 172, 173)	2
	◆ 31252	EPDM	◆ 31252	EPDM	◆ 31252	EPDM	Kit, Valve (Incls: 162, 163, 164, 166, 167, 168, 170, 172, 173)	2
● —	819000	F	819000	F	819000	F	Crankcase Assy (Incls: 8, 35, 36, 50, 53, 250)	1
● —	714500	SS	714500	SS	714500	SS	C.A.T. (For R.O. or Industrial Applications)	1
● —	714506	SS	714506	SS	714506	SS	Adapter (2 per C.A.T.) (See Data Sheet for complete selection)	2
—	6565.3		6565.3		6565.3		Video, Plunger Pump Service - Section 3	1

● Industrial discount. **Bold print part numbers are unique to a particular pump model. Italics are optional items.** ◆ Silicone oil/grease required.

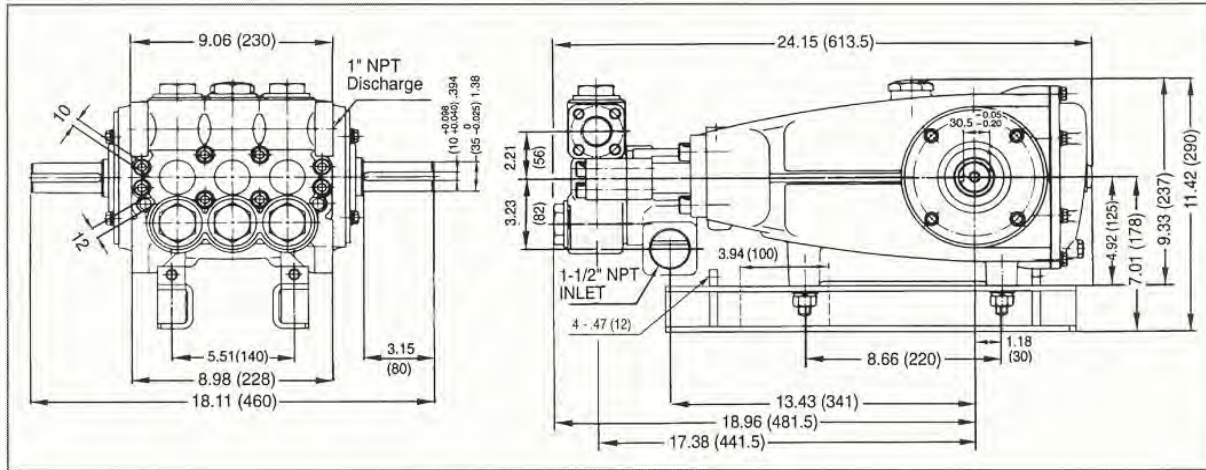
C.A.T. highly recommended for pressurized inlet, R.O. and Industrial applications.

See Tech Bulletins 03, 24, 35, 36, 40, 41, 43, 50, 52, 53, 69, 74, 77 and 83 for additional information.

† Production Parts Nickel Aluminum Bronze, Replacement Parts are 316 Stainless Steel

MATERIAL CODES (NoI Part of Part Number): AL=Aluminum BB=Brass CC=Ceramic D=Delryn® EPDM=Ethylene Propylene Diene Monomer F=Cast Iron FBB=Forged Brass FBR=Fiber FCM=Forged Chrome-moly FPM=Fluorocarbon (Viton®) HS=High Strength NAB=Nickel Aluminum Bronze NBR=Medium Nitrile (Buna-N) NY=Nylon POP=Polypropylene PTFE=Polytetrafluoroethylene (Teflon®) PVDF=Fluoroplastic (High Strength) S=304SS SS=316SS SSNP=316SS/Nickel Plated SSZZ=316SS/Zamak STCP=Steel/Chrome Plated SFG=Special Blend (Viton®) STG=Special Blend (Teflon®) White STL=Steel STZP=Steel/Zinc Plated ZP=Zinc Plated

ORDER CODES: Add to Model Number .0110 for FPM (Viton®), .0220 for EPDM. Consult factory for pricing.



Models 3535, 3531, 3537



- 1 Die cast aluminum **crankcase** means high strength, lightweight, and excellent tolerance control.
- 2 Oversized crankshaft **bearings** provide extended bearing life and pump performance.
- 3 Chrome-moly **crankshaft** provides unmatched strength and surface hardness for long life.
- 4 Matched oversized high strength **connecting rods** are noted for superior strength and bearing quality.
- 5 Special stainless steel **plunger rods** with high strength crossheads for longevity and corrosion resistance.
- 6 The stainless steel **slinger** provides back-up protection for the crankcase seal, keeping pumped liquids out of the crankcase.
- 7 Special concentric, high density, polished, graphite impregnated, solid ceramic **plungers** are abrasion resistant and result in extended seal life.
- 8 **Manifolds** are a high tensile strength forged brass, 316 stainless steel or nickel aluminum bronze for long term, continuous duty.
- 9 100% wet **seal** design adds to service life by allowing pumped liquids to cool and lubricate on both sides.
- 10 Stainless steel **valves, seats and springs** provide corrosion-resistance, positive seating and long life.
- 11 Specially formulated, CAT PUMP exclusive, **V-Packings** offer unmatched performance and seal life.
- 12 **Crossheads** are 360° supported providing uncompromising alignment.

Products described hereon are covered by one or more of the following U.S. patents 3558244, 3652188, 3809508, 3920356, 3930756 and 5035580

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World Headquarters
CAT PUMPS
1681-94th Lane N.E. Minneapolis, MN 55449-4324
Phone (612) 780-5440 — FAX (612) 780-2958
e-mail: sales@catpumps.com
www.catpumps.com
International Inquiries
FAX (612) 785-4329
e-mail: intl@sales@catpumps.com



CAT PUMPS (U.K.) LTD.
1 Fleet Business Park, Sandy Lane, Church Crookham, Fleet
Hampshire GU13 0BF, England
Phone Fleet 44 1252-622031 — Fax 44 1252-626655
N.V. CAT PUMPS INTERNATIONAL S.A.
Heveldeken 6A, 2550 Kontich, Belgium
Phone 32-3-450.71.50 — Fax 32-3-450.71.51
e-mail: cpi@catpumps.be www.catpumps.be
CAT PUMPS DEUTSCHLAND GmbH
Buchwiese 2, D-65510 Idstein, Germany
Phone 49 6126-93030 — Fax 49 6126-930333
e-mail: catpumps@t-online.de www.catpumps.de



35PFR PLUNGER PUMP SERVICE MANUAL



35 FRAME SPLIT MANIFOLD:

**3520, 3521 and 3527
3535, 3531 and 3537
3545, 3541**

INSTALLATION AND START-UP INFORMATION

Optimum performance of the pump is dependent upon the entire liquid system and will be obtained only with the proper selection, installation of plumbing and operation of the pump and accessories.

SPECIFICATIONS: Maximum specifications refer to individual attributes. It is **not** implied that all **maximums** can be performed **simultaneously**. If more than one maximum is considered, check with your CAT PUMPS supplier to confirm the proper performance and pump selection. Refer to individual pump Data Sheets for complete specifications, parts list and exploded view.

LUBRICATION: Fill crankcase with special CAT PUMP oil per pump specifications (4.2 Qts. - 4.0 L). **DO NOT RUN PUMP WITHOUT OIL IN CRANKCASE.** Change initial fill after 50 hours running period. Thereafter, change oil every **3 months or 500 hour intervals**. Oiler **adjustment** is vertical to start feed, horizontal to stop feed, dial to adjust flow rate. Additional lubrication may be required with increased hours of operation and temperature.

PUMP ROTATION: Pump was designed for forward rotation to allow optimum lubrication of the crosshead area. Reverse rotation is acceptable if the crankcase oil level is increased slightly above center dot to assure adequate lubrication.

PULLEY SELECTION: Select size of motor pulley required to deliver the desired flow from Horsepower Requirement and Pulley Selection Chart (refer to Tech Bulletin 003).

DRIVE SELECTION: The motor or engine driving the pump must be of adequate horsepower to maintain full RPM when the pump is under load. Select the electric motor from the Horsepower Requirement Chart according to required pump discharge flow, maximum **pressure at the pump** and drive losses of approximately 3-5%. Consult the manufacturer of gas or diesel engine for selection of the proper engine size.

MOUNTING: Mount the pump on a rigid, horizontal surface in a manner to permit drainage of crankcase oil. An uneven mounting surface will cause extensive damage to the pump base. To minimize piping stress, **use appropriate flexible hose to inlet and discharge ports.** Use the correct belt; make sure pulleys are aligned. Excessive belt tension may be harmful to the bearings. Hand rotate pump before starting to be certain shaft and bearings are free moving.

LOCATION: If the pump is used in extremely dirty or humid conditions, it is recommended pump be enclosed. Do not store or operate in excessively high temperature areas or without proper ventilation.

INLET CONDITIONS: Refer to complete **Inlet Condition Check-List** in this manual before starting system. **DO NOT STARVE THE PUMP OR RUN DRY.**

C.A.T.: Installation of a C.A.T. (Captive Acceleration Tube) is recommended in applications with stressful inlet conditions such as high temperatures, booster pump feed, long inlet lines or quick closing valves.

DISCHARGE CONDITIONS: **OPEN ALL VALVES BEFORE STARTING SYSTEM** to avoid deadhead overpressure condition and severe damage to the pump or system.

Install a **Pulsation Dampening** device on the discharge head or in the discharge line as close to the head as possible. Be certain the pulsation dampener (Prrrrr-o-lator) is properly precharged for the system pressure (see individual Data Sheet).

A **reliable Pressure Gauge** should be installed near the discharge outlet of the high pressure manifold. This is extremely important for adjusting pressure regulating devices and also for proper sizing of the nozzle or restricting orifice. The pump is rated for a maximum pressure; this is the **pressure** which would be **read at the discharge manifold of the pump, NOT AT THE GUN OR NOZZLE.**

Use PTFE liquid (sparingly) or tape to connect accessories or plumbing. Exercise caution not to wrap tape beyond the last thread to avoid tape from becoming lodged in the pump or accessories. This condition will cause a malfunction of the pump or system.

PRESSURE REGULATION: All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). The primary pressure device must be installed on the discharge side of the pump. The function of the primary pressure regulating device is to protect the pump from over pressurization, which can be caused by a plugged or closed off discharge line. Over pressurization can severely damage the pump, other system components and can cause bodily harm. The secondary safety relief device must be installed between the primary device and pump. This will ensure pressure relief of the system if the primary regulating device fails. Failure to install such a safety device will void the warranty on the pump.

If a large portion of the pumped liquid is by-passed (not used) when the high pressure system is running, this by-pass liquid should be routed to an adequately sized, baffled supply tank or to drain. If routed to the pump inlet, the **by-pass liquid can quickly develop excessive heat and result in damage to the pump.** A temperature control device to shut the system down within the pump limits or multiple THERMO VALVES must be installed in the by-pass line to protect the pump.

NOZZLES: A worn nozzle will result in loss of pressure. Do not adjust pressure regulating device to compensate. Replace nozzle and reset regulating device to system pressure.

PUMPED LIQUIDS: Some liquids may require a **flush between operations or before storing.** For pumping liquids other than water, contact your CAT PUMPS supplier.

STORING: For extended storing or between use in cold climates, drain all pumped liquids from pump and **flush with antifreeze solution to prevent freezing and damage** to the pump. **DO NOT RUN PUMP WITH FROZEN LIQUID** (refer to Tech Bulletin 083).

⚠ WARNING

All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). Failure to install such relief devices could result in personal injury or damage to the pump or to system components. CAT PUMPS does not assume any liability or responsibility for the operation of a customer's high pressure system.

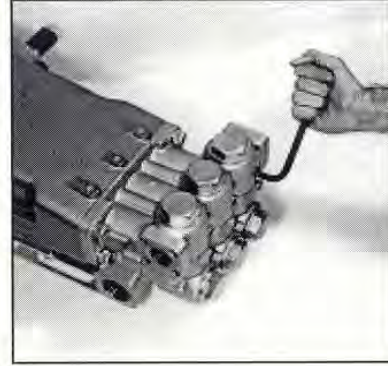
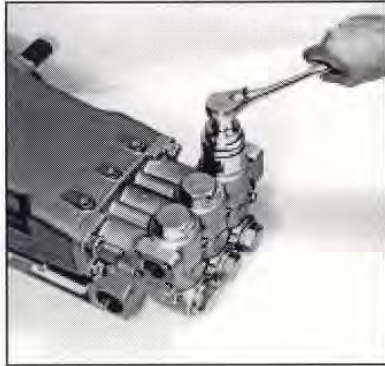
Products described hereon are covered by one or more of the following U.S. patents 3558244, 3652188, 3809508, 3920356, 3930756 and 5035580

World Headquarters
CAT PUMPS
1681-94th Lane N.E. Minneapolis, MN 55449-4324
Phone (763) 780-5440 — FAX (763) 780-2958
e-mail: sales@catpumps.com
www.catpumps.com
International Inquiries
FAX (763) 785-4329
e-mail: intl@catpumps.com



"The World's Most Dependable Pumps"

CAT PUMPS (U.K.) LTD.
1 Fleet Business Park, Sandy Lane, Church Crookham, Fleet
Hampshire GU52 8BF, England
Phone Fleet 44 1252-622031 — Fax 44 1252-626655
e-mail: sales@catpumps.co.uk
N.V. CAT PUMPS INTERNATIONAL S.A.
Heveldekens 6A, 2550 Kontich, Belgium
Phone 32-3-450.71.50 — Fax 32-3-450.71.51
e-mail: cp@catpumps.be www.catpumps.be
CAT PUMPS DEUTSCHLAND GmbH
Buchwiese 2, D-65510 Idstein, Germany
Phone 49 6 126-9303 0 — Fax 49 6 126-9303 33
e-mail: catpumps@t-online.de www.catpumps.de



SERVICING THE VALVES

DISASSEMBLY

1. Remove the six (6) M41 Hex Valve Plugs.
2. Remove the exposed Coil Spring from the top of the Spring Retainer. Thread an M10 bolt into the top of the Spring Retainer. The assembly will usually remain together. To separate, continue threading the bolt into the back side of the Valve Seat until it separates from the Spring Retainer. In all models if the assembly separates during removal, use a valve seat removal tool and lift the Seats from the chamber.

REASSEMBLY

NOTE: For certain applications apply liquid gasket to the o-ring crevices and seal surfaces. See Tech Bulletin #053 for model identification.

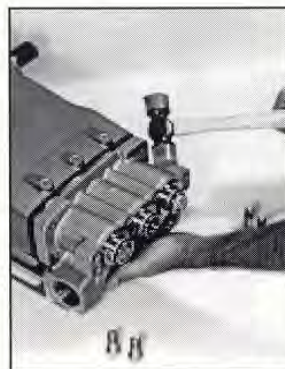
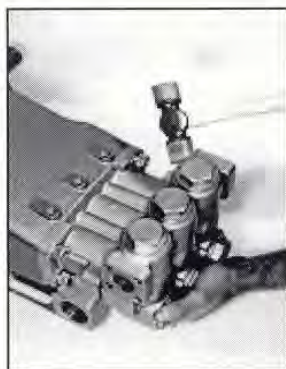
1. Examine the O-Rings and Back-up-Rings on the Seat and replace if cut or worn. Lubricate the O-Ring before installing.
2. Examine the surface of the Valve and Seat for pitting, grooves or wear and replace if necessary.
3. Next assemble Valve Retainer, Spring, Valve and Seat by snapping together securely. Thread the M10 bolt into spring retainer for installation.
4. Lubricate outer O-Ring and Back-up-Ring surface and walls of valve chamber and press Valve Assembly squarely into chamber. Remove M10 bolt. Place the washer over the top of the Spring Retainer and then the Coil Spring on top of the Washer.
5. Examine the O-Ring and Back-up-Ring on the Valve Plug and replace if cut or worn. Lubricate new O-Ring and Back-up-Ring before installing on Valve Plug to avoid damaging as they are worked over the plug threads. **NOTE:** The Back-up-Ring must go on first, then the O-Ring.
6. **Slowly** thread the Valve Plug into chamber. Exercise caution to avoid extruding or cutting the Back-up-Ring or O-Ring. Then torque to specifications **NOTE:** Apply Loctite 242 to the threads of the Valve Plug before threading into the manifold chamber.

REMOVING THE DISCHARGE MANIFOLD

1. Remove the eight (8) hex socket head screws.
2. Tap the back side of the Discharge Manifold with a soft mallet and gradually work head from pump.
3. Remove the O-Rings from lower chambers of the face of the Inlet Manifold.

REMOVING THE INLET MANIFOLD

1. Using a hex allen wrench, remove the four (4) hex socket head screws. Rotate the Crankshaft to begin the separation of the Inlet Manifold from the Crankcase.
2. Tap the rear of the Inlet Manifold with a soft mallet and gradually work from pump. **NOTE:** Support from the underside and exercise caution to keep manifold aligned with Plungers to avoid damage to the Plungers as the manifold is removed. **NOTE:** Two screwdrivers on opposite sides of the manifold may be used to assist separation.



SERVICING THE PACKINGS

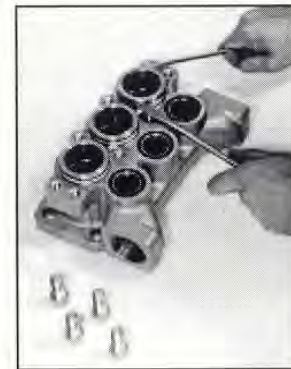
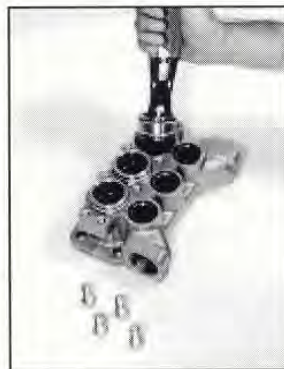
DISASSEMBLY OF THE V-PACKINGS

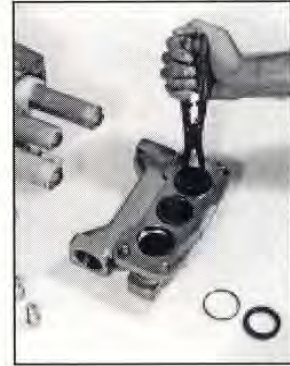
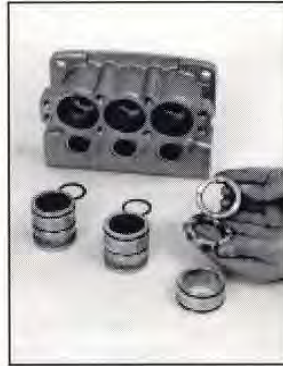
1. Place the **crankcase side** of the Inlet Manifold **down** on the work surface.
2. First remove the V-Packing Spacer. These may stay in either the Inlet or Discharge Manifold ports when the Discharge Manifold is removed. If they are extremely dirty or dry, remove the exposed O-Ring and Back-up-Ring and insert two screwdrivers on opposite sides to pry out of chamber.
3. Examine both front and rear O-Rings and Back-up-Rings on the V-Packing Spacer for cuts or wear and replace as needed. **NOTE:** The 3545, 3541 do not have Back-up-Rings.
4. To remove the V-Packing Cylinder (3520, 3521, 3527), insert two screwdrivers on opposite sides of the V-Packing Cylinder and pry out. Examine the O-Ring for wear and replace as needed.
5. Next remove Spacer with coil springs. Examine for broken or fatigued springs or scale build up or pitting and replace as needed.
6. Then with reverse pliers remove the Male Adapter, V-Packings and Female Adapter. **NOTE:** Using the reverse pliers may damage the V-Packings or Female Adapter.
7. Examine Female Adapter for worn I.D. and replace as needed.

REASSEMBLY OF THE V-PACKINGS

NOTE: For certain applications apply liquid gasket to the o-ring crevices and seal surfaces. See Tech Bulletin #053 for model identification.

1. Lubricate outer surface of V-Packing Cylinder and install new O-Ring in groove (3520, 3521, 3527). Press V-Packing Cylinder with **O-Ring end down** into the manifold chamber until completely seated.
2. Insert the Female Adapter into the V-Packing Cylinder (3520, 3521, 3527) or manifold chamber (3535, 3531, 3537, 3545, 3541) with the **"V" groove up**.
3. Next fit the new V-Packings together, lubricate the outer surface of the packings and insert into V-Packing Cylinder (3520, 3521, 3527) or manifold chamber (3535, 3531, 3537, 3545, 3541) with the **"V" groove up**.
4. Then install the Male Adapter into V-Packing Cylinder (3520, 3521, 3527) or manifold chamber (3535, 3531, 3537, 3545, 3541) with the **"V" groove down** (notches up).
5. Lubricate outer surface of Spacer with coil springs and insert into V-Packing Cylinder (3520, 3521, 3527) or manifold chamber (3535, 3531, 3537, 3545, 3541) with **springs facing down**. See Tech Bulletin #50 when servicing old style pumps; both the spacer with coil springs and Inlet Manifold must be updated.
6. Lubricate outer surface of V-Packing Spacer, install new O-Rings and Back-up-Rings in both front and rear groove and press into V-Packing Cylinder (3520, 3521, 3527) or manifold chamber (3535, 3531, 3537) with **small diameter down** until completely seated. **NOTE:** The 3545, 3541 do not have Back-up-Rings.





DISASSEMBLY OF THE LO-PRESSURE SEAL

1. With the Inlet Manifold on blocks and with the **crankcase side down**, insert screwdriver into seal chamber and tap opposite sides of the Washer Spacer to drive out seal assembly.
NOTE: Models 3535, 3531, 3537, 3545, 3541 include Spacer and Lo-Pressure Seal. Models 3520, 3521, 3527 include Washer, Lo-Pressure Seal, Inlet Adapter and O-Ring.
2. Elevate Inlet Adapter with **Lo-Pressure Seal down** and tap with screwdriver on opposite sides of seal to drive seal out of Inlet Adapter (Models 3520, 3521, 3527 only). Replace the Lo-Pressure Seal and examine O-Ring for wear and replace as needed.

REASSEMBLY OF THE LO-PRESSURE SEAL

NOTE: For certain applications apply liquid gasket to the o-ring crevices and seal surfaces. See Tech Bulletin #053 for model identification.

MODELS 3535, 3531, 3537

1. With the **crankcase side of Inlet Manifold up** insert the Spacer into the seal chamber.
2. Install Lo-Pressure Seal into seal chamber with **garter spring facing down** and press squarely into position.

MODELS 3520, 3521, 3527

1. With the **crankcase side of Inlet Manifold up** insert the Washer into the seal chamber.
2. Install Lo-Pressure Seal into larger diameter of Inlet Adapter **with spring up**.
3. Next lubricate outer surface of Adapter and install O-Ring into the groove of the Adapter.
4. Press **Inlet Adapter with seal** into seal chamber with **garter spring facing down**.

MODEL 3545, 3541

1. With the **crankcase side of the Inlet Manifold up** install Lo-Pressure Seal into the manifold chamber with **garter spring facing down** and press squarely into position.
NOTE: Spacer is installed after the Seal Retainer on model 3545, 3541. See Servicing The Plungers.

SERVICING THE PLUNGERS

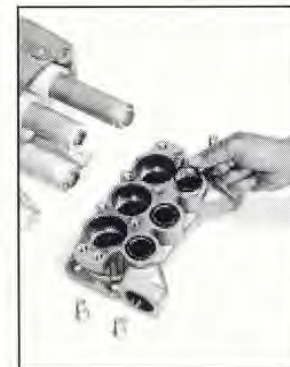
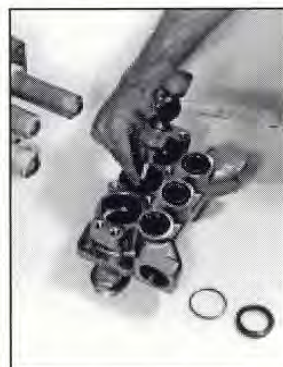
DISASSEMBLY

1. Remove the Seal Retainers from the Ceramic Plungers.
2. Remove the inner collar from the front of the seal retainer.
3. Remove the used Wick and install new Wick. Lubrication: Oiler setting for Wicks is three drops per hole, twice per month for normal operation. Oiler adjustment is vertical to start feed, horizontal to stop feed, 45° to flush bearing. Additional lubrication may be required with increased hours of operation and temperature.
NOTE: Model 3545, 3541 do not have Wicks or front Collar of Seal Retainer.

4. Replace Inner Collar on Seal Retainer.
5. Loosen Plunger Retainer 4 to 5 turns. Push Plunger towards Crankcase until Plunger Retainer pops out.
6. Unscrew and remove Plunger Retainer, Gasket, O-Ring, Back-up-Ring and Ceramic Plunger, Keyhole Washer and Barrier Slinger from the Plunger Rod.

REASSEMBLY

1. With these plunger items removed, examine the Crankcase Oil Seal for wear or deterioration and replace as needed.
2. Replace Keyhole Washer on Plunger Rod.
3. Carefully examine each Plunger for scoring or cracks and replace if worn.
NOTE: Ceramic Plunger can only be installed one direction (**front to back**). Do not force onto rod.
4. Examine Gasket, O-Ring and Back-up-Ring on Plunger Retainer and replace if cut or worn. Lubricate O-Ring for ease of installation and to avoid damaging O-Rings. NOTE: First install Gasket, then O-Ring and Back-up-Ring.
5. Apply loctite 242 to the threads of the Plunger Retainer and thread Plunger Retainer onto Plunger Rod. Torque per specifications.
6. Slip Seal Retainers over Plungers. NOTE: On Model 3545, 3541 install Spacer over end of Seal Retainer. Insert smaller diameter first. Line up Wicks with the oil holes in the Crankcase and tabs in the Oil Pan (3520, 3521, 3527, 3535, 3531, 3537).
7. Rotate shaft and line up two outside Plungers.
8. Lubricate the Plungers.
9. Carefully replace Inlet Manifold onto Plungers and press into Crankcase. Keep manifold aligned to avoid damaging Plungers.
10. Replace four (4) hex socket head screws and torque per chart.
11. Examine inlet port o-rings at bottom of manifold and replace if cut or worn.
12. Lubricate outer surface of V-Packing Spacer, O-Rings and valve chamber walls and carefully slip Discharge Manifold over V-Packing Spacer.
13. Hand tighten the two (2) hex socket head screws first. Then hand tighten the remaining six (6) hex socket head screws. Torque per chart and in this sequence.





PUMP STAND

SERVICING THE CRANKCASE SECTION

1. While manifold, Plungers and Seal Retainers are removed, examine Crankcase Seals for wear.
2. Check oil level and for evidence of water in oil.
3. Rotate Crankshaft by hand to feel for smooth bearing movement.
4. Examine Crankshaft Oil Seal externally for drying, cracking or leaking.
5. Consult factory or your local distributor if crankcase service is evidenced.

See section III of the Plunger Pump Service Video for additional information.

PREVENTATIVE MAINTENANCE CHECK-LIST						
Check	Daily	Weekly	50 hrs.	500 hrs.*	1500 hrs.**	3000 hrs.**
Clean Filters	x					
Oil Level/Quality	x					
Oil Leaks	x					
Water Leaks	x					
Belts, Pulley		x				
Plumbing		x				
Initial Oil Change			x			
Oil Change				x		
Seal Change					x	
Valve Change						x
Accessories					x	

* If other than CAT PUMPS special multi-viscosity ISO68 oil is used, change cycle should be every 300 hours.

** Each system's maintenance cycle will be exclusive. If system performance decreases, check immediately. If no wear at 1500 hours, check again at 2000 hours and each 500 hours until wear is observed. Valves typically require changing every other seal change.

Duty cycle, temperature, quality of pumped liquid and inlet feed conditions all effect the life of pump wear parts and service cycle.

*** Remember to service the regulator/unloader at each seal servicing and check all system accessories and connections before resuming operation. Refer to Service Manual and video for additional assistance.

TORQUE CHART					
Pump Item	Thread	Tool Size [Part No.]	Torque in.lbs. ft.lbs. Nm		
Plunger Retainer	M10	M21 Hex	220	18.1	25
Inlet Manifold Screws	M14	M12 Allen [33048]	480	39.8	54
Discharge Manifold Screws	M12	M10 Allen [33047]	355	29.6	40
Valve Plugs	M45	M41 Hex	1305	108.5	147
Crankcase Cover/ Bearing Cover Screws	M8	M13 Hex [25324]	115	9.4	13
Connecting Rod Screws	M10	M17 Hex [25083]	395	32.5	45
Bubble Oil Gauge	M28	Oil Gauge Tool [44050]	45	3.6	5
Mounting Bolts	M14	M22	570	47.4	68

TECHNICAL BULLETIN REFERENCE CHART		
No.	Subject	Models
002	Inlet Pressure VS Liquid Temperature	All Models
003	Power Unit Drive Packages	3PFR - 68PFR, 10FR - 60FR
024	Lubrication of Lo-Pressure Seals	All Models
035	Servicing Crankcase Section	7PFR - 60PFR
036	Cylinder and Plunger Reference Chart	All Models
040	Manifold and Valve Part	3527 and 3537
041	Oil Gauge and Crankcase	3520 and 3535
043	LPS and HPS Servicing	All Plunger Models
050	Spacer with Coil Springs	3520, 3527, 3535, 3537
052	Plunger Rod and Stud	3PFR, 5PFR, 15PFR, 35PFR, 60PFR
053	Liquid Gasket	All Plunger NAB-S.S. Models
064	By-Pass Hose Sizing	All Unloaders/Regulators
069	Forged Extended Manifolds	35PFR
074	Torque Chart	Piston and Plunger Pumps
077	Oil Drain Kit	All Models (except 2SF/4SF)
083	Winterizing a Pump	All Models
087	Female Adapters	15PFR, 35PFR, 60PFR

INLET CONDITION CHECK-LIST

Review Before Start-Up

Inadequate inlet conditions can cause serious malfunctions in the best designed pump. Surprisingly, the simplest of things can cause the most severe problems or go unnoticed to the unfamiliar or untrained eye. REVIEW THIS CHECK-LIST BEFORE OPERATION OF ANY SYSTEM. Remember, no two systems are alike, so there can be no ONE best way to set-up a system. All factors must be carefully considered.

INLET SUPPLY should exceed the maximum flow being delivered by the pump to assure proper performance.

- Open inlet shut-off valve and turn on water supply to starving pump. **DO NOT RUN PUMP DRY.**
- Avoid closed loop systems especially with high temperature, ultra-high pressure or large volumes. Conditions vary with regulating/unloader valve.
- Low vapor pressure liquids, such as solvents, require a booster pump and C.A.T. to maintain adequate inlet supply.
- Higher viscosity liquids require a positive head and a C.A.T. to assure adequate inlet supply.
- Higher temperature liquids tend to vaporize and require positive heads and C.A.T. to assure adequate inlet supply.
- When using an inlet supply reservoir, size it to provide adequate liquid to accommodate the maximum output of the pump, generally a minimum of 6 to 10 times the GPM (however, a combination of system factors can change this requirement); provide adequate baffling in the tank to eliminate air bubbles and turbulence; install diffusers on all return lines to the tank.

INLET LINE SIZE should be adequate to avoid starving the pump.

- Line size must be a minimum of one size larger than the pump inlet fitting. Avoid tees, 90 degree elbows or valves in the inlet line of the pump to reduce the risk of flow restriction and cavitation.
- The line **MUST** be a FLEXIBLE hose, NOT a rigid pipe, and reinforced on SUCTION systems to avoid collapsing.
- The simpler the inlet plumbing the less the potential for problems. Keep the length to a minimum, the number of elbows and joints to a minimum (ideally no elbows) and the inlet accessories to a minimum.
- Use pipe sealant to assure air-tight, positive sealing pipe joints.

INLET PRESSURE should fall within the specifications of the pump.

