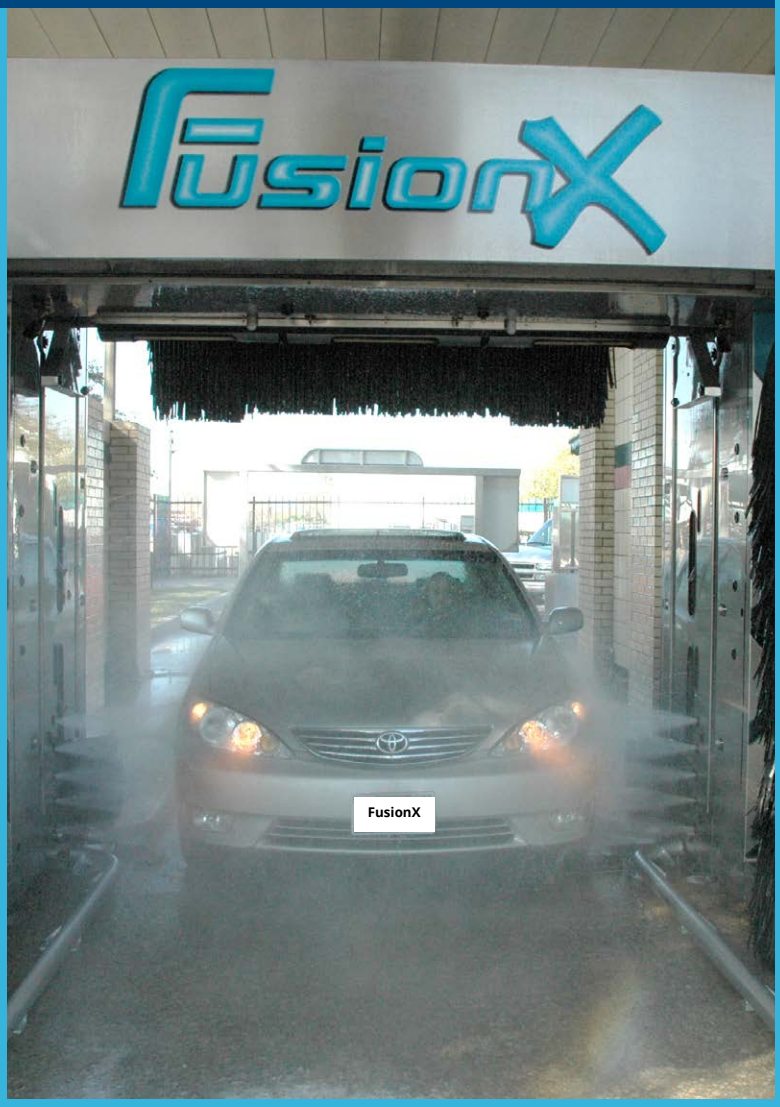
FusionX

Installation Manual



COLEMAN HANNA CARWASH SYSTEMS LLC

AN O'HANRAHAN COLEMAN COMPANY

IMPORTANT
SAFETY NOTICE!

Coleman Hanna Carwash Systems is keenly aware of the need for safety. We want your wash bay to be a safe environment for your customers. The signs shown below are included with every Coleman Hanna Carwash Systems in-bay automatic wash. Please mount the safety signs in a highly visible location at the entrance and on the interior walls of the automatic wash bay.

MOUNT INSIDE BAY **MOUNT AT THE ENTRANCE**

Keeping your customers and others who may be walking nearby aware of operating carwash equipment will help ensure everyone's safety

Thanks for your support.

Coleman Hanna Carwash Systems

The FusionX incoming electrical requires two electrical connections into the main disconnect switch. The connections go into the Electrical Control Center and hook up to the Safety Disconnect Switch, located on the upper right. The 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 Neutral terminal is located directly left of the auxiliary contact. The amperage requirements for the FusionX are explained under "Electrical Required" below:

Electrical Required:

FusionX incoming electrical:

- 125 Amp, 3ph , 208/230V (67 Amp Actual Draw)
  Fusible Disconnect Switch w/125 Amp Dual Element Fuses
- 20Amp, 1 Pole Breaker, 120V (10 Amp Actual Draw)

Optional Hot Wax System

30 Amp, 3ph, 208/230V

Optional Water Tank Heater (5KW)

20 Amp, 3ph, 208/230V

Water Line Required:

1" *(26mm)* Cold Water - Min. Pressure 40 psi *(2.75bar)* - Max. 60 psi *(4.5 bar)*
Max Flow Rate: 32 gpm *(122 lpm)*

Dimensions:

Pump Plant:	30"wide X 60"long X 70"high *(762mm X 1524mm X 1778mm)*
Electrical Panel:	29"wide X 36"high X 8" deep *(736mm X 914mm X 203mm)*
Gantry:	154" wide X 74" deep X 117" high *(3911mm X 1880mm X 2972mm)*

Vehicle Height Clearance: 84" *(2134mm)*

Recommended Bay Dimensions: (*Contact JCC for lesser dimensions*)

Length 39' *(11.89m)*

Width 16' *(4.88m)*

Height 12' *(3.66m)*

Min. Door Opening Height 10' 0" *(3.05m)*

Installation Procedures

Table of Contents

Tools Required

Here are the tools required to perform a proper installation:

- Hammer Drill and bits
- Hammer
- Transit
- Laser Level
- Level
- Chalk line
- Measuring tape
- 2 -Adjustable wrenches 10 (25cm)-12 inch (30cm)
- Phillips and Straight screwdrivers - assorted sizes
- 2 - Mule or Johnson Bars or 1-Mule and 1- floor jack
- 3/4 inch siphon hose - 8 feet long
- Other helpful tools include:
- 1 3/8ths and 1 1/2 inch open end wrenches
- Electric impact wrench with 3/4 inch deep well socket
- Right angle grinder with cut-off wheel
- Voltmeter with AC & DC scales

FusionX Installation Kit (Included With Shipment)

INSTALLATION KIT FOR FusionX

JOB:_____ **AKO**_____

LOCATION:_____ **DATE**_____

BUILT BY:_____ **DOUBLE CHECK BY:**_____

	QTY	DESCRIPTION	SHIPPED	BACK ORDERED
BOTTOM OF BOX:				
	1	BOOM PLATE		
	1	BACK-UP PLATE		
	4	EYE BOXES WITH LIDS		
	2	PROX TARGETS (for Home & End o Trk)		
	1	TREADLE PLATE		
	1	DISCONECT BOX		
	400	SHIMS		
	2	HOLD DOWN BRKTS		
	2	UNDERCAR RAMPS		
	100	5 1/2" X 1/2" CONCRETE BOLTS		
	4	1 1/4 PILLOW BEARINGS VPS120		
	4	EYE BOX RAMPS		
	2	1/2" SS DOWEL PINS, for track		
	4	TRACK END STOPS		
PANEL ROOM:				
	1	GEA INSTALL KIT		
	1	THERMOSTAT		
	1	STOP HORN		
HOSE DEPT:				
	70'	12/5 S.O. CORD		
	70'	12/3 S.O. CORD		
	70'	4/4 S.O. CORD FOR BLOWER		
	1	BOX 3/4 CLEAR HOSE		
	30'	3/8" GRAY P/L HOSE (for Air)		
	30'	3/8" GREEN P/L HOSE (for Tire Cleaner)		
	30'	1/2" BLUE P/L HOSE (for Presoak)		
	30'	1/2" RED P/L HOSE (for Two Step Presoak)		
	30'	1/2" GRAY P/L HOSE (for Triple Shine)		
	30'	1/2" GREEN P/L HOSE (for L.P. Hot Wax)		
	30'	1/2" YELLOW P/L HOSE (for BRUSH LUBE)		
	30'	3/4" BLUE (for Spot Free Rinse)		
	1	1" X 15' H.P. WIRE BRAID HOSE		
	1	1" X 28" WIRE BRAID		
	1	1" X 45" WIRE BRAID		
	1	1" X 60" WIRE BRAID		
	35'	1/2" WIRE BRAID HOSE		
	25'	1" SPIRAL WRAP		
	15'	2" SPIRAL WRAP		
	1	BOX OF HARDWARE		
MISC:	1	OWNERS MANUAL		
	1	VINYL BOOM COVER		

DOOR KIT ___

FOR TWO STEP ___

ELECT. WINTER WIZARD___

CIRCULATING P.S.(Blue) ____

MECHANICAL TREADLE___

FREE STANDING BLOWER___

FusionX Installation Procedure

The FusionX Electrical Control Center (ECC) 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 are 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.

The steps you will need to perform are:

1. Install the equipment in the equipment room.
   - **a.** Set the pump stand.
   - **b.** Set the FusionX Electrical Control Center (ECC)
2. Install the equipment in the automatic bay.
   - **a.** Set the track
   - **b.** Set the guide rails.
   - **c.** Set the Gantry.
   - **d.** Install Brushes.
   - **e.** Install the Wall and Gantry Boom Assembly.
   - **f.** Install the plumbing from the pump stand to the gantry.
   - **g.** Set the treadle plate, entrance and treadle plate eyes
   - **h.** Set the undercarriage bar and ramps.
   - **i.** Set the 2-position sign
   - **j.** Install the electrical from the FusionX ECC to the gantry.
3. Wire the Spot-free delivery pump to the RO System pump stand.
4. Wire the Stand-alone Dryers (If applicable)
5. Wire the Freeze Thermostat
6. Wire the Bay Doors.
7. Install the plumbing from the incoming water supply to the pump stand.

   NOTE: Use a licensed plumber for this step.
8. Install the electrical from the breaker panels to the WW ECC.

   NOTE: Use a licensed electrician for this step.
9. Set the Entrance Controller.
10. Set the Entrance Arch

Step 1: Set the Equipment in the Equipment Room

a) Set the Pump Stand

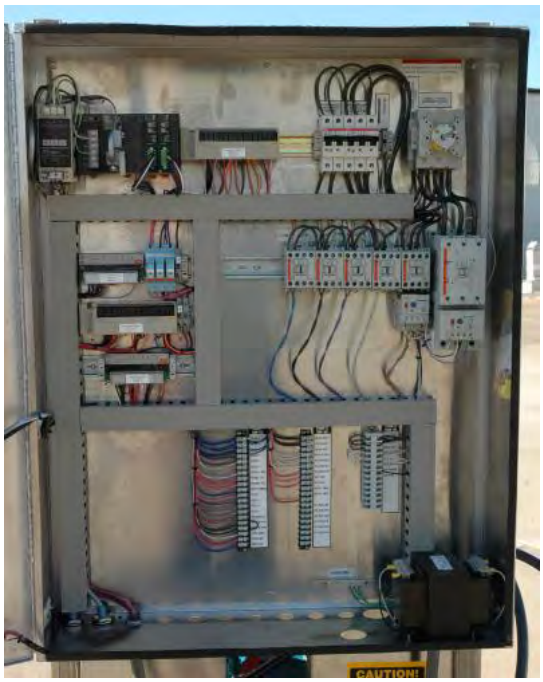
Pump Stand with Control Panel Mounted on the End

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 Fusionx Electrical Control Center

Electrical Control Center

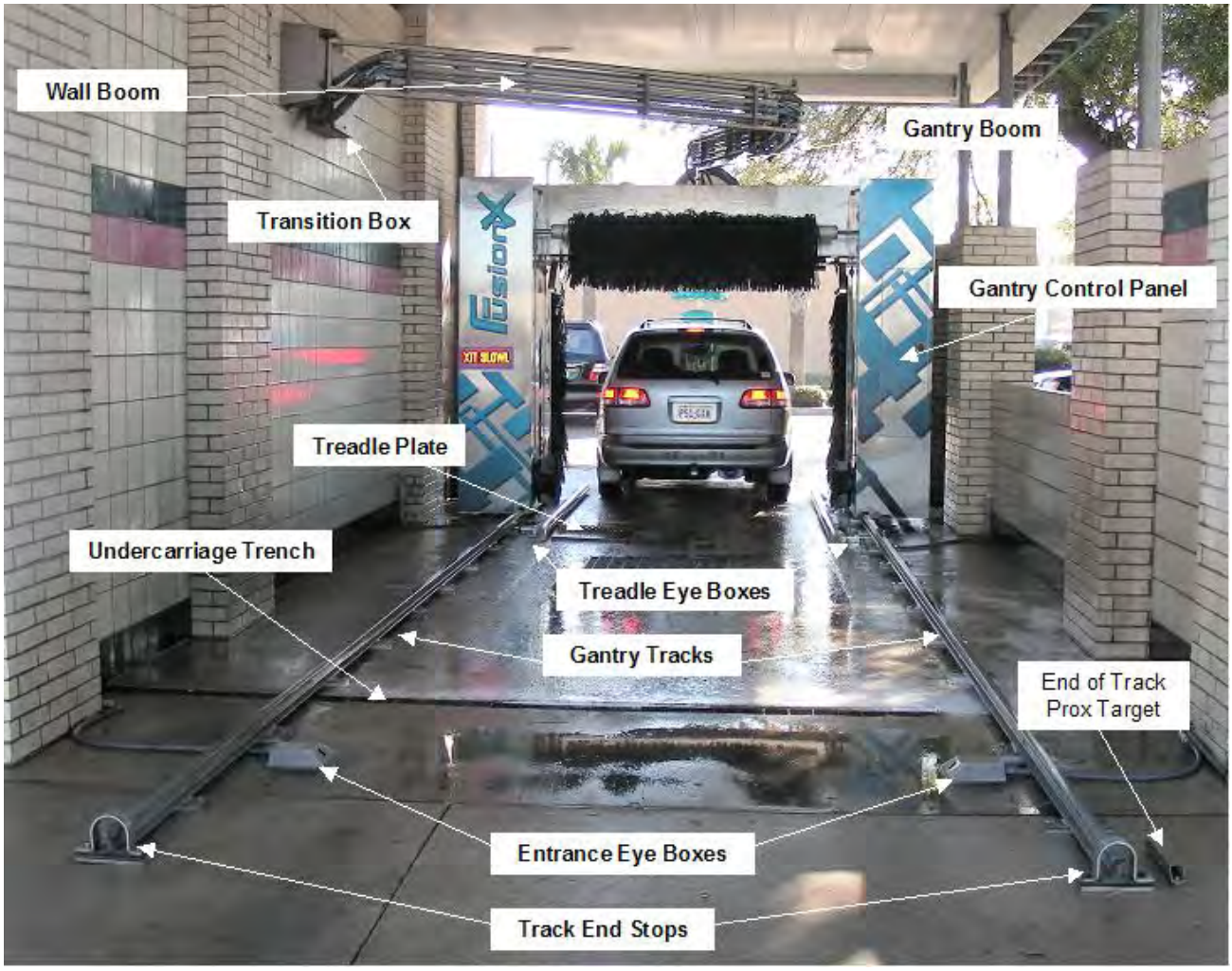


Control Center Components

Remove the electrical control center (ECC) from the pumping unit and mount to the wall using the proper mounting bolts according to the material of the wall.

NOTE: The ECC 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.

Step 2: Set the Equipment in the Bay



a) Set the Tracks

You will need the blueprint labeled **"FxM1.0 & FxM1.A"** 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 561/8" from the centerline of the bay to mark the center of the first track. Set one of the tracks at the center of this line. 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: ***The track is in two pieces with a stainless centering pin. The pin will ensure both sections are perfectly aligned***.

When mounting the track, always mount one side completely, and 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.

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

NOTE: The guide rails will be in two pieces. Mount according to print dimensions. 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.

NOTE: Be sure you set the gantry so the Electrical Panel is facing the entrance end of the Car Wash.

Once the gantry's in place locate and mount the end of track stops on both the entrance and exit ends. Also secure the gantry lock down brackets.

End of Track Stop

Gantry Lock Down Bracket

d) Install Top and Side Brushes

Align each side brush tube with the mounting flange located on the lower portion of the brush carriage. Secure with 4 bolts (included). Make sure all sides are flush with the mounting flange for proper balance. Mount the top brush in the same manner between the two flanges again securing them with 4 bolts.

e) Install the Boom Assembly

Each boom has two sections. The longer section mounts on the wall, and the shorter section mounts on the gantry. On each section of the boom assembly are five 1/2" stainless steel tubes for pre-soak. There is one for low ph pre-soak, one for high ph pre-soak, one for circulating pre-soak, one for triple foam, and one for low pressure hot wax. Also, on each section there are two 3/8" tubes, one for air and one for tire cleaner.

The 1" stainless steel tube is for the high pressure functions, and the ¾" Schedule 80 PVC is for spot-free rinse. The anti-freeze system circulates through the square tubing on the frame of the boom. Use one square tube as the supply and the other as the return.

There are two PVC conduits for the electrical. Use one for the 24VAC cable and (2) two communication cables. Use the other for the 208\230\380\415 VAC 3ph cable and an additional PVC conduit for the 3 phase electrical used for the blower.

1) Gantry Boom Assembly

NOTE: The Gantry Boom is the shorter of the two booms.

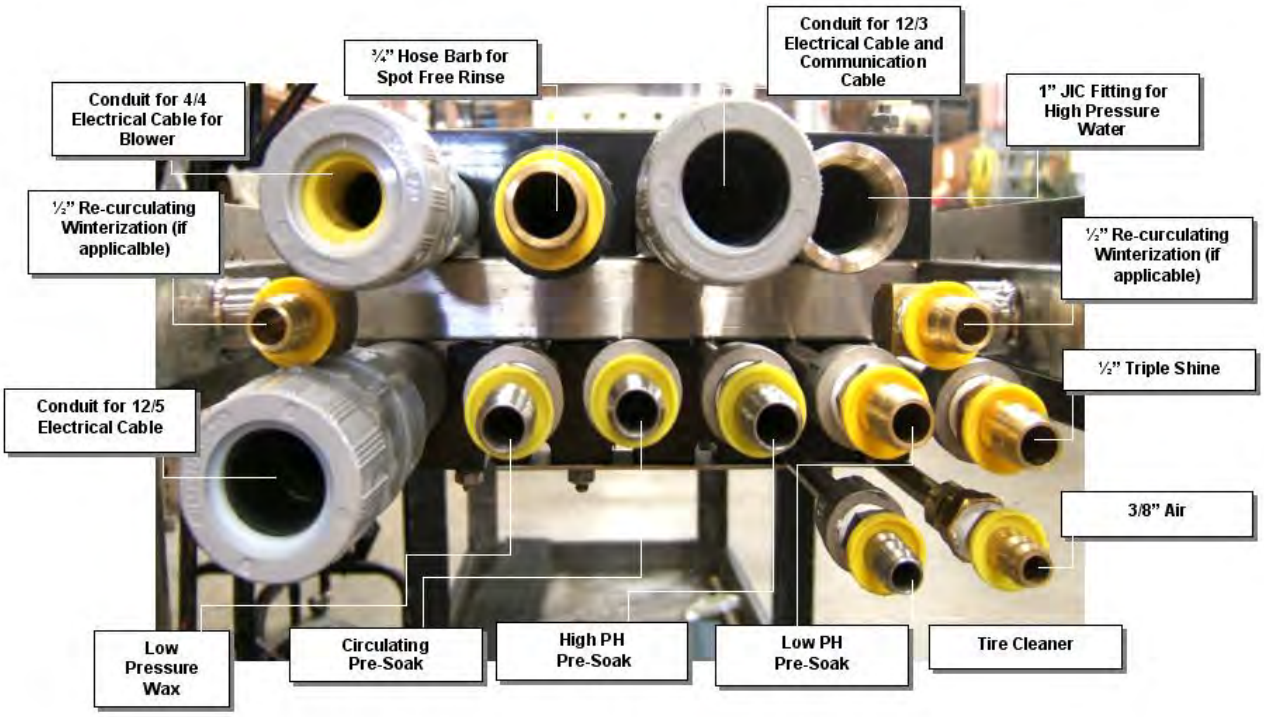
Mount the boom to the gantry first. This will help you line up the two booms when mounting the wall mounted boom assembly. Slide two 1¼" pillow block bearings on shaft and mount the bearings to the stainless steel plate that is welded in the center of gantry. The gantry boom needs about ¼" of clearance between the highest point on the top of gantry (which may be the top boom motor) and bottom of the boom.