- Acceleration loss of liquids may be increased by high RPM, high temperatures, low vapor pressures or high viscosity and may require pressurized inlet and C.A.T. to maintain adequate inlet supply. **DO NOT USE C.A.T WITH SUCTION INLET.**
- Optimum pump performance is obtained with +20 PSI (1.4 BAR) inlet pressure and a C.A.T. for certain applications. With adequate inlet plumbing, most pumps will perform with flooded suction. Maximum inlet pressure is 70 PSI (4.9 BAR).
- After prolonged storage, pump should be rotated by hand and purged of air to facilitate priming. Disconnect the discharge port and allow liquid to pass through pump and measure flow.

INLET ACCESSORIES are offered to protect against overpressurization, contamination or temperature and control flow.

- A shut-off valve is recommended to facilitate maintenance.
- Installation of a C.A.T. is essential in applications with stressful conditions such as high temperatures, booster pump feed or long inlet lines. **Do not use C.A.T. with negative inlet pressure.**
- A stand pipe can be used in some applications to help maintain a positive head at the pump inlet line.
- Inspect and clean inlet filters on a regular schedule to avoid flow restriction.
- A pressure transducer is necessary to accurately read inlet pressure. **Short term, intermittent cavitation will not register on a standard gauge.**
- All accessories should be sized to avoid restricting the inlet flow.
- All accessories should be compatible with the solution being pumped to prevent premature failure or malfunction.
- Optional inlet protection can be achieved by installing a pressure cut off switch between the inlet filter and the pump to shut off pump when there is no positive inlet pressure.

BY-PASS TO INLET Care should be exercised when deciding the method of by-pass from control valves.

- It is recommended the by-pass be directed to a baffled reservoir tank, with at least one baffle between the by-pass line and the inlet line to the pump.
- Although not recommended, by-pass liquid may be returned to the inlet line of the pump if the system is properly designed to protect your pump. When a pulsation dampener is used, a PRESSURE REDUCING VALVE must be installed on the inlet line (**BETWEEN THE BY-PASS CONNECTION AND THE INLET TO THE PUMP**) to avoid excessive pressure to the inlet of the pump. It is also recommended that a THERMO VALVE be used in the by-pass line to monitor the temperature build-up in the by-pass loop to avoid premature seal failure.
- A low-pressure, flexible cloth braid (not metal braid) hose should be used from the by-pass connection to the inlet of the pump.
- Caution should be exercised not to undersize the by-pass hose diameter and length. Refer to Technical Bulletin 064 for additional information on the size and length of the by-pass line.
- Check the pressure in the by-pass line to avoid overpressurizing the inlet.
- The by-pass line should be connected to the pump inlet line at a gentle angle of 45° or less and no closer than 10 times the pump inlet port diameter e.g. 1-1/2" port size = 15" distance from pump inlet port.



PUMP STAND

DIAGNOSIS AND MAINTENANCE

PROBLEM	PROBABLE CAUSE	SOLUTION
<ul style="list-style-type: none"> Pulsation 	<ul style="list-style-type: none"> Faulty Pulsation Dampener Poor inlet and discharge plumbing 	<ul style="list-style-type: none"> Check precharge. If low, recharge it or install a new one. Install flexible hose inlet, and discharge of pump. If long feed lines use C.A.T. on booster pump.
<ul style="list-style-type: none"> Low Pressure 	<ul style="list-style-type: none"> Worn nozzle Belt slippage Air leak in inlet plumbing Pressure gauge inoperative or not registering accurately Relief valve stuck, partially plugged or improperly adjusted; valve seat worn Inlet suction strainer clogged or improper size Worn Packing. Abrasives in pumped liquid or severe cavitation. Inadequate water supply Fouled or dirty inlet or discharge valves Worn inlet or discharge valves Leaky discharge hose 	<ul style="list-style-type: none"> Replace nozzle of proper size. Tighten or replace. Use correct belt type and length. Disassemble, reseal, and reassemble. Check with new gauge; replace worn or damaged gauge. Clean and adjust relief valve; check for worn or dirty valve seats. Repair with Valve Kit. Clean. Use adequate size. Check more frequently. Install proper filter. Check flow available to pump. Clean inlet and discharge valve assemblies. Replace worn valves, valve seats and/or discharge hose.
<ul style="list-style-type: none"> Pump runs extremely rough, pressure low 	<ul style="list-style-type: none"> Restricted inlet or air entering the inlet plumbing Stuck or worn inlet or discharge valves Leaking V-Packings 	<ul style="list-style-type: none"> Proper size inlet plumbing; check for air tight seal. Clean out foreign material, replace worn valves. Repair with Seal Kit.
<ul style="list-style-type: none"> Water leakage from under the manifold 	<ul style="list-style-type: none"> Worn or damaged Lo-Pressure seals Worn male and female adapter 	<ul style="list-style-type: none"> Repair with Seal Kit. Install new male and female adapter. Lubricate and replace o-rings in seal area.
<ul style="list-style-type: none"> Oil leak between crankcase and pumping section 	<ul style="list-style-type: none"> Worn crankcase oil seals 	<ul style="list-style-type: none"> Replace crankcase oil seals and change oil in crankcase.
<ul style="list-style-type: none"> Oil leaking in the area of crankshaft 	<ul style="list-style-type: none"> Worn or improperly installed crankshaft or cut or worn o-ring on bearing case Bad bearing 	<ul style="list-style-type: none"> Replace damaged o-ring and/or oil seals. Replace bearing.
<ul style="list-style-type: none"> Excessive play in the end of the crankshaft pulley 	<ul style="list-style-type: none"> Worn main bearing from excessive tension on drive belt 	<ul style="list-style-type: none"> Replace bearing. Properly tension belt. Use correct type and length.
<ul style="list-style-type: none"> Water in crankcase 	<ul style="list-style-type: none"> Humid air condensing into water inside the crankcase Worn and leaking Lo-Pressure Seals and V-Packing. Operating beyond normal service cycle. Leaking crankcase seals or seals installed backward 	<ul style="list-style-type: none"> Change oil every 3 months or 500 hour intervals using special CAT PUMPS Premium Grade Oil, PN 06100 (Case) 6107 (Bottle), (other approved oil every month or 300 hours). Repair with Seal Kit. Initiate more frequent service cycle. Replace seals. Follow proper installation procedure. Contact CAT PUMPS supplier for crankcase servicing.
<ul style="list-style-type: none"> Oil leaking from under-side of crankcase 	<ul style="list-style-type: none"> Worn crankcase oil seals 	<ul style="list-style-type: none"> Replace seals.
<ul style="list-style-type: none"> Oil leakage from drain plug 	<ul style="list-style-type: none"> Loose drain plug or worn drain plug o-ring 	<ul style="list-style-type: none"> Tighten drain plug or replace o-ring.
<ul style="list-style-type: none"> Loud knocking noise in pump 	<ul style="list-style-type: none"> Pulley loose on crankshaft Broken or worn bearing Stressful inlet conditions 	<ul style="list-style-type: none"> Check key and tighten set screw. Replace bearing. Install C.A.T. and/or booster pump.
<ul style="list-style-type: none"> Frequent or premature failure of the packing 	<ul style="list-style-type: none"> Scored plungers Excessive inlet pressure Abrasive material in the liquid being pumped Excessive temperature of pumped liquid Running pump dry 	<ul style="list-style-type: none"> Replace plungers. Reduce inlet pressure to specifications. Install proper filtration on pump inlet plumbing. Reduce liquid temperature to specifications. Use adequate sized holding tank for proper feed and by-pass. DO NOT RUN PUMP WITHOUT WATER.
<ul style="list-style-type: none"> Strong surging at the inlet and low pressure on the discharge side 	<ul style="list-style-type: none"> Foreign particles in the inlet or discharge valve or worn inlet and/or discharge valves Stressful inlet conditions 	<ul style="list-style-type: none"> Check for smooth lap surfaces on inlet and discharge valve seats. Discharge valve seats and inlet valve seats may be lapped on a very fine oil stone. Install and maintain good inlet filter. Install C.A.T. and/or booster pump.



CAT PUMPS WARRANTY

This pump is warranted by the manufacturer to be free from defects in **workmanship** and **material** for ONE YEAR from date of manufacturer's shipment except:

- TWO YEARS for the 2DX, 5DX, 6DX and all CAR WASH pumps except 5CP2120W, 5CP2140WCS, 5CP2150W are five years.
- FIVE YEARS for 2SF and 4SF pumps and all portable fresh water PRESSURE WASHER pumps.
- SIX MONTHS for all rebuilt pumps.
- 90 DAYS on all duplex pumps and Accessories.

The sole responsibility for warranty on all motors is that of their original manufacturers.

This warranty DOES NOT APPLY to malfunctions caused by the FAULT or NEGLIGENCE of the buyer or third party, including failure to perform periodic maintenance (oil, seal and valve change), to the IMPROPER USE of the pump as a component part, to failures reported to the manufacturer AFTER the WARRANTY PERIOD has EXPIRED, or to the NORMAL WEAR of standard wear items in the pump such as V-packings, seals, cups, o-rings, valves, etc.

This express warranty is in substitution for and in lieu of all other warranties, whether expressed or implied, including, without limitation, any warranties or merchantability or fitness for a particular purpose and all such warranties are hereby disclaimed and excluded by the manufacturer.

In order to take advantage of this warranty, you must first contact your local CAT PUMPS supplier for a Return Goods Authorization Number (763-780-5440,

Fax 763-780-2958). Any defective product must be returned **FREIGHT PREPAID** to CAT PUMPS, 1681 94th Lane N.E., Minneapolis, MN 55449 (or international office of origin) for examination and disposition. CAT PUMPS agrees to be responsible for return shipping costs on any approved warranty repair or replacement product with a carrier selected by CAT PUMPS. (Use original or comparable carton to avoid damage in shipment.) The serial number of the product will determine warranty date unless original purchase invoice can be provided.

The buyer agrees that the sole and exclusive remedy in law or in equity for breach of any and all warranties and the sole and exclusive remedy for the manufacturer's liability of any kind (including, without limitation, liability for negligence) with respect to the product and all other performance by the manufacturer will be limited to the REPAIR OF, OR AT MANUFACTURER'S OPTION, THE REPLACEMENT OF THE PRODUCT. Buyer further agrees that manufacturer will, in no event, have any responsibility or bear any liability for (a) the cost of labor for the removal of any defective product or the installation of any replacement product, or (b) the cost of transportation to the manufacturer of the defective products returned for evaluation. Finally, buyer agrees that the manufacturer shall not be liable for any other loss, damage or expense, including any special, incidental or consequential loss or damage (including, without limitation, lost profits), even if the manufacturer has been advised of the possibility of such potential loss or damage.

THIS WARRANTY IS SUBJECT TO THE FOLLOWING CONDITIONS:

- SPECIFICATIONS:** Pump operation must be within RPM, Discharge Pressure and Inlet Pressure specifications. **A pressure relief valve must be correctly installed in the system.**
- PUMPED LIQUIDS:** The warranty is VOID if pump operation commences without sufficient liquid to the pump. **Do not pump harsh acids or alkalines or abrasive liquids.** Contact Manufacturer for additional information on questionable liquids, high temperatures, and alternative constructions.
- LUBRICATION:** The warranty is VOID if pump operation commences **without the proper amount** of oil in the crankcase, oil becomes **contaminated** or pump operates **without periodic oil changes as recommended.** Fill Gearboxes with required lubricant before initial start-up. Review individual service manual and data sheet for required amount of oil (lubricant) and maintenance cycle.
- TEMPERATURE:** Protect pump from freezing. Do not store in area with freezing conditions. Drain completely of pumped liquid. Flush with antifreeze. Do not operate pump which contains frozen liquid. Do not store or operate in excessively high temperature areas or without proper ventilation.

USE OF OTHER THAN CAT PUMPS PARTS OR THEIR EQUIVALENT VOIDS THE WARRANTY

This supercedes any and all previous warranty statements. November 2000 Rev. H.



PREVENTATIVE MAINTENANCE CHECK-LIST						
Check	Daily	Weekly	50 hrs.	500hrs.*	1500hrs.*	3000 hrs.**
Clean Filters	x					
Oil Level/Quality	x					
Oil Leaks	x					
Water Leaks	x					
Belts, Pulley		x				
Plumbing		x				
Initial Oil Change			x			
Oil Change				x		
Seal Change					x	
Valve Change						x
Accessories					x	

* If other than CAT PUMPS special multi-viscosity ISO68 oil is used, change cycle should be every 300 hours.

** Each system's maintenance cycle will be exclusive. If system performance decreases, check immediately. If no wear at 1500 hours, check again at 2000 hours and each 500 hours until wear is observed. Valves typically require changing every other seal change.

Duty cycle, temperature, quality of pumped liquid and inlet feed conditions all effect the life of pump wear parts and service cycle.

** Remember to service the regulator/unloader at each seal servicing and check all system accessories and connections before resuming operation.

Refer to Service Manual and video for additional assistance.



Procon Pumps

For each low-pressure function you will find a Procon pump to deliver the chemical to the gantry. These pumps have molded brass bodies with carbon impellers in them. They are driven with an electric 230V motor mounted directly to it. These pumps should not run dry, as the carbon impellers will get hot and crack.

The pumps are located on a shelf below the chemical tank. The low ph presoak pump (if installed) is located below the other pumps. It is a stainless steel pump, which will withstand the corrosive effect of the low ph presoak better than the brass pumps.

The chemical tank has a float mounted in the back of it for each chemical. If the one of the chemical tanks runs dry, it breaks the circuit to the motor starter of that chemical, halting the operation of the pump.

Below is a wiring chart for the Procon Pumps. The terminal strip mentioned in the chart is located in the stainless steel box on the side of the pump stand marked "High Voltage". The motor starters for the pumps are located in the ECP and go from left to right in the order of the chart below.

PROCON MOTOR STARTERS		
TERMINAL STRIP	COLOR	FUNCTION
1 & 2	Tan	Pre-Soak
3 & 4	Brown	Low pH
5 & 6	Purple	Tire Cleaner
7 & 8	Black	Tri Foaming Conditioner
9 & 10	Black	Tri Foaming Conditioner
11 & 12	Black	Tri Foaming Conditioner



Electrical Control Panel

The electrical control panel (ECP) on the Water Wizard (WW) is the main control of the automatic. It is a square box constructed of 14-gauge stainless steel. Inside the box is the memory unit (SRM-1), one input card and two output cards with one optional output card, power supply, transformer, several t-strips and the safety switch. The 220V supply voltage ties to L1, L2, and L3 of the safety switch. The electrical control panel supplies power to the gantry motors, gantry input/output cards, prox sensors, and eye sensors

The door of the ECP holds (4) cycle buttons to enable the operator to test wash cycles with ease, and one reset button that resets the gantry computer and the auto cashier. In the middle of the door you will find a Red Lion controller. This is where the operator can custom design a wash, test functions on the automatic, and look at daily, weekly and monthly income levels. Any error codes will also be displayed on the LCD screen. Refer to Red Lion section for more detailed descriptions on the Red Lion.



Tel +1 (717) 767-6511
Fax +1 (717) 764-6587
www.redlion-controls.com

Bulletin No. CL20-D
Drawing No. LP0420
Revised 1/01

MODEL CL20 - PARADIGM 4 X 20 LCD OPERATOR INTERFACE TERMINAL



- 4 LINE X 20 CHARACTER LIQUID CRYSTAL DISPLAY WITH LED BACKLIGHT
- 250 ALARM POINT LOGGER
- RECIPE HANDLING
- COMPREHENSIVE REPORT GENERATION
- UNLIMITED PASSWORD PROTECTION
- REAL TIME CLOCK, BATTERY BACKED
- EXPRESSION EVALUATION
- 32 BIT / FLOATING POINT MATH
- DIRECT, NETWORK (One family of PLCs) OR MODEM LINK TO PLC CONTROL SYSTEM
- NEMA 4/IP65



GENERAL DESCRIPTION


The Model CL20 Operator Interface Terminal combines unique capabilities normally expected only from high-end units, at a very affordable price. The CL20 is configured using the same powerful EDICT97 Software as all Red Lion Paradigm Operator Interfaces. The result is savings in time to get challenging applications up and running, and frequent savings in hardware costs due to replacing many functions usually performed in separate expensive devices.


CL20 is robustly constructed for an industrial environment. With a metal enclosure and a non-corroding NEMA 4/IP65 front panel.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

 **WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 / CLASS II, DIVISION 2 / CLASS III, DIVISION 2**

 **CAUTION: Read complete instructions prior to installation and operation of the unit.**

UL US LISTED
63YN
LABORATORY EQUIPMENT

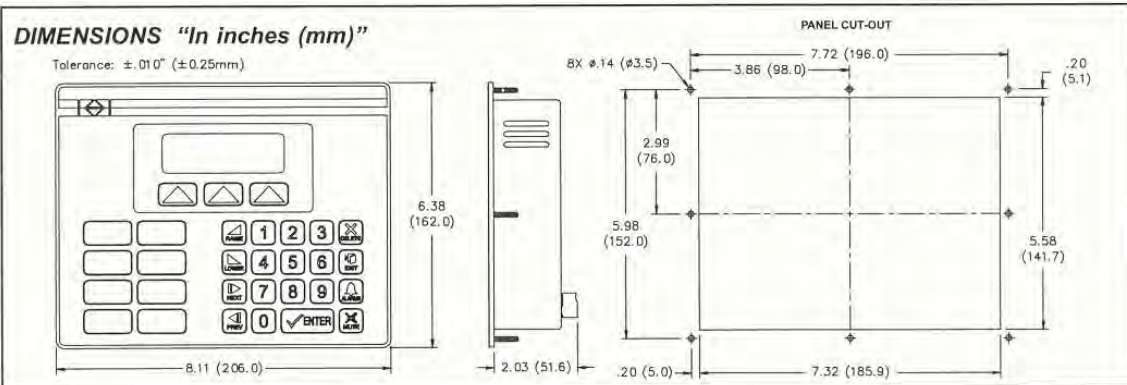
FOR USE IN HAZARDOUS LOCATIONS:
Class I, Division 2, Groups A, B, C, and D
Class II, Division 2, Groups F and G
Class III, Division 2

SPECIFICATIONS

1. **POWER REQUIREMENT:** 11 to 30 VDC @ 3.0 W
Power Up Current: 3.0 A for 1 msec. max.
Must use a Class 2 or SELV rated power supply.
2. **DISPLAY:** 4 lines of 20 characters, 0.197" (5 mm) high liquid crystal display with bright LED backlight.
3. **KEYPAD:** 3 screen legendable soft keys, 8 User re-legendable function keys, numeric pad with raise, lower, next, previous, enter, delete, exit, alarms and mute keys, all with Tactile feedback.
4. **MEMORY:** 128 K (64 K user) battery backed RAM (Battery life expectancy 10 years). Optional factory fit expansion to 256 K (192 K user).
5. **PHYSICAL DIMENSIONS:** L = 8.11" (206 mm), H = 6.38" (162 mm), D = 2.22" (56.5 mm).
6. **CONSTRUCTION:** Steel rear metal enclosure with NEMA 4/IP65 aluminum front plate when correctly fitted with the gasket provided. This unit is rated for NEMA 4/IP65 indoor use. Installation Category I, Pollution Degree 2.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
CL20	LCD, 4 X 20, 8 Function, 3 Soft keys, 128 K memory	CL200000
	LCD, 4 X 20, 8 Function, 3 Soft keys, 256 K memory	CL200010
	Battery Replacement	BAL3R004
	EDICT-97 Development Kit. Includes Software, Manual and 9-pin RS232 Programming Cables	SFEDT
	Communication Cables	P895xxxZ





7. **MOUNTING REQUIREMENTS:** Max. panel thickness is 0.375" (9.5 mm). For NEMA 4/IP65 sealing, a steel panel with a minimum thickness of 0.125" (3.175 mm) is recommended.
8. **SERIAL PORTS:** Data Format and Baud Rates for each port is individually software programmable up to 19200 baud.
Port 1: Programming Port - RS-232 on an RJ-11 jack.
Port 2: RS-232 Port on a Plug-In Screw Terminal Block
Port 3: RS-485 Port on a Plug-In Screw Terminal Block
(Up to 29 units can be connected and individually addressed.)
Note: LED Indicators show communications status on Ports 2 & 3
9. **COMMUNICATION MODES:** Any of the three ports can be used to communicate with Serial Devices.
Model - (CL200000) only one of Ports 1, 2, and 3 may be configured.
Exception Red Lion Controls Instrument, simple ASCII Printer, PC Link Network, Program Through, External Keyboards, and Roll-Your-Own Protocols can be used with other protocols on all Ports.
Model - (CL200010) may communicate in Master mode with a different device protocol on each port (See Note & Exception).
However, only one of the Ports 2 and 3 may be configured, if either is selected as a Slave Protocol.
Note: Ports 2 and 3 may be configured as different device protocols in Master mode and Port 1 may be used simultaneously in Slave mode for a third device protocol.
Exception: If Allen Bradley DH485 is selected on either Port 2 or 3, only Port 1 will be available for a separate device protocol.
10. **CERTIFICATIONS AND COMPLIANCES:**
SAFETY
UL Recognized Component, File # E179259, UL3101-1, CSA 22.2 No. 1010-1 Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.

UL Listed, File # E211967, UL3101-1, UL1604, CSA 22.2 No. 1010.1, CSA 22.2 No. 213-M1987
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
Type 4 Enclosure rating (Face only), UL50
IECEE CB Scheme Test Certificate # UL2795-179259/USA,
CB Scheme Test Report # 98ME60993-000098
Issued by Underwriters Laboratories, Inc.
IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating (face only), IEC 529

ELECTROMAGNETIC COMPATIBILITY

EN 50081-2 : 1994 Electromagnetic Compatibility Directive
Generic Emission Standard
Part 2 : Industrial Environment

EN 50082-2 : 1994 Electromagnetic Compatibility Directive
Generic Immunity Standard
Part 2 : Industrial Environment

EN 55022-B : 1995 Limits and Methods of Measurement of Radio
Disturbance Characteristics of Information
Technology Equipment

11. ENVIRONMENTAL CONDITIONS:

Operating Temperature: 0 to 40°C
Storage Temperature: -20 to 80°C
Operating and Storage Humidity: 80% max. relative humidity (non-condensing) from 0°C to 40°C.
Altitude: Up to 2000 meters

12. WEIGHT: 2.1 lb. (0.95 Kg)

COMMON FEATURES FOR CHARACTER BASED OPERATOR TERMINALS

PROGRAMMABILITY

Event Driven Configuration Tool

Edict 97, an extremely powerful Windows 95/3.11 based software program, provides for the intuitive configuration of every aspect of the operator interface's behavior. The requirement for time consuming PLC ladder logic is drastically reduced by the unique event driven approach of EDICT 97. The capability of this program, in conjunction with the PLC and the Paradigm operator interface unit, ensures a great deal of advanced functionality for your system. This powerful PLC/Paradigm system provides many of the capabilities and features normally associated with the more complicated and costly PC/SCADA systems. Display pages are easily generated, including PLC and internal variables, text strings, or bar charts. All dynamic elements are also available as alarms, recipes, triggers, and reports, for the run time software. After completion of the programming, the program is directly downloaded to the operator interface from your PC, without any compiling or saving requirement. When you require a change in your program, EDICT 97 loads only the change, not the entire program, saving valuable on-line time.

DYNAMIC DISPLAY PAGE ELEMENTS

Each display page has provisions to show static and dynamic information, including data variables, text messages, time, and date.

Data Variables can be either PLC derived or internally generated, either in data entry or display only mode. The Paradigm unit has an extremely powerful math capability, allowing the operator to manipulate the variables to meet the specific application's demands. If required, the display can be formatted to BCD, binary, hex, floating point, and string. Upper and lower limits of data entry variables are fully supported and able to be password protected.

Text Message Animation enables several different types of animated text from a local or global message table to be displayed. The message displayed is dependent on the condition of the particular controlling expression. The controlling expression may be a PLC bit level, a timer value, preset counter condition, or any one of a wide variety of message triggers.

Time and Date in the Paradigm unit has the capability to display in any combination of year, month, day, hours, minutes, and seconds.

Bar Graphs in horizontal format are easily attached to data variables. The partial or full length bar graph displays can be scaled and offset to optimize the required display effect.

SECURITY

The password protection scheme provides the ultimate in tamper-proof capability. Access can be limited on a unit, page, recipe, or even individual data entries.

ALARMS

The Paradigm unit can monitor and log from 100 to 500 alarms, depending on model. Such triggers as a simple bit level transition, a PLC coil activation, or a complex application algorithm can activate an alarm. The alarms can be time and date stamped, with an automatic screen display and/or downloading to a printer for hard copy recording purposes.

REAL TIME SCHEDULE

Real time schedule allows for repetitive or one time task to take place in the system. Typically a schedule action similar to...At 1:55 PM on Monday, Wednesday, and Friday, print the production report...is required in the application. In conjunction with the recipe capabilities, a downloading of a special recipe can be requested by the real time schedule feature.

USER PROGRAMS

This feature offers the user the ability to incorporate custom application requirements via a powerful program language. For example, a program designated "Calculate Volume" which determines the amount of fluid in a round tank at specific temperatures could be created. This program would be triggered to run and display each time the page denoted as "Volume Now" is requested.

The ability to customize to your application's specialized needs is easily solved with the user program capability.

KEYBOARD EDITING

All the interface keys can be programmed to perform virtually unlimited functions with each key, having multiple actions assigned to three types of key events: key pressed, key held down (auto repeat), and key released. Typical key actions would be Go to page, set value, load recipe, view alarms, print report, and many more.

COMMUNICATIONS

With over 70 communication drivers available, the Paradigm operator interface offers a wide range of connectivity including: PLCs, Variable Speed Drives, Temperature Controllers, Bar Code Readers, etc. Utilizing real PLC data references, the automatic comms configuration optimizes the system's communication performance. In the event that your specific driver does not appear on the Paradigm drivers list, let us know, as this list is always being expanded to meet our customers' needs.


HARDWARE INFORMATION

This bulletin contains a variety of information related to the installation and operation of the Operator Interface supplied. Ideally, you should read this document thoroughly before attempting to use the equipment. For information about the software aspects of the terminal, please consult other documentation.

CONTENTS OF PACKAGE

The Operator Interface is supplied in a packaging box containing the following...

- ◆ The interface terminal itself.
- ◆ A NEMA 4/IP65 rated mounting gasket.
- ◆ A bag containing panel hardware.
- ◆ This hardware bulletin.
- ◆ If any of these items are missing, please contact your supplier immediately.



ALL NONINCENDIVE CIRCUITS MUST BE WIRED USING DIVISION 2 WIRING METHODS AS SPECIFIED IN ARTICLE 501-4 (b), 502-4 (b), AND 503-3 (b) OF THE NATIONAL ELECTRICAL CODE, NFPA 70 FOR INSTALLATION WITHIN THE UNITED STATES, OR AS SPECIFIED IN SECTION 19-152 OF CANADIAN ELECTRICAL CODE FOR INSTALLATION IN CANADA.

POWER SUPPLY REQUIREMENTS

The Operator Interface requires an 11 to 30 VDC power supply rated at 3 W unless otherwise stated on the label.

- ◆ The terminal may take as little as 100 mA in certain circumstances, so be sure that the chosen power supply can operate correctly with this load. Large switch-mode supplies tend to need a certain minimum load before they will operate correctly.


In any case, it is very important that the power supply is mounted correctly if the unit is to operate reliably. A very high proportion of reported problems are caused by incorrect power supply installation, so please take care to observe the following points...

- ◆ The power supply must be mounted close to the unit, with usually not more than 6 feet of cable between the supply and the Operator Interface. Ideally, as short a length as is possible should be used.
- ◆ The wire used to connect the Operator Interface's power supply should be of at least 22 gauge wire. If a longer cable run is used, you should use heavier gauge wire. The routing of the cable should be kept away from large contactors, inverters and other devices which may generate significant electrical noise.


BATTERY BACKUP ISSUES

The Operator Interface is supplied with a Lithium Battery designed to maintain the internal memory and real-time clock during power outages. Assuming the operator interface terminal is powered up for 50% of the time, this battery should last over 4 years. A "Battery Low" system variable is available so that the programmer can choose specific action(s) to occur when the battery voltage drops below its nominal voltage.

It is possible to replace the battery without losing the contents of the Operator Interface's memory, but this does not reduce the importance of ensuring that a copy of the terminal's configuration is kept readily at hand to allow the terminal to be re-loaded in the case of mishaps. Please remember that although an image of the database contents can be uploaded, this file is not editable, so the importance of keeping a copy on disk cannot be over stressed.



WARNING - EXPLOSION HAZARD - THE AREA MUST BE KNOWN TO BE NON-HAZARDOUS BEFORE SERVICING/ REPLACING THE UNIT AND BEFORE INSTALLING OR REMOVING I/O WIRING AND BATTERY.



WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN DISCONNECTED AND THE AREA IS KNOWN TO BE NON-HAZARDOUS.

CHANGING THE BATTERY

To change the internal battery, follow these steps...

- ◆ Remove the power and PLC communications connector from the unit.
- ◆ Remove the four screws from the rear-cover and remove the cover.
- ◆ If you wish to avoid losing the terminal's configuration, reconnect the power connector and re-apply power. Note that this will require the panel to be powered-up and, as such, only suitably qualified staff should carry out this procedure.
- ◆ The battery is located in a holder on the main circuit board. This should be clearly visible. Remove the battery from its holder.
- ◆ Place the new battery in the holder. The terminal's power supply can now be disconnected, if you re-applied power in the step above.
- ◆ Replace the lid, screws and connector by following the above procedure in reverse. You may like to make a note of the date the battery was replaced to allow planned maintenance to be carried out.
- ◆ If you did not keep the unit powered-up during battery replacement, hold down the EXIT and MUTE keys on the keyboard and cycle power. Release the keys and follow the menu guides to clear the internal memory. The unit is now ready for a suitable configuration database to be re-loaded.

Please note that the old battery must be disposed of in a manner which complies with your local waste regulations. Also, the battery must not be disposed of in fire or in a manner whereby it may be damaged and its contents come into contact with human skin.

INSTALLATION & CONNECTIONS

The unit meets NEMA 4/IP65 requirements for indoor use, when properly installed. The units are intended to be mounted into an enclosed panel.

Installation Environment

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

Continuous exposure to direct sunlight may accelerate the aging process of the bezel. The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

CONNECTING TO A PLC

The Operator Interface is designed to operate with a PLC. A serial communication connection must be made between the operator interface terminal and PLC, and the details of this connection vary according to which PLC is used.

The following section lists the connection details for the PLC to be used .

PLC TYPE

Details on how to connect to most PLCs are available on request from RLC.

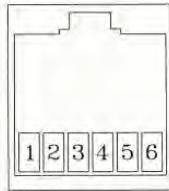
CONNECTING TO AN IBM[®] PC/AT

The Operator Interface is programmed via software running on an IBM PC/AT or a compatible computer. The connection between the PC/AT and the operator interface terminal is made via a custom cable provided with the EDICT Developer's Kit. The cable is designed for a 9-way serial port. Please contact your supplier if you require a 25-way version.

PROGRAMMING PORT PIN OUT

The Operator Interface's programming port is sometimes used to connect other RS-232 devices, such as printers. The following illustration and table gives the pin-out of this port to enable such connections to be made.

RJ11 FEMALE	
PIN	NAME
1	RTS
2	Tx
3	GND
4	GND
5	Rx
6	CTS



Rear View of Unit

The above table denotes the pin names of the programming port. When connecting, the pin name at the programming port is connected to the opposite of that pin name at the destination device.

MOUNTING INSTRUCTIONS

The Operator Interfaces are designed for through-panel mounting. A neoprene gasket is provided, to enable sealing to NEMA 4/IP65 specification. The panel cut-out diagram for the model supplied is provided. All mounting holes should be drilled for 0.14" (3.5 mm) clearance. Care should be taken to remove any loose material from the mounting hole to avoid such metal falling into the Operator Interface itself during installation.

FUNCTION KEY STRIPS

The function keys on the CL20 have clear windows that permit the user to insert labels appropriate to the process. A formatted page is supplied upon which the user can enter function names (e.g. RUN, PRINT, etc.). These strips are inserted from the rear of the panel through slots below the function keys located underneath the gasket.