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 flexible energy chain on the side brush motors, you need to recheck your measurements.

2) Wall-Mounted Boom Assembly

Lay out the location for mounting the "boom assembly mounting bracket" on the wall according to the measurements on drawing FxM1.0. Drill holes through the wall and use the back-plate to prevent the bolts from pulling through the wall construction. Once the boom bracket has been installed, slide 1¼" pillow block bearings onto the 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: ALWAYS USE "Never Seize" on bolt threads.



3) Transition/Disconnect Box

Lay out the wall for the location of the disconnect box for the boom according to the measurements on drawing FxM1.A. Mount the box so the large opening faces the boom. The hoses go out the side of the Disconnect Box directly to the pipes mounted on 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 an extended bay not next to the equipment room, the box will have the fittings welded to the opposite side of the hole in the side of the box. It will have 90° fittings facing up to attach the hoses coming from the equipment room. Route the hoses from the equipment room, through the attic or on top of the roof (depending on the roof style of the car wash, then down through the ceiling of the automatic bay into the hose connectors of the disconnect 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 with the large hole facing the boom and mount it to the wall using plastic anchors and stainless steel screws.

Once the box is mounted, swing the boom towards the entrance end of the car wash. This will be the maximum extension for the hoses and cables. Then connect all the hoses from the disconnect box to the pipes attached to the boom. Run the SO Cord through the conduits going through the cord grip connectors at each end of the conduit.

f) Install The Plumbing From The Gantry To The Pumping Plant

NOTE: Do not connect any hoses to the high-pressure box or low-pressure box until after you flush out the lines during the Startup procedure.

An installation kit is shipped with each unit, which includes all of the electrical cables and hoses you need between the gantry and pumping stand. The contents of the installation kit are listed on page three of this section. For instructions on where the hoses go, see the portion of this section labeled "Wall Mounted Boom Assembly."

A standard hook-up is when the automatic bay is next to equipment room. If the automatic bay is not next to the equipment room, you will need a bay extension kit. As a rule of thumb, add 22' of hose for each bay between the equipment room and the automatic bay. The price book lists the hose extension kit with its part number and price.

To hook up the product between the gantry and the pumping stand, you will need to use the hoses from the installation kit. All hoses for the products will hook to appropriate connector on the back of the pumping plant, except the blue ¾" 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.

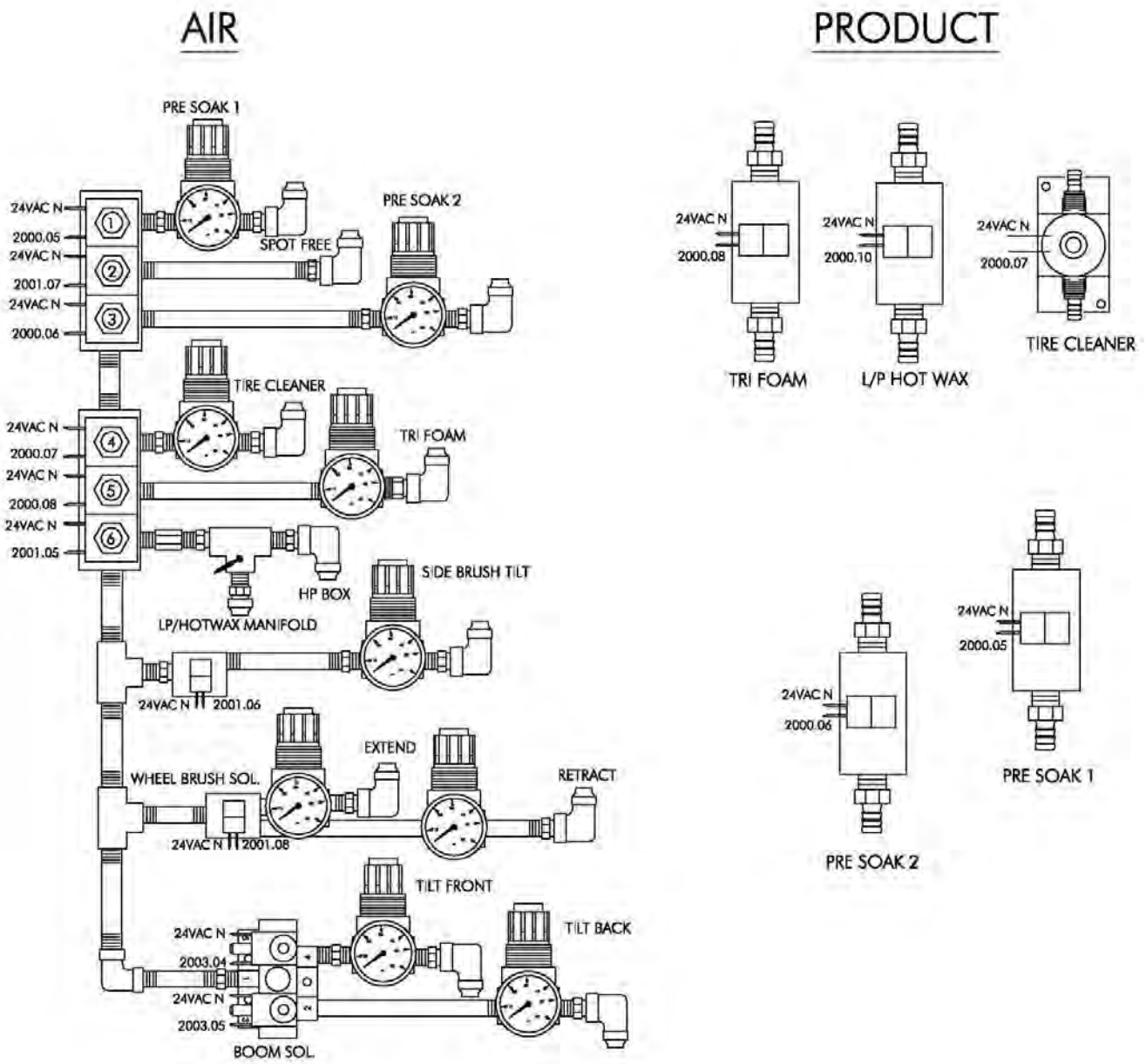
1) **Connect the hoses to the low pressure disconnect plate located in the top of the gantry.**

The following table shows how we identify each hose function by color and size:

Function	Hose Color	Hose Size
Low PH Presoak	Red	1/2"
High PH Presoak	Blue	1/2"
Circulating presoak	Blue	1/2"
Mitter Lube	Yellow	1/2"
Low pressure wax	Green	1/2"
Triple Shine	Gray	1/2"
Tire Cleaner	Green	3/8"
Air	Gray	3/8"
Spot-free Rinse	Blue	3/4"

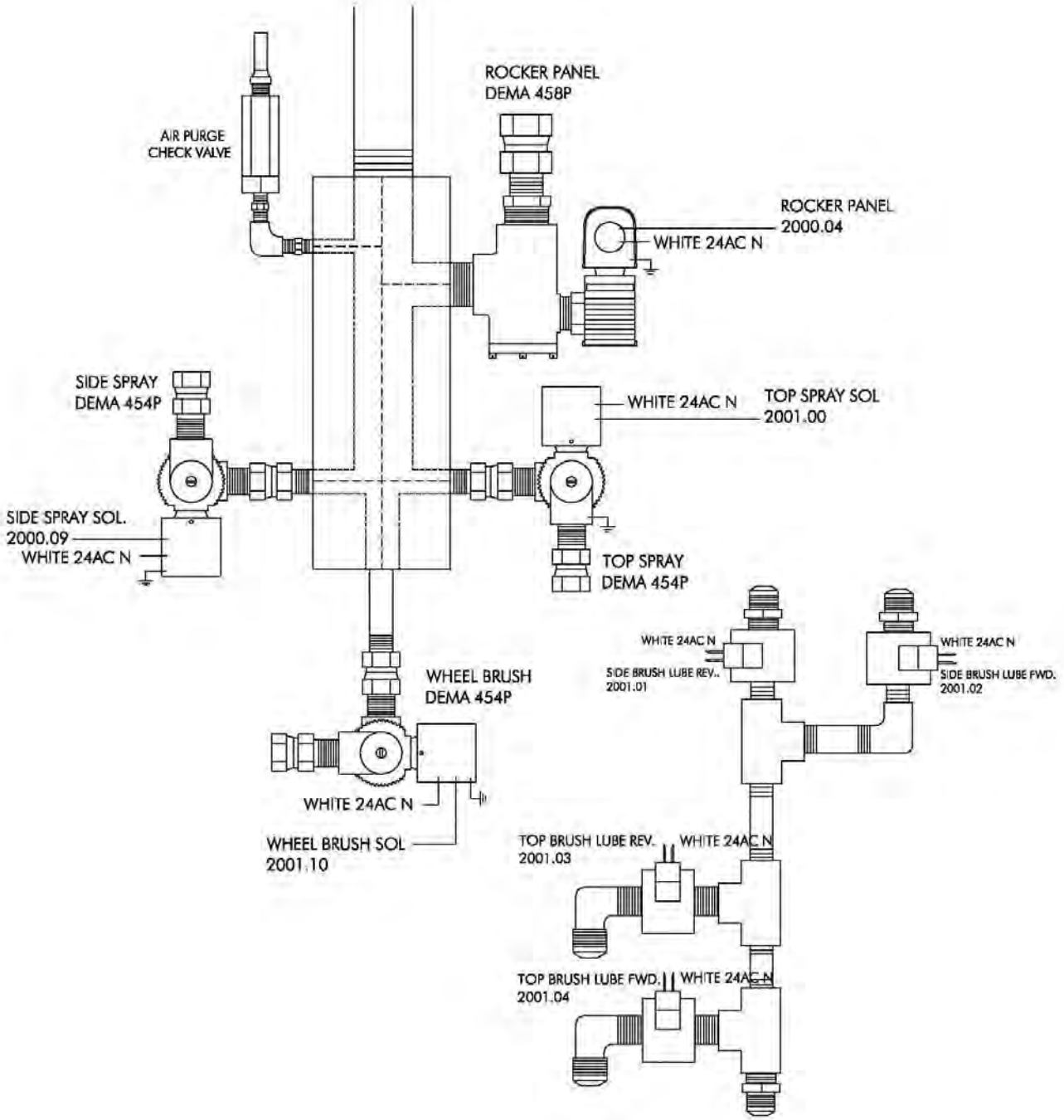
Begin connecting the hoses for the low-pressure box at the chemical pump on the pump stand and run the hoses to the back of the disconnect box. Then, connect the hoses between the wall-mounted boom and the gantry-mounted boom. Finally, connect the hoses from the low-pressure box to the gantry-mounted boom.

Low Pressure Box on Gantry (Driver's Side)



2) Connect hoses to the high-pressure box

High Pressure Box on Gantry (Passenger's Side)



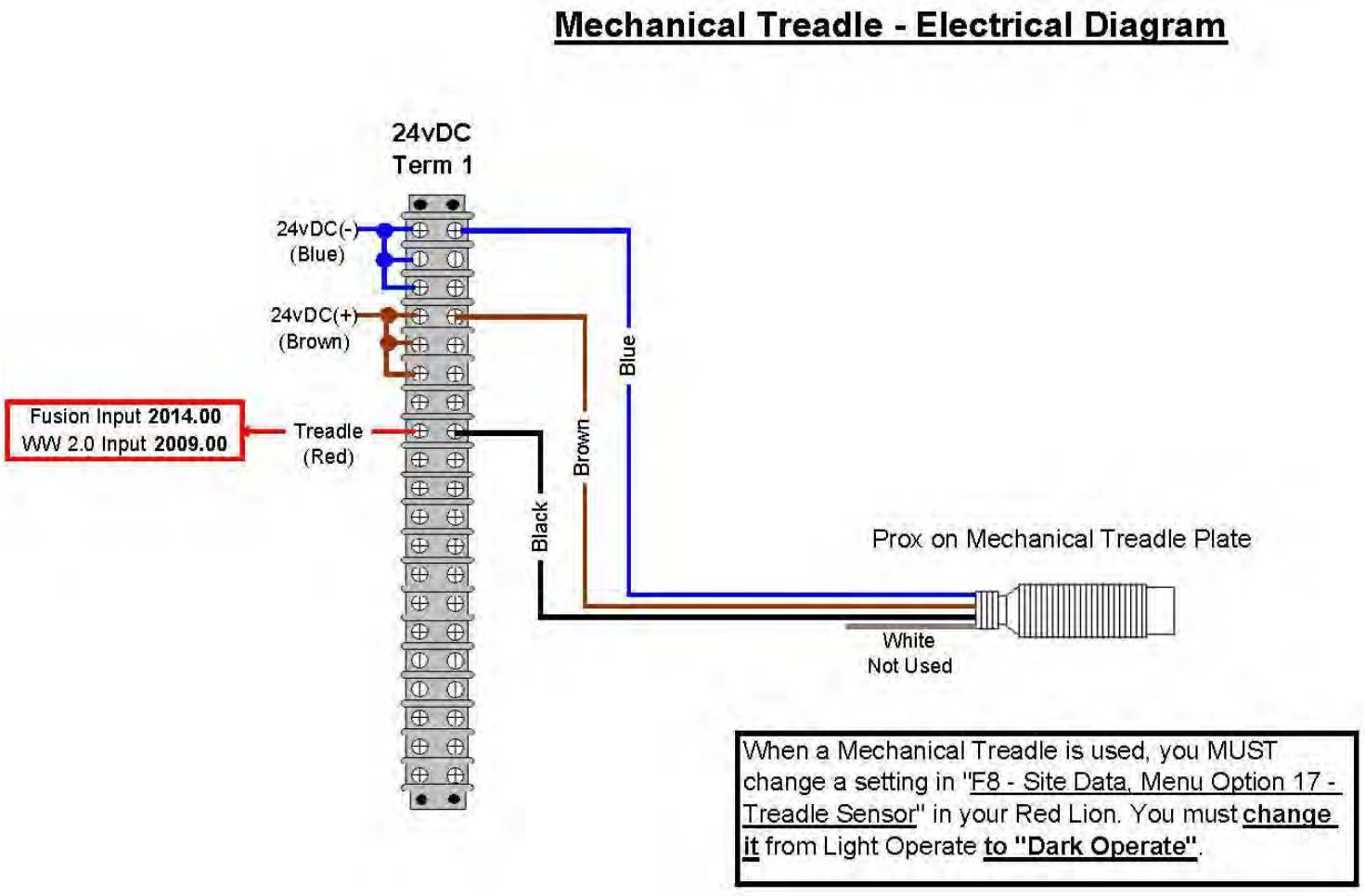
The ¾" push lock hose connects to the Automatic R.O. Delivery pump on the Self-Serve or Stand Alone R.O. System to the transition box. From inside of the transition box connect a ¾" push lock hose, run the hose through the wall and gantry boom to the ¾" fitting on the gantry disconnect plate located at the top of the wash gantry.

3) Connect the Undercarriage Bar
The ½" wire braid hose will connect to the ½" 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.

g) Set the Treadle Plate, Entrance and Treadle Eyes

Using the print labeled **"FxM1.0",** set the eye boxes for the entrance and treadle eyes with ¼" concrete anchors. Set the treadle plate into position. There is an etched center line on the treadle plate for proper alignment. Secure with ½" anchor bolts. Grind the bolts off flush with the nut, to avoid possible tire damage.



1) Eye Sensor Wiring

There are four eye sensors sent with each unit (two transmitters and two receivers). These eyes go in the stainless steel eye boxes you just mounted in the bay (see the drawing FxM2.0 and Eyes Wiring Diagram on page 17). Put the receivers in the stainless-steel boxes on the equipment room side of the bay, and the transmitters in the boxes on the opposite side of the bay.

Have your electrician run a conduit from the FusionX ECC 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 cables that are terminated with a plug on one end. Run the cables in a flexible, watertight conduit from the Eye box to each of the J-boxes provided by the electrician in the bay.

The cables are not long enough to reach to the ECC in the equipment room, so you will need to run the necessary wires to the four J-boxes your electrician installed in the bay. You need two wires [brown for 24 DCV (+) and blue for 24 DCV (-)] for power to the transmitter and receiver eyes. **Note: Wire the 24 vdc- (blue) from the *"TREADLE "* emitter eye to the emitter common on the terminal strip. The 24 vdc- (blue) wire from the *"ENTRANCE"* eye connects to 24vdc- on terminal 1, 2 or 3**

In addition you need another two signal wires for the receiver eyes. One wire will go to the treadle receiver eye, and the other will go to the entrance receiver eye. Both transmitter and receiver eyes are powered by 24 VDC. The two extra wires which go to each of the receiver eyes connects to the black wire of the cable going to the receiver eyes. This will serve as the input wire for each set of eyes, which you will tie into the **"Term #1"** terminal strip in the ECC.

Run the cable from the stainless steel eye boxes in the bay through the conduit from the J-box to the ECC. You need one input for the treadle eye, and one input for the entrance eye. **Refer to drawing on page 17 for correct wiring**.