Take care that the ink applied will not rub off of the paper, or else blemishes will be left on the inside of the window. Laminated paper or plastic film can prove easier to insert than normal photocopier paper. It also helps if the starting edge of the paper has about 0.25 inches (6.4 mm) of its corners cut off at a 45 degree angle.

Note: Add an additional 1.5" to label length to allow for easier insertion and removal.

TROUBLESHOOTING

For further technical assistance, contact technical support at the appropriate company numbers listed.

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The customer, in applying the products and software described herein, accepts that the products are wholly or partly programmable electronic systems that are inherently complex and which cannot thus be guaranteed to be free of errors. In doing so, the customer accepts the responsibility to ensure that the products are correctly programmed, configured, installed, commissioned, operated and maintained by competent and suitably trained staff and according to any instructions or safety instructions provided and as dictated by good engineering practices.

This documentation, and the software and products described herein, is subject to continuous development and improvement. All information is given in good faith, but RLC shall not be liable for any omissions or errors herein or within the software herein described.

Red Lion Controls Inc
20 Willow Springs Circle
York PA 17402
Tel +1 (717) 767-6511
Fax +1 (717) 764-6587

Red Lion Controls France
56 Boulevard du Courcierin, Batiment 21,
ZI Pariest F-77183 Croissy Beaubourg
Tel +33 (64) 80 12 12
Fax +33 (64) 80 12 13

Red Lion UK Ltd
Tapton Park
Chesterfield S41 0TZ
Tel +44 (1246) 22 21 22
Fax +44 (1246) 22 12 22



Input Selection - Gantry

CHANNEL 0000	
Input #	24V DC LOCATED ON GANTRY 16 POINT INPUT SRT2-ID16 ADDRESS 0
0	Eye on Gantry
1	Prox on Upper Boom Arm to turn off Air Solenoid
2	Eye on Top Boom Arm
3	Prox on Upper Boom Arm
4	Prox on Lower Boom Arm
5	Prox on Home Position
6	Prox on End of Track
7	Prox on Idler Wheel
8	MANUAL SWITCH DRIVE FORWARD
9	MANUAL SWITCH DRIVE REVERSE
10	MANUAL SWITCH TOP BOOM UP
11	MANUAL SWITCH TOP BOOM DOWN
12	MANUAL SWITCH OSCILLATE MOTOR
13	MANUAL SWITCH TILT FORWARD
14	MANUAL SWITCH TILT BACK
15	TOGGLE SWITCH TO SELECT MANUAL MODE

CHANNEL 0200	
Input #	24V DC LOCATED ON GANTRY 8 POINT INPUT SRT2-ID08 ADDRESS 4
0	Optional Height Determining Eye
1	Optional Prox for Lower Height on Top Spray Bar
2	
3	
4	
5	Drive Motor Tripped Out Signal
6	Oscillating Motor Tripped Out Signal
7	Top Motor Tripped Out Signal



Equipment Room

CHANNEL 0100	
Input #	24V DC LOCATED INSIDE EQUIPMENT ROOM 16 POINT INPUT SRT2-ID16 ADDRESS 2
0	EYE on Treadle Switch
1	Eye on Exit Door
2	Emergency Stop Station
3	Reset Switch
4	Front Entrance Switch to Turn on Undercarriage Wash
5	Thermostat for door. Close on Rise
6	Windy Day Switch
7	Freeze Thermostat. Closes when temp falls
8	Low Level on Tire Cleaner
9	Low Level on Foaming Conditioner Tanks
10	Pulse from Auto Cashier CYCLE 1
11	Pulse from Auto Cashier CYCLE 2
12	Pulse from Auto Cashier CYCLE 3
13	Pulse from Auto Cashier CYCLE 4
14	Low Level on Pre Soak Tank
15	Low Level on Water Tank



Outputs on Water Wizard - Gantry

CHANNEL 1000	
Output #	COMMON FOR MOTOR STARTERS LOCATED ON GANTRY 8 POINT OUTPUT SRT2-OD08 ADDRESS 0
0	Drive Motor Forward
1	Drive Motor Reverse
2	Drive Motor - Speed 1
3	
4	Oscillating Motors
5	Automatic Reset for Electronic Drives
6	Top Boom Down
7	Top Boom Up

CHANNEL 1100	
Output #	24V AC FOR SOLENOIDS LOCATED ON GANTRY 16 POINT RELAY SRT2-ROC16 ADDRESS 2
0	Rocker Panel Solenoid
1	Side Sprayer Solenoid
2	On-board blower #1and #3
3	On-board blower #2
4	Smart Nozzle Control
5	Tire Cleaner Solenoid
6	Water Dump Valve Top Boom
7	Presoak Top Solenoid
8	Presoak Side Solenoid
9	
10	
11	Tri-Colored Wax Solenoid
12	Air solenoid to tilt front
13	Air solenoid to tilt back
14	Air Purge Solenoid
15	Top Sprayer Solenoid



Equipment Room

CHANNEL 1200	
Output #	24 VAC OUTPUTS LOCATED INSIDE EQUIPMENT ROOM 16 POINT RELAY SRT2-ROC16 ADDRESS 4
0	High Pressure Soap Solenoid
1	High Pressure Wax Solenoid
2	Undercarriage Solenoid
3	Medium Pressure Solenoid
4	Spot Free Rinse Solenoid
5	Presoak Motor Starter
6	Tire Cleaner Motor Starter
7	Presoak Electric Heater
8	Tri Colored Foaming Conditioner Motor Starter
9	Reclaim water solenoid
10	Presoak recirculation solenoid
11	Low ph Presoak Motor Starter
12	Cycle Test Switches
13	Low PH Presoak Recirculation solenoid
14	24V DC Auto Cashier Reset
15	BLOWER DIGITAL TIMER

CHANNEL 1300	
Output #	110 V OUTPUTS LOCATED INSIDE EQUIPMENT ROOM 16 POINT RELAY G70A-ZOC16-3 ADDRESS 6
0	STOP Light
1	Enter Light and Enter Now at entrance of car wash
2	Back-Up Light
3	Presoak Light
4	Bottom Blaster Light
5	Clear Coat Protectant Light
6	Triple Shine Light
7	Spot Free Light
8	Exit Light
9	Clean car happy car Light
10	Please Wait Light at entrance of car wash
11	
12	
13	25 HP Motor Starter
14	Blower Motor Starter
15	Auto Cashier Reset (110V)



CHANNEL 1400 DOOR CONTROL CARD (OPTIONAL)	
Output #	24 V OUTPUTS LOCATED INSIDE EQUIPMENT ROOM 8 POINT RELAY SRT2-ROC08 ADDRESS 8
0	Open Door Entrance
1	Open Door Exit
2	Close Door Entrance
3	Close Door Exit
4	Talking Wizard Sign (White/Red)
5	Talking Wizard Sign (Tan)
6	Talking Wizard Sign (Yellow)
7	Talking Wizard Sign (Brown)



WATER WIZARD 6500 GANTRY

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Gantry

The Water Wizard uses a rollover design to enable us to wash cars faster and have most options and standard features built into the unit. Standard features include rocker panel, separate pre-soak nozzles, high-pressure wax, oscillating spray bars and top boom drop with oscillating nozzles. Optional features include tri-foam or single-foam wax, tire cleaner and two-step pre-soak.

The frame is constructed of 1½" stainless steel square tubing so corrosion is limited. The wheels on the Water Wizard are plated to give the operator more corrosion-free months than other competitors. Nylon bearings are on all oscillators and on the boom shaft. Nylon bearings could not be used on drive wheels or boom drive shaft due to weight. The frame measures

Also, on the gantry, is a low-pressure chemical manifold located on the driver's sides of the gantry. A high-pressure manifold is located on the passenger's side of the Gantry.

The electrical box for the gantry is located on the passenger's side. This electrical box has input and output cards and communicates with the Electrical Control Panel (ECP) inside equipment to do different functions. This electrical box also contains the motor starters and the service buttons. These buttons are for ease of servicing the unit.

To use the buttons, toggle the manual toggle switch to the on or up position. This will prevent the boom from wanting to go up, and the gantry from going to the home position. You can then move the gantry forward and back, move the boom up and down, oscillate the oscillating motors and tilt the boom.



High Pressure Cabinet

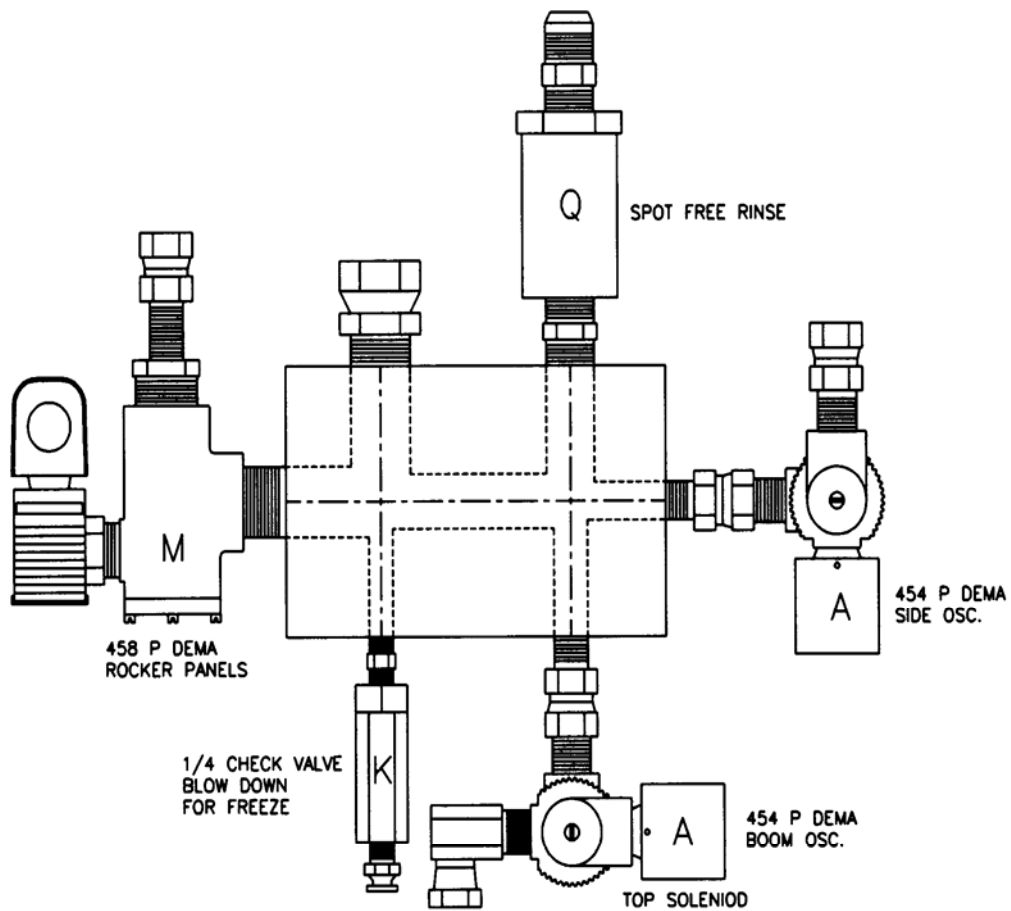
This box is mounted on the passenger's side of the gantry. High-pressure water from the Cat pump, as well as the spot free delivery will plumb into this manifold. From here we will open and close solenoids to direct the water to the proper nozzles when the car wash calls for it.

We use three DEMA Valves in this box, one DEMA 458P and two DEMA 454P. The 458P DEMA valve is used for the rocker panels. One 454P DEMA valve controls the high pressure in the rocker arms in the top boom. The other 454P DEMA valve controls the high-pressure water in the side panels of the gantry. By using this method, we are able to turn off the water to the side oscillators when the gantry is in the front and back of the car, thereby reducing water usage.

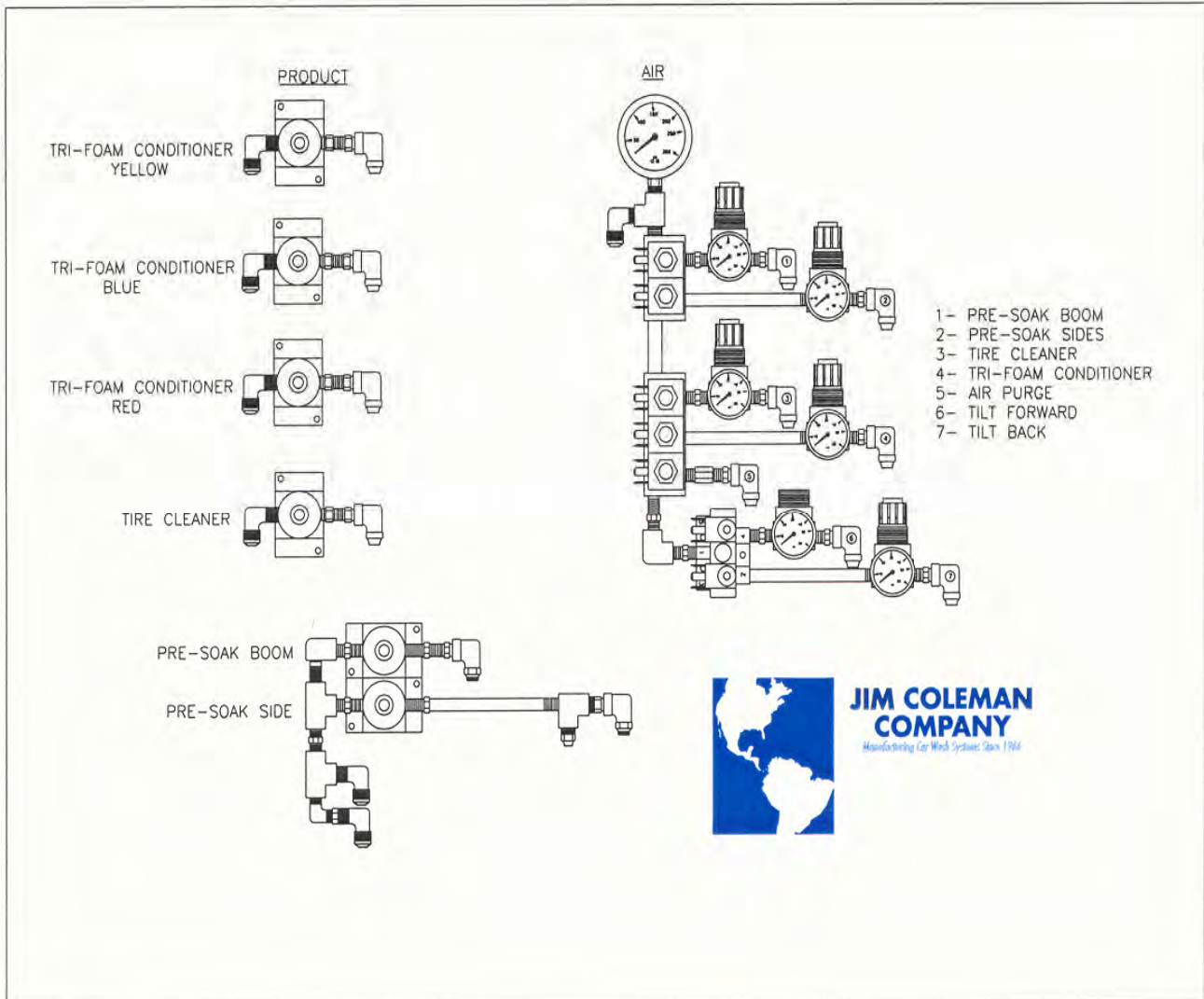
To get details for the electrical and plumbing, refer to the drawing. Below is a wiring chart for the high-pressure cabinet.

High Pressure Solenoids			
TERMINAL STRIP	WIRE COLOR	SOLENOID	ROC16
1	Blue	Rocker Panel	0
2	Red	Top	15
3	Orange	Side Sprayer	1
4	White	Neutral	

Dema Solenoid Valves



High Pressure Solenoid Valves



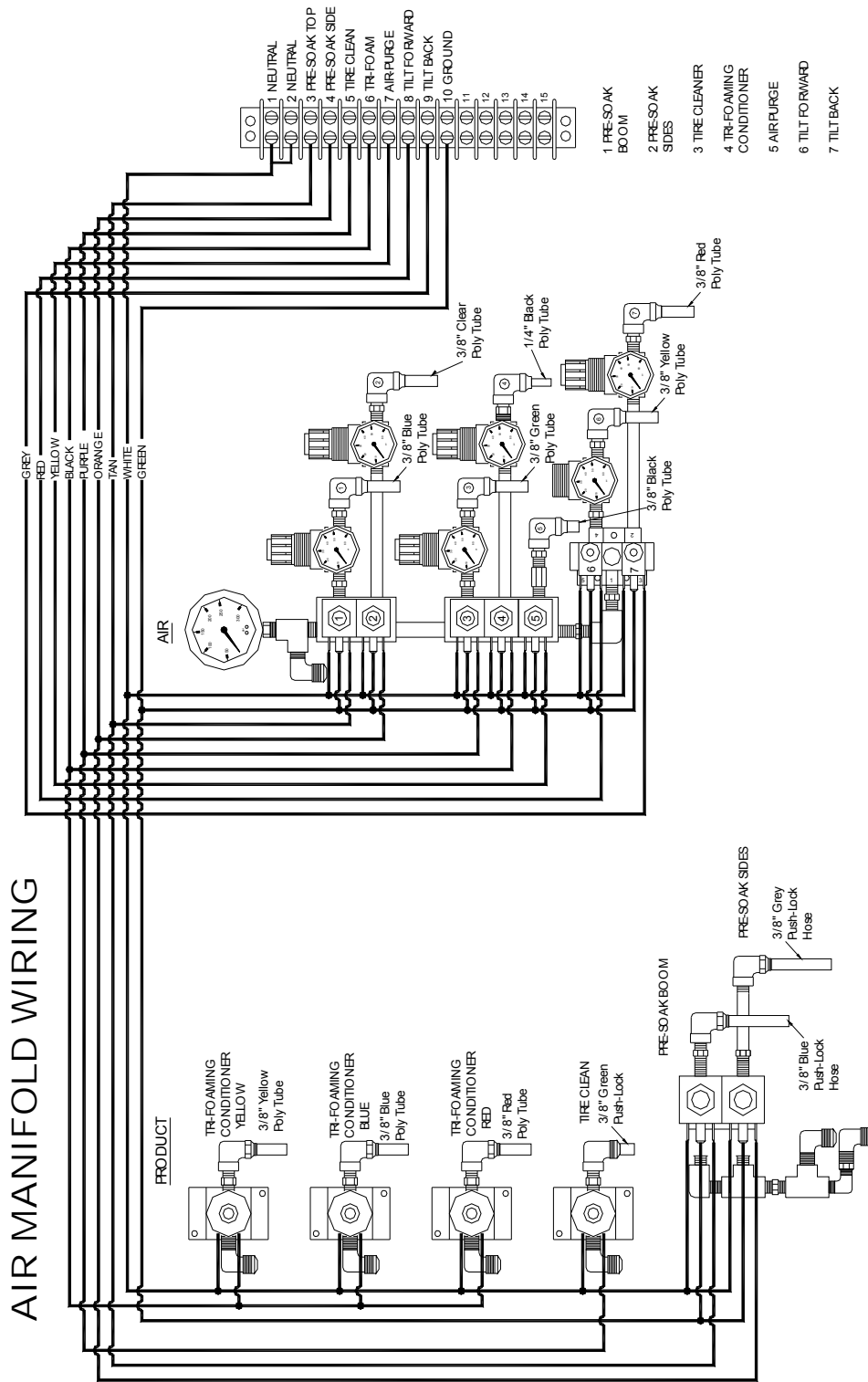


Low Pressure Cabinet

There is one low-pressure cabinet (L.P.C.) located on the driver side end of gantry. Inside the cabinet you will find two rows of solenoids - the product solenoid on the left side, and the air solenoids on the right side. The product solenoids are single solenoids so that different chemicals do not get mixed with each other. The pre-soak uses 2 solenoids that are plumbed together with (1) common inlet. By doing this we are able to separate the boom pre-soak from the side pre-soak, allowing us to turn the side pre-soak off when the gantry is in the front and back of car. On the right is a bank of air solenoids with one common inlet. Each air solenoid has a regulator with a gauge mounted to it. This enables the operator to adjust each chemical individually. By mounting the solenoids on the gantry, you are able to have a remote equipment room without compromising chemical changeover time. Refer to drawings for plumbing and electrical wiring.

Below is a wiring chart for the Low Pressure Cabinet.

LOW PRESSURE CABINET			
TERMINAL STRIP	WIRE COLOR	SOLENOID	ROC16
1	White	Neutral	
2	White	Neutral	
3	Tan	Pre-Soak (Top)	7
4	Orange	Pre-Soak (Side)	8
5	Purple	Tire Clean	5
6	Black	Tri Foam Conditioner	11
7	Yellow	Air Purge	14
8	Gray	Tilt Forward	12
9	Red	Tilt Back	13
10	Green	Ground	



Air Manifold Wiring



Turck Prox Switches

There are a total of seven Turck Prox Switches on the gantry. Four are located on the boom, to identify the location of the boom. Two are located on the bottom of the gantry, to identify the location of the gantry. One is located on the counting wheel to measure the distance the gantry has traveled along the track. To operate properly, each prox switch should be located approximately $\frac{1}{8}$ " to $\frac{1}{4}$ " from the metal plate it is sensing.

Below is a chart of the prox switches and the cable length each use.

PROX CABLE LOCATION	Cable	PROX #	SRT2-ID16 INPUT
Upper Boom Prox	4t-6	1	3
Tilt Prox	4t-6	2	1
Auto Height Prox	4t-6	3	1 (SRT2-ID08)
Lower Boom Prox	4t-4	4	4
Home Prox	4t-4	5	5
End Of Track Prox	4t-2	6	6
Counting Prox	4t-2	7	7



Telco Eyes

There are two sets of Telco Eyes located on the gantry. The eyes are aimed at each other and can detect when something is blocking the light beam. Inside the control panel mounted on the gantry are two amplifiers to operate the eyes. The first eye is mounted to look at an angle from one side to the other to detect the length of the vehicle.

The second set of eyes is mounted on the back of the gantry in two round cans, and act as a safety precaution for the other two eyes. These eyes will detect if something is obstructing the path, blocking the signal to input #0 and/or input #2 of the SRT2-ID16. If either the first or second set of eyes is blocked, the wash boom will not lower.

Telco Eyes Wiring Diagram

TELCO EYES	
WIRE COLOR	DESCRIPTION
Red/Black	Transmitter
Yellow/Silver	Receiver

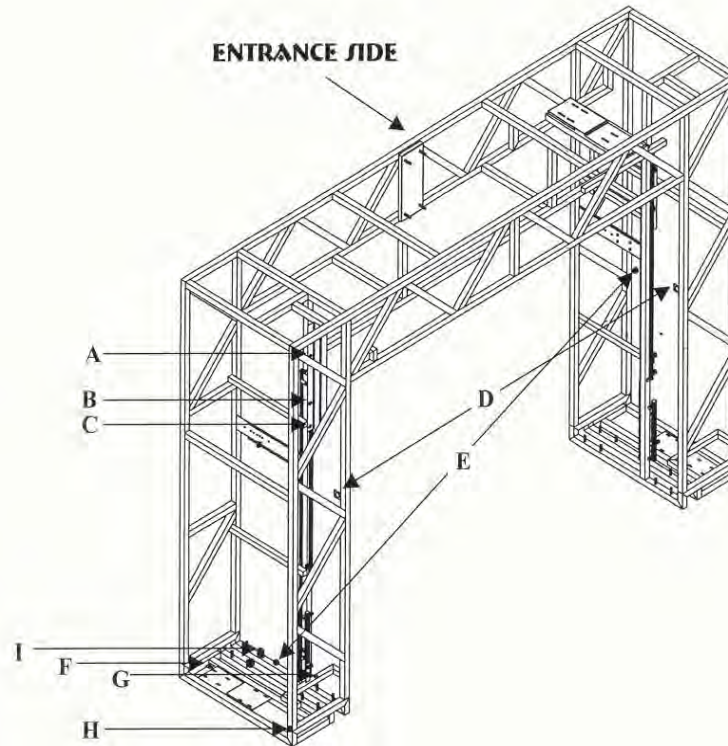
Prox Cable Location	Cable Length	Prox #
Upper Boom Prox	4t-6	1
Tilt Prox	4t-6	2
Lower Boom Prox	4t-4	3
Home Prox	4t-4	4
End Of Track Prox	4t-2	5
Counting Prox	4t-2	6
Auto Height Prox	4t-6	7

Car Length Measuring Eyes Gantry (Telco)	
Driver Side	Transmitter
Passenger Side	Receiver

Safety Eyes Boom (Telco)	
Driver Side	Transmitter
Passenger Side	Receiver

Photo Eye and Proximity Switch Locations

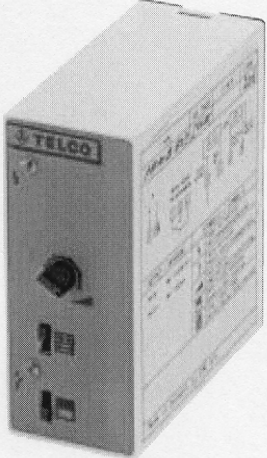
PHOTO EYE AND PROXIMITY SWITCH LOCATIONS



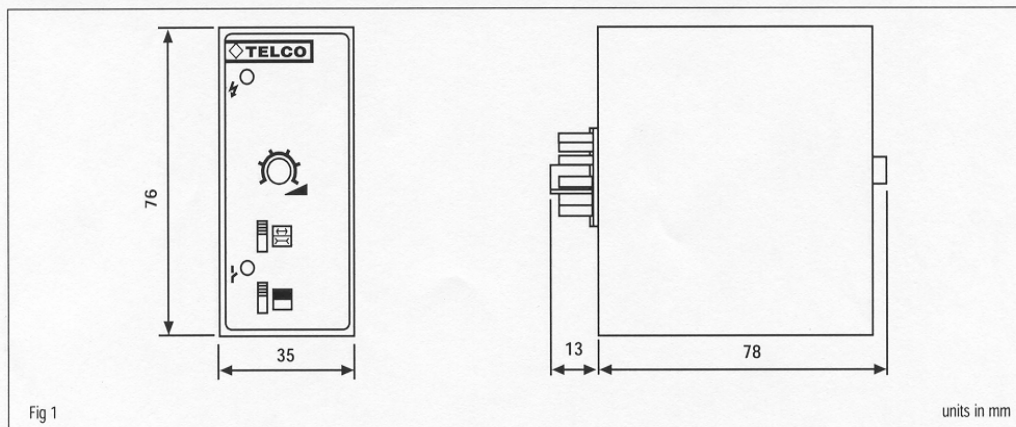
- | | |
|------------------------------|------------------------|
| A - TOP BOOM PROX. | F - END-OF-TRACK PROX. |
| B - TILT PROX. | G - LOWER BOOM PROX. |
| C - AUTO HEIGHT PROX. | H - HOME PROX. |
| D - AUTO HEIGHT EYES | I - COUNT WHEEL PROX. |
| E - (TELCO) MEASUREMENT EYES | |

NOTE: THE BOOM SAFETY EYES (TELCO) ARE MOUNTED EXTERNALLY ON THE EXIT SIDE OF THE GANTRY IN ROUND CANS.




Available Types

Model	Features	Supply	Outline See Fig. No.	Photo
PA10A510	Used with remote sensors LT100/110 LR101/111 Relay output	230 V AC	Fig 1	
PA10A511		115 V AC		
PA10A512		24 V AC		
PA10A513		24 V DC		
PA10A610	Used with remote sensors LT100/110 LR101/111 Transistor output	230 V AC		
PA10A611		115 V AC		
PA10A612		24 V AC		
PA10A613		24 V DC		
PA10B510	Used with remote sensors LT100/110 LR100/110 Transistor output	230 V AC		
PA10B511		115 V AC		
PA10B512		24 V AC		
PA10B513		24 V DC		
PA10B610	Used with remote sensors LT100/110 LR100/110 Transistor output	230 V AC		
PA10B611		115 V AC		
PA10B612		24 V AC		
PA10B613		24 V DC		

Mechanical Drawings



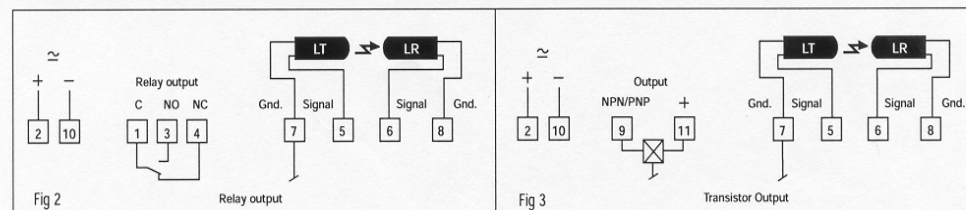
Recommended Sensors

Sensing Range			Model	Recommended Sensors
				
7 m	2,5 m	60 cm	PA10A	LT100 / LR101
15 m	5 m	1,1 m		LT110 / LR111
15 m	5 m	1,1 m	PA10B	LT100 / LR100
35 m	10 m	2 m		LT110 / LR110

Technical Data

Item	Specification
Supply voltage range	24 V DC, 24 V AC, 115 V AC, 230 V AC (other voltages on request)
Voltage tolerance	+/- 15 %
Power consumption	3.2 VA
Output Relay	1 Open / 1 Close 250 V AC / 3 A 120 V AC / 5 A
Output NPN / PNP transistor	40 mA / 30 V DC
Hysteresis	Approx. 45 %
Reaction time Ton / Toff	40 ms / 40 ms
Operation frequency F max	10 Hz
Ambient temperature (operation)	-10 deg C to 50 deg C
Ambient temperature (storage)	-40 deg C to 80 deg C
Sealing acc. to IEC60529	IP40
Housing material	Noryl

Wiring Diagrams



NPN / PNP Output Configuration

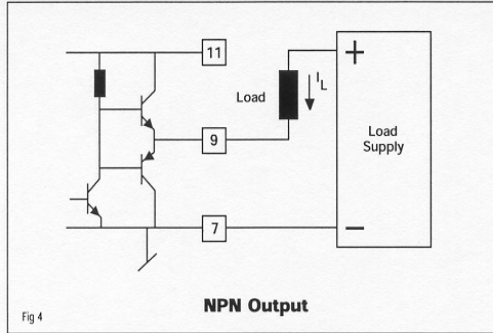


Fig 4

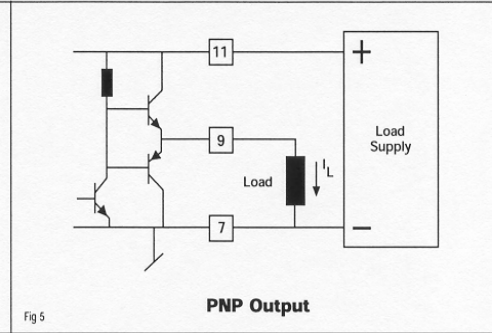


Fig 5

Characteristics

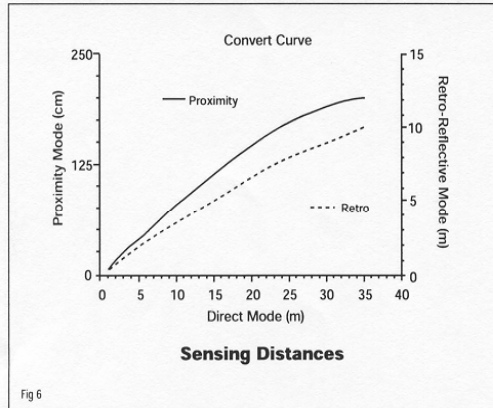


Fig 6

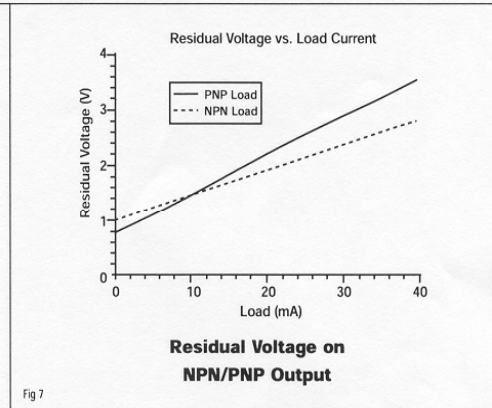


Fig 7

Operation Charts

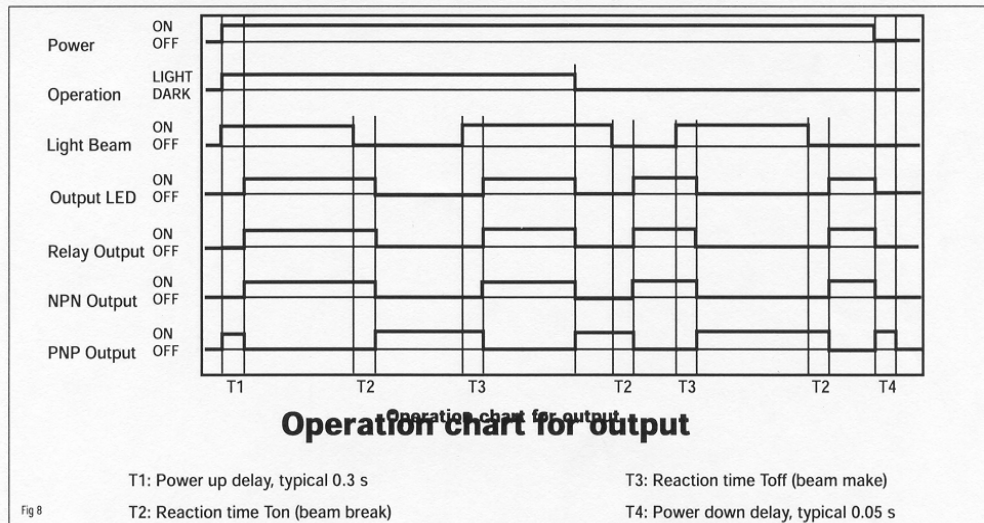
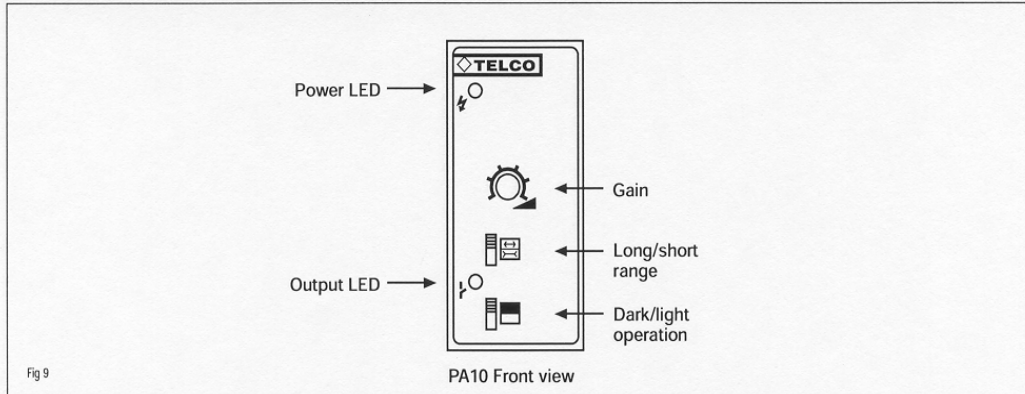


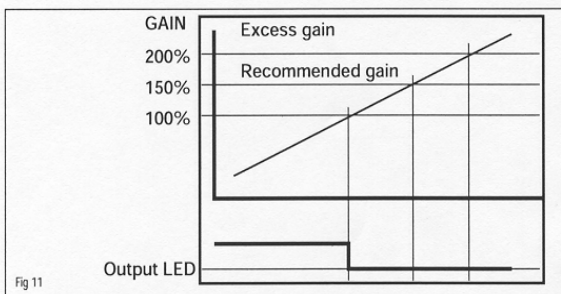
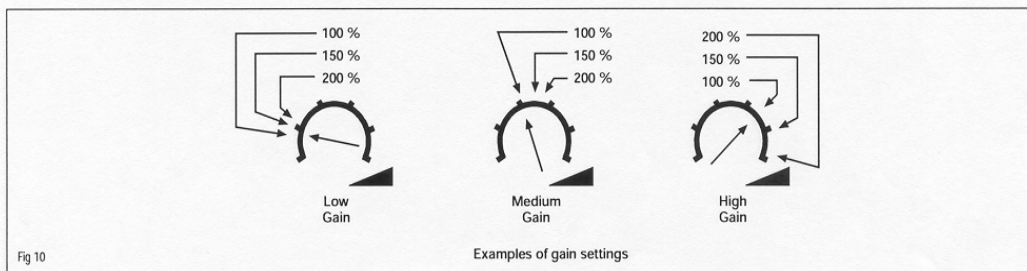
Fig 8

User Instructions



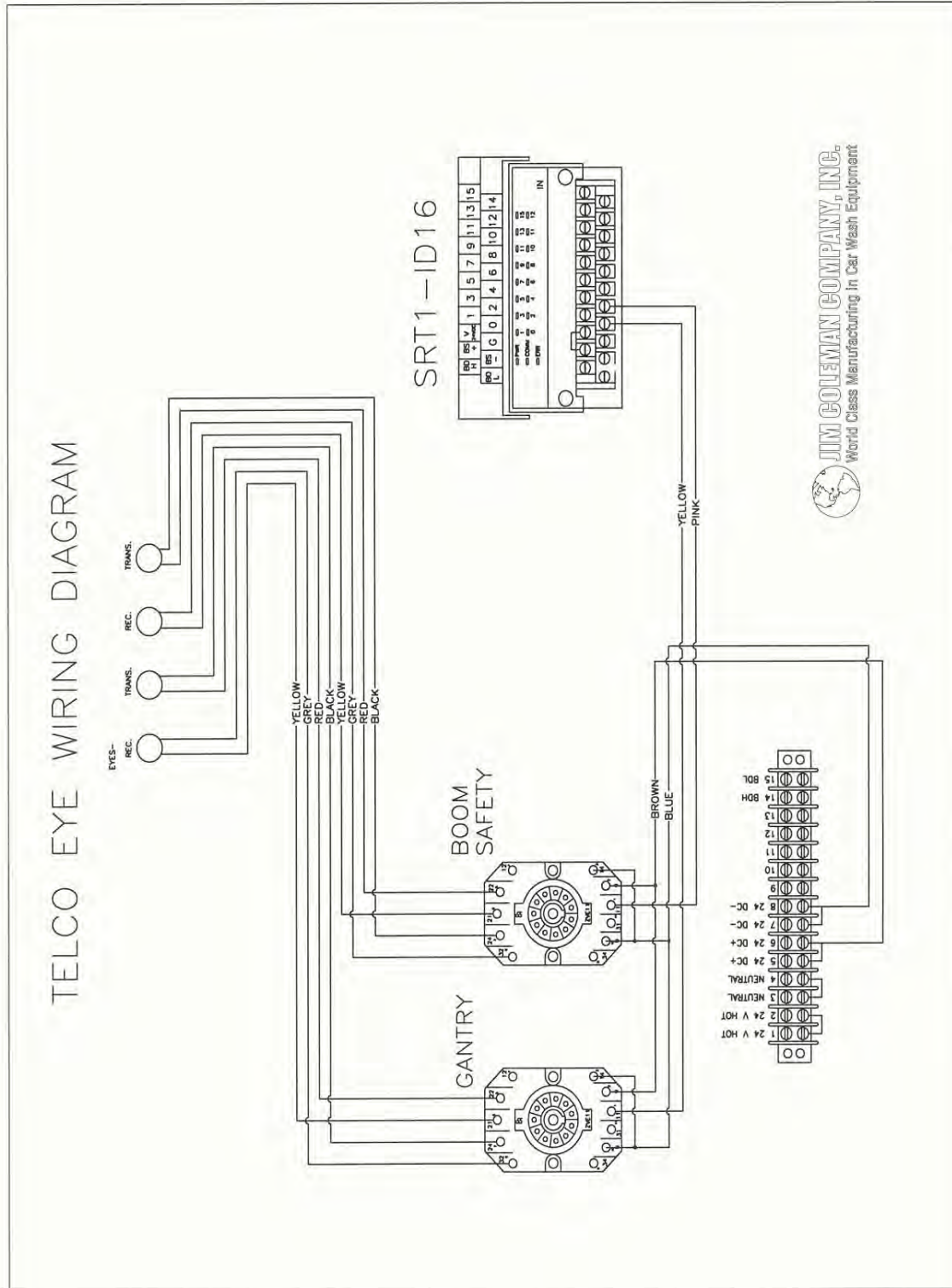
Instructions

1. Select the appropriate sensors for the type of application.
2. Connect the wiring to the relay socket as shown in the wiring section.
3. Plug in PA with power OFF.
4. Turn the power ON after double checking your wiring.
5. Select the required operation mode (dark or light operated - see fig 9).
6. Select the required operation range (long or short - see fig 9).
7. The Red LED provides output / detection indication.
8. For THRU-BEAM and REFLECTIVE mode, adjust the gain, increasing slowly until the red LED goes off (when dark operated) and then add a little further gain to ensure stable operation (see fig 10 and fig 11). If more gain is needed, increase according to the contamination.
9. For PROXIMITY detection, the Red LED is on (when dark operated) when no object is present. It goes off when an object is detected, with the output occurring at the same time.



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Telco Eye Wiring Diagram

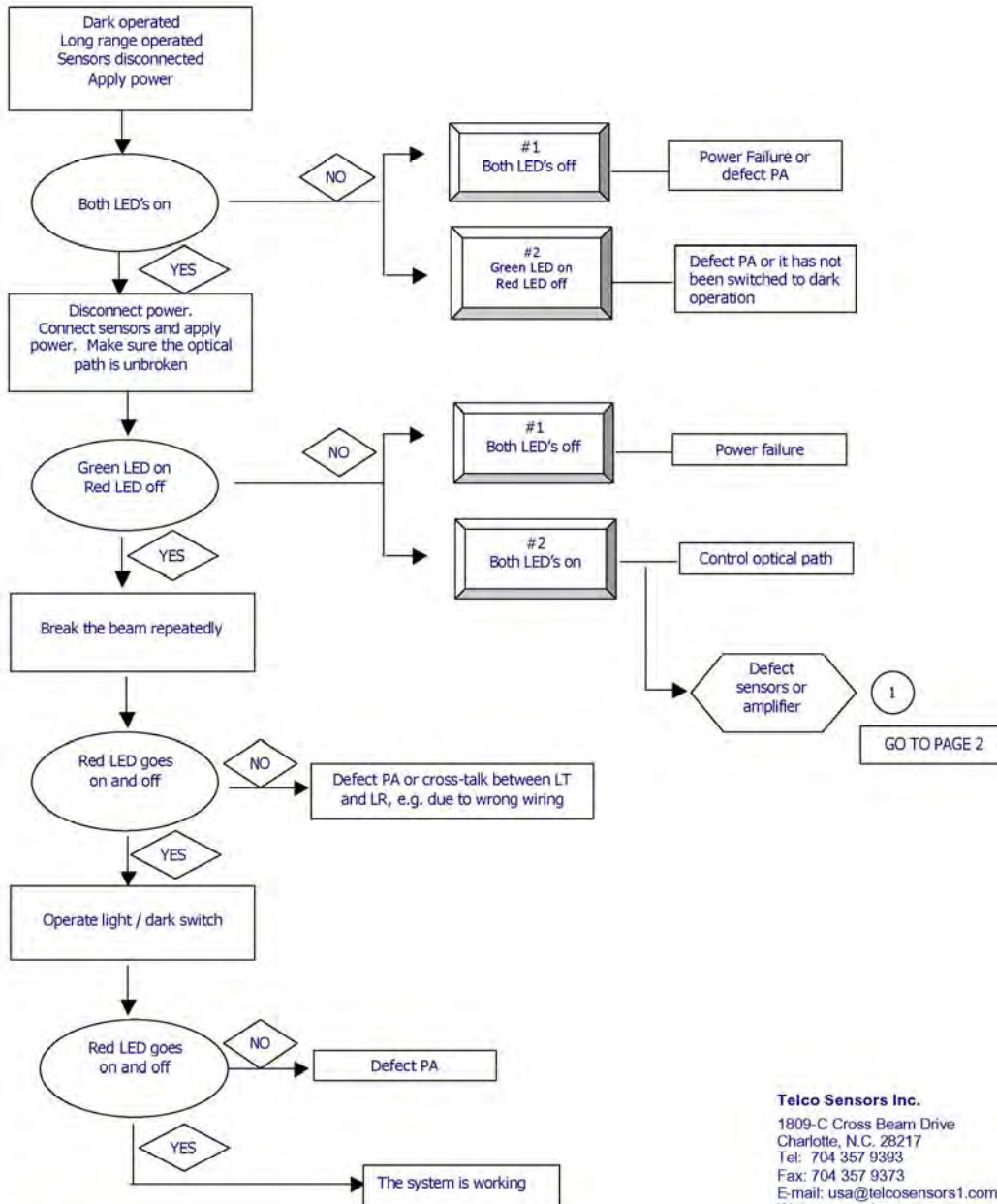


JIM COLEMAN COMPANY, INC.
World Class Manufacturing In Car Wash Equipment

Troubleshooting Guide for Telco PA



TROUBLESHOOTING GUIDE FOR PA SYSTEMS WITH LT and LR SENSORS

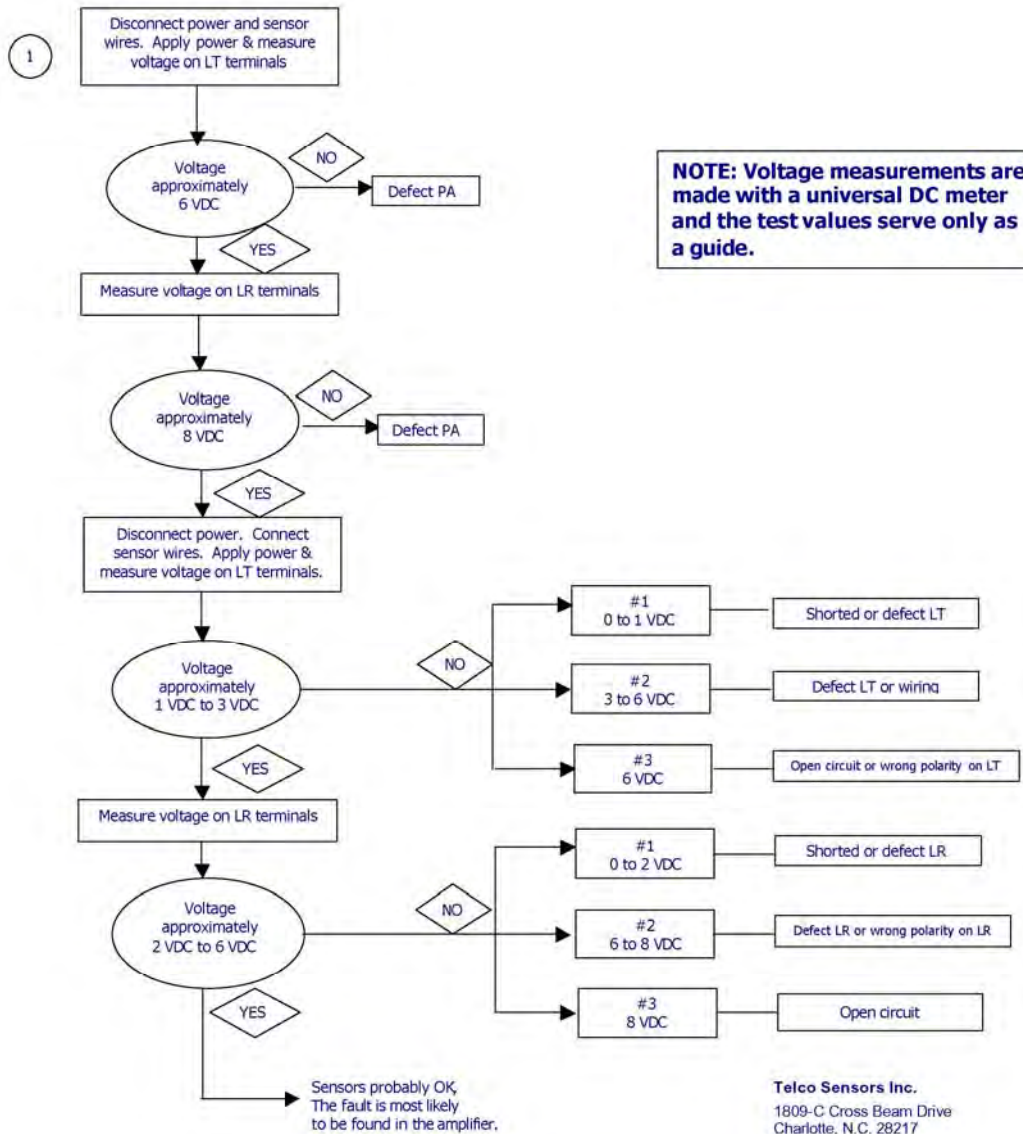


PAGE 1 OF 1

Telco Sensors Inc.
1809-C Cross Beam Drive
Charlotte, N.C. 28217
Tel: 704 357 9393
Fax: 704 357 9373
E-mail: usa@telcosensors1.com
Web: www.telcosensors.com

Member of the Telco Group of Companies

TROUBLESHOOTING GUIDE FOR PA SYSTEMS WITH LT and LR SENSORS





Manual Operation Override

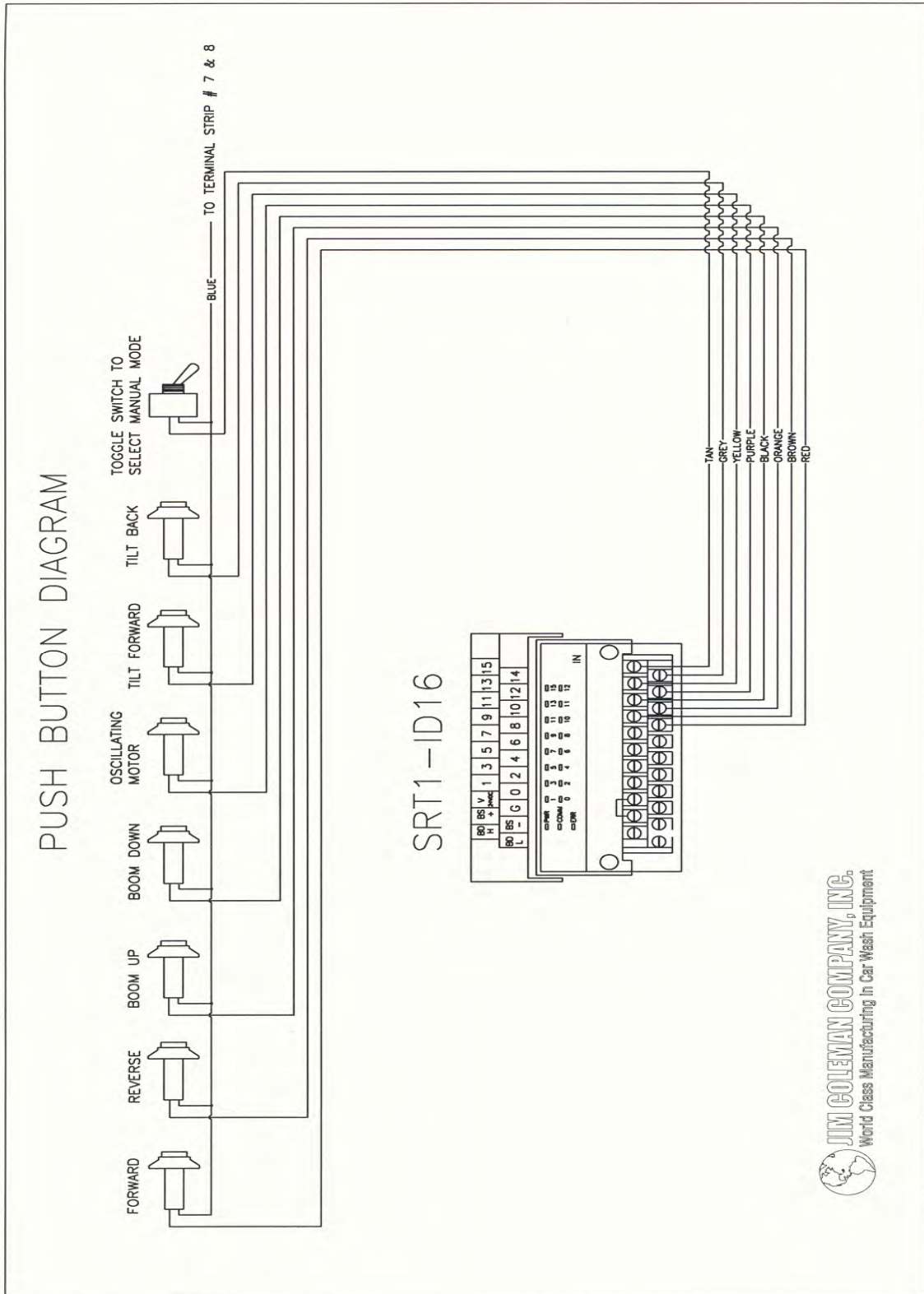
Inside the Electrical Control Panel on the gantry are manual push buttons to manually operate the automatic motors.

To use the manual push button you must first turn on the toggle switch to override the computer. Then press the manual button to move the unit either forward or reverse. This operation will allow you to test lowering or raising the boom as well. Press oscillate button to test the oscillating motors.

When you have completed your task, be certain to turn off the toggle switch from override.

See Diagram Following

Push Button Diagram

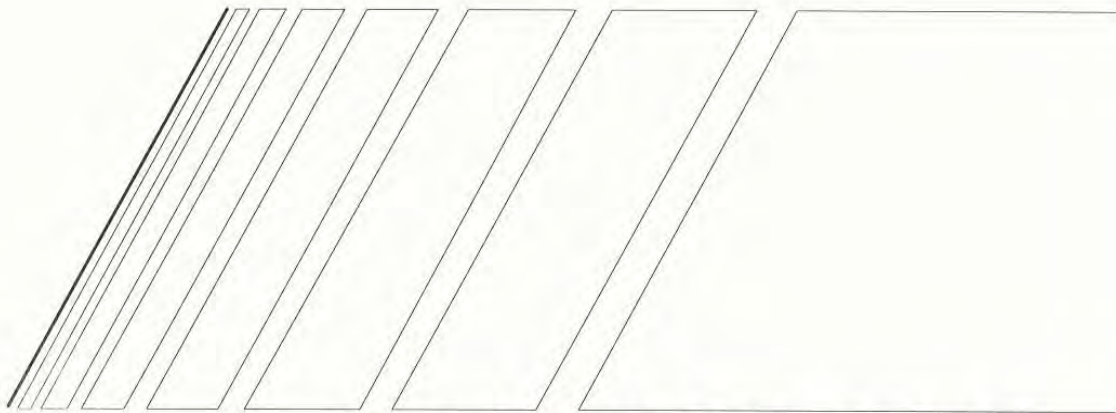




GANTRY

Omron User's Manual

OMRON



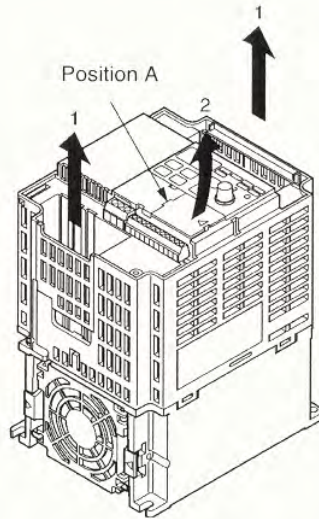
USER'S MANUAL

SYSDRIVE 3G3JV SERIES

Compact Simplified Inverter

● **Removing the Optional Cover**

- After removing the front cover, lift the optional cover in the arrow 2 direction based on position A as a fulcrum.

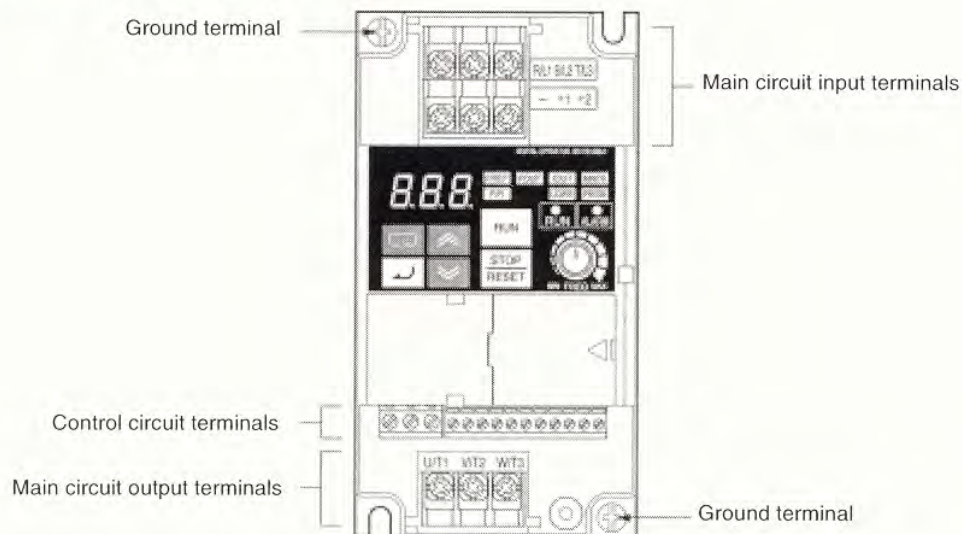


Note The front cover functions as a terminal cover. The Digital Operator cannot be removed.

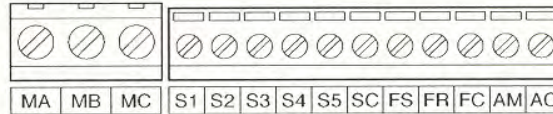
2-2-2 Terminal Block

Before wiring the terminal block, be sure to remove the front cover, top protection cover, and the bottom protection cover.

■ **Position of Terminal Block**



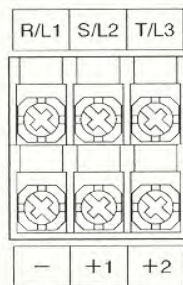
■ **Arrangement of Control Circuit Terminals**



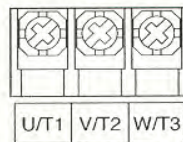
■ **Arrangement of Main Circuit Terminals**

- 3G3JV-A2001-A to 3G3JV-A2007-A
- 3G3JV-AB001-A to 3G3JV-AB004-A

Main Circuit Input Terminals (Upper Side)

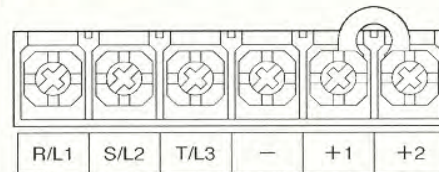


Main Circuit Output Terminals (Lower Side)

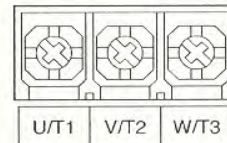


- 3G3JV-A2015-A to 3G3JV-A2037-A
- 3G3JV-AB007-A to 3G3JV-AB015-A
- 3G3JV-A4002-A to 3G3JV-A4037-A

Main Circuit Input Terminals (Upper Side)




Main Circuit Output Terminals (Lower Side)





■ **Main Circuit Terminals**

Symbol	Name	Description
R/L1	Power supply input terminals	3G3JV-A2□: 3-phase 200 to 230 V AC
S/L2		3G3JV-AB□: Single-phase 200 to 240 V AC
T/L3		3G3JV-A4□: 3-phase 380 to 460 V AC
U/T1	Motor output terminals	3-phase power supply output for driving motors.
V/T2		3G3JV-A2□: 3-phase 200 to 230 V AC
W/T3		3G3JV-AB□: 3-phase 200 to 240 V AC 3G3JV-A4□: 3-phase 380 to 460 V AC
+1	Connection terminals +1 and +2: DC reactor connection terminals	Connect the DC reactor for suppressing harmonics to terminals +1 and +2. When driving the Inverter with DC power, input the DC power to terminals +1 and –. (Terminal +1 is a positive terminal.)
+2		
–		
	Ground terminal	Be sure to ground the terminal under the following conditions. 3G3JV-A2□: Ground at a resistance of 100 Ω or less. 3G3JV-AB□: Ground at a resistance of 100 Ω or less. 3G3JV-A4□: Ground at a resistance of 10 Ω or less, and connect to the power supply's neutral phase to conform to EC Directives. Note Be sure to connect the ground terminal directly to the motor frame ground.

Note The maximum output voltage corresponds to the power supply input voltage of the Inverter.

■ **Control Circuit Terminals**

Symbol	Name	Function	Signal level	
Input	S1	Forward/Stop	Photocoupler 8 mA at 24 V DC Note NPN is the default setting for these terminals. Wire them by providing a common ground. No external power supply is required. To provide an external power supply and wire the terminals through a common positive line, however, set the SW7 to PNP and make sure that the power supply is at 24 V DC ±10%.	
	S2	Multi-function input 1 (S2)		Forward at ON. Stops at OFF.
	S3	Multi-function input 2 (S3)		Set by parameter n36 (Reverse/Stop)
	S4	Multi-function input 3 (S4)		Set by parameter n37 (External fault: Normally open)
	S5	Multi-function input 4 (S5)		Set by parameter n38 (Fault reset)
	SC	Sequence input common		Set by parameter n39 (Multi-step reference 1)
	FS	Frequency reference power supply	Common for S1 through S5	20 mA at 12 V DC
	FR	Frequency reference input	DC power supply for frequency reference use	0 to 10 V DC (input impedance: 20 kΩ)
	FC	Frequency reference common	Input terminal for frequency reference use	Common for frequency reference use

Symbol		Name	Function	Signal level
Output	MA	Multi-function contact output (Normally open)	Set by parameter n40 (during running)	Relay output 1 A max. at 30 V DC 1 A max. at 250 V AC
	MB	Multi-function contact output (Normally closed)		
	MC	Multi-function contact output common	Common for MA and MB use	
	AM	Analog monitor output	Set by parameter n44 (Output frequency)	
	AC	Analog monitor output common	Common for AM use	

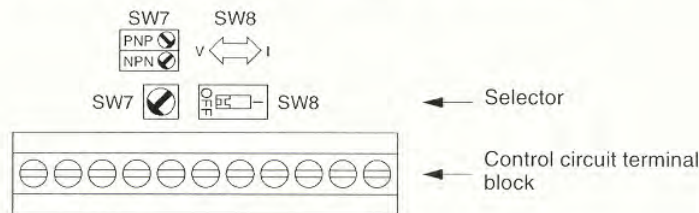
Note 1. Depending on the parameter settings, various functions can be selected for multi-function inputs and multi-function contacts outputs.

Note 2. Functions in parentheses are default settings.

■ **Selecting Input Method**

- Switches SW7 and SW8, both of which are located above the control circuit terminals, are used for input method selection.