NOTE: The remaining white, pink and grey wires should be terminated with the brown 24VDC +. This will eliminate possible signal errors.

h) Set the Undercarriage Pipe and Ramps

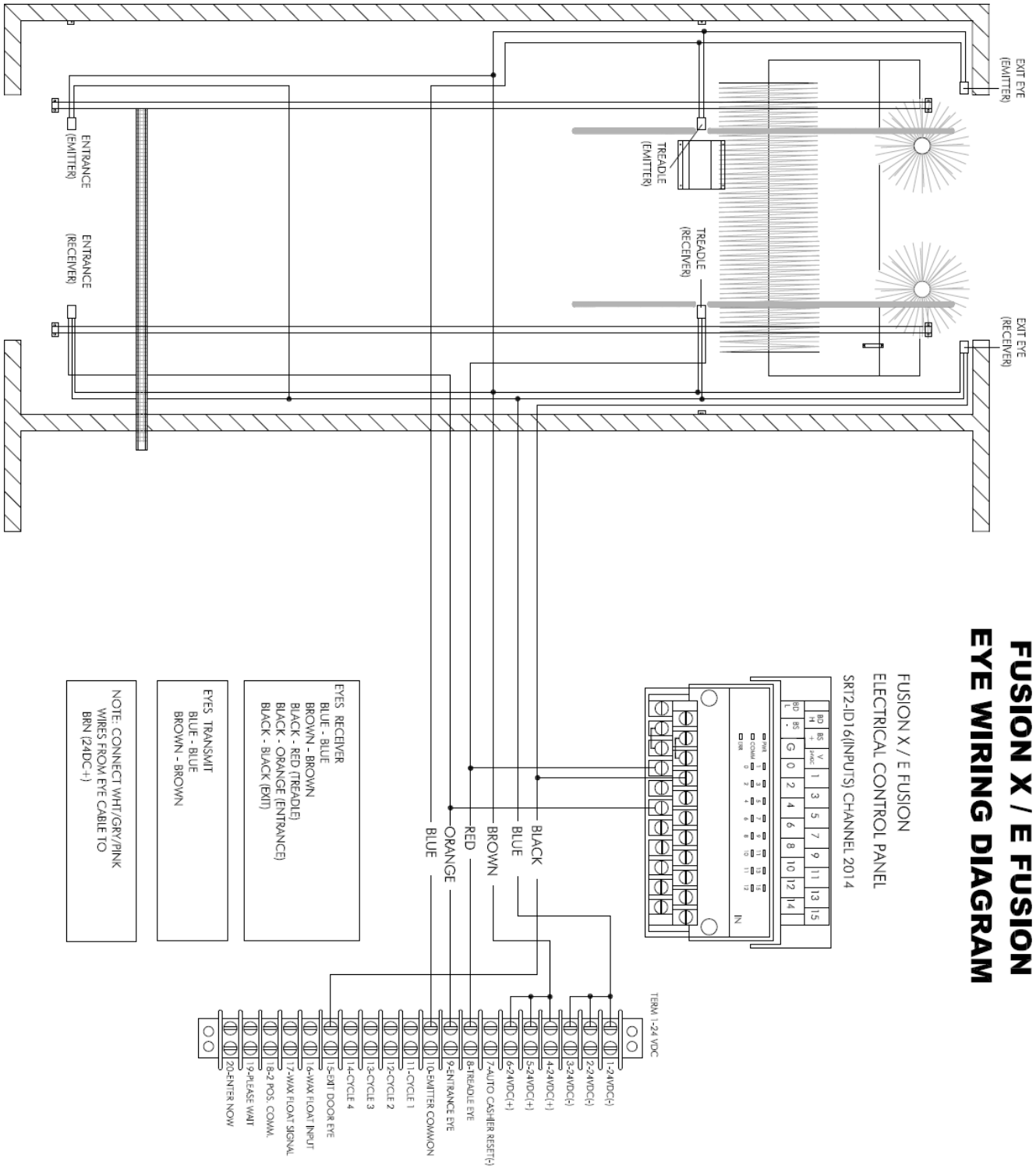
Still using the print labeled **"Fx M1.0"**, install the undercarriage pipe. When pouring the concrete for the bay floor, you may wish to build a trench for the undercarriage bar with a lip for a metal grate on top. Anchor the bar to the bottom of the trench with ⅜" anchor bolts. Install the metal grate 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 ⅜" anchor bolts. Grind the tops of the bolts off to the nut.

i) Set the 2-Position Sign

Mount the **2-Position Light Can** on the passenger's side at a height that can best be seen by the driver.

2 POSITION LIGHT AT ENTRANCE OF AUTOMATIC		
TERM 1 - 24 VDC	**WIRE COLOR**	**DESCRIPTION**
18	White	2 Pos. Common
19	Red	“Please Wait”
20	Blue	“Enter Now”
SIGN CAN		
Pigtail	White	2 Pos. Common
Pigtail	Blue	“Enter Now”
Pigtail	Red	“Please Wait”



FUSION X / E FUSION
EYE WIRING DIAGRAM

j) Set the Home and End of Track Prox Targets.

See drawing FxM1.0 for detailed the prox target mounting location. This will position the prox so it cannot pass the prox target before the gantry is at the end of the track. Mount them perfectly level to give the prox an even signal as it passes over the target. After mounting the target, carefully move the gantry so the prox is approximately 3/8ths" above the prox target.

Step 3: Install the Plumbing from the Water Supply to the Pump Stand

The FusionX 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 1/2" hose on the bottom of the tee, installed at the factory, will feed all chemical hydrominders. There is also a separate 1/2" connection for the heated presoak products.

Step 4: Install the Electrical from Electrical Panels to the ECC

Run the electrical service for the FusionX into the Electrical Control Center (ECC) 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 Main 3-phase service for the FusionX into L1, L2, and L3 of the safety disconnect 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 additional breakers.

The additional single-phase breaker protects the Low Pressure Pumps on the Pump Stand. The three-phase breaker protects the presoak heater and the motors/electronic drives on the gantry.

Terminate the 120 VAC (230 VAC International) circuit into the auxiliary, normally open contact on the left side of the safety switch. Terminate the Neutral in the terminal block labeled **"120 or 230 VAC Neutral"**. This circuit supplies voltage to the transformer, DC power supply, auto cashier, lights and computers.

Step 5: Hook up the Electrical from the ECC to the Gantry

The gantry needs 208/230/380/415VAC 3 phase, 24VAC, 24VDC, and 2 communication cables. In the installation kit, you will find four electrical cords: one 12/5 SO cord (70'), one 12/3 SO cord (70'), and two Communications Cable (RSM531-30M, 30 meters long). One comm. cable is for digital communications and the other is "analog" communications. These connections will be on separate terminal strip locations in the gantry control panel.

According to the National Electrical Code, Section 400.8, you are not permitted to run flexible SO cords through a wall. To avoid this problem, you can run the SO cords and comm. cables through a seal-tight from the bottom of the FusionX ECC to the back of the transition box.

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.

In the FusionX ECC, terminate one end of the 12/5 SO cord in L1, L2, and L3 3-Ph connections in the bottom side of the 3 phase breaker labeled Gantry. By hooking the gantry up in this manner, you can cut power to the gantry with the main switch or the breaker.

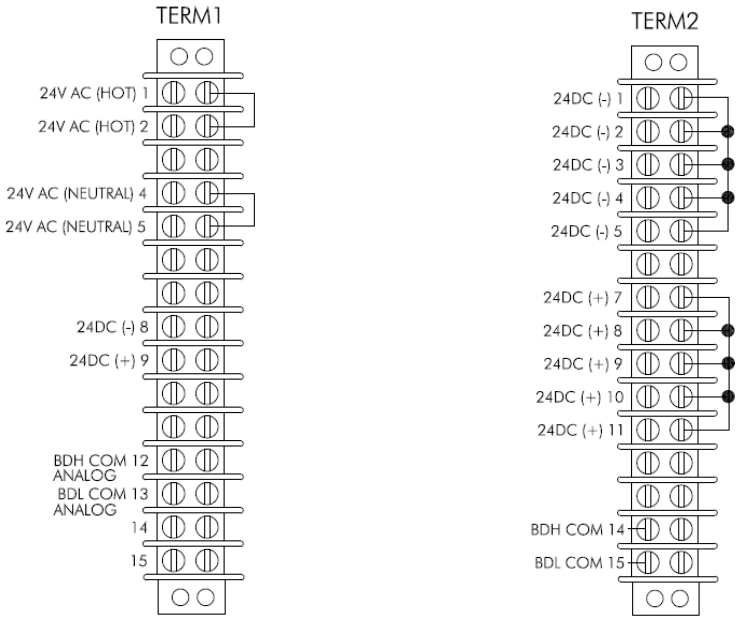
NOTE: The white wire in the 12/5 SO cord is not used. This can be used as a spare if you lose one of the legs in your SO cord.

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. A GC90 cord grip fitting is provided for installation into the cabinet.

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

Communication Cables

Connect the two comm. cables to the corresponding screw on connectors located on the bottom left hand side of the FusionX ECC. They are clearly marked for Analog and Digital. Analog to the left and Digital on the right.



Gantry Terminal Strips

The 12/3 SO cord and two communication cables terminate on terminal strips located at the bottom side of the electrical panel on the gantry.

12/3 SO cord
The 12/3 S.O. cord is used for 24V AC. Terminate the black wire of the 12/3 cord on terminal strip #1 at terminal screw #1or #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/earth bus at the bottom of the panel.

Communication Cables
Each cable has 4 wires plus a shield used for ground/earth. In the gantry, connect the ground wire to the ground bus.

Analog Cable
Connect the blue and brown wires from the Analog cable to the corresponding terminals on Terminal strip #1. Connect the brown wire [24V DC Positive (+)] to #9 and the blue wire [24V DC Negative (-)] to #8. The black and white wires in the Analog communication cable terminate to terminal screw #12 (BDH Comm). Terminate the white wire to terminal screw #13 (BDL Comm).

Digital Cable
Connect the blue and brown wires from the digital cable to the corresponding terminals on Terminal strip #2. Connect the brown wire [24V DC Positive (+)] to #7 and the blue wire [24V DC Negative (-)] to #1. The black and white wires in the digital communication cable terminate to terminal screw #14 (BDH Comm). Terminate the white wire to terminal screw #15 (BDL Comm).

Step 6: Hot Wax System Installation Instructions

The **Hot/Low Pressure Wax System** is an independent system that will need to be wall mounted in an area near the FusionX pumping unit as shown in Figure A.

Figure A

Electrical:

The system requires a 30 Amp 3 phase electrical service if incoming voltage is 208/230. If the incoming voltage is 380 or 415, it would require an 18 amp 3 phase service. The incoming power should connect to the top of the contactor as shown on the M14.0 and the FxECC drawings located in the front section of your manual. **This 3 phase service is not required if using non-heated Low Pressure Wax only.**

The **Hot/Low Pressure Wax System** requires two low voltage electrical connections from the Hot Wax Control Box to the Electrical Control Center. Run a 4 conductor 18 gauge cable from the Hot Wax Control box to the ECC. Connect one end of the Black and White wires to terminals 1 & 2 respectively in the HWCB. At the other end connect the black to 24 VAC Hot and the white to 24 VAC Neutral on terminal 2 in the ECC.

The remaining two wires will connect to terminals 16 and 17 on Terminal strip 1. There will be a factory installed jumper between these terminals that will need to be removed prior to completing this connection.

Incoming Water and Delivery:

The wax system should be supplied with a 1/2 inch soft water supply. The mixed product will be delivered from the Hot Wax System pump directly to the gantry. This pump is typically located on the lower left hand area of the pump stand. The outlet hose will connect first to the transition box, through the booms and terminate at the gantry mounted manifold connection.

Step 7: Wire the Spot-Free to the RO Production Stand

To wire the spot-free, run **two wires** to the spot-free cabinet located at a free standing system or mounted on the Super Saver equipment). Connect one wire to term strip #2 24VAC terminal #8 which is labeled “Spot Free”. Connect the other end of the wire to 24VAC Hot in the RO System panel or Super Saver Panel. You can get 24VAC hot from the commons of the output card on the spot-free PLC or from terminal #1 of any of the bay terminal strips if connecting to a Super Saver.

Connect the second wire to terminal #9 on term strip #2. 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 – 24VAC	Wire Color	PLC Input
#8 (COMMON)	Pink	24VAC Hot
#9 (N/O)	Pink	#10 or #11

NOTE: With Money Manager, wire per instructions inside Supersaver Cabinet.

Step 8: Wire the Stand-Alone Dryers

a) Stand-Alone "Wind Wizard" Dryers with Oscillating Center Nozzle

The Wind Wizard Stand-Alone Dryer is controlled by several outputs from the channel 2006 output card, ROC16. There is also an input signal from a proximity switch on the center oscillating blower nozzle that will be terminated on the channel 2015 input card, ID16. There are eight wires going from the Electrical Control Center (ECC) to the Free-Standing Blower Control Panel. There will be an 18-22 gauge-12 conductor cable provided in the installation kit for Stand-Alone Wind Wizard Dryers for these connections. Terminate these wires according to the following chart:

Wire Color	ECC Connections	Blower Control Panel Connections
White	24 vac Neutral, Term Strip 2	Term.# 96 on the motor overloads
Brown	24 vdc Positive (+), Term Strip 1	Brown wire from prox cable
Blue	24 vdc Negative (-), Term Strip 1	"SC" term on Nozzle VFD & Blue wire from prox cable
Orange	Output 2006.14, ROC16	"A1" on the center motor starter
Red	Output 2006.10, ROC16	"A1" on right and left motor starters
Yellow	Output 2006.09, ROC16	"S1" on Nozzle VFD
Purple	Output 2006.11, ROC16	"S2" on Nozzle VFD
Black	Input 2015.09, ID16	Black wire from prox cable

b) Stand-Alone Dryers from other manufacturers

Other types of stand-alone dryers are controlled by output 2006.14 of the ROC16. We provide both 24 vac and 120 vac signals to operate your dryers.

FOR 24 VAC SIGNAL:

If your dryers require a 24 vac signal to operate, connect your signal wire directly to output 2006.14. You will also need a 24 vac neutral. This connection can be made on Term Strip 2, on one of the terminals labeled "24v neutral". The length of the signal that is sent to your Blower Control Panel is adjustable through the Red Lion interface (F2 – Timers & Counters).

FOR 120 VAC SIGNAL:

If your dryers require a 120 vac signal to operate, connect your signal wire to Term Strip 3, on the terminal labeled "Ext. Blower". You will also need a 120 vac neutral. This connection can also be made on Term Strip 3, on one of the terminals labeled "120v neutral". The length of the signal that is sent to your Blower Control Panel is adjustable through the Red Lion interface (F2 – Timers & Counters).

DIXMOR DIGITAL TIMER WIRING

To wire the Digital timer, you need four wires from the ECC 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).**

Terminal 2 24VAC	Terminal 3 120VAC	Wire Color	Dixmor Timer Terminal Strip
	Hot #1	Black	#1
	Neutral #4	White	#2
#10		Purple	#3
#11		Purple	#5

c) On-Board Dryers

Run the 4/4 S. O. cord from the WW ECC 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 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 additional outputs and a set of photo eyes. For the exit door in the ECC, and the outputs and commons come pre-wired to the 24VAC terminal strip #2. The exit door eye signal must be wired to the 24VDC terminal strip #1.

To hook your door controls to the ECC, 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 ECC, hook the wires to the appropriate screws on the **"TERM 2"** terminal strip. See the wiring diagram that follows:

BAY DOOR WIRING DIAGRAM

TERM 2 24VAC	Wire Color	Door Control	SRT2-ROC16
#13	White/Yellow	Entrance Common	COM 0
#14	White/Blue	Entrance Open	2004.00
#15	Red/Black	Entrance Close	2004.02
#16	White/Yellow	Exit Common	COM 1
#17	Red/Yellow	Exit Open	2004.01
#18	Red/Green	Exit Close	2004.03

In addition, there is a **"windy day"** feature that is incorporated in the Red Lion Interface (F8 – Site Data), 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.

Included with the door package is a set of photo eyes. Install the 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 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 from receiver eye only). The Emiiter/Transmitter eye blue wire will terminate on the **"Emitter Common"** on Term Strip 1, terminal #10. Wiring the emitter this will allow us to detect a short circuit in the receiver eye. Terminate the black wire of the receiver eye cable to Term #3 Screw #17 in the WW ECC. This screw is pre-wired to input #2014.01 of the SRT2-ID16 in the ECC.

Step 10: Wire the Freeze Thermostat

No Bay Doors or Bay Doors With no Bay Heat

Inputs 2014.05 and 2014.07 of the SRT2-ID16 of the WW ECC in the equipment room are the two inputs that control the Freeze Blowout and the Bay Door programs. When the temperature rises above the temperature preset on the Thermostat, **Input 2014.05** will come on and **Input 2014.07** will go off (if wired correctly). When the temperature falls below the temperature preset on the thermostat, **Input 2014.05** will go off and **Input 2014.07** will come on. **Inputs 2014.05** and **2014.07** should never be on at the same time.

When **Input 2014.05** first comes on, the car wash controller sends a 3 second signal to open both Bay Doors. When **Input 2014.07** first comes on, the car wash controller sends a 3 second signal to close both bay doors and execute the blowout program. (See the description of the blowout program below).

To wire the **Thermostat**, you will need to run three wires to the **Thermostat** from the **ECC**. Wire one wire to **24 VDC (-)** in the ECC, one wire to the SRT2-ID16 **Input 2014.05**, and one wire to the SRT2-ID16 **Input 2014.07**. In the Thermostat, the **24 VDC (-)** wire goes to the **Common** terminal **(Red screw**). Output 2014.05 of the SRT2-ID16 goes to the **Close on Temperature Rise** contact (White screw), and **Input 2014.07** of the SRT2-ID16 goes to the **Open on Temperature Rise** contact (**Blue screw**).

When the **Blowout Program** is activated, the gantry will blowout all the chemical and water lines once after the temperature drops, and then again once **3 minutes** after each wash after the car leaves the bay and as long as **Input 2009.07** remains lit. The blowout process goes through a sequence of blowing out all the lines on the gantry five times.

The **Blowout Program** will sequence through the following:

Rocker Panel	Side High Pressure Rinse
Top High Pressure Rinse	Tire Cleaner
Presoak	Low Pressure Wax
Tri-foam Wax	Spot Free

NOTE: The undercarriage hose does not get blown out nor does it have a weep system. To protect the undercarriage from freezing, run some sort of heating system along the hose. If you have the winter wizard system, run the uninsulated copper tube from the rail heat along the side of the undercarriage spray bar. You can also run the hoses for the rail heat along with the undercarraige hose to protect it from freezing. If you do not have rail heat, you can run heat tape or something similar along the hose.

Bay Doors with Bay Heat

If you have Bay Doors with Bay Heat, and you don't want the gantry to blowout the lines, you can wire the thermostat differently. **In this case, you will need two thermostats.** One thermostat will measure the temperature in the bay, and one thermostat will measure the outside air temperature.

Pull two wires to the thermostat in the bay, and pull three wires to the outside air thermostat. Wire the commons of both thermostats to **24 VDC (-)**. You can bring two wires from the panel, one for each thermostat, or you can bring one wire from the panel to the first thermostat terminating the wire on the

Common terminal (Red screw) of the first Thermostat. Then run a jumper wire from the first thermostat to the second thermostat, and terminate the jumper wire at each thermostat on the **Thermostat Common terminals (Red screw).**

For the **Bay Thermostat**, Terminate one wire on the **Open on Temperature Rise** contact of the thermostat (**Blue screw**) and terminate the other end of the wire to **Input 2014.07** of the SRT2-ID16 (**Freeze Thermostat**).

For the **Outside Air Thermostat,** terminate one wire on the **Close on Temperature Rise** contact of the thermostat (**White screw**), and terminate the other end of the wire to **Input 2014.0**5 (Door Thermostat) of the SRT2-ID16 of the ECC in the equipment room.

Step 11: Set the Entry Wizard 2.0 or other Auto Cashier

Using the print labeled "**SHEET M1.0**", set the auto cashier.
NOTE: Entry Wizard is to have a dedicated 120 volt circuit. DO NOT use power from the FusionX Electrical Control Panel.

Electrical Hookup 120 VAC
Running from a 20 amp breaker from the main Equipment Room Breaker Panel, you should have one conduit with (3) three #12 AWG wires. These wires are:

1-120VAC Hot
1-120VAC Neutral (White)
1-Ground (Green)

> **NOTE: Refer to Auto Cashier instructions for correct voltage.**

Cycle Switch and Entry Wizard Reset

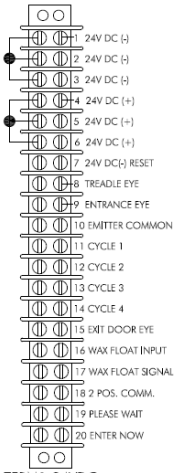
In a separate conduit, run (7) seven #18 AWG wires. These wires are:

Cycle 1 – Pink	**Term 1**
Cycle 2 – Brown	**Term 1**
Cycle 3 – Purple	**Term 1**
Cycle 4 – Gray	**Term 1**
24 VDC (-) Blue	**Term 1**
24 VAC (Hot) Auto Cashier Reset	**Term 2**
24 VAC Neutral	**Term 2**

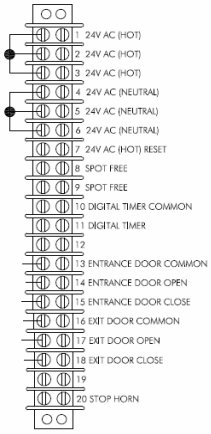
NOTE: It is recommended to run 4-5 additional wires for future needs.

In the FusionX ECC, terminate the above wires on the terminal strip labeled:

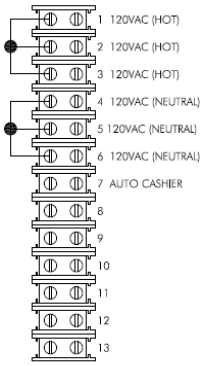
"TERM 1 - 24VDC" & "TERM 2 – 24VAC"



TERM1-24VDC



TERM2-24VAC



TERM3-120VAC

AUTO CASHIER – HAMILTON

The Hamilton Auto Cashier and Entry Wizard Auto Cashier send and receive the same type of signals to and from the Water Wizard 2.0 Electrical Control Center (ECC). Therefore, the wiring is very similar in both units. Run the Auto Cashier wiring into the (ECC) 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 8 wires. They are:

1-120V Hot *(To Main Panel – Not WW ECC)*
1-120V Neutral *(To Main Panel – Not WW ECC*)
1-Ground
4-Cycle Wires 24V DC (-)
1-Inhibit Signal 120V

NOTE: Run all low voltage in a separate conduit.

Inside the Hamilton, there is a single gang box containing the power wires and inhibit wires. Remove the cover and terminate your 120V hot from the ECC to the Hamilton. Then terminate the inhibit signal wire from the ECC to one of the small red wires. This will leave the 120V neutral (white) wire and one small red wire in the single gang box. Twist these two wires together and terminate with the 120V neutral from the ECC. You will then need to wire the signal wires. You will wire the 24V DC (-) from the ECC 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 ECC 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 WIRING DIAGRAM

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

AUTO CASHIER HAMILTON GOLDLINE

For the power and cycle switches you will need to run three wires for the main power, five wires cycle switches, and two wires for Cycle Inhibit.

Inside the Hamilton Goldline, locate the relay panel as shown in the figure on the following page. On the relay panel are three terminal strips with six screws each. The terminal strips are labeled **A, B,** and **C.** All the wires from the WW ECC to the auto cashier hook to these three terminal strips.

NOTE: (120 V power must come from Main Equipment Room Breaker Panel)

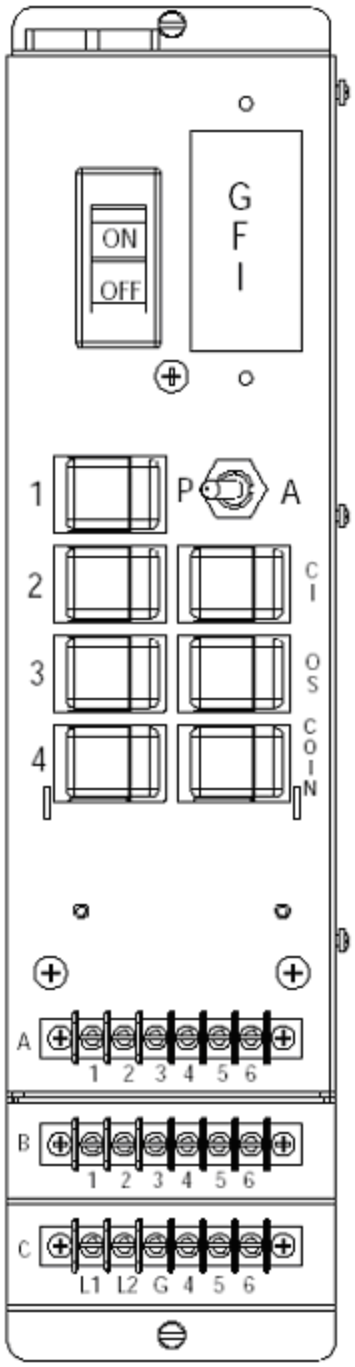
Terminal C is for incoming power and cycle inhibit. For the incoming power, terminate the **120VAC hot** to **L1**, **120 VAC Neutral** to **L2**, and the **ground wire** to **G**. Terminate **Auto Cashier Reset** to **C5** and **120 VAC Neutral** to **C6**.

Terminals A and B are for the cycle switches and the **Out of Service Relay**. Terminate the wire for **24 VDC (-)** to terminal **A1**. Then run jumper wires from **A1** to **A3**, from **A3** to **A5** and from **A5** to **B1**. Terminate the four wires for each of the cycles as follows:

Cycle 1 to A2
Cycle 2 to A4
Cycle 3 to A6
Cycle 4 to B2.

Terminals B3, B4, and **B5** are contacts for an out of service relay. **B3** is the **Common**, **B4** is the **Normally Open Contact**, and **B5** is the **Normally Closed Contact**. If the Goldline goes out of service, this relay is activated. See the diagram below:

Relay Panel



AUTO CASHIER UNITEC

Run the Unitec Auto Cashier wiring into the Electrical Control Center (ECC) inside the equipment room. This is where we will accept signals from the Auto Cashier, as well as send the reset signal. You will find 3 terminal strips for the Auto Cashier terminations in the lower portion of the panel. Terminal strip #1 is 24Vdc, terminal strip #2 is 24Vac and terminal strip #3 is 120Vac. The terminal strips and all terminations are labeled for your convenience. You will need a total of 10 wires. They are:

Main Power:

- (1) – 120Vac Hot
- (1) - 120Vac Neutral
- (1) – Earth Ground

Cycle Selection Wires:

- (4) – Cycle Wires, 24Vdc(-)
- (1) – 24Vdc(-) Common, supply voltage (blue wire)

Wash in Use Signal:

- (1) – Inhibit Signal (Labeled “Auto Cashier Reset”, available in 24Vdc(-), 24Vac Hot and 120Vac Hot)
- (1) – Inhibit Signal Neutral/Common (Dependant upon selected voltage of Inhibit Signal)

NOTE : There is a setting in the Red Lion that will need to be changed for proper operation . You will need to have a “Level-4” access code to be able to make this change. The factory default setting for this access code is “1, 2, 3, 4, Enter”. Press the “F5 – Log in Page” button to enter this code. Now press the “F8 – Site Data” button. Press the “Raise” button 4 times. You will see a sub-heading of “Type Cashier”. Press the “Enter” button to select this screen. At the bottom of the display, you will see the word “Toggle”. Press the arrow button directly under this word and you will observe that “Unitec” has now been selected.

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

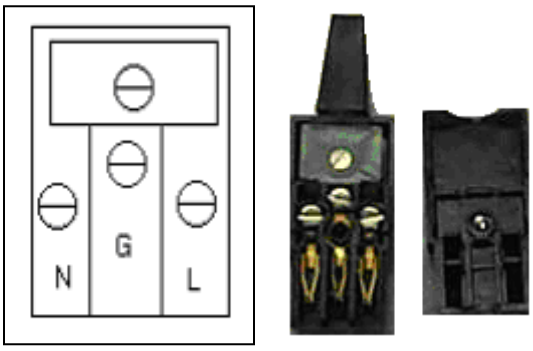
Refer to the Unitec Installation Manual for instructions to terminate the wiring inside of the Unitec cabinet.

To test the Unitec Auto Cashier Reset, press the “F7 – Tech Menu” button. Press “Raise” three times to get to the sub-heading “Test Misc. Functions”. Press “Enter” and this will bring you to the “Auto Cash Reset” output. Press the arrow button under the word “Toggle” and this output will be turned “On”. Check to see that the Unitec will be put “Out of Service”. Once this has been determined, you can toggle this output “Off”.

UNITEC WIRING DIAGRAM

Signal	J-18 Connector
Wash-In-Use Hot	1 (To WW ECC Panel 120 Volt)
Wash-In-Use Neutral	2 (To WW ECC Panel 120 Volt)
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	4
Cycle #2	3
Cycle #3	2
Cycle #4	1
Spare Option Relays	5-8

Three-Prong AC Connector For Incoming Power
(Power must come from Main Equipment Room Breaker Panel)



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

Step 12: 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 13: Wheel Scrub Features and Set-up Instructions

You will find a recipe bit titled “Wheel Brushes” in the Program Recipe menu. A custom recipe is required to apply this function to a wash recipe. You cannot perform the wheel brush step on the first pass of a wash recipe. The wheel brush photo eye must first find the rear wheel position.

Air Pressure Adjustments

There are two air regulators to move the brushes in and out, one of them to extend and one to retract. The extend regulator adjustment is very critical and should be adjusted to the lowest possible operating pressure, usually about 20 psi. Very little pressure is required to clean the vehicle wheels and too much air pressure could cause unnecessary load and wear on the wheel brush spindle gearmotors. The retract regulator should be adjusted so the brushes return smoothly but positively into their home position, usually about 30 psi.

Timers

There are also two timers and two counters associated with this option. Under “F2-Timers & Counters” on the Red Lion, go to the “Adjust Timers” menu (Menu Option 0) and press the “Enter” button until you see a timer called “Wheel Brush Dwell”. This timer determines how long the brush will stay engaged in the wheel in each direction (clockwise & counter-clockwise). This is factory set to 3 seconds.

Press the “Next” button to advance to the “Wheel Brush Retract Dwell” timer. This timer determines how long the brush disengages from the wheel between direction changes. This timer is factory set to 1 second. You want the brushes to disengage the wheel slightly while it changes directions. If it does not, you would want to increase this timer value.

Counters

Since we always know where the front tire will be because of the Treadle, we use that to our advantage. Under “F2-Timers & Counters”, go to “Adjust Gantry Counts” menu (Menu Option 1) and press the “Enter” button. There you will see an adjustable counter titled “Treadle Position”.

Setting Front Wheel Counter

To set this counter, put the gantry in manual mode (turn toggle switch in gantry panel ‘on’), and manually position the gantry until the wheel brush is perfectly aligned with the center of the treadle eye. It is best if there is a vehicle parked properly on the treadle plate to achieve the best result. Manually extend the wheel brush to assure you are in the proper position using the manual push buttons for the Wheel Brush located in the gantry control panel.

Once you have achieved this position go back to the Red Lion and press the arrow key that is located directly below the center of the screen, below the word “Off” on the display. This word will then change to “On”. You will see the value under the word “Treadle” change. You have now set where the wheel brush will position at the front tire when the wheel brush function is performed in a wash recipe.

Setting Rear Wheel Counter

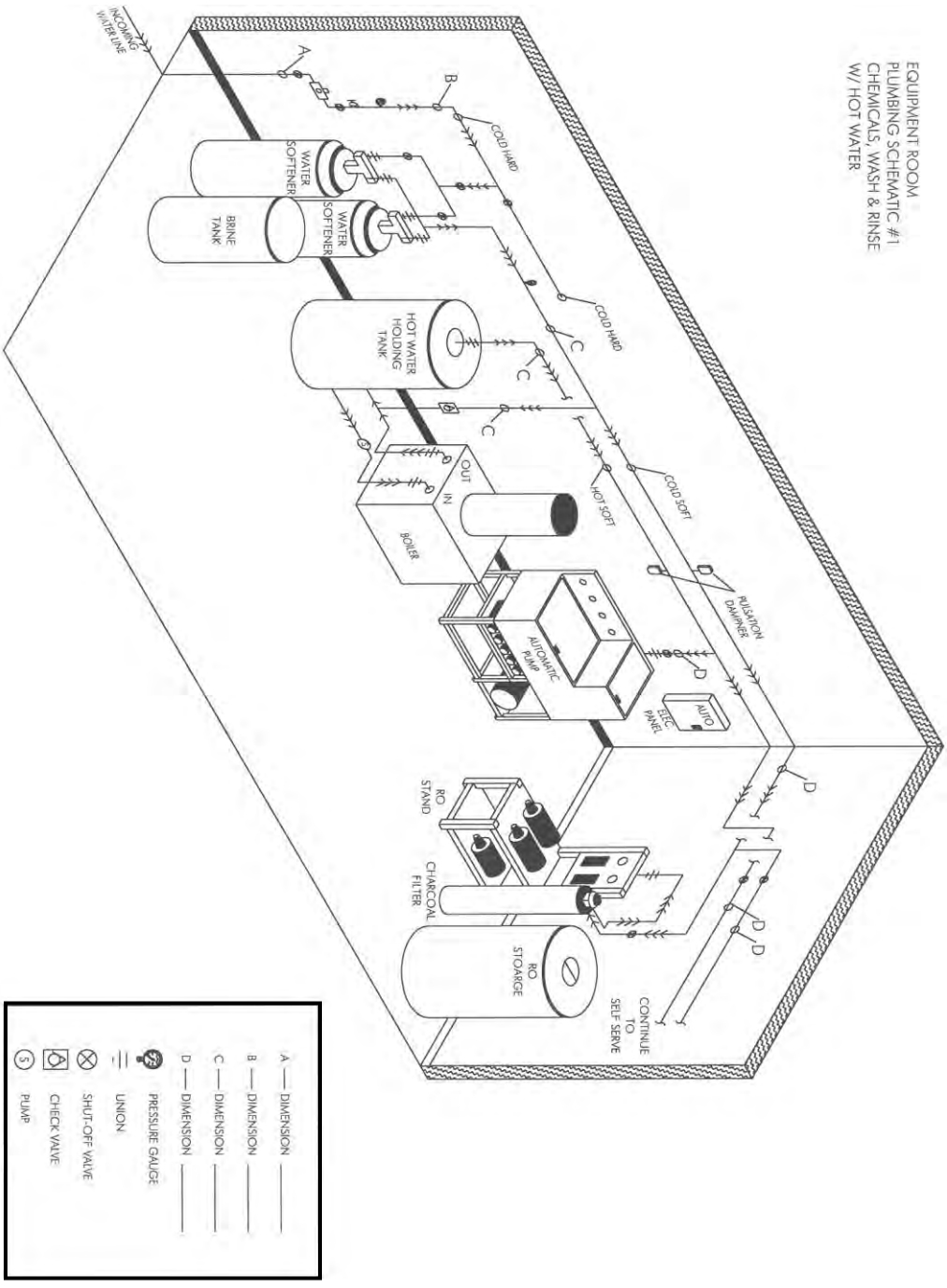
The wheel brush photo eye will locate the rear wheel position in pass 1. This position is also adjustable. Watch it wash a variety of vehicles to determine if the rear wheel position should be adjusted.

If you determine that this adjustment must be done, Under “F2-Timers & Counters”, go to “Adjust Gantry Counts” menu (Menu Option 1) and press the “Enter” button. Now press the “Next” button repeatedly until you see a counter called “Rear Wheel Offset”.