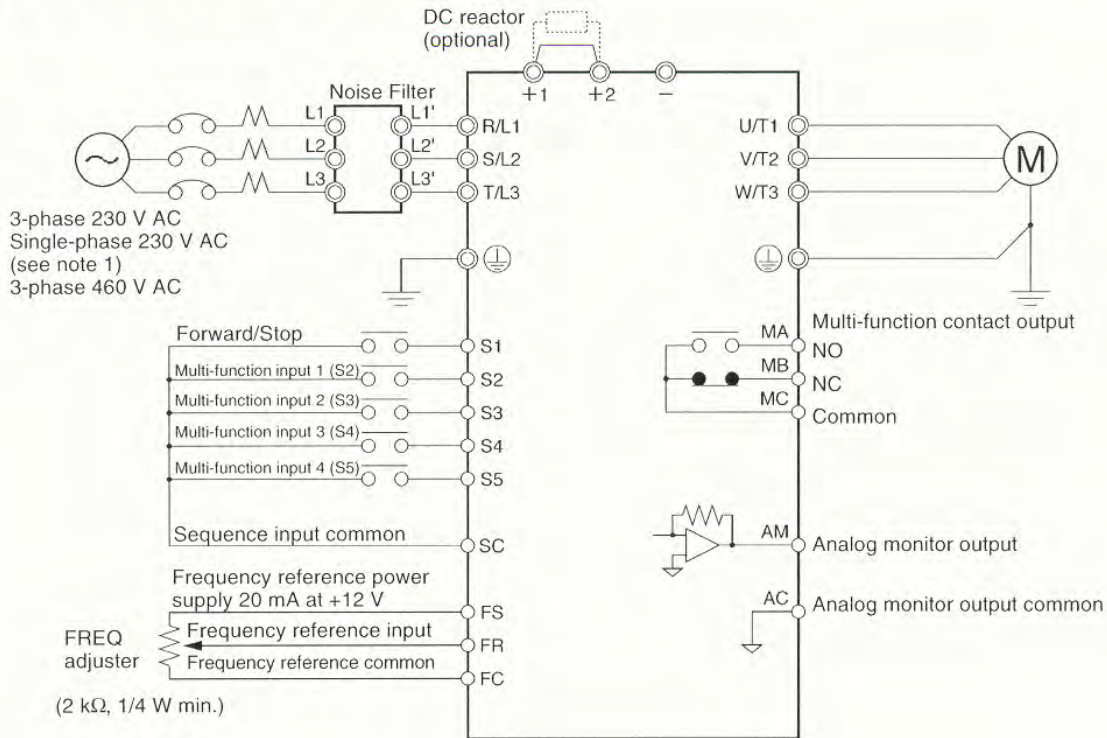
Remove the front cover and optional cover to use these switches.



Design

Chapter 2

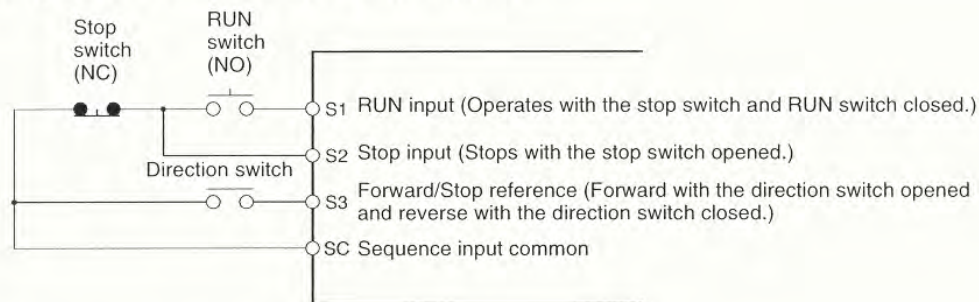
2-2-3 Standard Connections



Note 1. Connect single-phase 230 V AC to terminals R/L1 and S/L2 of the 3G3JV-AB□.

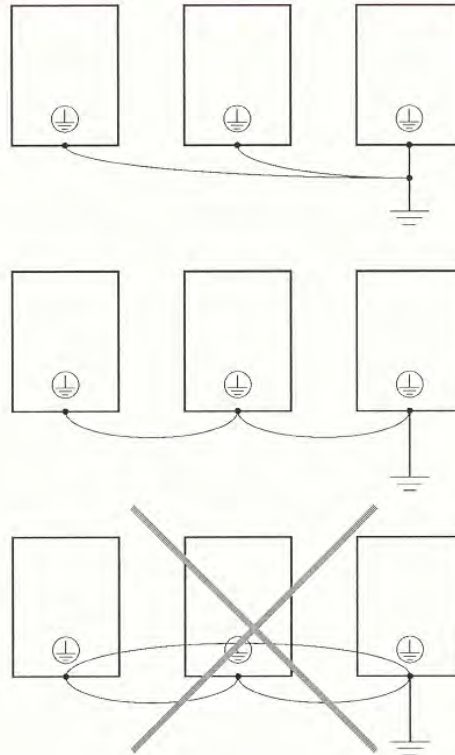
Note 2. The braking resistor cannot be connected because no braking transistor is incorporated.

• **Example of 3-wire Sequence Connections**



Note Set parameter n37 for 3-wire sequence input.

- When using more than one Inverter, be careful not to loop the ground wire.



■ Countermeasures against Harmonics

With the continuing development of electronics, the generation of harmonics from industrial machines has been causing problems recently.

The Ministry of International Trade and Industry provided some guidelines in September 1994 for the suppression of harmonics from electrical household appliances and electrical equipment in Japan. Since then, the problem has been drawing considerable attention.

Refer to the following information for the definition of harmonics (i.e., harmonic currents with voltages) and countermeasures against the generation of harmonics from the Inverter.













• Harmonics

Definition




Harmonics consist of electric power produced from AC power and alternating at frequencies that are integral multiples of the frequency of the AC power.

3-1 Nomenclature



Appearance	Name	Function
	Data display	Displays relevant data items, such as frequency reference, output frequency, and parameter set values.
	FREQ adjuster	Sets the frequency reference within a range between 0 Hz and the maximum frequency.
	FREF indicator	The frequency reference can be monitored or set while this indicator is lit.
	FOUT indicator	The output frequency of the Inverter can be monitored while this indicator is lit.
	IOUT indicator	The output current of the Inverter can be monitored while this indicator is lit.
	MNTR indicator	The values set in U01 through U10 are monitored while this indicator is lit.
	F/R indicator	The direction of rotation can be selected while this indicator is lit, when operating the Inverter with the RUN Key.
	LO/RE indicator	The operation of the Inverter through the Digital Operator or according to the parameters set is selectable while this indicator is lit. Note This status of this indicator can be only monitored while the Inverter is in operation. Any RUN command input is ignored while this indicator is lit.
	PRGM indicator	The parameters in n01 through n79 can be set or monitored while this indicator is lit. Note While the Inverter is in operation, the parameters can be only monitored and only some parameters can be changed. The RUN command input is ignored while this indicator is lit.
	Mode Key	Switches the setting and monitor item indicators in sequence. Parameter setting being made is canceled if this key is pressed before entering the setting.
	Increment Key	Increases multi-function monitor numbers, parameter numbers, and parameter set values.
	Decrement Key	Decreases multi-function monitor numbers, parameter numbers, and parameter set values.



Appearance	Name	Function
	Enter Key	Enters multi-function monitor numbers, parameter numbers, and internal data values after they are set or changed.
	RUN Key	Starts the Inverter running when the 3G3FV is in operation with the Digital Operator.
	STOP/RESET Key	Stops the Inverter unless n06 is set to disable the STOP Key. Functions as a Reset Key when an Inverter error occurs. (See note.)

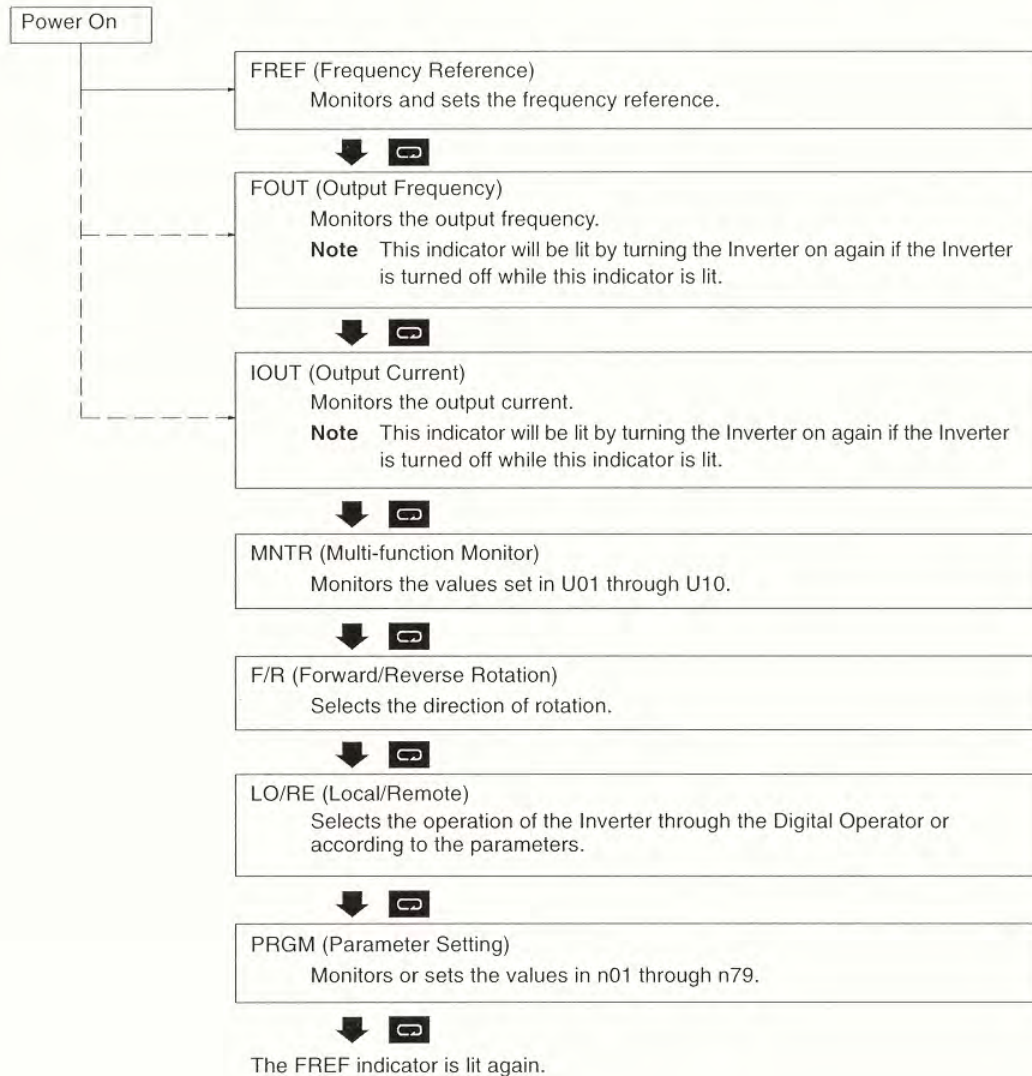
Note For safety's reasons, the reset will not work while a RUN command (forward or reverse) is in effect. Wait until the RUN command is OFF before resetting the Inverter.

3-2 Outline of Operation

■ Selecting Indicators

Whenever the Mode Key is pressed, an indicator is lit in sequence beginning with the FREF indicator. The data display indicates the item corresponding to the indicator selected.

The FOUT or IOUT indicator will be lit by turning the Inverter on again if the Inverter is turned off while the FOUT or IOUT indicator is lit. The FREF indicator will be lit by turning the Inverter on again if the Inverter is turned off while an indicator other than the FOUR or IOUT indicator is lit.



■ **Example of Frequency Reference Settings**



Key sequence	Indicator	Display example	Explanation
	FREF	6.0	Power On Note If the FREF indicator has not been lit, press the Mode Key repeatedly until the FREF indicator is lit.
↑ ↓	FREF	60.0	Use the Increment or Decrement Key to set the frequency reference. The data display will flash while the frequency reference is set. (see note 1)
↵	FREF	60.0	Press the Enter Key so that the set value will be entered and the data display will be lit. (see note 1)

Note 1. The Enter Key need not be pressed when performing the setting for n08. The frequency reference will change when the set value is changed with the Increment or Decrement Key while the data display is continuously lit.

Note 2. The frequency reference can be set in either of the following cases.

- Parameter n03 for frequency reference selection is set to 1 (i.e., frequency reference 1 is enabled) and the Inverter is in remote mode.
- Parameter n07 for frequency selection in local mode is set to 1 (i.e., the Digital Operator is enabled) and the Inverter is in local mode.
- Frequency references 2 through 8 are input for multi-step speed operation.

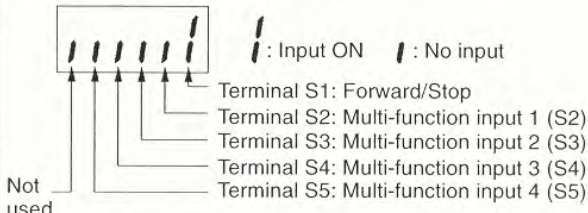
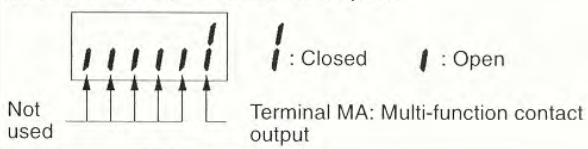
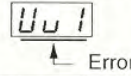
Note 3. The frequency reference can be changed, even during operation.

■ **Example of Multi-function Display**









Key sequence	Indicator	Display	Explanation
	FREF	6.0	Power On
⏺	MNTR	U01	Press the Mode Key repeatedly until the MNTR indicator is lit. U01 will be displayed.
↑ ↓	MNTR	U05	Use the Increment or Decrement Key to select the monitor item to be displayed.
↵	MNTR	283	Press the Enter Key so that the data of the selected monitor item will be displayed.
⏺	MNTR	U05	The monitor number display will appear again by pressing the Mode Key.

● **Status Monitor**

Item	Display	Display unit	Function
U01	Frequency reference	Hz	Monitors the frequency reference. (Same as FREF)
U02	Output frequency	Hz	Monitors the output frequency. (Same as FOUT)
U03	Output current	A	Monitors the output current. (Same as IOUT)
U04	Output voltage	V	Monitors the internal output voltage reference value of the Inverter.
U05	DC bus voltage	V	Monitors the DC voltage of the internal main circuit of the Inverter.
U06	Input terminal status	---	Shows the ON/OFF status of inputs. 
U07	Output terminal status	---	Shows the ON/OFF status of outputs. 
U09	Error log (most recent one)	---	Displays the latest error. 
U10	Software No.	---	OMRON use only.

■ **Example of Forward/Reverse Selection Settings**






Key sequence	Indicator	Display example	Explanation
			Press the Mode Key repeatedly until the F/R indicator is lit. The present setting will be displayed. For: Forward; rEv: Reverse
			Use the Increment or Decrement Key to change the direction of motor rotation. The direction of motor rotation selected will be enabled when the display changes after the key is pressed.

Note The direction of motor rotation can be changed, even during operation.

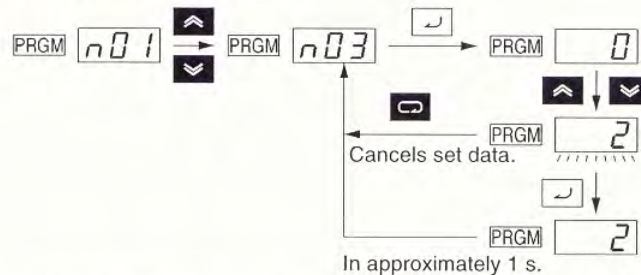
■ **Example of Local/Remote Selection Settings**










Key sequence	Indicator	Display example	Explanation
	LO/RE	rE	Press the Mode Key repeatedly until the LO/RE indicator is lit. The present setting will be displayed. rE: Remote; Lo: Local
 	LO/RE	Lo	Use the Increment or Decrement Key to set the Inverter to local or remote mode. The selection will be enabled when the display changes after the key is pressed.

- Note 1.** Local or remote selection is possible only when the Inverter is not in operation. The present setting can be monitored when the Inverter is in operation.
- Note 2.** Local or remote settings in multi-function input terminals can be changed through the multi-function input terminals only.
- Note 3.** Any RUN command input will be ignored while the LO/RE indicator is lit. To enable a RUN command, first turn the RUN command OFF and then press the Mode Key to display an item that has a green indicator (FREF to MNTR). Then input the RUN command again.

■ **Example of Parameter Settings**



Key sequence	Indicator	Display example	Explanation
	FREF	00	Power On
	PRGM	n01	Press the Mode Key repeatedly until the PRGM indicator is lit.
 	PRGM	n03	Use the Increment or Decrement Key to set the parameter number.
	PRGM	0	Press the Enter Key. The data of the selected parameter number will be displayed.
 	PRGM	2	Use the Increment or Decrement Key to set the data. At that time the display will flash.
	PRGM	2	Press the Enter Key so that the set value will be entered and the data display will be lit. (see note 1)
In approximately 1 s.	PRGM	n03	The parameter number will be displayed.



- Note 1.** To cancel the set value, press the Mode Key instead. The parameter number will be displayed.
- Note 2.** There are parameters that cannot be changed while the Inverter is in operation. Refer to the list of parameters. When attempting to change such parameters, the data display will not change by pressing the Increment or Decrement Key.
- Note 3.** Any RUN command input will be ignored while the Parameter Setting (PRGM) indicator is lit. To enable a RUN command, first turn the RUN command OFF and then press the Mode Key to display an item that has a green indicator (FREF to MNTR). Then input the RUN command again.



7-1 Protective and Diagnostic Functions

7-1-1 Fault Detection (Fatal Error)

The Inverter will detect the following faults if the Inverter or motor burns or the internal circuitry of the Inverter malfunctions. When the Inverter detects a fault, the fault code will be displayed on the Digital Operator, the fault contact output will operate, and the Inverter output will be shut off causing the motor to coast to a stop. The stopping method can be selected for some faults, and the selected stopping method will be used with these faults. If a fault has occurred, refer to the following table to identify and correct the cause of the fault. Use one of the following methods to reset the fault after restarting the Inverter. If the operation command is being input, however, the reset signal will be ignored. Therefore, be sure to reset the fault with the operation command turned off.

- Turn on the fault reset signal. A multi-function input (n36 to n39) must be set to 5 (Fault Reset).
- Press the STOP/RESET Key on the Digital Operator.
- Turn the main circuit power supply off and then on again.

■ Fault Displays and Processing

Fault display	Fault name and meaning	Probable cause and remedy
αL	<p>Overcurrent (OC) The Inverter output current is as high as or higher than 200% of the rated output current.</p>	<ul style="list-style-type: none"> • A short-circuit or ground fault has occurred and at the Inverter output. → Check and correct the motor power cable. • The V/f setting is incorrect. → Reduce the V/f set voltage. • The motor capacity is too large for the Inverter. → Reduce the motor capacity to the maximum permissible motor capacity. • The magnetic contactor on the output side of the Inverter has been opened and closed. → Rearrange the sequence so that the magnetic contactor will not open or close while the Inverter has current output. • The output circuit of the Inverter is damaged. → Replace the Inverter.
αU	<p>Overvoltage (OV) The main circuit DC voltage has reached the overvoltage detection level (200-V models: 410 V DC min.; 400-V models: 820 V DC min.).</p>	<ul style="list-style-type: none"> • The deceleration time is too short. → Increase the deceleration time. • The power supply voltage is too high. → Decrease the voltage so it will be within specifications. • There is excessive regenerative energy due to overshooting at the time of acceleration. → Suppress the overshooting as much as possible.



Fault display	Fault name and meaning	Probable cause and remedy
UV1	<p>Main circuit undervoltage (UV1)</p> <p>The main circuit DC voltage has reached the undervoltage detection level (230 V DC for the 3G3JV-A2□-A, 160 V DC for the 3G3JV-AB□-A, and 460 V DC for the 3G3JV-A4□-A).</p>	<ul style="list-style-type: none"> • Power supply to the Inverter has phase loss, power input terminal screws are loose, or the power cable is disconnected. <ul style="list-style-type: none"> → Check the above and take necessary countermeasures. • Incorrect power supply voltage <ul style="list-style-type: none"> → Make sure that the power supply voltage is within specifications. • Momentary power interruption has occurred. <ul style="list-style-type: none"> → Use the momentary power interruption compensation (Set n47 so that the Inverter restarts after power is restored) → Improve the power supply. • The internal circuitry of the Inverter is damaged. <ul style="list-style-type: none"> → Change the Inverter.
OH	<p>Radiation fin overheated (OH)</p> <p>The temperature of the radiation fins of the Inverter has reached 110°C ± 10°C.</p>	<ul style="list-style-type: none"> • The ambient temperature is too high. <ul style="list-style-type: none"> → Ventilate the Inverter or install a cooling unit. • The load is excessive. <ul style="list-style-type: none"> → Reduce the load. → Decrease the Inverter capacity. • The V/f setting is incorrect. <ul style="list-style-type: none"> → Reduce the V/f set voltage. • The acceleration/deceleration time is too short. <ul style="list-style-type: none"> → Increase the acceleration/deceleration time. • The ventilation is obstructed. <ul style="list-style-type: none"> → Change the location of the Inverter to meet the installation conditions. • The cooling fan of the Inverter does not work. <ul style="list-style-type: none"> → Replace the cooling fan.



Fault display	Fault name and meaning	Probable cause and remedy
OL1	<p>Motor overload (OL1) The electric thermal relay actuated the motor overload protective function.</p>	<ul style="list-style-type: none"> • The load is excessive. → Reduce the load. → Decrease the Inverter capacity. • The V/f setting is incorrect. → Reduce the V/f set voltage. • The value in n11 for maximum voltage frequency is low. → Check the motor nameplate and set n11 to the rated frequency. • The acceleration/deceleration time is too short. → Increase the acceleration/deceleration time. • The value in n32 for rated motor current is incorrect. → Check the motor nameplate and set n32 to the rated current. • The Inverter is driving more than one motor. → Disable the motor overload detection function and install an electronic thermal relay for each of the motors. The motor overload detection function is disabled by setting n32 to 0.0 or n33 to 2. • The motor protective time setting in n34 is short. → Set n34 to 8 (the default value).
OL2	<p>Inverter overload (OL2) The electronic thermal relay has actuated the Inverter overload protective function.</p>	<ul style="list-style-type: none"> • The load is excessive. → Reduce the load. • The V/f setting is incorrect. → Reduce the V/f set voltage. • The acceleration/deceleration time is too short. → Increase the acceleration/deceleration time. • The Inverter capacity is insufficient. → Use an Inverter model with a higher capacity.
OL3	<p>Overtorque detection (OL3) There has been a current or torque the same as or greater than the setting in n60 for overtorque detection level and that in n61 for overtorque detection time. A fault has been detected with n59 for overtorque detection function selection set to 2 or 4.</p>	<ul style="list-style-type: none"> • The mechanical system is locked or has a failure. → Check the mechanical system and correct the cause of overtorque. • The parameter settings were incorrect. → Adjust the n60 and n61 parameters according to the mechanical system. Increase the set values in n60 and n61.
GF	<p>Ground fault (GF) The ground fault current at the output of the Inverter has exceeded the rated output current of the Inverter.</p>	<ul style="list-style-type: none"> • A ground fault has occurred at the Inverter output. → Check the connections between the Inverter and motor and reset the fault after correcting its cause.



Fault display	Fault name and meaning	Probable cause and remedy
EF□	External fault □ (EF□) An external fault has been input from a multi-function input. A multi-function input 1, 2, 3, or 4 set to 3 or 4 has operated. The EF number indicates the number of the corresponding input (S2 to S5).	<ul style="list-style-type: none"> • An external fault was input from a multi-function input. → Remove the cause of the external fault. • The sequence is incorrect. → Check and change the external fault input sequence including the input timing and NO or NC contact.
F00	Digital Operator transmission fault 1 (F00) An initial memory fault has been detected	<ul style="list-style-type: none"> • The internal circuitry of the Inverter has a fault. → Turn the Inverter off and on. → Replace the Inverter if the same fault occurs again.
F01	Digital Operator transmission fault 2 (F01) A ROM fault has been detected.	<ul style="list-style-type: none"> • The internal circuitry of the Inverter has a fault. → Turn the Inverter off and on. → Replace the Inverter if the same fault occurs again.
F04	Initial memory fault (F04) An error in the built-in EEPROM of the Inverter has been detected.	<ul style="list-style-type: none"> • The internal circuitry of the Inverter has a fault. → Initialize the Inverter with n01 set to 8 or 9 and turn the Inverter off and on. → Replace the Inverter if the same fault occurs again.
F05	Analog-to-digital converter fault (F05) An analog-to-digital converter fault has been detected.	<ul style="list-style-type: none"> • The internal circuitry of the Inverter has a fault. → Turn the Inverter off and on. → Replace the Inverter if the same fault occurs again.
F07	Digital Operator fault (F07) An error in the built-in control circuit of the Digital Operator has been detected.	<ul style="list-style-type: none"> • The internal circuitry of the Digital Operator has a fault. → Turn the Digital Operator off and on. → Replace the Digital Operator if the same fault occurs again.
STP	Emergency stop (STP) An emergency stop alarm is input to a multi-function input. (A multi-function input 1, 2, 3, or 4 set to 19 or 21 has operated.)	<ul style="list-style-type: none"> • An emergency stop alarm is input to a multi-function input. → Remove the cause of the fault. • The sequence is incorrect. → Check and change the external fault input sequence including the input timing and NO or NC contact.
OFF	Power supply error <ul style="list-style-type: none"> • Insufficient power supply voltage • Control power supply fault • Hardware fault 	<ul style="list-style-type: none"> • No power supply is provided. → Check and correct the power supply wire and voltage. • Terminal screws are loosened. → Check and tighten the terminal screws. • The Inverter is damaged. → Replace the Inverter.

7-1-2 Warning Detection (Nonfatal Error)

The warning detection is a type of Inverter protective function that does not operate the fault contact output and returns the Inverter to its original status once the cause of the error has been removed. The Digital Operator flashes and display the detail of the error. If a warning occurs, take appropriate countermeasures according to the table below.

Note Some warnings or some cases stop the operation of the Inverter as described in the table.

■ **Warning Displays and Processing**

Fault display	Warning name and Meaning	Probable cause and remedy
Uu (flashing)	Main Circuit Undervoltage (UV) The main circuit DC voltage has reached the undervoltage detection level (200 V DC for the 3G3JV-A2□-A, 160 V DC for the 3G3JV-AB□-A, and 400 V DC for the 3G3JV-A4□-A).	<ul style="list-style-type: none"> • Power supply to the Inverter has phase loss, power input terminal screws are loose, or the power line is disconnected. → Check the above and take necessary countermeasures. • Incorrect power supply voltage → Make sure that the power supply voltage is within specifications.
ou (flashing)	Main Circuit Overvoltage The main circuit DC voltage has reached the overvoltage detection level (200-V models: 410 V DC min.; 400-V models: 820 V DC min.).	<ul style="list-style-type: none"> • The power supply voltage is too high. → Decrease the voltage so it will be within specifications.
oH (flashing)	Radiation fin overheated (OH) The temperature of the radiation fins of the Inverter has reached $110^{\circ}\text{C} \pm 10^{\circ}\text{C}$.	<ul style="list-style-type: none"> • The ambient temperature is too high. → Ventilate the Inverter or install a cooling unit.
$oL3$ (flashing)	Overtorque detection (OL3) There has been a current or torque the same as or greater than the setting in n60 for overtorque detection level and that in n61 for overtorque detection time. A fault has been detected with n59 for overtorque detection function selection set to 1 or 3.	<ul style="list-style-type: none"> • The mechanical system is locked or has a failure. → Check the mechanical system and correct the cause of overtorque. • The parameter settings were incorrect. → Adjust the n60 and n61 parameters according to the mechanical system. Increase the set values in n60 and n61.
SEr (flashing)	Sequence error (SER) A sequence change has been input while the Inverter is in operation. Local or remote selection is input while the Inverter is in operation. Note The Inverter coasts to a stop.	<ul style="list-style-type: none"> • A sequence error has occurred. → Check and adjust the local or remote selection sequence as multi-function input.
bb (flashing)	External base block (bb) The external base block command has been input. Note The Inverter coasts to a stop.	<ul style="list-style-type: none"> • The external base block command has been input as multi-function input. → Remove the cause of external base block input. • The sequence is incorrect. → Check and change the external fault input sequence including the input timing and NO or NC contact.



Fault display	Warning name and Meaning	Probable cause and remedy
<p><i>EF</i> (flashing)</p>	<p>Forward- and reverse-rotation input (EF) The forward and reverse commands are input to the control circuit terminals simultaneously for 0.5 s or more. Note The Inverter stops according to the method set in n04.</p>	<ul style="list-style-type: none"> • A sequence error has occurred. → Check and adjust the local or remote selection sequence.
<p><i>STP</i> (flashing)</p>	<p>Emergency stop (STP) The Digital Operator stops operating. The STOP/RESET Key on the Digital Operator is pressed while the Inverter is operating according to the forward or reverse command through the control circuit terminals. Note The Inverter stops according to the method set in n04.</p>	<ul style="list-style-type: none"> • The parameter setting was incorrect. → Turn off the forward or reverse command once, check that the n06 parameter setting for STOP/RESET Key function selection, and restart the Inverter.
<p><i>FRn</i> (flashing)</p>	<p>Cooling fan fault (FAN) The cooling fan has been locked.</p>	<ul style="list-style-type: none"> • An emergency stop alarm is input to a multi-function input. → Remove the cause of the fault. • The sequence is incorrect. → Check and change the external fault input sequence including the input timing and NO or NC contact.
<p><i>FRn</i> (flashing)</p>	<p>Cooling fan fault (FAN) The cooling fan has been locked.</p>	<ul style="list-style-type: none"> • The cooling fan wiring has a fault. → Turn off the Inverter, dismount the fan, and check and repair the wiring. • The cooling fan is not in good condition. → Check and remove the foreign material or dust on the fan. • The cooling fan is beyond repair. → Replace the fan.



8-1 Inverter Specifications

3-phase 230-V AC models	Model 3G3JV-		A2001 -A	A2002 -A	A2004 -A	A2007 -A	A2015 -A	A2022 -A	A2037 -A	
	Power supply	Rated voltage and frequency	3-phase 200 to 230 V AC at 50/60 Hz							
		Allowable voltage fluctuation	-15% to 10%							
		Allowable frequency fluctuation	±5%							
Power supply capacity (kVA) (See note 1.)		0.4	0.9	1.6	2.7	4.3	5.9	9.3		
Heat radiation (W)		13.0	18.0	28.1	45.1	72.8	94.8	149.1		
Weight (kg)		0.5	0.5	0.8	0.9	1.3	1.5	2.1		
Cooling method		Natural cooling			Cooling fan					

Single-phase 230-V AC models	Model 3G3JV-		AB001 -A	AB002 -A	AB004 -A	AB007 -A	AB015 -A	---	---	
	Power supply	Rated voltage and frequency	Single-phase 200 to 240 V AC at 50/60 Hz							
		Allowable voltage fluctuation	-15% to 10%							
		Allowable frequency fluctuation	±5%							
Power supply capacity (kVA) (See note 1.)		0.5	0.9	1.6	2.7	4.3	---	---		
Heat radiation (W) (See note 2.)		14.1	20.0	31.9	51.4	82.8	---	---		
Weight (kg)		0.5	0.5	0.9	1.5	1.5	---	---		
Cooling method		Natural cooling			Cooling fan					

Max. applicable motor capacity (kW)		0.1	0.2	0.4	0.75	1.5	2.2	3.7	
Output specifications	Rated output capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7	
	Rated output current (A)	0.8	1.6	3.0	5.0	8.0	11.0	17.5	
	Rated output voltage (V)	3-phase 200 to 240 V AC (according to the input voltage)							
	Max. output frequency	400 Hz parameter setting							
Control characteristics	Harmonic-current countermeasures	DC reactor (option) connection possible							
	Control method	Sine wave PWM (V/f control)							
	Carrier frequency	2.5 to 10.0 kHz (in vector control)							
	Frequency control range	0.1 to 400 Hz							
	Frequency precision (temperature characteristics)	Digital commands: ±0.01% (-10°C to 50°C) Analog commands: ±0.5% (25°C ± 10°C)							
	Frequency setting resolution	Digital commands: 0.1 Hz (less than 100 Hz) and 1 Hz (100 Hz or over) Analog commands: 0.06 Hz/60 Hz (equivalent to 1/1000)							
	Output frequency resolution	0.01 Hz							



Control characteristics	Overload capacity	150% of rated output current for 1 min
	External frequency set signal	Selectable with FREQ adjuster: 0 to 10 V DC (20 k Ω), 4 to 20 mA (250 Ω), and 0 to 20 mA (250 Ω)
	Acceleration/deceleration time	0.0 to 999 s (Independent acceleration and deceleration time settings: 2 types)
	Braking torque	Approx. 20% (Braking Resistor and Braking Unit cannot be connected.)
	Voltage/frequency characteristics	Set a user V/f pattern
Protective functions	Motor protection	Protection by electronic thermal
	Instantaneous overcurrent protection	Stops at approx. 250% of rated output current
	Overload protection	Stops in 1 min at approximately 150% of rated output current
	Overvoltage protection	Stops when main-circuit DC voltage is approximately 410 V
	Undervoltage protection	Stops when main-circuit DC voltage is approximately 200 V (160 V for single-phase 200-V AC model)
	Momentary power interruption compensation (selection)	Stops for 15 ms or more. By setting the Inverter to momentary power interruption mode, operation can be continued if power is restored within approximately 0.5 s.
	Cooling fin overheating	Detects at 110°C \pm 10°C
	Grounding protection	Protection at rated output current level
Charge indicator (RUN indicator)	Lit when the main circuit DC voltage is approximately 50 V or less.	
Environment	Location	Indoors (with no corrosive gas, oil spray, or metallic dust)
	Ambient temperature	Operating: -10°C to 50°C
	Ambient humidity	Operating: 95% max. (with no condensation)
	Ambient temperature	-20°C to 60°C
	Altitude	1,000 m max.
	Insulation resistance	5 M Ω min. (Do not carry out any insulation resistance or withstand voltage tests)
	Vibration resistance	9.8 m/s ² max. between 10 to 20 Hz 2.0 m/s ² max. between 20 and 50 Hz
Degree of protection	Panel-mounting models: Conforms to IP20	

Note 1. The power supply capacity is the capacity for the Inverter's rated output. It will vary depending on the impedance at the input power supply. (This is due to fluctuations in the power factor. The power factor can be improved by inserting an AC reactor.) There will also be variations in the ratio between the rated current of the motor that is used and the rated output current of the Inverter.