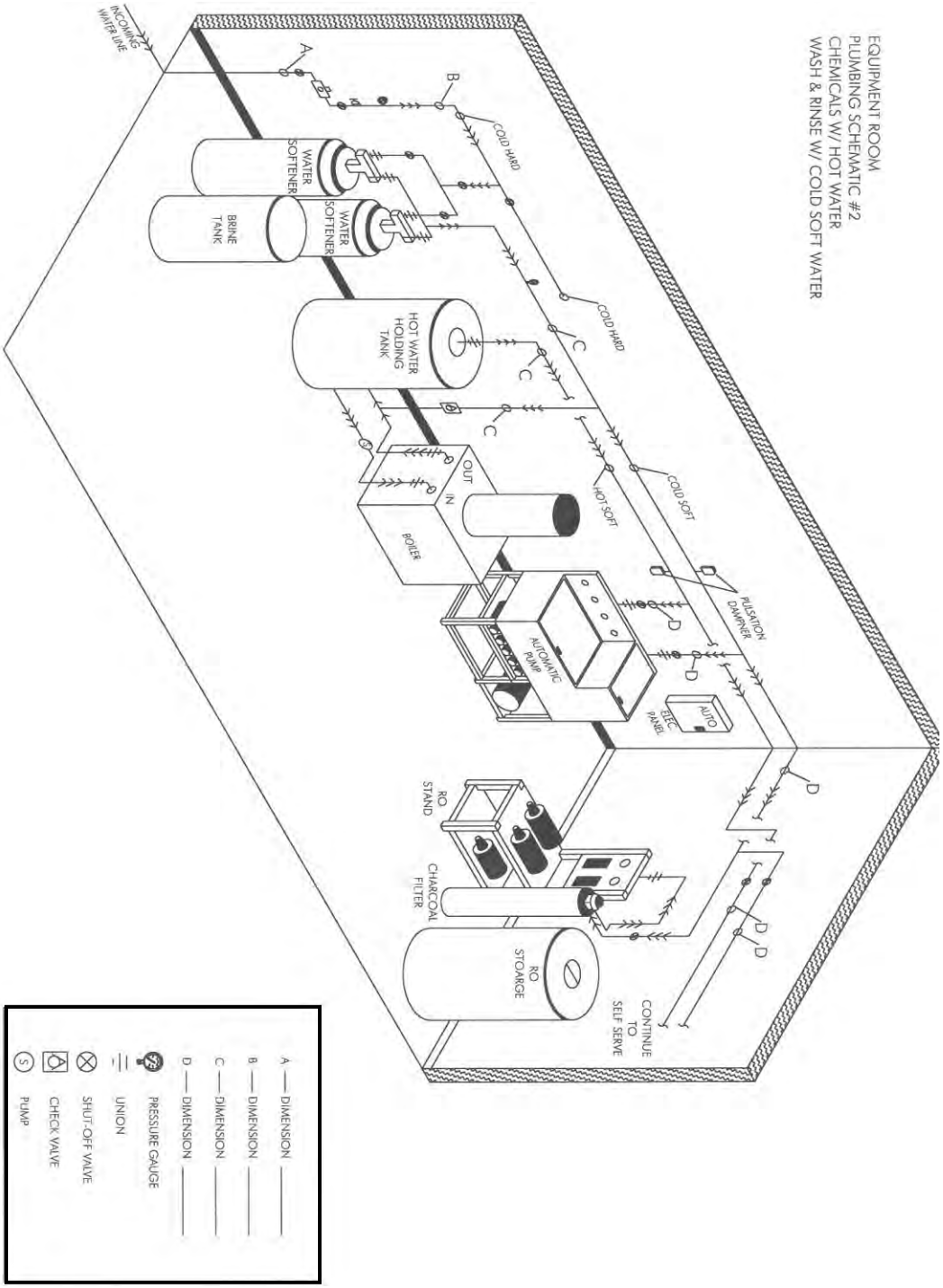
If you need to adjust the rear wheel brush position closer to the front of the vehicle, you should decrease this counter. If you need to adjust the rear wheel brush position closer to the rear of the vehicle, you should increase this counter. The counters on the eFusion and the FusionX are incremented in inches. If the Wheel Brush always positions about 2 inches past the center of the rear wheels, you can decrease the counter setting by 2 inches.

Equipment Room Plumbing

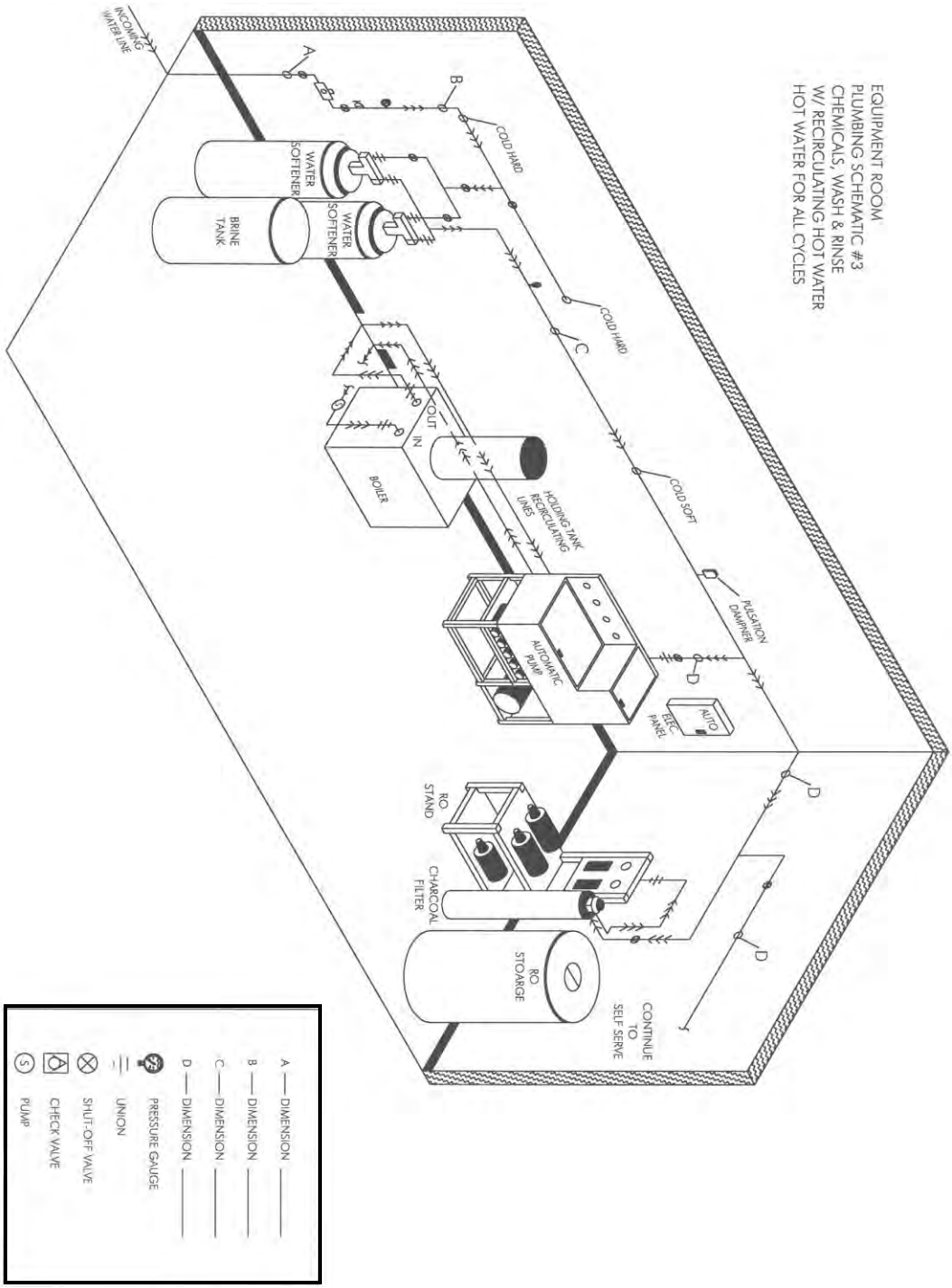
Schematic #1: Chemicals, Wash & Rinse w/ Hot Water



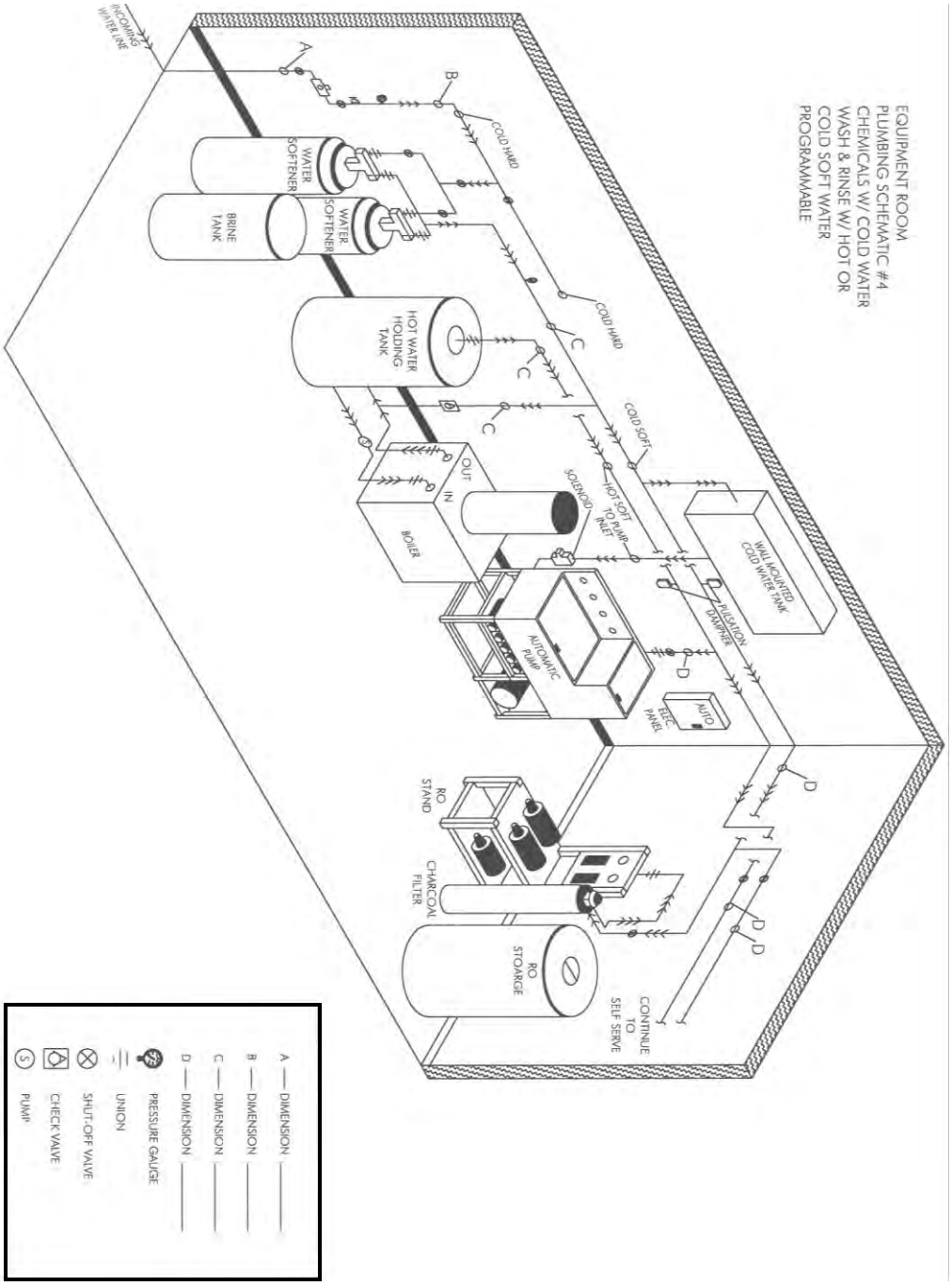
Schematic #2: Chemicals, w/ Hot Water, Wash & Rinse w/ Cold Soft Water



Schematic #3: Chemicals, Wash & Rinse w/ Recirculating Hot Water (Hot Water For All Cycles)



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



NOZZLE LOCATIONS

SPARKLE REVERSE OSMOSIS SYSTEMS

Table of Contents

SPARKLE REVERSE OSMOSIS UNIT 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. Spot Free 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. All electrical hook-ups as required by local Electrical Codes and City Ordinances.

2. 3/4" (Use 1” for 4000 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^{o} F, then hot and cold water must be blended together to provide a consistent water temperature between 70^{o} and 90^{o} F.

3. 1/2" Drain Line.

4. A clean floor and working space for the R.O. Unit and Product Storage Tank.

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 1/2" 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 1/2" 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
   White Lead ------ Mid Level Float Switch
   Black Lead ------- Upper, Mid and Lower Float

   (See Appendix A)

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).

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.

System Size	Production			
	Voltage	Amps	Delivery pump	Total amps
2000 GPD System	230v single Phase	5.4	9.9 amps/single ph	15.3
4000 GPD System	230v Three Phase	4.7	4.7 amps/ three ph	9.4
6000 GPD System	230v Three Phase	9.4	4.7 amps/ three ph	14.1

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.

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
200 GPD System	.7	1.0	1.4	1.5
4000 GPD System	1.6	2.0	3.0	3.5
6000 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 Jim Coleman Company at 1-800-999-9878 or 1-713-683-9878.

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.

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.

AUTOMATIC HOOK UP

You will need to run two wires from the R.O. Electrical Panel to the Water Wizard 2.0 "Electrical Control Center". On "Term 2 24VAC", on the water wizard 2.0 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 Wizard 2.0s, use input #011 for the second one. All other wires are connected the same.

COMPUTER OPERATION DESCRIPTION

PRODUCTION

Computer receives a signal from upper float switch and the mid-level float switch, that the 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.

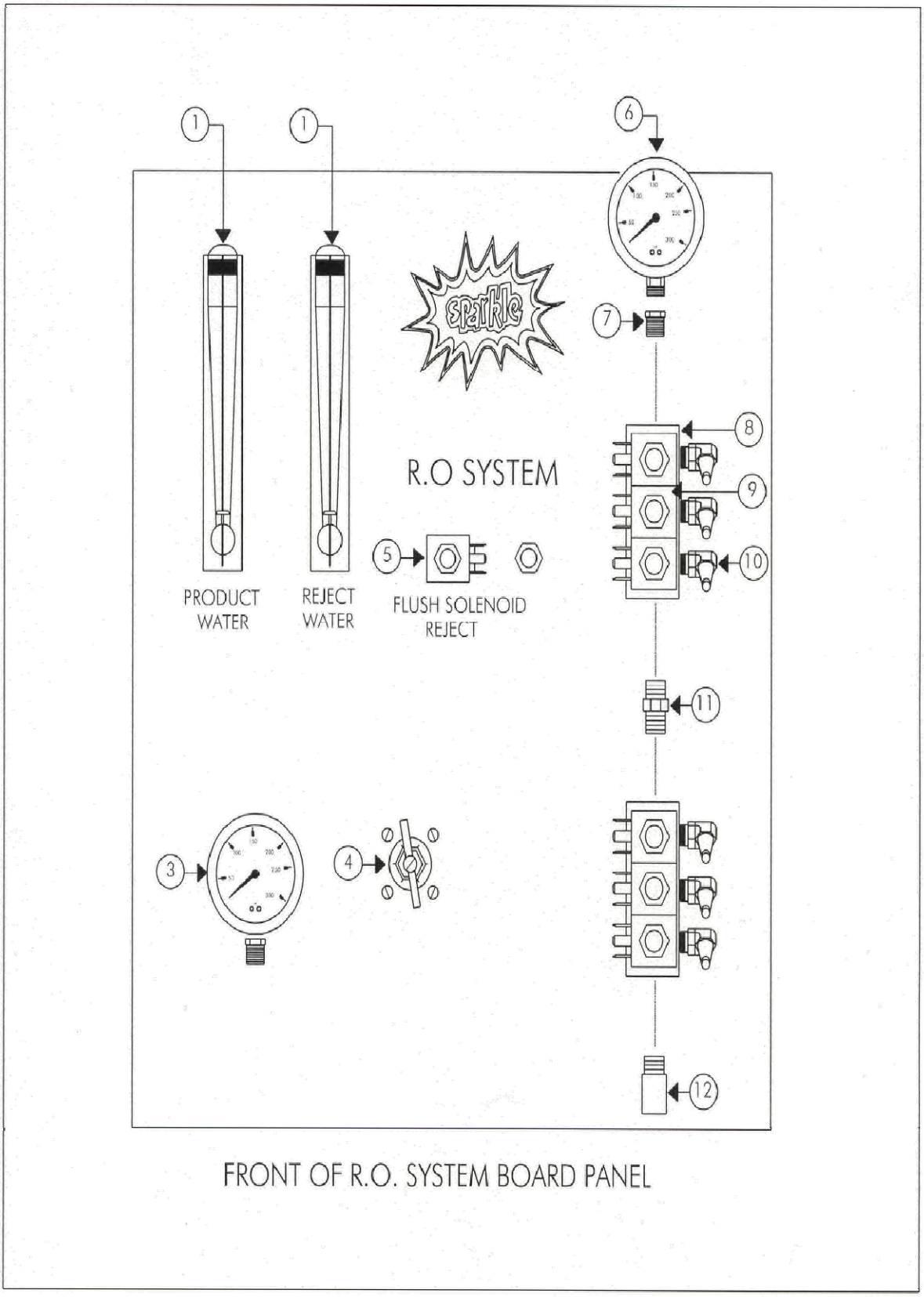
If the membrane is 4"x40" the unit is capable of producing 2000 gallons per day.
If the membrane is (2) 4"x40" the unit is capable of producing 4000 gallons per day.
If the membrane is (3) 4"x40" the unit is capable of 6000 gallons per day and so on.

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

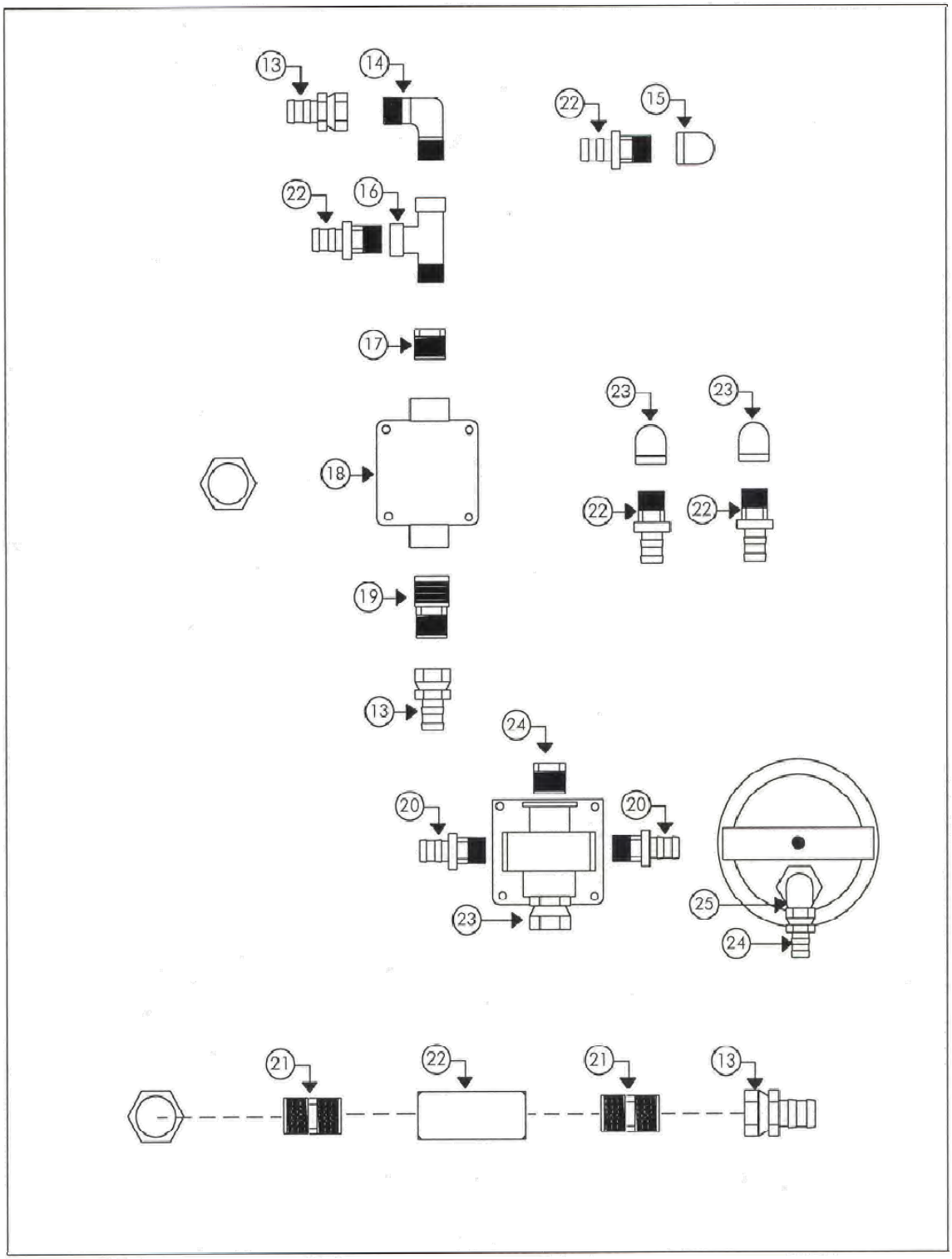
ITEMS	PART #	DESCRIPTION
30	62132	Reverse Osmosis Membrane AKA-1600 4"x 40
	62132-2	Reverse Osmosis Element for AKA-1600
31	22084	½ MPT x ½ FPT Coupling
	57030	Pump for 1600 GPD Reverse Osmosis
35	22056	½ ST Ell
37	22172	½ Hex Nipple
39	22166	3/8 x ¼ Hex Nipple
40		Pressure Switch Reverse Action 69WR5
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

REVERSE OSMOSIS PARTS LIST cont.