Note 2. The heat radiation is the electric power consumed in the Inverter at the Inverter's rated output.



3-phase 460-V AC models	Model 3G3JV-		A4002- A	A4004- A	A4007- A	A4015- A	A4022- A	A4037- A	
	Power supply	Rated voltage and frequency	3-phase 380 to 460 V AC at 50/60 Hz						
		Allowable voltage fluctuation	-15% to 10%						
		Allowable frequency fluctuation	±5%						
Power supply capacity (kVA) (See note 1.)		1.3	1.9	3.6	5.1	5.9	9.1		
Heat radiation (W) (See note 2.)		23.1	30.1	54.9	75.7	83.0	117.9		
Weight (kg)		1.0	1.1	1.5	1.5	1.5	2.1		
Cooling method		Natural cooling				Cooling fan			

Max. applicable motor capacity (kW)		0.2	0.4	0.75	1.5	2.2	3.7	
Output specifications	Rated output capacity (kVA)	0.9	1.4	2.6	3.7	4.2	6.6	
	Rated output current (A)	1.2	1.8	3.4	4.8	5.5	8.6	
	Rated output voltage (V)	3-phase 380 to 460 V AC (according to the input voltage)						
	Max. output frequency	400 Hz parameter setting						
Control characteristics	Harmonic-current countermeasures	DC reactor (option) connection possible						
	Control method	Sine wave PWM (V/f control)						
	Carrier frequency	2.5 to 10.0 kHz (in vector control)						
	Frequency control range	0.1 to 400 Hz						
	Frequency precision (temperature characteristics)	Digital commands: ±0.01% (-10°C to 50°C) Analog commands: ±0.5% (25°C ± 10°C)						
	Frequency setting resolution	Digital commands: 0.1 Hz (less than 100 Hz) and 1 Hz (100 Hz or over) Analog commands: 0.06 Hz/60 Hz (equivalent to 1/1000)						
	Output frequency resolution	0.01 Hz						
	Overload capacity	150% of rated output current for 1 min						
	External frequency set signal	Selectable with FREQ adjuster: 0 to 10 V DC (20 kΩ), 4 to 20 mA (250 Ω), and 0 to 20 mA (250 Ω)						
	Acceleration/deceleration time	0.0 to 999 s (Independent acceleration and deceleration time settings: 2 types)						
	Braking torque	Approx. 20% (Braking Resistor and Braking Unit cannot be connected.)						
	Voltage/frequency characteristics	Set a user V/f pattern						



Protective functions	Motor protection	Protection by electronic thermal
	Instantaneous overcurrent protection	Stops at approx. 250% of rated output current
	Overload protection	Stops in 1 min at approximately 150% of rated output current
	Overvoltage protection	Stops when main-circuit DC voltage is approximately 820 V
	Undervoltage protection	Stops when main-circuit DC voltage is approximately 400 V
	Momentary power interruption compensation (selection)	Stops for 15 ms or more. By setting the Inverter to momentary power interruption mode, operation can be continued if power is restored within approximately 0.5 s.
	Cooling fin overheating	Detects at 110°C ± 10°C
	Grounding protection	Protection at rated output current level
	Charge indicator (RUN indicator)	Lit when the main circuit DC voltage is approximately 50 V or less.
Environment	Location	Indoors (with no corrosive gas, oil spray, or metallic dust)
	Ambient temperature	Operating: -10°C to 50°C
	Ambient humidity	Operating: 95% max. (with no condensation)
	Ambient temperature	-20°C to 60°C
	Altitude	1,000 m max.
	Insulation resistance	5 MΩ min. (Do not carry out any insulation resistance or withstand voltage tests)
	Vibration resistance	9.8 m/s ² max. between 10 to 20 Hz 2.0 m/s ² max. between 20 and 50 Hz
Degree of protection		Panel-mounting models: Conforms to IP20

Note 1. The power supply capacity is the capacity for the Inverter's rated output. It will vary depending on the impedance at the input power supply. (This is due to fluctuations in the power factor. The power factor can be improved by inserting an AC reactor.) There will also be variations in the ratio between the rated current of the motor that is used and the rated output current of the Inverter.

Note 2. The heat radiation is the electric power consumed in the Inverter at the Inverter's rated output.



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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n01	Parameter write-prohibit selection/parameter initialization	Used to prohibit parameters to be written, sets parameters, or change the monitor range of parameters. Used to initialize parameters to default values. 0: Sets or monitors parameter n01. Parameters n02 through n79 can be monitored only. 1: Sets or monitors parameters n01 through n79. 6: Clears the error log. 8: Initializes parameters to default values in 2-wire sequence. (Japan) 9: Initializes parameters to default values in 3-wire sequence. (Japan) 10: For North America, initializes parameter in 2-wire sequence. 11: For North America, initializes parameter in 3-wire sequence.	0, 1, 6, 8, 9	1	1	No	5-2
n02	Operation mode selection	Used to select the input method for the RUN and STOP commands in remote mode. 0: The STOP/RESET Key on the digital Operator is enabled. 1: Multi-function inputs through the control circuit terminals in 2- or 3-wire sequence. Note The RUN command only through key sequences on the Digital Operator is acceptable in local mode.	0, 1	1	1	No	5-7
n03	Frequency reference selection	Used to set the input method for the frequency reference in remote mode. 0: Digital Operator 1: Frequency reference 1 (n21) 2: Frequency reference control circuit terminal (0 to 10 V) 3: Frequency reference control circuit terminal (4 to 20 mA) 4: Frequency reference control circuit terminal (0 to 20 mA)	0 to 4	1	2	No	5-8
n04	Interruption mode selection	Used to set the stopping method for use when the STOP command is input. 0: Decelerates to stop in preset time. 1: Coasts to stop (with output shut off by the STOP command)	0, 1	1	0	No	5-17
n05	Reverse rotation-prohibit selection	Used to select the operation with the reverse command input. 0: Reverse enabled. 1: Reverse disabled.	0, 1	1	0	No	5-16



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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n06	STOP/RESET Key function selection	Used to select the stop method in remote mode with n02 for operation mode selection set to 1. 0: STOP/RESET Key of the Digital Operator enabled. 1: STOP/RESET Key of the Digital Operator disabled.	0, 1	1	0	No	5-7
n07	Frequency selection in local mode	Used to set the input method for the frequency reference in local mode. 0: The FREQ adjuster of the Digital Operator enabled. 1: Key sequences on the Digital Operator enabled.	0, 1	1	0	No	5-8
n08	Key sequential frequency setting	Used to enable the Enter Key for setting the frequency reference with the Increment and Decrement Keys. 0: The value is entered with the Enter Key pressed. 1: The value is enabled when the value is input.	0, 1	1	0	No	5-12
n09	Maximum frequency (FMAX)	Used to set the V/f pattern as the basic characteristic of the Inverter with output voltage per frequency set.	50.0 to 400	0.1 Hz (see note)	60.0	No	5-4
n10	Maximum voltage (VMAX)	<p>Note Set the parameters so that the following condition will be satisfied. $n14 \leq n12 < n11 \leq n09$</p> <p>Note The value set in n13 will be ignored if parameters n14 and n12 are the same in value.</p>	1 to 255 (see note 2)	1 V	230 (see note 2)	No	5-4
n11	Maximum voltage frequency (FA)		0.2 to 400	0.1 Hz (see note 1)	60.0	No	5-4
n12	Middle output frequency (FB)		0.1 to 399	0.1 Hz (see note 1)	1.5	No	5-4
n13	Middle output frequency voltage (VC)		1 to 255 (see note 2)	1 V	12 (see note 2)	No	5-4
n14	Minimum output frequency (FMIN)		0.1 to 10.0	0.1 Hz	1.5	No	5-4
n15	Minimum output frequency voltage (VMIN)	1 to 50 (see note 2)	1 V	12.0 (see note 2)	No	5-4	



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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n16	Acceleration time 1	Acceleration time: The time required to go from 0% to 100% of the maximum frequency.	0.0 to 999	0.1 s	10.0	Yes	5-14
n17	Deceleration time 1	Deceleration time: The time required to go from 100% to 0% of the maximum frequency.			10.0	Yes	5-14
n18	Acceleration time 2	Note The actual acceleration or deceleration time is obtained from the following formula. Acceleration/Deceleration time = (Acceleration/Deceleration time set value) × (Frequency reference value) ÷ (Max. frequency)			10.0	Yes	5-14
n19	Deceleration time 2				10.0	Yes	5-14
n20	S-shape acceleration/deceleration characteristic	Used to set S-shape acceleration/deceleration characteristics. 0: No S-shape acceleration/deceleration (trapezoidal acceleration/deceleration) 1: S-shape acceleration/deceleration characteristic time 0.2 s 2: S-shape acceleration/deceleration characteristic time 0.5 s 3: S-shape acceleration/deceleration characteristic time 1.0 s Note When the S-shape acceleration/deceleration characteristic time is set, the acceleration and deceleration times will be lengthened according to the S-shape at the beginning and end of acceleration/deceleration.	0 to 3	1	0	No	5-15
n21	Frequency reference 1	Used to set internal frequency references. Note Frequency reference 1 is enabled in remote mode with n03 for frequency reference selection set to 1. Note These frequency references are selected with multi-step speed references (multi-function input). See the reference pages for the relationship between multi-step speed references and frequency references.	0.0 to max. frequency	0.1 Hz (see note 1)	6.0	Yes	5-10
n22	Frequency reference 2				0.0	Yes	5-10
n23	Frequency reference 3				0.0	Yes	5-10
n24	Frequency reference 4				0.0	Yes	5-10
n25	Frequency reference 5				0.0	Yes	5-10
n26	Frequency reference 6				0.0	Yes	5-10
n27	Frequency reference 7				0.0	Yes	5-10
n28	Frequency reference 8				0.0	Yes	5-10
n29	Inching frequency command				Used to set the inching frequency command. Note The inching frequency command is selected with the inching command (multi-function input). The inching frequency command takes precedence over the multi-step speed reference.	6.0	Yes



Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n30	Frequency reference upper limit	<p>Used to set the upper and lower frequency reference limits in percentage based on the maximum frequency as 100%.</p> <p>Note If n31 is set to a value less than the minimum output frequency (n14), the Inverter will have no output when a frequency reference less than the minimum output frequency input is input.</p>	0 to 110	1%	100	No	5-9
n31	Frequency reference lower limit		0 to 110	1%	0	No	5-9
n32	Rated motor current	<p>Used to set the rated motor current for motor overload detection (OL1) based on the rated motor current.</p> <p>Note Motor overload detection (OL1) is disabled by setting the parameter to 0.0.</p> <p>Note The rated motor current is default to the standard rated current of the maximum applicable motor.</p>	0.0 to 120% of rated output current of the Inverter.	0.1 A	Varies with the capacity.	No	5-2
n33	Motor protection characteristics	<p>Used to set the motor overload detection (OL1) for the electronic thermal characteristics of the motor.</p> <p>0: Protection characteristics for general-purpose induction motors</p> <p>1: Protection characteristics for inverter-dedicated motors</p> <p>2: No protection</p> <p>Note If a single Inverter is connected to more than one motor, set the parameter to 2 for no protection. The parameter is also disabled by setting n32 for rated motor to 0.0.</p>	0 to 2	1	0	No	6-14



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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n34	Motor protective time setting	Used to set the electric thermal characteristics of the motor to be connected in 1-minute increments. Note The default setting does not require any changes in normal operation. Note To set the parameter according to the characteristics of the motor, check with the motor manufacturer the thermal time constant and set the parameter with some margin. In other words, set the value slightly shorter than the thermal time constant. Note To detect motor overloading quicker, reduce the set value, provided that it does not cause any application problems.	1 to 60	1 min	8	No	6-14
n35	Cooling fan operation function	Used to operate the Cooling Fan of the Inverter while the Inverter is turned on or only while the Inverter is in operation. 0: Rotates only while RUN command is input and for 1 minute after Inverter stops operating 1: Rotates while Inverter is turned on Note This parameter is available only if the Inverter incorporates a Cooling Fan. Note If the operation frequency of the Inverter is low, the life of the fan can be prolonged by setting the parameter to 0.	0, 1	1	0	No	6-14



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Parameter No.	Name	Description			Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n36	Multi-function input 1 (Input terminal S2)	Used to select the functions of multi-function input terminals S2 through S5.			2 to 8, 10 to 22	1	2	No	5-18
		Set value	Function	Description					
n37	Multi-function input 2 (Input terminal S3)	0	Forward/Reverse rotation command	3-wire sequence (to be set in n37 only) By setting n37 to 0, the set value in n36 is ignored and the following setting are forcibly made. S1: RUN input (RUN when ON) S2: STOP input (STOP when OFF) S3: Forward/Reverse rotation command (OFF: Forward; ON: Reverse)	0, 2 to 8, 10 to 22	1	5	No	5-18
n38	Multi-function input 3 (Input terminal S4)				2 to 8, 10 to 22	1	3	No	5-18
n39	Multi-function input 4 (Input terminal S5)	2	Reverse/Stop	Reverse rotation command in 2-wire sequence (Reversed with the terminal turned ON)	2 to 8, 10 to 22, 34	1	6	No	5-18
		3	External fault (NO)	ON: External fault (FP□ detection: □ is a terminal number)					
		4	External fault (NC)	OFF: External fault (EF□ detection: □ is a terminal number)					
		5	Fault reset	ON: Fault reset (disabled while RUN command is input)					
		6	Multi-step speed reference 1	Signals to select frequency references 1 through 8. Refer to <i>5-5-4 Setting Frequency References through Key Sequences</i> for the relationship between multi-step speed references and frequency references.					
		7	Multi-step speed reference 2						
		8	Multi-step speed reference 3						
		10	Inching frequency command						
		11	Acceleration/Deceleration time change-over	ON: Acceleration time 2 and deceleration time 2 are selected.					



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Parameter No.	Name	Description		Setting range	Unit of setting	Default setting	Changes during operation	Reference page	
n39	Multi-function input 4 (Input terminal S5)	12	External base block command (NO)	ON: Output shut off (while motor coasting to a stop and "bb" flashing)	2 to 8, 10 to 22, 34	1	6	No	5-18
		13	External base block command (NC)	OFF: Output shut off (with motor free running and "bb" flashing)					
		14	Search command (Searching starts from maximum frequency)	ON: Speed search (Searching starts from n09)					
		15	Search command (Searching starts from preset frequency)	ON: Speed search					
		16	Acceleration/Deceleration-prohibit command	ON: Acceleration/Deceleration is on hold (running at parameter frequency)					
		17	Local or remote selection	ON: Local mode (operated with the Digital Operator)					
		19	Emergency stop fault (NO)	The Inverter stops according to the setting in n04 for interruption mode selection with the emergency stop input turned ON. NO: Emergency stop with the contact closed. NC: Emergency stop with the contact opened. Fault: Fault output is ON and reset with RESET input. Alarm output is ON (no reset required). "STP" is displayed (lit with fault input ON and flashes with alarm input ON)					
		20	Emergency stop alarm (NO)						
		21	Emergency stop fault (NC)						
		22	Emergency stop alarm (NC)						
34	Up or down command	Up or down command (set in n39 only) By setting n39 to 34, the set value in n38 is ignored and the following setting are forcibly made. S4: Up command S5: Down command							



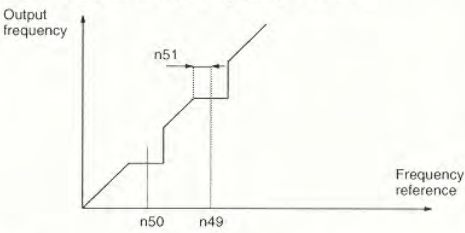
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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page		
n40	Multi-function output (MA/MB and MC output terminals)	Used to select the functions of multi-function output terminals.	0 to 7, 10 to 17	1	1	No	5-21		
		Set value						Function	Description
		0						Fault output	ON: Fault output (with protective function working)
		1						Operation in progress	ON: Operation in progress
		2						Frequency detection	ON: Frequency detection (with frequency reference coinciding with output frequency)
		3						Idling	ON: Idling (at less than min. output frequency)
		4						Frequency detection 1	ON: Output frequency \geq frequency detection level (n58)
		5						Frequency detection 2	ON: Output frequency \leq frequency detection level (n58)
		6						Overtorque being monitored (NO-contact output)	Output if any of the following parameter conditions is satisfied. n59: Overtorque detection function selection n60: Overtorque detection level
		7						Overtorque being monitored (NC-contact output)	n61: Overtorque detection time NO contact: ON with overtorque being detected NC contact: OFF with overtorque being detected
		8						Not used	---
		9							
		10						Alarm output	ON: Alarm being detected (Nonfatal error being detected)
		11						Base block in progress	Base block in progress (in operation with output shut-off)
		12						RUN mode	ON: Local mode (with the Digital Operator)
		13						Inverter ready	ON: Inverter ready to operate (with no fault detected)
		14						Fault retry	ON: Fault retry
		15						UV in progress	ON: Undervoltage being monitored
16	Rotating in reverse direction	ON: Rotating in reverse direction							
17	Speed search in progress	ON: Speed search in progress							

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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n41	Frequency reference gain	Used to the input characteristics of analog frequency references. Gain: The frequency of maximum analog input (10 V or 20 mA) in percentage based on the maximum frequency as 100%.	0 to 255	1%	100	Yes	5-9
n42	Frequency reference bias	Bias: The frequency of minimum analog input (0 V or 0 or 4 mA) in percentage based on the maximum frequency as 100%.	-99 to 99	1%	0	Yes	5-9
n43	Analog frequency reference time	Used to set the digital filter with a first-order lag for analog frequency references to be input.	0.00 to 2.00	0.01 s	0.10	No	5-10
n44	Analog monitor output	Used to set the output frequency or current as a monitored item. 0: Output frequency (10-V output at max. frequency with n45 set to 1.00). 1: Output current (10-V output with Inverter rated output current with n45 set to 1.00)	0, 1	1	0	No	5-23
n45	Analog monitor output gain	Used to set the output characteristics of analog monitor output.	0.00 to 2.00	0.01	1.00	Yes	5-23
n46	Carrier frequency selection	Used to set the carrier frequency. Note The default setting does not need any changes in normal operation. Note Refer to 6-1 <i>Setting the Carrier Frequency</i> for details.	1 to 4, 7 to 9	1	Varies with the capacity.	No	6-2
n47	Momentary power interruption compensation	Used to specify the processing that is performed when a momentary power interruption occurs. 0: Inverter stops operating 1: Inverter continues operating if power interruption is 0.5 s or less. 2: Inverter restarts when power is restored.	0 to 2	1	0	No	6-15
n48	Fault retry	Used to set the number of times the Inverter is reset and restarted automatically in the case the Inverter has an overvoltage fault, overcurrent fault, or ground fault.	0 to 10	1	0	No	6-15
n49	Jump frequency 1	Used to set the frequency jump function. 	0.0 to 400	0.1 Hz (see note 1)	0.0	No	6-16
n50	Jump frequency 2		0.0 to 400	0.1 Hz (see note 1)	0.0	No	6-16
n51	Jump width		0.0 to 25.5	0.1 Hz	0.0	No	6-16
		Note These values must satisfy the following condition: $n49 \geq n50$					



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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n52	DC control current	Used to impose DC on the induction motor for braking control.	0 to 100	1%	50	No	6-5
n53	Interruption DC control time	Set the DC braking current in percentage based on the rated current of the Inverter as 100%.	0.0 to 25.5	0.1 s	0.0	No	6-5
n54	Startup DC control time		0.0 to 25.5	0.1 s	0.0	No	6-5
n55	Stall prevention during deceleration	Used to select a function to change the deceleration time of the motor automatically so that there will be no overvoltage imposed on the motor during deceleration. 0: Stall prevention during deceleration enabled 1: Stall prevention during deceleration disabled	0, 1	1	0	No	6-6
n56	Stall prevention level during acceleration	Used to select a function to stop the acceleration of the motor automatically for stall prevention during acceleration. Set the level in percentage based on the rated current of the Inverter as 100%.	30 to 200	1%	170	No	6-7
n57	Stall prevention level during operation	Used to select a function to reduce the output frequency of the Inverter automatically for stall prevention during operation. Set the level in percentage based on the rated current of the Inverter as 100%.	30 to 200	1%	160	No	6-8
n58	Frequency detection level	Used to set the frequency to be detected. Note The parameter n40 for multi-function output must be set for the output of frequency detection levels 1 and 2.	0.0 to 400	0.1 Hz	0.0	No	6-18
n59	Overtorque detection function selection	Used to enable or disable overtorque detection and select the processing method after overtorque detection. 0: Overtorque detection disabled 1: Overtorque detection only when speed coincides and operation continues (issues alarm) 2: Overtorque detection only when speed coincides and output shut off (for protection) 3: Overtorque always detected and operation continues (issues alarm) 4: Overtorque always detected and output shut off (for protection)	0 to 4	1	0	No	6-9
n60	Overtorque detection level	Used to set overtorque detection level. Set the level in percentage based on the rated current of the Inverter as 100%.	30 to 200	1%	160	No	6-9
n61	Overtorque detection time	Used to set the detection time of overtorque.	0.1 to 10.0	0.1 s	0.1	No	6-10



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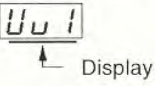
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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n62	UP/DOWN command frequency memory	Used to store the adjusted frequency reference with the UP/DOWN function. 0: Frequency not stored 1: Frequency stored The frequency must be on hold for 5 s or more.	0, 1	1	0	No	6-19
n63	Torque compensation gain	Used to set the gain of the torque compensation function. The default setting does not need any changes in normal operation.	0.0 to 2.5	0.1	1.0	Yes	6-11
n64	Motor rated slip	Used to set the rated slip value of the motor in use. Note Used as the constant of the slip compensation function.	0.0 to 20.0	0.1 Hz	Varies with the capacity.	Yes	6-12
n65	Motor no-load current	Used to set the no-load current of the motor in use based on the rated motor current as 100%. Note Used as the constant of the slip compensation function.	0 to 99	1%	Varies with the capacity.	No	6-12
n66	Slip compensation gain	Used to set the gain of the slip compensation function. Note The slip compensation function is disabled with n66 set to 0.0.	0.0 to 2.5	0.1	0.0	Yes	6-12
n67	Slip compensation time constant	Used for the response speed of the slip compensation function. Note The default setting does not need any changes in normal operation.	0.0 to 25.5	0.1 s	2.0	No	6-12
n68	OMRON's control reference use	Do not change the set value.	---	---	0	---	---
n69	OMRON's control reference use	Do not change the set value.	---	---	0	---	---
n70	OMRON's control reference use	Do not change the set value.	---	---	0	---	---
n71	OMRON's control reference use	Do not change the set value.	---	---	2	---	---
n72	OMRON's control reference use	Do not change the set value.	---	---	2	---	---
n73	OMRON's control reference use	Do not change the set value.	---	---	10	---	---
n74	OMRON's control reference use	Do not change the set value.	---	---	0	---	---
n75	Low-speed carrier frequency reduction selection	Used to select a function to reduce the carrier frequency when Inverter is at low speed. 0: Function disabled 1: Function enabled Note Normally set n75 to 0.	0, 1	1	0	No	6-4
n76	OMRON's control reference use	Do not change the set value	---	---	rdy	---	---
n77	OMRON's control reference use	Do not change the set value	---	---	0	---	---



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Parameter No.	Name	Description	Setting range	Unit of setting	Default setting	Changes during operation	Reference page
n78	Error log	Used to display the latest error recorded.  Note "—" will be displayed if no error has been recorded. Note This parameter is monitored only.	---	---	---	---	6-21
n79	Software number	Used to display the software number of the Inverter for OMRON's control reference use. Note This parameter is monitored only.	---	---	---	---	---

Note 1. Values will be set in 0.1-Hz increments if the frequency is less than 100 Hz and 1-Hz increments if the frequency is 100 Hz or over.

Note 2. With 460-V Inverters, the values for the upper limit of setting ranges and the default settings will be twice those given in the above table.



Omron Information

OMRON IDM CONTROLS, INC.

9510 N. HOUSTON-ROSSLYN RD.
HOUSTON, TEXAS 77088 USA
800.395.4106

OMRON ELECTRONICS LLC

1 COMMERCE DRIVE
SCHAUMBURG, ILLINOIS 60173 USA
800.55.OMRON (66766)

OMRON CANADA, INC.

885 MILNER AVENUE
SCARBOROUGH, ONTARIO M1B 5V8
416.286.6465

OMRON ON-LINE

Global – <http://www.omron.com>
USA – <http://www.idmcontrols.com>
USA – <http://www.omron.com/oei>
Canada – <http://www.omron.com/oci>

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Mexico, D.F. 555.534.1195 Monterrey, N.L. 818.377.4281

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Setting Parameters on Yaskawa/Omron VF Drives

Press the **DSPL** button on the YASKAWA or the **BLUE BUTTON** on the OMRON until the **PRGM** light is illuminated. Use the up and down arrows to locate the parameter that needs to be changed or reviewed. Use the **DATA/ENTER** button or the **YELLOW BUTTON** to select a parameter that's to be changed or reviewed. Use the up or down arrow buttons to change the selected parameter to the values listed below. Press the **DATA/ENTER** or **YELLOW BUTTON** to save the set value and return to the parameter list. Press the up arrow to proceed to the next parameter on the list and repeat the instructions from above. The order in which you enter these setting must be exactly as they are listed. Once you have completed the list below, press the **DSPL** or the **BLUE BUTTON** to return to the run mode. The value or n21 will now be displayed. If you are only reviewing the setting, **DO NOT REVIEW n01** or all settings will be reset to the YASKAWA/OMRON factory defaults.

DRIVE PARAMETERS:

n01 TO 10
n03 TO 1
n16 TO 1.0 ACCEL TIME
n17 TO 1.0 DECEL TIME
n21 TO 55.0 /35.0 /60.0 FREQ. (drive/osc/boom)
n22 TO 30.0 SLOW SPEED
n33 TO 1
n39 TO 7
n38 TO 6
n40 TO 0
n47 TO 2
n48 TO 6
n53 TO 10.0 D.C. BRAKING TIME (for Boom Only)
n78 IS THE ERROR LOG, DISPLAYS ONLY THE MOST RECENT FAULT



***** IMPORTANT *****

If only reviewing settings, **DO NOT REVIEW A1-03 on the any of the J1000 VFDs**. This will reset all settings to the VFD manufacturer's factory defaults and you would have to re-enter all settings.

****Note:** You **MUST** enter the parameters in the **EXACT ORDER** as they are listed below. If the VFD displays an Error while you setting the parameters, you likely entered a parameter in an incorrect order or to an incorrect value.

WW 1.0 - VFD Parameters			
Parameters for Gantry Drive Motor VFD			
NEW STYLE Yaskawa J1000 Drive			Parameter Descriptions
A1-03	to	2220	2-wire init
b1-01	to	0	Freq Reference = d1-01(thru -04)
C1-01	to	0.5	Accel 1
C1-02	to	0.5	Decel 1
d1-01	to	55.0	Freq. Ref.1
d1-02	to	30.0	Freq. Ref.2
H1-05	to	4	Input S5=Spd.Ref.B
H1-04	to	3	Input S4=Spd.Ref.A
H1-03	to	14	Input S3=External Reset
L1-01	to	2	O/L Protect
L2-01	to	2	Pwr.Loss Ride Thru=Indefinite
L5-01	to	2	# auto restarts=2



WW 1.0 - VFD Parameters			
Parameters for Oscillator Motor VFD			
NEW STYLE Yaskawa J1000 Drive			Parameter Descriptions
A1-03	to	2220	2-wire init
b1-01	to	0	Freq Reference = d1-01
C1-01	to	1.0	Accel 1
C1-02	to	1.0	Decel 1
d1-01	to	42.0	Freq. Ref.1
H1-05	to	0F	Input S5=Not Used
H1-04	to	0F	Input S4=Not Used
H1-03	to	14	S3 = External Reset
L1-01	to	2	O/L Protect
L2-01	to	2	Pwr.Loss Ride Thru=Indefinite
L5-01	to	2	# auto restarts=2



WW 1.0 - VFD Parameters			
Parameters for Wash Boom Motor VFD			
NEW STYLE Yaskawa J1000 Drive			Parameter Descriptions
A1-03	to	2220	2-wire init
b1-01	to	0	Freq Reference = d1-01
b2-04	to	2.0	DC Inj.@ Stop
C1-01	to	0.5	Accel 1
C1-02	to	0.5	Decel 1
d1-01	to	60.0	Freq. Ref.1
H1-05	to	0F	Input S5=Not Used
H1-04	to	0F	Input S4=Not Used
H1-03	to	14	Input S3=External Reset
L1-01	to	2	O/L Protect
L2-01	to	2	Pwr.Loss Ride Thru=Indefinite
L3-04	to	4	Stall Prevent During Decel=Overexcit
L5-01	to	2	# auto restarts=2
n3-13	to	1.30	Overexcitation Gain up to 1.40



Spray Tips on Gantry

SPRAY TIPS ON GANTRY		
TIP CHART		
LOCATION	TIP #	QNTY
Top Boom & Sides	0503	15
Bottom Sides	0504	6
Opt'l – 0*Nozzles	23504-06 inserts	14
Rocker Panel	1508	10
Opt'l – 0*Rocker Panel	23504-08 inserts	10
Tire Cleaner	4003	4
Pre-Soak	8010	9
Undercarriage	6508	5

ZERO DEGREE NOZZLE TIPS		
LOCATION	TIP #	QNTY
Boom	6	6
Sides	6	8
Rocker Panel	8	10



Input Selection

GANTRY

CHANNEL 0000	
Input #	24V DC LOCATED ON GANTRY 16 POINT INPUT SRT2-ID16 ADDRESS 0
0	Eye on Gantry
1	Prox on Upper Boom Arm to turn off Air Solenoid
2	Eye on Top Boom Arm
3	Prox on Upper Boom Arm
4	Prox on Lower Boom Arm
5	Prox on Home Position
6	Prox on End of Track
7	Prox on Idler Wheel
8	MANUAL SWITCH DRIVE FORWARD
9	MANUAL SWITCH DRIVE REVERSE
10	MANUAL SWITCH TOP BOOM UP
11	MANUAL SWITCH TOP BOOM DOWN
12	MANUAL SWITCH OSCILLATE MOTOR
13	MANUAL SWITCH TILT FORWARD
14	MANUAL SWITCH TILT BACK
15	TOGGLE SWITCH TO SELECT MANUAL MODE

CHANNEL 0200	
Input #	24V DC LOCATED ON GANTRY 8 POINT INPUT SRT2-ID08 ADDRESS 4
0	Optional Height Determining Eye
1	Optional Prox for Lower Height on Top Spray Bar
2	
3	
4	
5	Drive Motor Tripped Out Signal
6	Oscillating Motor Tripped Out Signal
7	Top Motor Tripped Out Signal



Input Selection

GANTRY

CHANNEL 1000	
OUTPUT #	COMMON FOR MOTOR STARTERS LOCATED ON GANTRY 8 POINT OUTPUT SRT2-OD08 ADDRESS 0
0	Drive Motor Forward
1	Drive Motor Reverse
2	Drive Motor - Speed 1
3	
4	Oscillating Motors
5	Automatic Reset for Electronic Drives
6	Top Boom Down
7	Top Boom Up

CHANNEL 1100	
Output #	24V AC FOR SOLENOIDS LOCATED ON GANTRY 16 POINT RELAY SRT2-ROC16 ADDRESS 2
0	Rocker Panel Solenoid
1	Side Sprayer Solenoid
2	On-board blower #1 and #3
3	On-board blower #2
4	Smart Nozzle Control
5	Tire Cleaner Solenoid
6	Water Dump Valve Top Boom
7	Presoak Top Solenoid
8	Presoak Side Solenoid
9	
10	
11	Tri-Colored Wax Solenoid
12	Air solenoid to tilt front
13	Air solenoid to tilt back
14	Air Purge Solenoid
15	Top Sprayer Solenoid



On-Board Scrolling Sign Outputs/Messages

	Displayed Messages	WW 1.0 Outputs	Wire Color	Scrolling Sign Wire Color
1.	Welcome Message, user programmable	None		
2.	Wash	1400.04	Brown	Brown
3.	Rinse	1400.05	Red	Red
4.	Presoak	1400.06	Orange	Orange
5.	Stop	1400.07	Blue	Yellow
6.	Rocker Panel Blaster	6 & 7		Black= 24vac hot White= 24 vac neutral Green= ground
7.	Back Up	5 & 7		
8.	Clearcoat Protectant	5 & 6		
9.	Drive Forward	4 & 7		Note
10.	Tire Cleaner	4 & 6		On the channel 1400, ROC-08, the common voltage on COM 2 and COM 3 must be 24 volts AC Neutral for the sign to operate properly.
11.	Wax	4 & 5		
12.	Exit Slowly	5, 6 & 7		
13.	Triple Shine	4, 6 & 7		
14.	Soaking	4, 5 & 7		
15.	Spot Free Rinse	4, 5 & 6		
16.	Blower	4, 5, 6 & 7		



W_ATER WIZARD 6500

CHEMICALS

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Approximate Dilutions at PSI for Water-Thin Products (1.0 CP)

Tip Color	Orifice Size	(Std. Drill number)	Ratio
No Tip	.187	3/16	4:1
Grey	.128	30	5:1
Black	.098	40	6:1
Beige	.07	50	8:1
Red	.052	55	17:1
White	.043	57	23:1
Blue	.040	60	25:1
Tan	.035	65	36:1
Green	.028	70	48:1
Orange	.025	72	64:1
Brown	.023	74	75:1
Yellow	.020	76	90:1
Purple	.014	79	120:1
Pink	.010	87	240:1



Formulas for Product Usage and Costs

Measurements:	1oz	=	29.5 ml
	1 gal	=	128 oz (3776 ml)
	5 gal	=	640 oz (18880 ml)
	30 gal	=	3840 oz (113280 ml)
	55 gal	=	7040 oz (207680 ml)

Standard Hydro Formula:

$$\frac{\text{stock solution used per cycle}}{\text{product used per cycle}} = \text{amount of cycle per minute}$$

Bladder Tank Usage Formula:

$$\frac{\text{amount of stock solution used} \times 60 \text{ second}}{\text{time between cycles per minute}} = \text{amount of cycle}$$

Standard Cost Formula:

$$\frac{\text{price per box (drum)}}{\text{ml per box (drum)}} = \text{cost per ml}$$

Cost Per Car/Cycle Formula:

$$\text{cost per ml} \times \text{ml used per cycle} = \text{cost per car}$$

Rectangular Volume:

$$\text{rectangular Volume} = \text{Length} \times \text{Width} \times .00434 = \text{Gal/Inch}$$

Cylinder Volume:

$$\text{cylinder Volume} = \text{Diameter} \times \text{Diameter} \times .0034 = \text{Gal/ Inch}$$



WATER WIZARD 6500

CHEMICALS

Turtle Wax Chemical Tip Chart

Chemical	Turtle Wax #	Water Tip	Chemical Tip	Dilution
Frictionless Detergent	HP 16/5; 27/5	None	Yellow	90:1
Citrus Prep Presoak (Low pH)	HP 86/5	None	Yellow	90:1
*Super Foaming Sealer Wax	HP 73/5; 19/5	None	Green	47:1 In Tank
Poly Triple Shine	HP 20/5; 21/5; 22/5	Red	Purple	472:1
Tire Cleaner	HP 78/5	None	Tan	42:1

* This Chemical Solution is delivered at high or medium pressure through the Cat 3535 Pump. There are many variables that affect the dilution as it is delivered on the vehicle, such as pressure, flow and water tank ball valve position. The position of the ball valve under the water tank determines the amount of suction created on the inlet side of the pump.



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Single/Double Tip Dilution for Hydrominder Systems -Only-

HP – 16/5 Frictionless Detergent
 Concentration Factor 2

Dilution	Single Tip
345:1	Pink
158:1	Purple
90:1	Yellow
62:1	Brown
47:1	Green
32:1	Tan
21:1	Blue
16:1	Red
11:1	Beige
7:1	Black
6:1	Gray

Dilution	Usage/gal.	Water Tip	Chemical Tip
1:1888	2 ml	None	Pink
1:1258	3 ml	Gray	Pink
1:944	4 ml	None	Purple
1:755	5 ml	Beige	Pink
1:629	6 ml	Gray	Purple
1:539	7 ml	Blue	Pink
1:472	8 ml	Tan	Pink
1:378	10 ml	Gray	Yellow
1:290	13 ml	Black	Yellow
1:270	14 ml	Red	Purple
1:252	15 ml	White	Purple
1:236	16 ml	Tan	Purple



CHEMICALS

Double Tip Dilution for Hydrominder Systems -Only-

HP-20/21/22/5 POLY TRIPLE SHINE

Concentration Factor 8

<u>Dilution</u>	<u>Usage/gal.</u>	<u>Water Tip</u>	<u>Chemical Tip</u>
1:1258	3 ml	Gray	Pink
1:755	5 ml	Black	Pink
1:472	8 ml	Red	Purple
1:420	9 ml	Beige	Purple
1:378	10 ml	Gray	Yellow
1:343	11 ml	Blue	Purple
1:315	12 ml	Tan	Purple
1:290	13 ml	Black	Yellow
1:252	15 ml	Gray	Brown

HP-73/5;19/5 Superfoaming Sealer Wax – Clear Coat Protectant

Concentration Factor 6

<u>Dilution</u>	<u>Usage/gal.</u>	<u>Water Tip</u>	<u>Chemical Tip</u>
1510:1	2.5 ml	Gray	Pink
1258:1	3 ml	Gray	Purple
944:1	4 ml	Black	Pink
629:1	6 ml	Black	Purple
472:1	8 ml	White	Pink
378:1	10 ml	Beige	Purple
343:1	11 ml	Gray	Yellow
314:1	12 ml	Red	Purple
290:1	13 ml	White	Purple
251:1	15 ml	Black	Yellow



CHEMICALS

Single Tip Dilution Hydrominder System -Only-

HP-78/5 Foaming Whitewall Cleaner
Concentration Factor 4.2

<u>Dilution</u>	<u>Usage/gal.</u>	<u>Tip</u>
472:1	8 ml	Pink
290:1	13 ml	Purple
86:1	44 ml	Yellow
63:1	60 ml	Brown
54:1	70 ml	Orange
50:1	75 ml	Green
42:1	90 ml	Tan
24:1	160 ml	Blue
20:1	190 ml	White
14:1	270 ml	Red
9:1	420 ml	Beige
6:1	640 ml	Black
5:1	700 ml	Gray



HP-19/5 Crystal Glaze

Table One

<u>Tip</u>	<u>Dilution</u>
Pink	345:1
Purple	158:1
Yellow	90:1
Brown	62:1
Green	47:1
Tan	32:1
Blue	21:1
Red	16:1
Beige	11:1
Black	7:1
Gray	6:1

Note 1: These suggested dilution ratios may vary due to water pressure and flow. It is advised to check your dispensing system flow to ensure proper usage of carwash chemicals.



TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Frictionless Detergent (HP-16)

DESCRIPTION: A truly unique, dilutable detergent concentrate specifically designed for use in today's new, high tech "touchless" car washes. It works well in tunnel applications as well as power washers, and now it's HYPER-CONCENTRATED.

BENEFITS: Easy To Use: This one-step product does it all. It functions through foamers, pre-soak arches, bumper blasters, and prep guns. No neutralizers are necessary.

Fast Acting: An optimum blend of foaming agents and safe alkaline cleaning agents cut through and loosen road film. It is solvent and phosphate free.

Safe: This new alkaline cleaning chemistry allows the removal of road soils safely from clear coat, conventional, and even repainted surfaces. It won't strip wax and it rinses clean without leaving a residue.

Unsurpassed Effectiveness: Field tests confirm that HYPER-CONCENTRATED Frictionless Detergent is unsurpassed for cleaning in "touchless" applications.

EcoLogo^M Certified: In order to promote the use of more environmentally responsible products and services, the Environmental Choice^M Program was established in 1988. The Environmental Choice^M Program is Canada's only national and comprehensive eco-labelling program. The EcoLogo^M is the recognized seal of approval of the Environmental Choice^M Program.

PACKAGING: A 5-gallon plastic bag and closure in a corrugated cardboard box with a clear poly shrink-wrap cover.

DILUTION: Direct Feed: Apply 1 to 2 ounces (29.5-59ml) of product per vehicle.

NOTE: Consult your local Turtle Wax distributor for complete information on the wide range of dilution options for this product. Actual dilution or chemical usage may vary based on desired results.

SPECIFICATIONS:

Appearance:	A thin red liquid
Fragrance:	None
pH:	13.0
Density:	10.26 lbs./gal.
Emulsifier:	Non-ionic
DOT Labeling:	Corrosive PG-III



FJ 9/25/01



TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Crystal Polymer Glaze (HP-19)

DESCRIPTION: A concentrated liquid polymer sealant glaze designed for use in automatic car wash equipment, and now it's HYPER-CONCENTRATED.

BENEFITS: **Effective:** Hydrophobic (water repellent) sealing agents are deposited on the car's surface to seal out water, weather, salt, and dirt and protect your car's finish.

Substantive Surfactants: This system of low foaming conditioning surfactants insures a smooth, even deposition of sealant.

Clear coat Safe: This product has been specifically designed for today's high-tech, finishes. It is also safe for older conventional paint finishes. It's safe for all car finishes.

Fresh Orange Fragrance: A uniquely fresh, creamy citrus orange fragrance helps signal the application of this unique protective system.

EcoLogo[™] Certified: In order to promote the use of more environmentally responsible products and services, the Environmental Choice[™] Program was established in 1988. The Environmental Choice[™] Program is Canada's only national and comprehensive eco-labelling program. The EcoLogo[™] is the recognized seal of approval of the Environmental Choice[™] Program.

NOTE: Apply Crystal Polymer Conditioner (HP-18) as a preliminary wax treatment.

PACKAGING: A 5-gallon plastic bag and closure in a corrugated cardboard box with a clear poly shrink-wrap cover.

DILUTION: Direct Feed: Dispense 1/8 to 1/4 ounce (approx. 3-7 ml) of concentrate per vehicle through a spray applicator.

NOTE: Consult your local Turtle Wax distributor for complete information on the wide range of dilution options for this product. Actual dilution or chemical usage may vary based on desired results.

SPECIFICATIONS:

Appearance:	A thin dark maroon liquid
Fragrance:	Orange
pH:	n/ap
Density:	7.18 Lbs./gal.
Emulsifier:	Cationic
DOT Labeling:	Flammable (PG-III)



FJ 9/26/01

TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE NEW & IMPROVED TRIPLE SHINE RED (HP-20), BLUE (HP-21), & GOLD (HP-22).

DESCRIPTION: Three high foaming spray conditioners in Red, Blue, and Gold for use in all automatic car wash foam arches that is HYPER-CONCENTRATED.

BENEFITS: Special Surfactants: A unique substantive surfactant is combined with special biodegradable foaming conditioners in a three color format to deposit a coating on the cars finish.

Triple Action Formula: This new formula contains a blend of special ingredients that allow for faster rinsing Flash Foam™ and increased tunnel speed, carnauba wax to help enhance the water resistance this formula provides to all vehicle finishes, and optical brighteners to enhance the brightness of the foam.

Clear Coat Safe: This product has been specifically designed for today's high-tech finishes. It also is effective on conventional and older finishes. It's universally safe for all finishes.

Color and Fragrance: Unique vibrant red, blue, and gold colors along with cherry fragrance will signal the application of this uniquely protective system.

NOTE: Application of HYPER-CONCENTRATE Sealer Wax (HP-10) must be used as a final sealant to prolong durability.

EcoLogo^M Certified: In order to promote the use of more environmentally responsible products and services, the Environmental Choice^M Program was established in 1988. The Environmental Choice^M Program is Canada's only national and comprehensive eco-labeling program. The EcoLogo^M is the recognized seal of approval of the Environmental Choice^M Program.

PACKAGING: A 5-gallon plastic bag and closure in a corrugated cardboard box with a clear poly shrink-wrap cover.

DILUTION: Direct Feed: Apply 1/4 ounce (approx. 5-8mls) of each colored product per vehicle through separate foam applicators.

NOTE: Consult your local Turtle Wax distributor for complete information on the wide range of dilution options for this product. Actual dilution or chemical usage may vary based on desired results.

SPECIFICATIONS:

Appearance:	A thin dark red (HP-20), dark blue (HP-21), or dark yellow (HP-22) liquid.
Fragrance:	Cherry
pH:	7.5 – 9.25
Density:	8.3 – 8.6 Lbs. /gal.
Emulsifier:	Cationic / Amphoteric
DOT Labeling:	None

FJ April 18, 2002



TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Super Foaming Sealer Wax (HP 73)

DESCRIPTION: A concentrated liquid foaming wax designed for self-serve car wash applications through high-pressure wands, and now it's HYPER-CONCENTRATED.

BENEFITS: Effective: Hydrophobic Agents (water repellents) plate out on the metal surfaces of the car to seal out water, weather, salt, and dirt and protect your car's finish.

Substantive Surfactants: A special blend of substantive surfactants and wax are blended with amphoteric and nonionic foamers that cause the waxes to bond stronger and last longer. These surfactants are all biodegradable.

Concentrated: One five-gallon FLEX-PAK of this new HYPER-CONCENTRATED formula seals up to 2500 cars.

Glass Protection: This product contains no silicone and is not substantive to glass. It won't smear on windows.

EcoLogo^M Certified: In order to promote the use of more environmentally responsible products and services, the Environmental Choice^M Program was established in 1988. The Environmental Choice^M Program is Canada's only national and comprehensive eco-labelling program. The EcoLogo^M is the recognized seal of approval of the Environmental Choice^M Program.

PACKAGING: A 5-gallon plastic bag and closure in a corrugated cardboard box with a clear poly shrink-wrap cover.

DILUTION: Dilute stock solution 1:472 to 1:378 and apply 60 ounces per cycle minute, or apply 4-7 ml (1/8 - 1/4 oz.) of Hyper-Concentrate per cycle minute.

NOTE: To achieve these dilution rates, a special double tip assembly will be required. Contact your local Turtle Wax Distributor for more details. Actual dilution or chemical usage may vary based on desired results.

SPECIFICATIONS:	Appearance:	Clear yellow thin liquid
	Fragrance:	Lemon citrus fragrance
	pH:	7.5
	Density:	7.84 Lbs./gal.
	Emulsifier:	Cationic/Nonionic/Amphoteric
	DOT Labeling:	Flammable (PG-III)



FJ 9/26/01

TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Foaming Whitewall Tire Cleaner (HP-78)

DESCRIPTION: A HYPER-CONCENTRATED foaming whitewall tire cleaner designed for use in high pressure frictionless washing systems.

BENEFITS: Fast Acting: This high sudsing formula quickly penetrates and lift tough soils.

Safe: Special chemicals protect all wheel finishes from attack by caustics.

Unique: It is the only whitewall tire cleaner made today that is designed to clean without friction that is HYPER-CONCENTRATED.

EcoLogo^M Certified: In order to promote the use of more environmentally responsible products and services, the Environmental Choice^M Program was established in 1988. The Environmental Choice^M Program is Canada's only national and comprehensive eco-labelling program. The EcoLogo^M is the recognized seal of approval of the Environmental Choice^M Program.

PACKAGING: A 5-gallon plastic bag and closure in a corrugated cardboard box with a clear poly shrink-wrap cover.

DILUTION: Dilute stock solution at 1:64 - 1:36 and apply direct, or apply 7 - 14 ml (1/4 - 1/2 oz.) Hyper-Concentrate per cycle minute.

SPECIFICATIONS:

Appearance:	A clear thin fluorescent green liquid
Fragrance:	Pine
pH:	13.5
Density:	9.38 Lbs./ gal.
Emulsifier:	Anionic
DOT Labeling:	Corrosive (PG-III)



FJ 9/26/01



TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Acid Pre-Soak Frictionless Detergent (HP-86)

DESCRIPTION: A truly unique, dilutable detergent concentrate specifically designed for use in today's new, high tech "touchless" car washes. It is specifically designed to work synergistically with Turtle Wax Frictionless Detergent (HP-16) to maximize the cleaning power and provide the ultimate frictionless cleaning system.

BENEFITS: Easy To Use: This product functions as the first step in a two step process which features the premier frictionless detergent (HP-16). Together, they go beyond current technology to provide the best frictionless cleaning system yet devised.

Fast Acting: An optimum blend of foaming agents and safe non-toxic and non-corrosive acids cut through and loosen stubborn road film. It is phosphate free.

Safe: This break-through technology of a new and effective acid is much safer to handle and use than any other conventional acid currently being used in the industry.

Hard Water Compatible: The cleaning agents are compatible with hard water minerals.

Unsurpassed Effectiveness: Field tests confirm that HYPER-CONCENTRATED Acid Pre-Soak Frictionless Detergent is unsurpassed for cleaning in two step "touchless" applications.

EcoLogo^M Certified: In order to promote the use of more environmentally responsible products and services, the Environmental Choice^M Program was established in 1988. The Environmental Choice^M Program is Canada's only national and comprehensive eco-labelling program. The EcoLogo^M is the recognized seal of approval of the Environmental Choice^M Program.

PACKAGING: A 5-gallon plastic bag and closure in a corrugated cardboard box with a clear poly shrink-wrap cover.

DILUTION: Direct Feed: Apply 1 to 2 ounces (29.5-59ml) of product per vehicle.

NOTE: Consult your local Turtle Wax distributor for complete information on the wide range of dilution options for this product. Actual dilution or chemical usage may vary based on desired results.

SPECIFICATIONS:	Appearance:	A thin reddish liquid
	Fragrance:	Citrus Lemon
	pH:	<1.0
	Density:	9.10 Lbs./ gal.
	Emulsifier:	Non-ionic
	DOT Labeling:	Non-Hazardous



CHEMICALS

FJ 9/26/01
turtle wax, inc.
5655 West 73rd St.
Chicago, Illinois 60638-6211



Material Safety Data Sheet

EMERGENCY SPILL PHONE: 1 (800) 424-9300 (CHEMTREC) **MSDS No: HP-16(C)**
EMERGENCY MEDICAL PHONE: Contact your local poison control center
PRODUCT INFORMATION PHONE: 1 (708) 563-3600

NFPA Hazard Ratings: Health 3, Flammability 1, Reactivity 0
HMIS Hazard Ratings: Health 3, Flammability 1, Reactivity 0, Protection D

Prepared By: Research and Development, Phone: 1 (708) 563-3600
Date Issued: September 20, 2001

1 - MATERIAL IDENTIFICATION

PRODUCT NAME: HYPER CONCENTRATE FRICTIONLESS DETERGENT, HP-16(C)

Chemical Family: Water solution: alkalies, detergents.
Material Use or Occurrence: Frictionless car wash soap.
Product Identification No.: UN(3266) Canada

2 - IMPORTANT INGREDIENTS

<u>CHEMICAL NAME</u> (Synonyms)	<u>CAS No.</u>	<u>PERCENT</u>	<u>PEL/TLV/TWA</u>		<u>CARCINOGEN</u> (OSHA,NPT,IARC)
			<u>OSHA</u>	<u>ACGIH</u>	
Tetrasodium ethylene-diamine tetraacetate (Na ₄ EDTA)	64-02-8	16-20%	None	None	No
Sodium Metasilicate pentahydrate (Metso Pentabead 20)	6834-92-0	5-8%	None	None	No

3 - CHEMICAL AND PHYSICAL PROPERTIES

Boiling Point: n/av Melting Point: n/av
Specific Gravity: 1.144 Vapor Pressure: n/av
Solubility In Water: complete Vapor Density (Air=1): n/av
Evaporation Rate: n/av % Non-volatile: 29.0%
Coefficient of Oil/Water Distribution: n/av pH: 13.0+
Appearance and Odor: Dark Red Liquid. Odor: Slightly acrid

4 - FIRE AND EXPLOSION DATA

Flash Point (Cl. Cup): >200°F (98°C) Explosive Limits: Lower: n/ av Upper: n/ av
Extinguishing Media: Water, carbon dioxide, foams, dry chemical
Special Fire Fighting Procedures and Hazards: Protect personnel from corrosive alkaline solution, even when diluted. Avoid flow of contaminated fire waters to storm sewers.

5 - REACTIVITY INFORMATION

Stable: X Unstable: Precautions: None
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: Strong acids cause heat and possible spattering.
Hazardous Decomposition Product: If dried and burned: CO₂, CO, NO_x, SO₂, Hydrocarbons.

1-2816-64-8



Turtle Wax, Inc. **MSDS No. HP-16(C) –September 20, 2001**

6 - HEALTH HAZARDS - PROTECTIVE MEASURES - FIRST AID

Inhalation:

Mist or spray of concentrated product can cause corrosive damage to nose, throat, and lungs. No chronic effects known.

Respiratory - as required to prevent inhalation of concentrated product if misted.

Remove to fresh air. Use artificial respiration and oxygen if needed.

Skin:

Corrosive. Concentrated product can cause skin burns, and effects may be delayed. No chronic effects known.

Wear alkali resistant gloves, boots, clothing, and/or head covering as needed to prevent exposure to concentrated product.

Immediately remove contaminated clothing. Immediately wash affected areas thoroughly with soap and water. Wash contaminated clothes separately from other clothes and avoid contact with wash water. Discard any footwear that cannot be decontaminated.

Eyes:

Causes eye burns and potential blindness. No chronic effects known.

Wear splash proof goggles.

Flush with water for 15 minutes. Get prompt medical attention.

Ingestion:

Can cause burns in mouth, throat, and stomach. No chronic effects known.

Avoid swallowing. Wear face shield if face contact with concentrated product is possible.

Rinse mouth. Do not induce vomiting. If conscious, drink large amounts of water and milk, followed by citrus juice or dilute vinegar. Get prompt medical attention.

IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS PERSIST.

KEEP OUT OF REACH OF CHILDREN.

Most likely routes of entry: Skin, Eyes

7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Avoid contact of concentrated product with skin and eyes. If material is neutralized with dilute acid, flush down sewer. Otherwise, take up small spills with absorbent; dike around large spills and pump liquid to recovery containers. Avoid flow of un-neutralized material into storm sewers. Floors may be slippery. See Section 6 for other protective measures.

Storage and Handling: Use good housekeeping practices in storage. Store in a clean dry place. Keep containers closed. Keep from Freezing.

Waste Disposal: In accordance with applicable local, state, and federal regulations. Is a RCRA hazardous waste (D002-Corrosive)

Empty Containers: Rinse thoroughly before handling, reuse, disposal, or recycling. Handle wash water as described above under "Spills and Leaks".

8 - REGULATORY INFORMATION

DOT (HM-181) USA & Int'l:

Class and Label - 8, Corrosive

Shipping Name - Corrosive Liquid, Basic, Inorganic, n.o.s.,
(Sodium Metasilicate), 8, UN3266, PGIII.

For inner containers of 38.4 oz. or less each, not shipped by air, and for USA only:

Class and Label: None

Shipping description: None required (May use "Limited Quantity").

SARA Title III: Reportable for Section 313 (Form R): None

TSCA INVENTORY: All ingredients are commercially available and presumed to be listed by manufacturer.

CALIFORNIA PROP. 65: No listed substances are known to be present.

NEW JERSEY LABEL INGREDIENTS: Water (CAS # 7732-18-5), Tetrasodium ethylenediaminetetraacetate (CAS # 64-02-8), Sodium Metasilicate (CAS # 6834-92-0), Linear Primary Alcohol Ethoxylate (CAS # 68439-46-3), Primary alkane sulfonate (CAS # 5324-84-5).

CANADA EPA DSL INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

EEC SIXTH AMENDMENT INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

The information contained here in has been compiled from sources believed to be reliable and is accurate to the best of our knowledge at this date. It is provided without warranty, expressed or implied, as to the results of use of this information or to the product to which it



CHEMICALS

relates. Recipient assumes all responsibility for the use of this information and the use, storage, or disposal of the product, including any resultant personal injury or property damage.

turtle wax, inc.
5655 West 73rd St.
Chicago, Illinois 60638-6211



Material Safety Data Sheet

EMERGENCY SPILL PHONE: 1 (800) 424-9300 (CHEMTREC) MSDS No: HP-20(C)
EMERGENCY MEDICAL PHONE: Contact Your Local Poison Control Center
PRODUCT INFORMATION PHONE: 1 (708) 563-3600

NFPA Hazard Ratings: Health 0, Flammability 1, Reactivity 0
HMIS Hazard Ratings: Health 1, Flammability 1, Reactivity 0, Protection B

Prepared By: Research and Development, Phone: 1 (708) 563-3600
Date Issued: April 18, 2002

1 - MATERIAL IDENTIFICATION

PRODUCT NAME: TRIPLE SHINE (RED), HP-20(C)

Chemical Family: Solvent Solution, Solvent, Surfactant, Additives

Material Use or Occurrence: Foaming Auto Wax

2 - IMPORTANT INGREDIENTS

CHEMICAL NAME (Synonyms)	CAS No.	PERCENT	PEL/TLV/TWA		CARCINOGEN (OSHA,NPT,IARC)
			OSHA	ACGIH	
Ethylene Glycol Butyl Ether ppm (Butyl Cellosolve) No		111-76-2	5-8%	25 ppm	25
Isopropyl Alcohol (Isopropanol)	67-63-0	0.5-2%	(Skin) 400 ppm	(Skin) 400 ppm	No

3 - CHEMICAL AND PHYSICAL PROPERTIES

Boiling Point: n/av
Specific Gravity: 1.012
Solubility In Water: Complete
Evaporation Rate: n/av
Coefficient of Oil/Water Distribution: n/av
Appearance and Odor: Dark Red Liquid, Odor: Typical.

Melting Point: n/av
Vapor Pressure: n/av
Vapor Density (Air=1) n/av
% Non-volatile: 27%
pH: 8.0

4 - FIRE AND EXPLOSION DATA

Flash Point(Seta Flash Cl. Cup): > 200°F, (93°C) Explosive Limits: Lower:n/av Upper:n/av
Extinguishing Media: Water Spray, Alcohol Foam, Carbon Dioxide, Dry Chemical
Special Fire Fighting Procedures and Hazards: Treat as combustible fluid. Avoid flow to sewers.

5 - REACTIVITY INFORMATION

Stable: X Unstable:
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: None Known
Hazardous Decomposition Product: CO₂, CO, NO_x, HCl, Hydrocarbons.



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1-2820-64-7

Turtle Wax MSDS No. HP-20(C) –April 18, 2002

6 - HEALTH HAZARDS - PROTECTIVE MEASURES - FIRST AID

Inhalation:

Repeated or excessive inhalation of vapor, mist, or spray of concentrated product can cause irritation, **chemical pneumonia, dizziness, and nausea. No chronic effects known.**

Respiratory - as required to prevent inhalation of concentrated product if misted.

Remove to fresh air. Use artificial respiration and oxygen if needed.

Skin:

Repeated or excessive contact with concentrated product can cause blisters or rash due to defatting action. No chronic effects known.

Wear oil resistant gloves, boots, clothing, and/or head covering as needed to prevent exposure to concentrated product.

Remove contaminated clothing. Wash effected area thoroughly with soap and water.

Eyes:

Causes irritation. No chronic effects known.

Wear splash proof goggles.

Flush with water for 15 minutes. Get prompt medical attention.

Ingestion:

Can cause digestive system upset and irritation, nausea. No chronic effects known.

Avoid swallowing. Wear face shield if face contact with concentrated product is likely.

Rinse mouth. Do not induce vomiting. Drink large amounts of water. Get prompt medical attention.

**IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS PERSIST.
KEEP OUT OF REACH OF CHILDREN.**

Most likely routs of entry: Skin, Eyes

7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Remove all ignition sources. Take up small spills with absorbent, and put in closed containers. Dike around large spills and pump to recovery container. Avoid flow to storm sewers. Floors may be slippery. See Sec. 6 for other protective measures.

Storage and Handling:

Use good housekeeping practices in storage. Store in a clean dry place. Keep containers closed. Keep from Freezing.

Waste Disposal: In accordance with applicable local, state, and federal regulations. This is not a RCRA hazardous waste as of this date.

Empty Containers: Rinse thoroughly before handling, reuse, disposal, or recycling.

8 - REGULATORY INFORMATION

DOT (HM-181) USA: Not regulated as a hazardous material.

[Int'l. (IMDG)] Not regulated as a hazardous material.

SARA, Title III: Reportable for Section 313(Form R): Glycol Ether (Butyl Cellosolve), (10-15%)

TSCA INVENTORY: All ingredients are commercially available and presumed to be listed by manufacturer.

CALIFORNIA PROP. 65: No listed substances are known to be present.

NEW JERSEY LABEL INGREDIENTS: Cocoamidopropyl betaine (CAS# 61789-40-0), Amine oxide (CAS# 1643-20-5), Water (CAS # 7732-18-5), Ethylene Glycol Butyl Ether (CAS # 111-76-2), Dialkyl-Dimethyl Ammonium Chloride (CAS # 73398-64-8), Isopropyl Alcohol (CAS # 63-67-0), Ethoxylated Amines (CAS # 68155-39-5), Alkanolamide (CAS # 68603-42-9), Montan Wax (CAS # 8002-53-7), Carnauba Wax (CAS # 8015-86-9).

CANADA EPA DSL INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

EEC SIXTH AMENDMENT INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

_____The information contained here in has been compiled from sources believed to be reliable and is accurate to the best of our



CHEMICALS

knowledge at this date. It is provided without warranty, expressed or implied, as to the results of use of this information or to the product to which it relates. Recipient assumes all responsibility for the use of this information and the use, storage, or disposal of the product, including any resultant personal injury or property damage.