FRONT OF R.O. SYSTEM BOARD PANEL

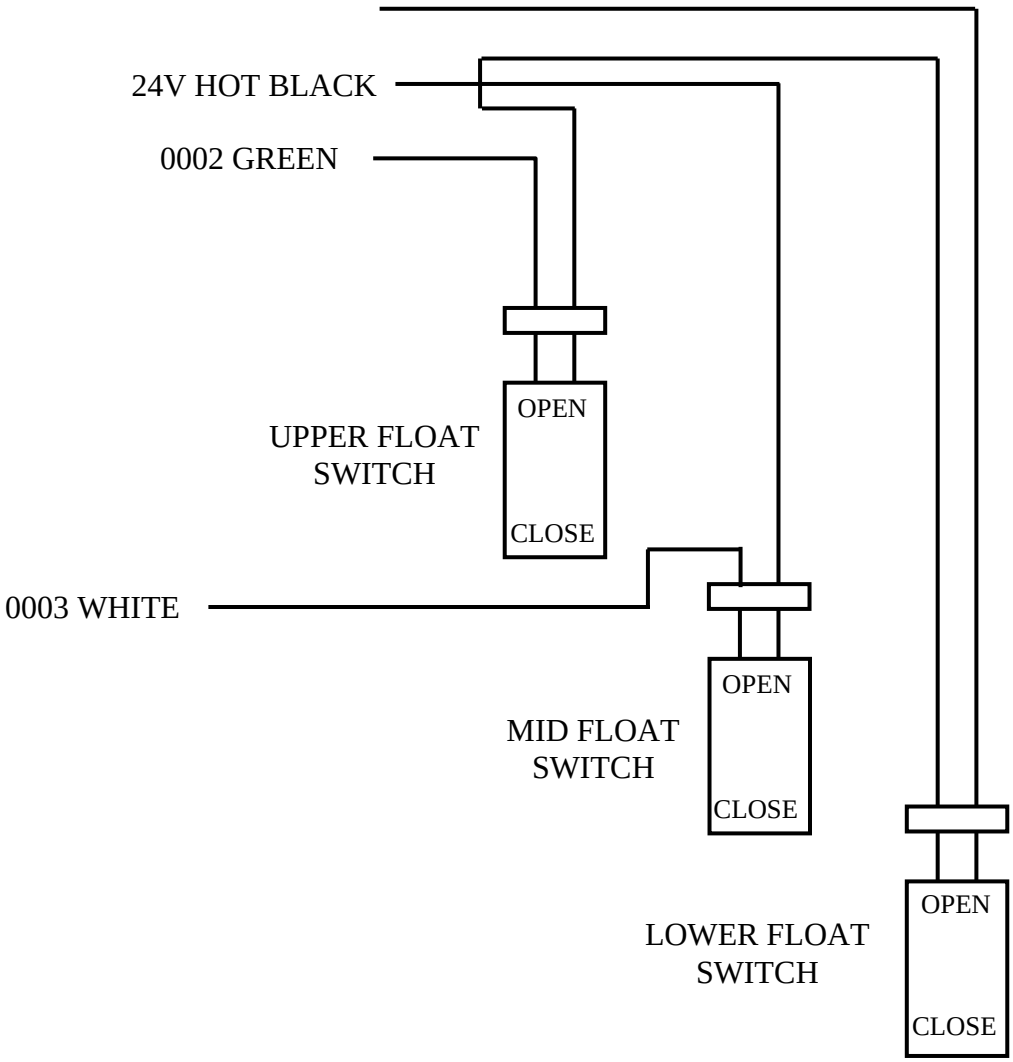
BACK OF R.O. SYSTEM BOARD PANEL



TROUBLE SHOOTING GUIDE

NO.	INPUTS	LIGHTS	LIGHT OPERATION
0000	Water Pressure Switch	**On**	Turns off When Pressure is Low
0001	Low Water Float Switch	**Off**	Turns on When Tank Runs Empty
0002	Upper Water Float Switch	**Off**	Turns on When Tank is Low on Water
0003	Mid Level Float Switch	**Off**	Turns on When Water Level Drops Below Float Switch
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 SF
0007	Bay 4 Input	**Off**	Turns on When Bay 4 is on SF
0008	Bay 5 Input	**Off**	Turns on When Bay 5 is on SF
0009	Bay 6 Input	**Off**	Turns on When Bay 6 is on SF
0010	Bay 7 or Auto 1 Input	**Off**	Turns on When Auto 1 is on SF
0011	Bay 8 or Auto 2 Input	**Off**	Turns on When Auto 2 is on SF
	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 Storage 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 Pressure Light**	**Off**	**Flashes When Water Pressure is Low**

FLOAT SWITCH HOOK-UP



(Appendix A)

Operating Instructions & Parts Manual

FW0154
0112
Supersedes
0907

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Pressure Booster Pumps

Description

Pressure booster pumps increase water pressure from city mains or private water systems. Applications include providing high water pressure for washing buildings, dairy walls or floors, hog parlors, poultry houses, rinsing or spray cooling equipment, lawn sprinkling and insecticide spraying. Stainless steel models can handle salt-water and contaminated water in reverse osmosis filter and other aggressive water applications.

Single-phase models are equipped with a capacitor start, thermal protected motor.

Three-phase models require separate overload protection.

Unpacking

When unpacking the unit, inspect carefully for any damage that may have occurred during transit.

NOTE: Use pump with clear water only.

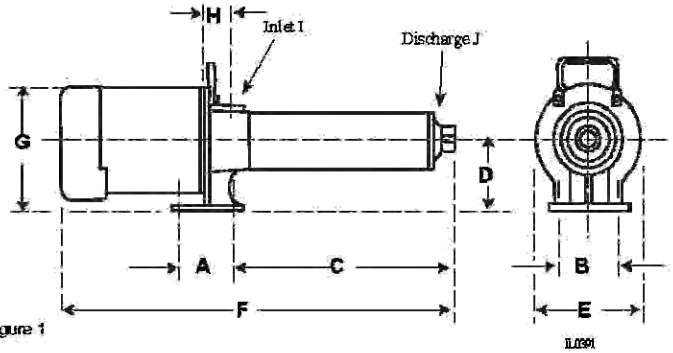


Figure 1

IL099

60 Hz Motor Driven Pump Dimensions (See Figure 1) • Chart A

Stainless Steel Fitted	Powder-Coated Cast Iron Fitted	Cast Iron Fitted	Dimensions In Inches A	B	C	D	E	F	G	H	I	J	Lbs. Ship Wt.
PB0508S031	PB0508C031	PB0508A031†	3-1/4	3-3/4	10-3/16	3-7/8	6-1/2	19-15/16	7-3/8	1-7/16	3/4	3/4	35
PB0512S051	PB0512C051	PB0512A051†	3-1/4	3-3/4	13-3/8	3-7/8	6-1/2	23-3/8	7-3/8	1-7/16	3/4	3/4	38
PB0516S071	PB0516C071	PB0516A071	3-1/4	3-3/4	16-1/2	3-7/8	6-1/2	27	7-3/8	1-7/16	3/4	3/4	43
PB0712S071	PB0712C071	PB0712A071	3-1/4	3-3/4	13-3/8	3-7/8	6-1/2	23-7/8	7-3/8	1-7/16	3/4	3/4	42
PB1014S101	PB1014C101	PB1014A101	3-1/4	3-3/4	16-5/16	3-7/8	6-1/2	27-1/4	7-3/8	1-7/16	3/4	3/4	48
PB1016S151	PB1016C151	PB1016A151	3-1/4	3-3/4	17-5/8	3-7/8	6-1/2	29-3/16	7-3/8	1-7/16	3/4	3/4	51
PB1914S201	PB1914C201	PB1914A201	3-1/4	3-3/4	18-1/8	3-7/8	6-1/2	29-11/16	7-3/8	1-7/16	3/4	3/4	51
PB2711S201	PB2711C201	PB2711A201	3-1/4	3-3/4	15-3/8	3-7/8	6-1/2	27-1/2	7-3/8	1-7/16	1	1	52
PB3506S201	PB3506C201	PB3506A201	3-1/4	3-3/4	13-15/16	3-7/8	6-1/2	25-7/8	7-3/8	1-7/16	1	1	51
PB2714S301	PB2714C301	PB2714A301	3-1/4	3-3/4	18-1/2	3-7/8	6-1/2	30-9/16	7-3/8	1-7/16	1	1	54
PB3508S301	PB3508C301	PB3508A301	3-1/4	3-3/4	17-1/8	3-7/8	6-1/2	29-3/16	7-3/8	1-7/16	1	1	53
-	-	PB5504A201	3-1/4	3-3/4	13-3/4	3-7/8	6-1/2	25-15/16	7-3/8	2-1/8	2	2	57-
	-	PB5506A301	3-1/4	3-3/4	18-1/16	3-7/8	6-1/2	30-3/16	7-3/8	2-1/8	2	2	57-
	-	PB8504A201	3-1/4	3-3/4	16-1/2	3-7/8	6-1/2	28-5/8	7-3/8	2-1/8	2	2	58-
	-	PB8505A301	3-1/4	3-3/4	19-5/16	3-7/8	6-1/2	31-1/2	7-3/8	2-1/8	2	2	58
50 Hz Motor Driven Pump Dimensions (See Figure 1) •58													
PB0508Y031	-	PB0508X031	3-1/4	3-3/4	10-3/16	3-7/8	6-1/2	20-3/16	7-3/8	1-7/16	3/4	3/4	34
PB0514Y051	-	PB0514X051	3-1/4	3-3/4	14-7/16	3-7/8	6-1/2	25-7/16	7-3/8	1-7/16	3/4	3/4	41
PB0714Y071	-	PB0714X071	3-1/4	3-3/4	14-15/16	3-7/8	6-1/2	25-15/16	7-3/8	1-7/16	3/4	3/4	47
PB1020Y101	-	PB1020X101	3-1/4	3-3/4	21-11/16	3-7/8	6-1/2	33-5/16	7-3/8	1-7/16	3/4	3/4	53
PB1023Y101	PB1023Z101	PB1023X101	3-1/4	3-3/4	24-3/8	3-7/8	6-1/2	36	7-3/8	1-7/16	3/4	3/4	55
PB2717Y201	-	-	3-1/4	3-3/4	21-5/16	3-7/8	6-1/2	33-7/16	7-3/8	1-7/16	1	1	56
-	-	PB3508X151	3-1/4	3-3/4	16-13/16	3-7/8	6-1/2	29-11/16	7-3/8	1-7/16	1	1	52
PB1021Y101	-	-	3-1/4	3-3/4	22-1/2	3-7/8	6-1/2	34-3/16	7-3/8	1-7/16	3/4	3/4	54
PB1920Y151	-	-	3-1/4	3-3/4	24-1/16	3-7/8	6-1/2	34-3/8	7-3/8	1-7/16	3/4	3/4	56
-	PB1922Z201	-	3-1/4	3-3/4	26-1/8	3-7/8	6-1/2	37-3/16	7-3/8	1-7/16	3/4	3/4	59

(*) NOTE: Figure 1, holes in mounting base are open slotted 3/8" wide x 1/2" long; dimension A & B are centerline from these open slotted holes. These holes are suitable for 1/4 to 3/8" bolts. Dimensions also apply to three phase models.

(†) Equipped with carrying handle. 132079 handle available as an option on other models. Add 1-3/8" to "G" if handle is included.

 132934

PERFORMANCE SPECIFICATIONS

PRESSURE ADDED - PSI					10	20	40	60	80	100	120	140	160	180	200	Max. Press. PSI	Suction Pipe Tap NPT	Disch. Pipe Tap NPT
Stainless Steel Fitted	Powder Coated Cast Iron Fitted	Cast Iron Fitted	HP	Stage	Output - Gallons per Minute													
	PB0508C031	PB0508A031•	1/3	8	9.5	8.7	7.3	5.8	3.5							87		
PB0512S051	PB0512C051	PB0512A051•	1/2	12	9.8	9.2	8.2	7.3	6.3	5.2	3.5					131		
PB0516S071	PB0516C071	PB0516A071	3/4	16	9.9	9.5	8.7	8.0	7.3	6.5	5.8	4.8	3.5			175		
PB0712S071	PB0712C071	PB0712A071•	3/4	12	14.0	13.4	12.2	10.9	9.5	7.9	6.0	3.6				152	3/4"	3/4"
PB1014S101	PB1014C101	PB1014A101	1	14	*	*	14.5	13.4	12.3	11.2	9.8	8.3	6.3	3.3		185		
PB1016S151	PB1016C151	PB1016A151	1-1/2	16	*	*	14.7	13.8	12.9	11.9	10.8	9.7	8.2	6.6	4.3	211		
PB1914S201	PB1914C201	PB1914A201	2	14	27.5	27.0	25.7	24.2	22.6	20.8	18.7	16.2	13.0	7.8		190		
PB3506S201	PB3506C201	PB3506A201	2	6	41.5	41.1	40.5	34.2	23.3							90		
PB2711S201	PB2711C201	PB2711A201	2	11	*	*	31.3	29.3	26.8	23.8	19.8	13.0				150	1"	1"
PB3508S301	PB3508C301	PB3508A301	3	8	41.5	41.1	40.9	40.0	34.2	26.4	10.0					120		
PB2714S301	PB2714C301	PB2714A301	3	14	*	*	32.2	30.6	28.9	27.0	24.8	22.0	18.4	12.2		190		
-	-	PB5504A201	2	4	77.8	71.5	52.5									55		
-	-	PB5506A301	3	6	77.8	74.4	65.0	51.1	31.9							93	2"	2"
-	-	PB8504A201	2	4	105.8	90.0	47.0									49		
-	-	PB8506A301	3	5	108.8	88.8	60.0	25.0								60		

† Example: If PB0508A031 pump is connected to supply line of sufficient capacity, carrying water at 40 PSI, and the output of the pump is held to 7.3 GPM by a gate valve, the pump will add 40 PSI to line pressure for a total output pressure of 80 PSI.

* Operation of pump in this range may result in reduced pump life and/or motor damage.
To keep pump and seal lubricated, a minimum flow of 1.5 GPM must always be maintained through the pump.

Motor voltage: Single Phase 1/3 - 2 HP - 115/230; 3 HP - 230V 60 Hz.
Three Phase 1/2 - 2 HP - 208-230/460, 50/60Hz.
Three Phase 3 HP - 208-230/460, 60 HZ
For three phase models, use suffix "3" on the model no. Example: PB0512A053

• Handle included with these models only.

Single Phase Motor Data 60HZ							Chart C
Single Phase† 60 Hz 3450 RPM Capacitor Start							
HP	Motor Voltage	Factory Connected Motor Voltage	Service Factor Motor Amps		Locked Rotor Motor Amps		Code Letter
			115V	230V	115V	230V	
1/3	115/230	115V	8.6	4.3	26.0	13.0	K
1/2	115/230	115V	13.0	6.5	36.0	18.0	K
3/4	115/230	115V	14.0	7.0	52.0	26.0	K
1	115/230	230V	18.0	9.0	78.0	39.0	L
1-1/2	115/230	230V	21.0	10.5	98.0	49.0	J
2	115/230	230V	25.0	12.5	116.0	58.0	H
3	230	230V	-	13.5	-	53.0	D
Single Phase Motor Data 50HZ							
Single Phase† 50 Hz 2850 RPM Capacitor Start							
1/2	115/230	115V	10.0	5.0	48.0	24.0	M
3/4	115/230	115V	14.4	7.2	64.0	32.0	L
1	115/230	230V	16.4	8.2	72.0	36.0	K1-1/2
	115/230	230V	23.6	11.8	104.0	52.0	K
2	230	230V	-	13.2	-	55.0	H

†Thermal overload protector - automatic reset

Three Phase Motor Data							Chart D
Three Phase† 60/50 Hz 3450/2850 RPM Capacitor Start							
HP	Motor Voltage	Factory Connected Motor Voltage	Service Factor Motor Amps		Locked Rotor Motor Amps		Code Letter
			230V	460V	230V	460V	
3/4	208-230/460	230V	3.5	1.75	19.0	9.5	K
1	208-230/460	230V	4.5	2.25	26.9	13.5	K
1-1/2	208-230/460	230V	5.7	2.85	33.5	16.8	K
2	208-230/460	230V	7.4	3.70	44.0	22.0	K
3□	208-230/460	230V	9.8	4.90	48.0	24.0	D

□

†3 HP, 3 Phase motor operable on 60Hz only.

Material Construction		Chart E
Component	Standard Models*	Stainless Steel Models
Motor	Rear access - Nema 56J face	Rear access - Nema 56J face
Bearings	Ball-ball, permanently lubricated	Ball-ball, permanently lubricated
Impellers	Noryl with 304 stainless steel bearing insert	Noryl with 304 stainless steel bearing insert
Diffuser	Noryl	Noryl
Diffuser plates	Delrin	Delrin
Pump shaft	416 Stainless steel	304 Stainless steel
Pump shaft coupling	316 Stainless steel	316 Stainless steel
Pump shell	304 Stainless steel	304 Stainless steel
Discharge & inlet casting	Cast iron	304 Stainless steel
O-Rings	Buna-N	Viton
Seal composition	Carbon-silicon carbide, stainless steel spring and Buna-N	Carbon-silicon carbide, stainless steel spring and Viton

*Models with powder coated inlet & discharge also available.