Turtle Wax

5655 West 73rd St.

Chicago, Illinois 60638-6211



Material Safety Data Sheet

EMERGENCY SPILL PHONE: 1 (800) 424-9300 (CHEMTREC) MSDS No: HP-21(C)
EMERGENCY MEDICAL PHONE: Contact your local poison control center
PRODUCT INFORMATION PHONE: 1 (708) 563-3600

NFPA Hazard Ratings: Health 0, Flammability 1, Reactivity 0
HMIS Hazard Ratings: Health 1, Flammability 1, Reactivity 0, Protection B

Prepared By: Research and Development, Phone: 1 (708) 563-3600
Date Issued: April 18, 2002

1 - MATERIAL IDENTIFICATION

PRODUCT NAME: TRIPLE SHINE (BLUE), HP-21(C)

Chemical Family: Solvent Solution, Solvent, Surfactant, Additives

Material Use or Occurrence: Foaming Auto Wax

2 - IMPORTANT INGREDIENTS

<u>CHEMICAL NAME</u> (Synonyms)	<u>CAS No.</u>	<u>PERCENT</u>	<u>PEL/TLV/TWA</u>		<u>CARCINOGEN</u> (OSHA,NPT,IARC)
			<u>OSHA</u>	<u>ACGIH</u>	
Ethylene Glycol Butyl Ether (Butyl Cellosolve)	111-76-2	5-8%	25 ppm (Skin)	25 ppm (Skin)	No
Isopropyl Alcohol (Isopropanol)	67-63-0	0.5-2%	400 ppm	400 ppm	No

3 - CHEMICAL AND PHYSICAL PROPERTIES

Boiling Point: n/av Melting Point: n/av
Specific Gravity: 1.008 g/cc Vapor Pressure: n/av
Solubility In Water: Complete Vapor Density (Air=1) n/av
Evaporation Rate: n/av % Non-volatile: 27%
Coefficient of Oil/Water Distribution: n/av pH: 8.0
Appearance and Odor: Dark Blue Liquid, Odor: Typical.

4 - FIRE AND EXPLOSION DATA

Flash Point (Seta Flash Cl. Cup): >200°F, (93°C) Explosive Limits: Lower: n/ av Upper: n/ av
Extinguishing Media: Water Spray, Alcohol Foam, Carbon Dioxide, Dry Chemical
Special Fire Fighting Procedures and Hazards: Treat as combustible fluid. Avoid flow to storm sewers.

5 - REACTIVITY INFORMATION

Stable: X Unstable: Precautions: None
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: None Known
Hazardous Decomposition Product: CO₂, CO, NO_x, HCl, Hydrocarbons.

1-2821-64-7



CHEMICALS

Turtle Wax, Inc. MSDS No. HP-21(C) –April 18, 2002

6 - HEALTH HAZARDS - PROTECTIVE MEASURES - FIRST AID

Inhalation:

Repeated or excessive inhalation of vapor, mist, or spray of concentrated product can cause irritation, chemical pneumonia, dizziness, and nausea. No chronic effects known.

Respiratory - as required to prevent inhalation of concentrated product if misted.

Remove to fresh air. Use artificial respiration and oxygen if needed.

Skin:

Repeated or excessive contact with concentrated product can cause blisters or rash due to defatting action. No chronic effects known.

Wear oil resistant gloves, boots, clothing, and/or head covering as needed to prevent exposure to concentrated product.

Remove contaminated clothing. Wash effected area thoroughly with soap and water.

Eyes:

Causes irritation. No chronic effects known.

Wear splash proof goggles.

Flush with water for 15 minutes. Get prompt medical attention.

Ingestion:

Can cause digestive system upset and irritation, nausea. No chronic effects known.

Avoid swallowing. Wear face shield if face contact with concentrated product is likely.

Rinse mouth. Do not induce vomiting. Drink large amounts of water. Get prompt medical attention.

**IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS PERSIST.
KEEP OUT OF REACH OF CHILDREN.**

Most likely routes of entry: Skin, Eyes

7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Remove all ignition sources. Take up small spills with absorbent, and put in closed containers. Dike around large spills and pump to recovery container. Avoid flow to storm sewers. Floors may be slippery. See Sec. 6 for other protective measures.

Storage and Handling:

Use good housekeeping practices in storage. Store in a clean dry place. Keep containers closed. Keep from Freezing.

Waste Disposal: In accordance with applicable local, state, and federal regulations. This is not a RCRA hazardous waste as of this date.

Empty Containers: Rinse thoroughly before handling, reuse, disposal, or recycling.

8 - REGULATORY INFORMATION

DOT (HM-181) USA: Not regulated as a hazardous material.
[Int'l. (IMDG)] Not regulated as a hazardous material.

SARA, Title III: Reportable for Section 313(Form R): Glycol Ether (Butyl Cellosolve), (10-15%)

TSCA INVENTORY: All ingredients are commercially available and presumed to be listed by manufacturer.

CALIFORNIA PROP. 65: No listed substances are known to be present.

NEW JERSEY LABEL INGREDIENTS: Cocoamidopropyl betaine (CAS# 61789-40-0), Amine oxide (CAS# 1643-20-5), Water (CAS # 7732-18-5), Ethylene Glycol Butyl Ether (CAS # 111-76-2), Dialkyl-Dimethyl Ammonium Chloride (CAS # 73398-64-8), Isopropyl Alcohol (CAS # 63-67-0), Ethoxylated Amines (CAS # 68155-39-5), Alkanolamide (CAS # 68603-42-9), Montan Wax (CAS # 8002-53-7), Carnauba Wax (CAS # 8015-86-9) .

CANADA EPA DSL INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

EEC SIXTH AMENDMENT INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients. The information contained here in has been compiled from sources believed to be reliable and is accurate to the best of our knowledge at this date. It is provided without warranty, expressed or implied, as to the results of use of this information or to the product to which it relates. Recipient assumes all responsibility for the use of this information and the use, storage, or disposal of the product, including any resultant personal injury or property damage.



CHEMICALS

Turtle Wax
5655 West 73rd St.



Chicago, Illinois 60638-6211

Material Safety Data Sheet

EMERGENCY SPILL PHONE: 1 (800) 424-9300 (CHEMTREC) MSDS No: HP-22(C)

EMERGENCY MEDICAL PHONE: Contact your local poison control center

PRODUCT INFORMATION PHONE: 1 (708) 563-3600

NFPA Hazard Ratings: Health 0, Flammability 1, Reactivity 0
HMIS Hazard Ratings: Health 1, Flammability 1, Reactivity 0, Protection B

Prepared By: Research and Development, Phone: 1 (708) 563-3600
Date Issued: April 18, 2002

1 - MATERIAL IDENTIFICATION

PRODUCT NAME: TRIPLE SHINE (GOLD), HP-22(C)

Chemical Family: Solvent Solution, Solvent, Surfactant, Additives

Material Use or Occurrence: Foaming Auto Wax

2 - IMPORTANT INGREDIENTS

CHEMICAL NAME (Synonyms)	CAS No.	PERCENT	PEL/TLV/TWA		CARCINOGEN (OSHA,NPT,IARC)
			OSHA	ACGIH	
Ethylene Glycol Butyl Ether (Butyl Cellosolve)	111-76-2	5-8%	25 ppm (Skin)	25 ppm (Skin)	No
Isopropyl Alcohol (Isopropanol)	67-63-0	0.5-2%	400 ppm	400 ppm	No

3 - CHEMICAL AND PHYSICAL PROPERTIES

Boiling Point: n/av
Specific Gravity: 1.010 g/cc
Solubility In Water: Complete
Evaporation Rate: n/av
Coefficient of Oil/Water Distribution: n/av
Appearance and Odor: Dark Yellow Liquid, Odor: Typical.

Melting Point: n/av
Vapor Pressure: n/av
Vapor Density (Air=1) n/av
% Non-volatile: 32%
pH: 8.75

4 - FIRE AND EXPLOSION DATA

Flash Point (Seta Flash Cl. Cup): > 200°F, (93°C) Explosive Limits: Lower: n/ av Upper: n/ av
Extinguishing Media: Water Spray, Alcohol Foam, Carbon Dioxide, Dry Chemical
Special Fire Fighting Procedures and Hazards: Treat as combustible fluid. Avoid flow to storm sewers.

5 - REACTIVITY INFORMATION

Stable: X Unstable:
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: None Known
Hazardous Decomposition Product: CO₂, CO, NO_x, HCl, Hydrocarbons.

1-2822-64-7.



CHEMICALS

Turtle Wax, Inc. **MSDS No. HP-22(C) – April 18, 2002**

6 - HEALTH HAZARDS - PROTECTIVE MEASURES - FIRST AID

Inhalation:

Repeated or excessive inhalation of vapor, mist, or spray of concentrated product can cause irritation, chemical pneumonia, dizziness, and nausea. No chronic effects known.

Respiratory - as required to prevent inhalation of concentrated product if misted.

Remove to fresh air. Use artificial respiration and oxygen if needed.

Skin:

Repeated or excessive contact with concentrated product can cause blisters or rash due to defatting action. No chronic effects known.

Wear oil resistant gloves, boots, clothing, and/or head covering as needed to prevent exposure to concentrated product.

Remove contaminated clothing. Wash effected area thoroughly with soap and water.

Eyes:

Causes irritation. No chronic effects known.

Wear splash proof goggles.

Flush with water for 15 minutes. Get prompt medical attention.

Ingestion:

Can cause digestive system upset and irritation, nausea. No chronic effects known.

Avoid swallowing. Wear face shield if face contact with concentrated product is likely.

Rinse mouth. Do not induce vomiting. Drink large amounts of water. Get prompt medical attention.

**IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS PERSIST.
KEEP OUT OF REACH OF CHILDREN.**

Most likely routes of entry: Skin, Eyes

7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Remove all ignition sources. Take up small spills with absorbent, and put in closed containers. Dike around large spills and pump to recovery container. Avoid flow to storm sewers. Floors may be slippery. See Sec. 6 for other protective measures.

Storage and Handling: Use good housekeeping practices in storage. Store in a clean dry place. Keep containers closed. Keep from Freezing.

Waste Disposal: In accordance with applicable local, state, and federal regulations. This is not a RCRA hazardous waste as of this date.

Empty Containers: Rinse thoroughly before handling, reuse, disposal, or recycling.

8 - REGULATORY INFORMATION

DOT (HM-181) USA: Not regulated as a hazardous material.

[Int'l. (IMDG)]: Not regulated as a hazardous material.

SARA, Title III: Reportable for Section 313(Form R): Glycol Ether (Butyl Cellosolve),(10-15%)

TSCA INVENTORY: All ingredients are commercially available and presumed to be listed by manufacturer.

CALIFORNIA PROP. 65: No listed substances are known to be present.

NEW JERSEY LABEL INGREDIENTS: Cocoamidopropyl betaine (CAS# 61789-40-0), Amine oxide (CAS# 1643-20-5), Water (CAS # 7732-18-5), Ethylene Glycol Butyl Ether (CAS # 111-76-2), Dialkyl-Dimethyl Ammonium Chloride (CAS # 73398-64-8), Isopropyl Alcohol (CAS # 63-67-0), Ethoxylated Amines (CAS # 68155-39-5), Alkanolamide (CAS # 68603-42-9), Montan Wax (CAS # 8002-53-7), Carnauba Wax (CAS # 8015-86-9).

CANADA EPA DSL INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

EEC SIXTH AMENDMENT INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

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CHEMICALS

turtle wax, inc.
5655 West 73rd St.
Chicago, Illinois 60638-6211



Material Safety Data Sheet

EMERGENCY SPILL PHONE: 1 (800) 424-9300 (CHEMTREC) **MSDS No: HP-73(C)**
EMERGENCY MEDICAL PHONE: Contact Your Local Poison Control Center
PRODUCT INFORMATION PHONE: 1 (708) 563-3600

NFPA Hazard Ratings: Health 0, Flammability 2, Reactivity 0
HMIS Hazard Ratings: Health 1, Flammability 2, Reactivity 0, Protection B

Prepared By: Research and Development, Phone: 1 (708) 563-3600
Date Issued: October 3, 2001

1 - MATERIAL IDENTIFICATION

PRODUCT NAME: HYPER-CONCENTRATE FOAMING SEALER WAX , HP-73(C)
Chemical Family: Solvent Solution, Solvent, Surfactant, Additives
Material Use or Occurrence: Auto Wax Sealant

2 - IMPORTANT INGREDIENTS

<u>CHEMICAL NAME</u> (Synonyms)	<u>CAS No.</u>	<u>PERCENT</u>	<u>PEL/TLV/TWA</u>		<u>CARCINOGEN</u> (OSHA,NPT,IARC)
			<u>OSHA</u>	<u>ACGIH</u>	
Ethylene Glycol Butyl Ether (Butyl Cellosolve)	111-76-2	8-12%	25 ppm (Skin)	25 ppm (Skin)	No
Petroleum Distillates (Mineral Seal Oil)	64741-44-2	10-15%	5 mg/M ³ (Mist)	5 mg/M ³ (Mist)	No

3 - CHEMICAL AND PHYSICAL PROPERTIES

Boiling Point: n/av	Melting Point: n/av
Specific Gravity: 0.950	Vapor Pressure: n/av
Solubility In Water: Complete	Vapor Density (Air=1) n/av
Evaporation Rate: n/av	% Non-volatile: 36%
Coefficient of Oil/Water Distribution: n/av	pH: 7.5
Appearance and Odor: Yellow Liquid. Odor: Citrus	

4 - FIRE AND EXPLOSION DATA

Flash Point (Cl. Cup): > 200°F, (93°C) Explosive Limits: Lower: n/av Upper: n/av
Extinguishing Media: Water Spray, Alcohol Foam, Carbon Dioxide, Dry Chemical
Special Fire Fighting Procedures and Hazards: Treat as combustible fluid. Avoid flow to storm sewers.

5 - REACTIVITY INFORMATION

Stable: X Unstable: Precautions: None
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: None Known
Hazardous Decomposition Product: CO₂, CO, NO_x, HCl, Hydrocarbons.

1-2873-64-6



CHEMICALS

Turtle Wax, Inc. **MSDS No. HP-73(C) – October 3, 2001**

6 - HEALTH HAZARDS - PROTECTIVE MEASURES - FIRST AID

Inhalation:

Repeated or excessive inhalation of vapor, mist, or spray of concentrated product can cause irritation, chemical pneumonia, dizziness, and nausea. No chronic effects known.

Respiratory - as required to prevent inhalation of concentrated product if misted.

Remove to fresh air. Use artificial respiration and oxygen if needed.

Skin:

Repeated or excessive contact with concentrated product can cause blisters or rash due to defatting action. No chronic effects known.

Wear oil resistant gloves, boots, clothing, and/or head covering as needed to prevent exposure to concentrated product.

Remove contaminated clothing. Wash effected area thoroughly with soap and water.

Eyes:

Causes irritation. No chronic effects known.

Wear splash proof goggles.

Flush with water for 15 minutes. Get prompt medical attention.

Ingestion:

Can cause digestive system upset and irritation, nausea. May aggravate pre-existing liver and kidney condition. No chronic effects known.

Avoid swallowing. Wear face shield if face contact with concentrated product is likely.

Rinse mouth. Do not induce vomiting. Drink large amounts of water. Get prompt medical attention.

**IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS PERSIST.
KEEP OUT OF REACH OF CHILDREN.**

Most likely routes of entry: Skin, Eyes

7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Remove all ignition sources. Take up small spills with absorbent, and put in closed containers. Dike around large spills and pump to recovery container. Avoid flow to storm sewers. Floors may be slippery. See Sec. 6 for other protective measures.

Storage and Handling: Use good housekeeping practices in storage. Store in a clean dry place. Keep containers closed. Keep from Freezing.

Waste Disposal: In accordance with applicable local, state, and federal regulations. This is not a RCRA hazardous waste.

Empty Containers: Rinse thoroughly before handling, reuse, disposal, or recycling.

8 - REGULATORY INFORMATION

DOT (HM-181) USA & Int'l: None

Shipping Name: None (Non-hazardous)

SARA, Title III: Reportable for Section 313(Form R): Glycol Ether (Butyl Cellosolve),(10-15%)

TSCA INVENTORY: All ingredients are commercially available and presumed to be listed by manufacturer.

CALIFORNIA PROP. 65: No listed substances are known to be present.

NEW JERSEY LABEL INGREDIENTS: Dialkyl-dimethyl ammonium chloride (CAS # 73398-64-8), Petroleum Distillate (CAS# 64741-44-2), Ethylene Glycol Butyl Ether (CAS # 111-76-2), Cocoamidopropyl betaine (CAS# 61789-40-0), Amine oxide (CAS# 1643-20-5), Propylene Glycol (CAS # 57-55-6).

CANADA EPA DSL INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

EEC SIXTH AMENDMENT INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

The information contained here in has been compiled from sources believed to be reliable and is accurate to the best of our knowledge at this date. It is provided without warranty, expressed or implied, as to the results of use of this information or to the product to which it relates. Recipient assumes all responsibility for the use of this information and the use, storage, or disposal of the product, including any resultant personal injury or property damage.



CHEMICALS

turtle wax, inc.
5655 West 73rd St.
Chicago, Illinois 60638-6211



Material Safety Data Sheet

EMERGENCY SPILL PHONE: 1 (800) 424-9300 (CHEMTREC) MSDS No: HP-86(C)
EMERGENCY MEDICAL PHONE: Contact your local poison control center
PRODUCT INFORMATION PHONE: 1 (708) 563-3600

NFPA Hazard Ratings: Health 3, Flammability 2, Reactivity 0
HMIS Hazard Ratings: Health 3, Flammability 2, Reactivity 0, Protection D

Prepared By: Research and Development, Phone: 1 (708) 563-3600
Date Issued: September 20, 2001

1 - MATERIAL IDENTIFICATION

PRODUCT NAME: CITRUS-PREP™ CITRUS PRE-SOAK, HP-86/5(C)

Chemical Family: Water solution: organic acid salts, detergents, solvent

Material Use or Occurrence: Automotive Pre-Soak.

Product Identification No.: None (Canada)

2 - IMPORTANT INGREDIENTS

<u>CHEMICAL NAME</u> (Synonyms)	<u>CAS No.</u>	<u>PERCENT</u> <u>OSHA</u>	<u>PEL/TLV/TWA</u> <u>ACGIH</u>	<u>CARCINOGEN</u> (OSHA,NPT,IARC)	
Organic Acid Salt (Proprietary)	n/av	12-15%	n/ av	n/ av	No
Ethylene Glycol Butyl Ether (2-Butoxyethanol)	111-76-2	5-8%	25ppm(Skin)	25ppm(Skin)	No

3 - CHEMICAL AND PHYSICAL PROPERTIES

Boiling Point: n/av
Specific Gravity: 1.093
Solubility In Water: Complete
Evaporation Rate: n/av
Coefficient of Oil/Water Distribution: n/av
Appearance and Odor: Dark Orange Water Thin Liquid. Odor: Typical citrus.

Melting Point: n/av
Vapor Pressure: n/av
Vapor Density (Air=1): n/av
% Non-volatile: 25%
pH: 1.0

4 - FIRE AND EXPLOSION DATA

Flash Point (Cl. Cup): >200°F (93°C) Explosive Limits: Lower: n/ av Upper: n/ av
Extinguishing Media: Water, carbon dioxide, foams, dry chemical
Special Fire Fighting Procedures and Hazards: Protect personnel from corrosive acid solution, even when diluted. Avoid flow of contaminated fire waters to storm sewers.

5 - REACTIVITY INFORMATION

Stable: X Unstable:
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: Strong alkalis cause heat and possible spattering.
Hazardous Decomposition Product: If burned: CO₂, CO, and Hydrocarbons. Avoid contact with chlorates, hypochlorites, and nitrates.

1-2886-64-4



Turtle Wax, Inc. MSDS No. HP-86/5(C) – September 20, 2001

6 - HEALTH HAZARDS - PROTECTIVE MEASURES - FIRST AID

Inhalation:

Mist or spray of concentrated product can cause corrosive damage to nose, throat, and lungs. No chronic effects known.

Respiratory - as required to prevent inhalation of concentrated product if misted.

Remove to fresh air. Use artificial respiration and oxygen if needed.

Skin:

Caution. Concentrated product causes skin irritation and burns with prolonged exposure. No chronic effects known.

Wear acid resistant gloves, boots, clothing, and/or head covering as needed to prevent exposure to concentrated product.

Immediately remove contaminated clothing. Immediately wash affected areas thoroughly with soap and water. Wash contaminated clothes separately from other clothes and avoid contact with wash water.

Discard any footwear that cannot be decontaminated.

Eyes:

Causes eye irritation. No chronic effects known.

Wear splash proof goggles.

Flush with water for 15 minutes. Get prompt medical attention.

Ingestion:

Can cause burns in mouth, throat. No chronic effects known.

Avoid swallowing. Wear face shield if face contact with concentrated product is possible.

Rinse mouth. Do not induce vomiting. If conscious, drink large amounts of water and milk. Get prompt medical attention.

IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS PERSIST.
KEEP OUT OF REACH OF CHILDREN.

Most likely routes of entry: Skin, Eyes

7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Avoid contact with skin and eyes. If material is neutralized with dilute lime, flush down sewer. Otherwise, take up small spills with absorbent; dike around large spills and pump liquid to recovery containers. Avoid flow of un-neutralized material into storm sewers. Floors may be slippery. See Section 6 for other protective measures.

Storage and Handling: Use good housekeeping practices in storage. Store in a clean dry place. Keep containers closed. Keep from Freezing.

Waste Disposal: In accordance with applicable local, state, and federal regulations. Is a RCRA hazardous waste (D002-Corrosive).

Empty Containers: Rinse thoroughly before handling, reuse, disposal, or recycling.

8 - REGULATORY INFORMATION

DOT (HM-181) USA & Int'l:

Not regulated as a hazardous material.

SARA, Title III: Reportable for Section 313(Form R): Glycol Ethers(2-Butoxyethanol)(3-5%).

TSCA INVENTORY: All ingredients are commercially available and presumed to be listed by manufacturer.

CALIFORNIA PROP. 65: No listed substances are known to be present.

NEW JERSEY LABEL INGREDIENTS: Water (CAS # 7732-18-5), Organic acid salt (CAS # Proprietary),

Ethylene Glycol Butyl Ether (CAS # 111-76-2), Nonylphenoxy (ethyleneoxy) ethanol (CAS # 9016-45-9),

Sodium Citrate (CAS # 68-04-2), Sodium Xylene Sulfonate (CAS # 1300-72-7).

CANADA EPA DSL INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

EEC SIXTH AMENDMENT INVENTORY: Consult Turtle Wax, Inc. regarding status of ingredients.

The information contained here in has been compiled from sources believed to be reliable and is accurate to the best of our knowledge at this date. It is provided without warranty, expressed or implied, as to the results of use of this information or to the product to which it relates. Recipient assumes all responsibility for the use of this information and the use, storage, or disposal of the product, including any resultant personal injury or property damage.

LIMITED WARRANTY

The Manufacturer warrants any component or part of the Jim Coleman Company Car Wash equipment to be free from defects in material and workmanship for a period of one year from date of shipment, with the exception of such parts as are commonly recognized to be subject to wear in normal usage, such as high pressure hoses, swivels, nozzles, safety shut off guns, etc., which are warranted for ninety (90) days. All electrical parts not manufactured by Jim Coleman Company are warranted to be free from defects in material and workmanship for a period of 90 days. Electrical motors shall be covered under manufacturer's warranty for a period of one year, unless otherwise specified. Jim Coleman Company electronic controls, such as timers, coin acceptors and computer monitoring equipment, carry a one-year warranty. Claims under this warranty must be asserted in writing within the one-year period covered by this warranty.

Any component or part alleged to be defective in material or workmanship shall, at option of Manufacturer, be returned with shipping cost prepaid. If, upon examination, such component or part is found to be defective in workmanship or materials, Manufacturer, at its option, will either repair or replace such component or part, and shall ship such repaired or replaced component or parts F.O.B. factory, Houston, Texas. Manufacturer reserves the right to use "Like New" or Remanufactured parts in repair of warranty items that exceed 6 months in service. The cost of such replacement or repair shall be the exclusive remedy for any breach of any warranty and Manufacturer shall not be liable to any person for consequential damages for injury or commercial loss resulting from any breach of any warranty. This warrant does not cover any labor installation cost, either with respect to the original equipment, the repaired or replaced component, or part defective in workmanship or materials. Jim Coleman Company does not warrant loss of income should there be any during such time repairs are being made. Jim Coleman Company shall not be responsible for vehicle damage or repairs as may arise during normal wash cycle operation. Operator acknowledges accepted risks involved with friction in-bay automatic washes.

This warranty does not apply to components or parts which have been misused, altered, neglected, not installed, adjusted, maintained, or used in accordance with applicable codes and ordinances and in accordance with Manufacturer's recommendations as to such factors.

THIS WARRANTY IS IN LIEU OF ALL WARRANTIES, EXPRESS OR IMPLIED, OF EITHER MANUFACTURER OR SELLER, AND MANUFACTURER MAKES NO WARRANTY AGAINST INFRINGEMENT OF THE LIKE, MAKES NO WARRANTY OF MERCHANTABILITY, MAKES NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTY ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

This warranty does not apply to damage resulting from improper operation or abuse, exceeding the rated capacities of the unit, running foreign particles or non related solutions through pumps or valves, using acidic solutions, improper installation or maintenance, operational neglect, neglect of manufacturers recommended maintenance, use of water containing solids in excess of twenty microns in diameter or 2000 PPM, damage caused by customer, unjustifiable nuisance calls, or acts of God.

Compliance with any local governmental laws or regulations relating to the location, use or operation of the equipment, or its use in conjunction with other equipment, shall be the responsibility of the purchaser. The rights and obligations of the parties shall be governed by the State of Texas.



JIM COLEMAN COMPANY

World Class Manufacturing in Car Wash Equipment

SERVICE BULLETIN #8

Date: July 25, 2001
To: Jim Coleman Company Distributors
Subject: Water Wizard Touchless Automatic

Problem: Transferring program on a phone line or with no phone available

Solution: Easier to upgrade programs in field.

There is a new device available to download programs to the Omron computers we use on the Water Wizards. This new Device is called a CPM1-EMU Program Transfer Unit. It is an inexpensive unit that allows the service man in the field to upgrade the program on the Water Wizard in less than 1 minute. No phone line is required with this new program transfer unit. This will allow the service man to upgrade a location at his convenience without calling the factory. You will need to purchase the program transfer unit and a memory chip to upgrade at a location. The memory chips can be re used over and over as program changes become available.

Part#:	Description	List Price
33650	CPM1-EMU Program Transfer Unit	\$320.00
33660	CPM1-EE Prom	\$40.00

If you have any questions on the previous steps please contact David Rock at 713-683-9878 or 800-999-9878.



JIM COLEMAN COMPANY

World Class Manufacturing in Car Wash Equipment

SERVICE BULLETIN #12

Date: November 14, 2001
To: Jim Coleman Company Distributors
Subject: Water Wizard Touchless Automatic

Problem: Short life on Banner eyes and Prox's
Solution: Install an Electrical insulating silicone grease under the Electrical screw on connector.

There have been some reports that there have been some problems with the prox's operating erratically. We have tested some prox's that were replaced under warranty and have found that they have gotten wet inside the prox and this has caused the prox to malfunction. The solution that the prox manufacturer is recommending is to install a silicone-based grease inside the screw on electrical connector. This grease will prevent the water from entering the prox. Jim Coleman Company is recommending that a service man install this grease under all six prox connectors and all Banner eye connectors. This should be done to prevent future prox corrosion problems. Jim Coleman Company has the Silicone based grease available for sale thru their parts department or you can purchase it from WW Grainger and there part number is 6Y765. A tube of grease should service about 12 – 15 Water Wizards.

Part#:	Description	List Price	Dist.
6627	Electrical Insulating Grease	\$20.00	
\$14.00			



JIM COLEMAN COMPANY

World Class Manufacturing in Car Wash Equipment

SERVICE BULLETIN #13

Date: November 14, 2001
To: Jim Coleman Company Distributors
Subject: Water Wizard Touchless Automatic

Problem: Short life on the Three High Pressure swivels located inside the Top Boom
Solution: Upgrade your Oscillating spray bars to the new style to eliminate the swivels.

There have been some reports that there have been some problems with short life span on the 3 top swivels located in the Top Boom. Jim Coleman Company has redesigned the top Oscillating spray bar to eliminate the swivel completely. You can order the parts to upgrade an existing site to eliminate the swivels. The upgrade will cost \$70.00 per Oscillating bar or a total of \$210.00 to upgrade the complete unit. When you return the 3 old Oscillating spray bars you will receive a credit of \$35.00 each or a total of \$105.00. It will require about 2 hours in the field to change out the spray bars.

Part#:	Description
List Price	
6790	Top Oscillating Spray Bar (new Style)
\$70.00	

Reminder: You need to order 3 of Part # 6790 for each Water Wizard.
 If you have any questions on the previous steps please contact David Rock at 713-683-9878 or 800-999-9878.



JIM COLEMAN COMPANY

World Class Manufacturing in Car Wash Equipment

SERVICE BULLETIN #14

Date: August 21, 2002
To: Jim Coleman Company Distributors
Subject: Water Wizard Touchless Automatic

Problem: Hoses rubbing on end of stainless steel boom

Solution: Install formed plastic pieces over ends.

There have been some reports that there have been some problems with hoses rubbing on the openings of the stainless steel booms creating short life on the hoses. We have had some plastic pieces formed to slip over the ends of the boom to give the hoses a smooth edge the pieces will be held on with a clear adhesive to make the installation simple. There is no charge for the kit and it will require one kit per boom assembly.

Part#:	Description
List Price	
6795	Wall Mt. Boom end kit
\$0.00	

Reminder: You need to have a clear adhesive prior to going to the site
If you have any questions on the previous steps please contact David Rock at 713-683-9878 or 800-999-9878.



JIM COLEMAN COMPANY

World Class Manufacturing in Car Wash Equipment

SERVICE BULLETIN #15

Date: October 1, 2002

To: Jim Coleman Company Distributors

Subject: Water Wizard Touchless Automatic

Problem: Gantry not keeping proper distance away from car.

There have been some reports that there have been some problems with the gantry getting too far away from the vehicle and sometimes too close. This problem is caused by the different speeds the gantry travels on different passes. When the gantry travels on the normal speed it will coast a certain distance at the end of the pass but when the gantry travels at the slow speed the gantry will coast less and there fore sometimes get off count.

Solution: Install version 14.2 software.

This new version 14.2 software will automatically put the gantry into the slow speed about 12 inches before it stops. This will allow the gantry to stop at the same place on every pass. Unless you watch very closely you will not notice the speed change in the gantry.

This new software can be downloaded directly to your site or you can purchase a memory chip to download from your handheld Program Transfer unit. If you already have a memory chip you can use your memory chip to save this new program without purchasing another one. If you need a Program Transfer unit or memory chip the prices are below.

Part#:	Description	List Price
33650	CPM1-EMU Program Transfer Unit	\$320.00
33660	CPM1-EE Prom	\$40.00

If you have any questions or want to schedule a download of this program please contact David Rock at 713-683-9878 or 800-999-9878.



JIM COLEMAN COMPANY

World Class Manufacturing in Car Wash Equipment

SERVICE BULLETIN #16

Date: November 11, 2002
To: Jim Coleman Company Distributors
Subject: Water Wizard Touchless Automatic

Problem: Version 14.2 Software.

There have been some reports that after downloading version 14.2 software that the gantry top boom is too close to the vehicle.

Solution: Change the count on the Red Lion Operator Interface panel to a count of **8 or higher**.

On some Gantry's in the field you will need to adjust the count to make sure that the Gantry boom is 18 inches away from the vehicle in front and back. Always wash a variety of vehicles to make sure the boom on the gantry is a safe distance away from the vehicle. You can adjust the distance the boom is away from the vehicle in the Red Lion Software.

This problem was corrected in the software on October 30, 2002. So if you received a download of the software after October 30 no attention needed.

If you have any questions please contact David Rock at 713-683-9878 or 800-999-9878.



WATER WIZARD[®]

INSTALLATION MANUAL



AN O'HANRAHAN COLEMAN COMPANY

5842 W. 34th St • Houston, TX 77092
info@colemanhanna.com • www.colemanhanna.com
Toll Free: 800-999-9878
Direct: 713-683-9878
Fax: 713-683-9624