Minimum Wire Size Chart (Gauge)								Chart F
Motor HP	Volts	Phase	Distance In Feet From Motor To Service Panel					Breaker Size (Amps)
			0-50	50-100	100-150	150-200	200-300	
			Wire Size					
1/3	115/230	1	14/14	14/14	14/14	12/14	12/14	15/15
1/2	115/230	1	12/14	12/14	12/14	12/14	10/14	20/15
3/4	115/230	1	12/14	12/14	10/14	10/12	8/12	20/15
1	115/230	1	10/14	10/14	10/12	8/12	6/10	30/15
1½	115/230	1	10/12	8/12	6/12	*/10	*/10	30/20
2	115/230	1	10/12	8/12	6/12	*/10	*/10	30/20
3	230	1	10	10	10	10	8	30
3/4	230/460	3	14/14	14/14	14/14	14/14	14/14	15/15
1	230/460	3	14/14	14/14	14/14	14/14	12/14	15/15
1½	230/460	3	14/14	14/14	14/14	12/14	12/14	15/15
2	230/460	3	14/14	14/14	14/14	12/14	10/12	15/15 3
3	230/460	3	14/14	14/14	14/14	12/14	10/12	15/15

(*) Not economical to run in 115V, use 230V.

General Safety Information

Carefully read and follow all safety instructions in this manual and on pump. Keep safety labels in good condition. Replace missing or damaged safety labels.

This is a SAFETY ALERT SYMBOL. When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠DANGER *Warns of hazards that WILL cause serious personal injury, death or major property damage if ignored.*

⚠WARNING *Warns of hazards that CAN cause serious personal injury or death, if ignored.*

⚠CAUTION *Warns of hazards that MAY cause minor personal injury, product or property damage if ignored.*

IMPORTANT: Indicates factors concerned with operation, installation, assembly or maintenance which could result in damage to the machine or equipment if ignored.

NOTE: Indicates special instructions which are important but are not related to hazards.

⚠WARNING

Hazardous voltage. Can shock, burn or cause death. Ground pump before connecting to power supply.

Wire motor for correct voltage. See "Electrical" section and Motor Data Charts C&D of this manual, and motor nameplate.

Ground motor before connecting to power supply.

Meet United States National Electrical Code and local codes for all wiring.

Do not handle a pump or pump motor with wet hands or when standing on a wet or damp surface or in water.

Follow wiring instructions in this manual when connecting to power lines.

⚠WARNING *Always disconnect power source before performing any work on or near the motor or its connected load.*

Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in flammable and/or explosive atmospheres.

Hazardous pressure! Install pressure relief valve in discharge pipe. Release all pressure on system before working on any component.

1. Make workshop child proof - use padlocks, master switches, remove starter keys.
2. Wear safety glasses when working with pumps.
3. Wear a face shield and proper apparel when pumping hazardous chemicals.
4. Keep work area clean, uncluttered and properly lighted; replace all unused tools and equipment.
5. Provide guarding around moving parts.
6. Keep visitors at a safe distance from the work area.
7. Periodically inspect pump and system components.
8. Protect electrical cord. Replace or repair damaged or worn cords immediately.
9. Do not insert finger or any object into pump or motor openings.
10. Secure the discharge line before starting the pump. An unsecured discharge line will whip, possibly causing personal injury and/or property damage or puncture.

⚠CAUTION *Do not touch an operating motor or engine. They are designed to operate at high temperatures.*

⚠WARNING *This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.*

⚠WARNING *Risk of Electric Shock. This pump has not been investigated for use in swimming pool areas.*
NOTE: Pumps with the "CSA-CUS" mark are tested to UL standard UL778 and certified to CSA standard C22.2 No. 108.

Pre-Installation

HANDLING

1. Use handle supplied to lift pump.
2. Avoid impact on pump or motor. In particular, avoid impact on discharge end of pump or rear motor access cover.

LOCATION

⚠WARNING *In any installation where property damage and/or personal injury might result from an inoperative or leaking pump due to power outages, discharge line blockage, or any other reason, a backup system(s) should be used.*

1. Locate pump as close to the fluid source as possible, keeping the inlet pipe short as possible.
2. Place unit where the pump and piping are protected from the weather and extremes of heat, humidity and below freezing temperatures.
3. Mount unit in a dry location that is easily accessible for inspection and maintenance. If a dry location is not available, mount it on a foundation well above the wet floor.
4. Allow ample clearance around unit for free air circulation.

SUCTION LIMITATIONS

1. Units are non self-priming.
2. Pressure booster pumps are not recommended for suction lift applications.

PIPING

1. Use galvanized piping, rigid plastic or other suitable pipe that will not collapse under suction or rupture due to pressure.

⚠CAUTION ***If hose is used, make sure it is the reinforced industrial type that is rated higher than the shutoff pressure of the system. Ordinary garden hose will collapse and starve the pump of water.***

2. The diameter of the inlet and discharge pipe should be no smaller than the corresponding ports of the pump (See Figure 1). Smaller pipe will reduce the capacity of the pump. Increase pipe size on long runs.
3. Avoid air pockets in inlet piping or air will accumulate at high points, making priming difficult.
4. Use pipe compound on all joints and connections. Use Teflon tape or plastic joint stick, on plastic pipe. Draw all pipe up tightly.

IMPORTANT: The entire system must be air and water tight for efficient/proper operation.

Installation

PUMP INSTALLATION

IMPORTANT: Pump is built to handle clear water only; it is not designed to handle water containing sand, silt or other abrasives.

1.Refer to Figures 6, 7, and 8 for typical installations.

⚠CAUTION *Support pump and piping when assembling and when installed. Failure to do so may cause piping to break, pump to fail, motor bearing failures, etc.*

2. If the pump is used as part of a permanent installation, bolt to a rigid foundation.

⚠WARNING *Use only components that are rated for maximum pressure pump can produce when used in boosting system or any other system. Do not exceed the total maximum pressure boost as listed per model in Performance Charts B.*

PRESSURE BOOST SYSTEMS

1. On pressure boost systems, locate the pump so that there will always be a positive supply of water to the pump (See Figures 6, 7 and 8).
2. For service convenience, install a gate valve and union in the inlet and discharge line.

⚠CAUTION *Do not use a globe valve or other restricting type of valve that will seriously restrict the pumps discharge capacity.*

3. Install a check valve as shown in Figure 6. Be sure check valve flow arrows point in the direction of water flow.
4. Whenever dirt, sand or debris is present in the supply water, install a strainer or filter on the inlet side of the pump (See Figure 7).

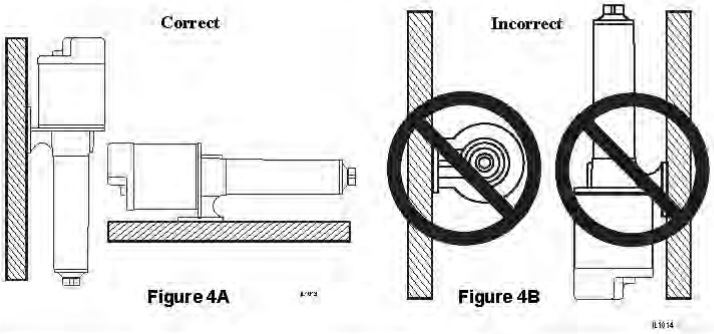
NOTE: For heavy amounts of sediment, install a trap filter on the inlet side of the pump (See Figure 5).

NOTE: Pressure gauges installed before and after the filter will show pressure differential indicating the need for filter replacement or cleaning.

Figure 2 - No Air Pockets in Inlet Pipe

Figure 3 - Inlet Pipe Must Not Leak

⚠CAUTION *Mount pump in correct position or pump failure will result.*



SAND AND SEDIMENT TRAP FILTER

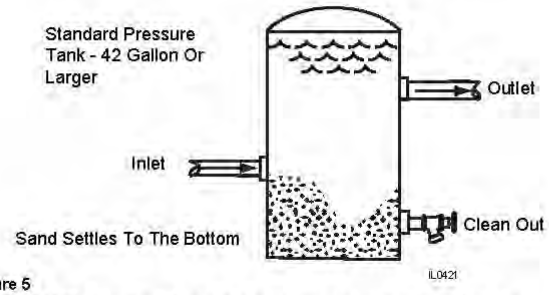


Figure 5

IMPORTANT: Clean all filters and strainers on a regular schedule.

Installation (Continued)

5. A pressure gauge installed in the inlet pipe close to the inlet port, (See Figure 6) will show if enough water is being supplied to the pump. See Operation Section - Priming, Pressure Boost Installations.
6. On installations that are using nozzles for mist spraying, install a filter in the discharge plumbing to prevent the nozzles from becoming plugged. Multiple filters should be plumbed in parallel.

⚠WARNING *Install a pressure relief valve on any installation where pump pressure can exceed the pressure tank's maximum working pressure or on systems where the discharge line can be shut off or obstructed. Extreme over pressure can result in personal injury or property damage.*

⚠CAUTION *This unit is not waterproof and is not intended to be used in showers, saunas or other potentially wet locations. The motor is designed to be used in a clean dry location with access to an adequate supply of cooling air. Ambient temperature around the motor should not exceed 104°F (40°C). For outdoor installations, motor must be protected by a cover that does not block airflow to and around the motor. This unit is not weatherproof nor is it able to be submersed in water or any other liquid.*

⚠ ***To avoid dangerous or fatal electrical shock, turn off power to motor before working on electrical connections.***

⚠ ***Supply voltage must be within ± 10% of nameplate voltage. Incorrect voltage can cause fire or seriously damage motor and voids warranty. If in doubt, consult a licensed electrician.***

⚠ ***Use wire size specified in wiring Chart F. If possible, connect pump to a separate branch circuit with no other appliances on it. If motor wiring diagram differs from diagram shown below, follow diagram on motor.***

Pump used to boost incoming city pressure (automatic operation).

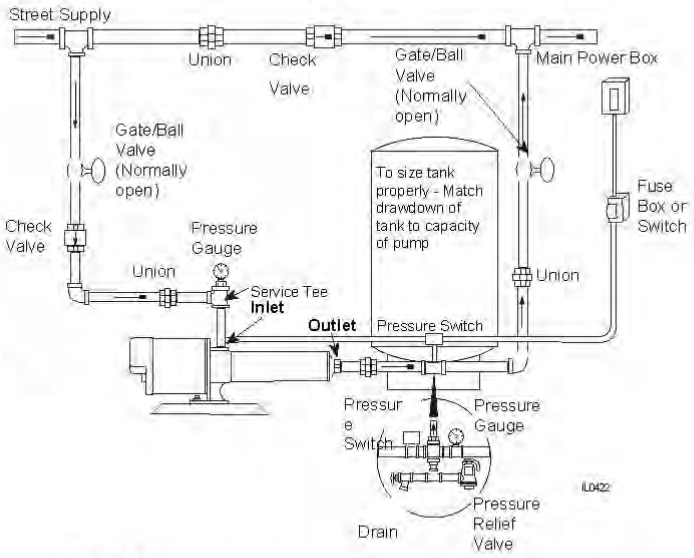


Figure 6

IMPORTANT: A contained air pressure tank and pressure switch is required to keep the pump from rapid cycling and prevent the motor from over heating. Install the tank and switch on the house side of system.

Pump used to boost water pressure in mist spray applications (automatic operation).

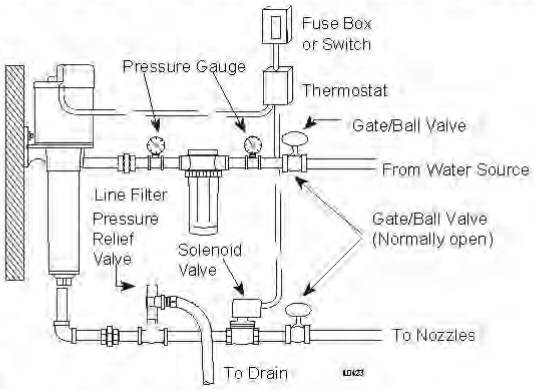


Figure 7

NOTE: Install solenoid valve on discharge side of pump.
IMPORTANT: Clean all filters and strainers on a regular schedule.

Installation (Continued)

⚠WARNING

Hazardous voltage. Can shock, burn or cause death. Ground pump before connecting to power supply.

⚠ *Ground motor before connecting to electrical power supply.*

⚠ *Failure to ground motor can cause severe or fatal electri- cal shock hazard.*

⚠ *Do not ground to a gas supply line.*

⚠CAUTION ***Proper rotation of pump impeller is critical on three phase motors. See Motor Rotation under Operation section and Figure 12.***

WIRING

1. Install, ground, wire and maintain this pump in accordance with your local electrical code and all other codes and ordinances that apply. Consult your local building inspector for local code information.
2. Ground the pump permanently using a wire of size and type specified by local or United States National Electrical Code. **Do not ground to a gas supply line.**
3. Connect ground wire first. Connect to ground first, then to green grounding terminal provided on the motor frame, identified as GRD. Ground connection MUST be made 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.
4. Connect the other end of the ground wire to a properly grounded service panel or to a control panel ground bar if it is connected to the power supply ground.

IMPORTANT: Check local and/or United States National Electric Codes for proper grounding information.

⚠CAUTION *Make certain that the power supply conforms to the electrical specifications of the motor supplied. See Motor Data Charts.*

Pump used to boost incoming pressure from a wall hydrant (manual operation).

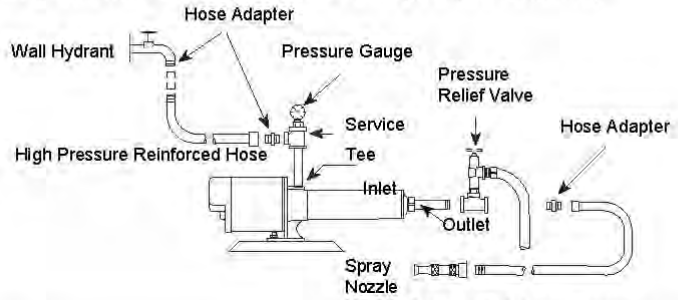
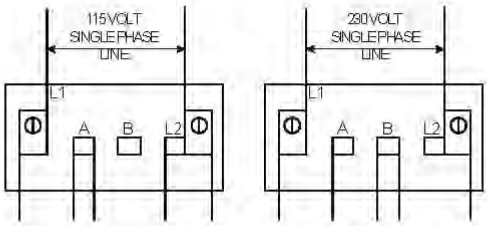
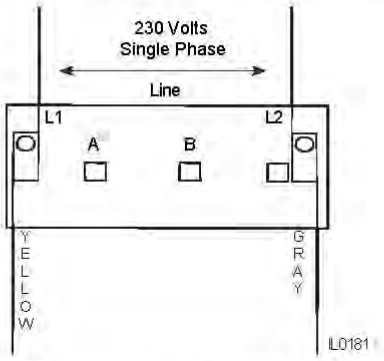


Figure 8



NOTE: Dual voltage motors, change the red and gray wire to the voltage required.

Figure 9 - Wiring Diagram for Single Phase 1/3 -2 HP Motors



NOTE: Single voltage (230V) motor, and can not be connected to 115V.

Figure 10 - Wiring Diagram for Single Phase 3 HP Motors

Installation (Continued)

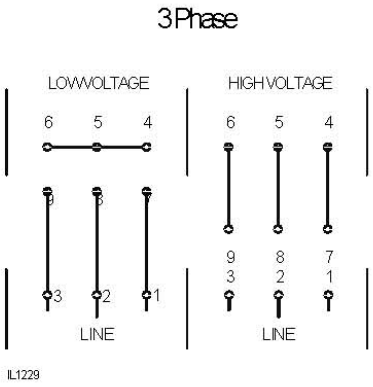


Figure 11 - Wiring Diagram for Baldor TEFC 3 Phase motors

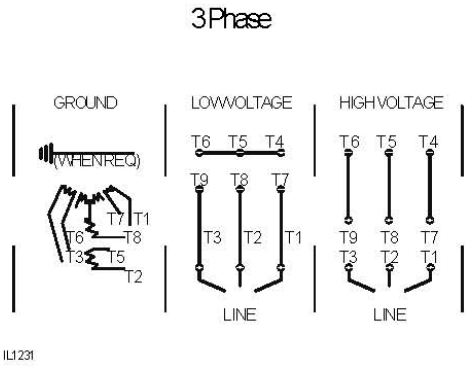


Figure 13 - Wiring Diagram for Marathon TEFC 3 Phase motors

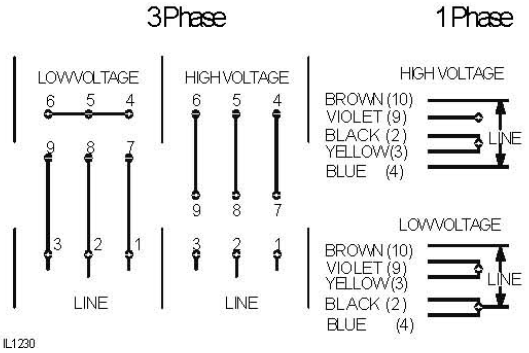
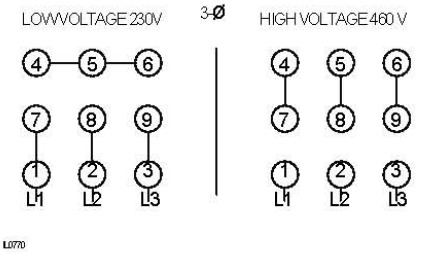


Figure 12 - Wiring Diagram for Franklin Electric TEFC 1 Phase and 3 Phase motors



1 - Tan	4 - Yellow	7 - Purple
2 - Red	5 - Black	8 - Gray
3 - Orange	6 - Blue	9 - White

CONNECTION FOR 3 PHASE, 9 LEADS. IF YOUR 3 PHASE LEADS ARE COLOR CODED, MATCH NUMBER ABOVE TO THE CORRESPONDING COLOR.

NOTE: To reverse rotation, interchange any two incoming lines (Power) leads.

Figure 14 - Wiring Diagram for Three Phase Motors

Installation (Continued)

5.Specific Wiring Procedure (Refer to Figures 9, 10, 11, 12, 13, 14 and Minimum Wire Size Chart).

a. Select the voltage you are to use, either 115V or 230V single phase, 230V or 460V three phase.
b. The 1/3, 1/2 and 3/4 HP single phase pumps are factory connected for 115V at the motor. The 1, 1 1/2, 2 and 3 HP pumps are factory connected for 230V at the motor. Three phase models are factory connected for 230V at the motor.
c. If the motor wiring must be changed to conform to your specific voltage requirements then the motor, pressure switch or other controls should be rewired to conform to one of the wiring diagrams (either 115V or 230V, single phase; 230V or 460V, three phase). Single phase 3 HP motors are 230V only and cannot be wired for 115V service.
d. The motor wiring diagrams are Figures 9, 10, 11, 12, 13 & 14, and also are located on the motor label of the pump.

6. Remove the rear access cover of the motor.
7. Make the wiring change and replace the rear access cover.

⚠WARNING *Replace rear access cover before starting or operating pump. Failure to do so can result in personal injury.*

IMPORTANT: Do not use an extension cord or splice wires. Joints should be made in an approved junction box. If the above information or the following wiring diagrams are confusing, consult a licensed electrician.

8. All units are not supplied with pressure switches, float devices, on/off switches, or the like (control devices). Controls should be wired in at this time, utilizing whatever instructions come with the controls. All units supplied with cords, will run whenever cord is plugged into power and will turn off whenever cord is disconnected from power.

MOTOR PROTECTION

All single phase motors have built in thermal protection for all voltages. The overload protects the motor against burnout from overload of low voltage, high voltage and other causes. The device is automatic and resets itself once the temperature has dropped to a safe point. Frequent tripping of the device indicates trouble in the motor or power lines and immediate attention is needed.

⚠WARNING *Never examine, make wiring changes or touch the motor before disconnecting the main electrical supply switch. The thermal device may have opened the electrical circuit.*

Three phase motors do not have a built in thermal protection. It is recommended that a properly sized magnetic or manual starter (both with properly sized heaters) be used with all three phase motors. Install starters following instructions of the starter manufacturer. See Motor Rotation under Operation Section for changing rotation on three phase motors.

All motors (single and three phase) should be equipped with a correctly fused disconnect switch to provide protection. Consult local or United States National Electric Codes for proper fuse protection based on motor data chart (See Charts C, D and Wire chart F).

Operation

⚠CAUTION *Unit must be full of fluid before operating. Do not run dry, or against a closed discharge. Do not pump dirty water or abrasive liquids. To do so will cause pump failure and will void the warranty.*

VALVES

The inlet valve should be in the full open position and the discharge valve should be partially open, permitting some back pressure to be exerted against the pump when starting up. Open valve after start up is completed.

PRIMING

NOTE: Before starting the pump it is absolutely necessary that **both the pump and the inlet pipe be completely filled with water.**

PRESSURE BOOST INSTALLATIONS

Priming is automatic when pump is connected to a pressure source such as a hydrant or city main (See Figures 6, 7 & 8).

1. Open valves or nozzle on inlet and discharge side of pump.
2. To relieve trapped air, allow water supply to run a minimum of 30 seconds before starting the pump.

IMPORTANT: An adequate flow of water going into the pump is required so that the pumps impellers and shaft seal do not run dry and fail.

3. If you installed a pressure gauge at the pump inlet, a reading of 2 psi minimum should show whenever the pump is in operation (See Figures 6, 7 & 8).

This reading insures that there is an ample supply of water into the pump inlet housing.

MOTOR/PUMP ROTATION

1. Single phase models are one (1) rotation only (counterclockwise when facing the pump end) and cannot be reversed.
2. Proper rotation of pump impeller is critical for three phase pumps. Pump motor should turn counterclockwise (CCW) when facing pump end. Momentarily "bump" (apply power for less than a second) the motor to check for proper rotation. To change rotation on three phase units, interchange any two (2) incoming line (power) leads.

⚠CAUTION *Do not go over recommended maximum operating pressure (see Specifications), while maintaining minimum flow of 1.5 GPM thru the pump. Do not restrict the inlet line to the pump.*

If driver (electric motor) is overloaded, a valve can be installed in the discharge line to increase the back pressure and reduce driver loading.

Operation (Continued)

START - UP PROCEDURE

Once the preceding instructions have been completed, the pump can be started.

1. During the first few hours of operation, inspect the pump, piping and any auxiliary equipment used in connection with the unit.
2. Check for leaks, excessive vibration or unusual noises.

Figure 15 - Correct Motor/Pump Rotation (all units)

NOTE: See rotation arrow on inlet casting.

Maintenance

⚠CAUTION *Disconnect power supply and depressurize system before servicing pump or removing any component.*

ROUTINE

Pump should be checked routinely for proper operation. Replace or clean all filters and line strainers on a regular basis.

DRAINING

This pump cannot be completely drained because of internal design. Most of the liquid can be drained by tilting the discharge forward after removing discharge casting; or, the liquid can be drained through the inlet port. Store in heated areas.

CLEANING

If used for spraying insecticides, pump should be thoroughly flushed with clean water after using.

LUBRICATION

The motor has prelubricated bearings. No lubrication is required.

SERVICING THREE-PHASE UNITS

Loctite (thread sealer) is used on the threads between the motor shaft and the pump shaft coupling. When reassembling, reapply thread sealer.

PUMP DISASSEMBLY

To disassemble the pump, refer to the exploded parts view and Figures 16, 17 & 18

Tools Required:

- Block of wood (2" x 4" x 12")
  Piece of 3/4" pipe (12" to 24" long)
- Pipe wrench
- Strap wrench
- 1/4" Dowel rod (about 24" long)
- 9/16" Open end wrench
- 3/8" Open end wrench

1. To stabilize pump during disassembly, place block of wood underneath pump barrel.
2. Thread pipe into pump inlet port. This acts as a handle.
3. Using the pipe wrench, remove the discharge head, turning CCW (counter clockwise).
4. With the strap wrench, loosen the barrel, turning CCW (counter clockwise). DO NOT use pipe wrench on pump barrel.
5. Holding the impeller stack in place, position pump in upright position, standing unit on the motor end cover. 6. Use the 1/4" dowel rod to hold the stages down and in place on the pump shaft. Remove pump barrel.
7. Slide the stages off the pump shaft onto the 1/4" dowel rod. Leave stages on rod and carefully set aside.

NOTE: There may be some small .010" shim washers located next to the pump shaft coupling. Keep these shims for reassembly.

8. Through the side opening of the mounting frame, hold the motor shaft with 9/16" wrench. Remove the shaft and coupling from the motor using the 3/8" wrench on the hex shaped pump shaft.

NOTE: If the hex shaft comes free, leaving the coupling attached to the motor, use vise grips to free the coupling.

MECHANICAL SEAL REPLACEMENT

1. Follow instructions under "Pump Disassembly".
2. Remove the mechanical seal assembly.
   a. The rotary portion of the seal assembly (carbon ring, Buna-N gasket and spring will slide easily off the end of shaft).
   b. Using two (2) screwdrivers, pry the ceramic seal and rubber gasket from the recess of the mounting ring (See Figure 16).

⚠CAUTION *The precision lapped faces of the mechanical seal are easily damaged. Handle the replacement seal carefully. Short seal life will result if seal faces (ceramic & carbon) are nicked, scratched or dirty.*

3. Clean the seal cavity of the mounting ring and the motor thoroughly.
4. Wet outer edge of rubber cup on ceramic seat with liquid soap solution. Use sparingly (one drop only).

NOTE: Liquid soap solution - one drop of liquid soap combined with one teaspoonful of water.

5. With thumb pressure, press ceramic seal half firmly and squarely into seal cavity. Polished face of ceramic seat is up. If seal will not seat correctly, remove, placing seal face up on bench. Reclean cavity. Seal should now seat correctly (See Figure 17).
6. If seal does not seat correctly after recleaning cavity, place a cardboard washer over polished seal face and carefully press into place using a piece of standard clean 3/4" pipe as a press (See Figure 18).

Maintenance (Continued)

IMPORTANT: Do not scratch seal face.

7. Dispose of cardboard washer and recheck seal face to be sure it is free of dirt, foreign particles, scratches and grease.
8. Inspect shaft to be sure it is free of nicks and scratches.
9. Apply liquid soap solution sparingly (one drop is sufficient) to inside diameter of rubber rotating member.
10. Slide rotating seal member (carbon face down toward ceramic face) and spring over the shaft.

IMPORTANT: Do not nick or scratch carbon face of seal when handling.

MOTOR REPLACEMENT

The motor can be replaced with any standard Nema 56J jet pump motor (of proper HP for each pump) by referring to the following instructions.

1. Follow steps as outlined under Rotary Seal Replacement and Pump Disassembly.
2. Remove cap screws that connect the motor to the mounting ring and pull motor away.
3. Replace motor with standard Nema 56J jet pump motor by positioning motor against the mounting frame and assembling with four (4) cap screws.

IMPORTANT: Because damage to the shaft seal can occur in disassembly, a new seal will be necessary.

PUMP REASSEMBLY

Before reassembling the pump, carefully inspect the component parts of the cartridge (stage) assembly, looking for damage, wear or heat distortion. Pay careful attention to spacing direction of components, and location of shims. Refer to Figure 19 for proper facing and parts arrangement.

If damage to Stage components is evident, a complete cartridge assembly or individual stage assemblies are available for replacement (See Replacement Parts List).

1. Reassembly should follow the reverse order of the disassembly procedure with special care given to replacement of the rotary seal.
2. Check top and bottom of o-rings for damage. It is recommended that new o-rings be used.
3. Do not use pipe compound of Teflon tape on barrel threads. The o-rings will prevent pump from leaking.
4. After pump is reassembled, tighten the discharge head to a torque of 45-50 ft/lbs. If torque wrench is not available, tighten firmly but avoid distortion or damage to plastic internal parts.
5. After reassembly, apply power momentarily to unit (15 to 30 seconds). The pump and motor should rotate freely or with a light rubbing.

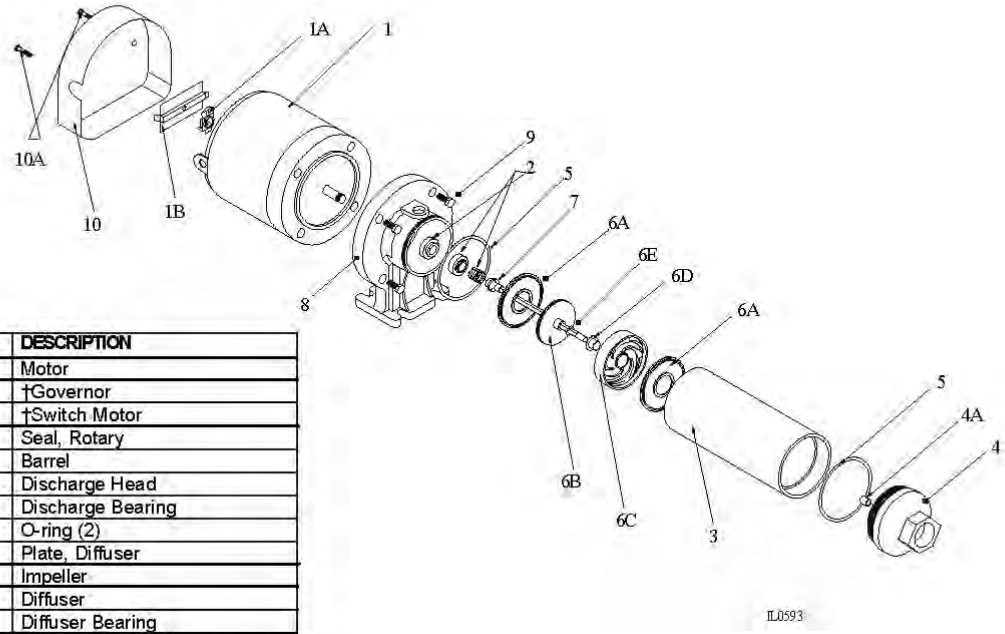
Figure 16 - Remove Mechanical Seal

Figure 17 - Press In Seal

Figure 18 - If Necessary, Press With Cardboard And Pipe

Troubleshooting Chart		
Symptom	**Possible Cause(s)**	**Corrective Action**
Pump won't start or run at full speed	1. Blown fuse or open circuit breaker	1. Replace fuse or close circuit breaker. See wire size chart for proper break/fuse size
	2. Power supply in OFF position	2. Turn power on
	3. Incorrect voltage at motor (check voltage with motor running)	3. Low voltage a. Voltage must be within ± 10% of motor rated voltage. Check incoming voltage. Contact power company b. Make certain that voltage of motor matches voltage of power supply. See motor name plate and motor wiring diagrams c. Check wire size from main switch to pump. See wire size chart for correct wire size
	4. Loose, broken or incorrect wiring	4. Rewire any incorrect circuits. Tighten connections, replace defective wires
	5. Defective motor	5. Replace motor
	6. Pump hydraulic components clogged/ worn/damaged	6. Replace worn parts or entire pump. Clean parts if required
Pump operates, but delivers little or no water	1. Manual or solenoid valves plumbed into system restricting flow	1. a Check all valves on pump inlet and discharge sides of system to be sure they are opened properly to allow flow to and from the pump b. Bleed trapped air in pump which keeps water from reaching the pump. (Normally due to closed valve in discharge plumbing)
	2. In-line filter restricting flow	2. Check all in-line filters to be sure they are not plugged or restricted
	3. Low line voltage	3. See low line voltage corrective action (above)
	4. Inadequate water supply to booster pump	4. Check pressure on inlet side of booster to be sure positive pressure is maintained to the booster pump
	5. Undersized piping	5. Replace undersized piping
	6. Leak on inlet side of system	6. Make sure connections are tight. Repair leaks as necessary
	7. Inadequate, defective or plugged foot valve and/or strainer	7. Clean, repair or replace as needed
	8. Worn or defective pump parts or pump.	8. Replace worn parts or entire plugged impeller Clean parts if
	9. Suction lift too great	9. Pump should be operated under flooded suction only
	10. Pump not primed	10. Prime pump - Make certain inlet pipe is drawn up tight and pump and pipe are full of water
	11. Incorrect rotation, motor running backwards	11. Reverse motor rotation can occur on three phase units. To correct, interchange any two incoming power leads.
Excessive noise while pump in	1. Pump not secured to firm foundation	1. Secure properly
	2. Piping not supported	2. Make necessary adjustments
	3. Restricted inlet line	3. Clean or correct
	4. Cavitation (noise like marbles in pump)	4. a. Reduce speed on direct drive b. Increase inlet pipe size c. Too viscous (material being pumped too thick
	5. Worn motor bearings	5. Replace bearings or motor
Pump leaks	1. Worn mechanical seal (leaks at shaft)	1. Replace shaft (rotary) seal
	2. Worn o-ring seals	2. Replace o-ring seals, located inside both ends of the stainless steel shell

Booster Pump Parts Drawing



ITEM NO.	DESCRIPTION
1	Motor
1A	†Governor
1B	†Switch Motor
2	Seal, Rotary
3	Barrel
4	Discharge Head
4A	Discharge Bearing
5	O-ring (2)
6A	Plate, Diffuser
6B	Impeller
6C	Diffuser
6D	Diffuser Bearing
6E	Shim as Required
7	Shaft and Coupling Assembly
8	Mounting Ring
9	Hex Head Bolts (4)
10	†MotorAccess Cover
10A	†Screws, Access Cover (2)

*See note below parts included in cartridge assembly
†ODP Motor Only

Figure 19

Internal Parts Detail

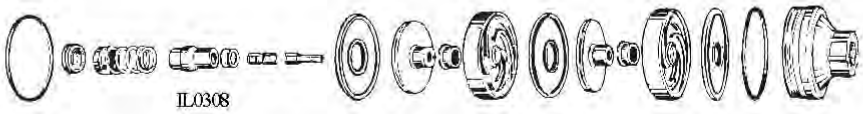


Figure 20 - Cartridge Assembly Includes Discharge Bearing, Shaft & Coupling Assembly, Diffuser Plate, Impellers, Diffuser Bearings, Diffusers and O-rings

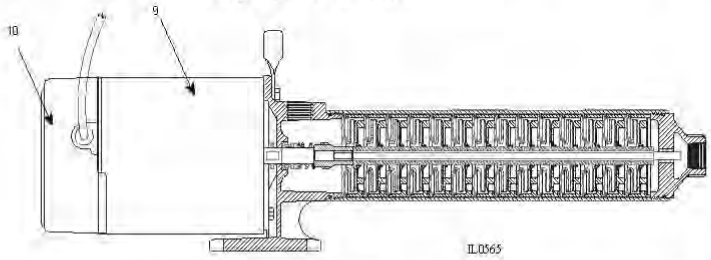
NOTE: Illustration shows only two stages. Pump has multiple stages. Individual parts are not available separately.

PRESSURE BOOSTER PUMP REPAIR PARTS

(For Pricing Refer To Repair Parts Price List)

Replacement Motors

FORM NO. FW0045
0208
SUPERSEDES 0907
PAGE 4-7A REPAIR PARTS



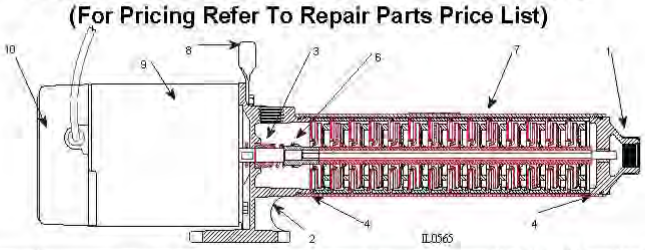
ITEM	REPLACEMENT MOTORS	QTY	CAST IRON	POWDER COATED	STAINLESS STEEL	CAST IRON	POWDER COATED	STAINLESS STEEL
			SINGLE PHASE 60 HZ			THREE PHASE 60 HZ		
9	ODP NEMA J 1/3 HP	1	98J103	98J103	98S103			
	ODP NEMA J 1/2 HP		98J105	98J105	98S105	98J305	98J305	98S305
	ODP NEMA J 3/4 HP		98J107	98J107	98S107	98J307	98J307	98S307
	ODP NEMA J 1 HP		98J110	98J110	98S110	98J310	98J310	98S310
	ODP NEMA J 1-1/2 HP		98J115	98J115	98S115	98J315	98J315	98S315
	ODP NEMA J 2 HP		98J120	98J120	98S120	98J320	98J320	98S320
	ODP NEMA J 3 HP		98J630	98J630	98S630	98J330	98J330	98S330
10	Motor Cover w/Screws	1	136132R	136132R	136132R	136132R	136132R	136132R
*	Screws, Motor Cover	2	136133	136133	136133	136133	136133	136133
			SINGLE PHASE 50 HZ			THREE PHASE 60/50 HZ		
9	ODP NEMA J 1/3 HP	1	98J003	98J003	98S003			
	ODP NEMA J 1/2 HP		98J005	98J005	98S005	98J305	98J305	98S305
	ODP NEMA J 3/4 HP		98J007	98J007	98S007	98J307	98J307	98S307
	ODP NEMA J 1 HP		98J010	98J010	98S010	98J310	98J310	98S310
	ODP NEMA J 1-1/2 HP		98J015	98J015	98S015	98J315	98J315	98S315
	ODP NEMA J 2 HP		98J820	98J820	98S820	98J320	98J320	98S320
10	Motor Cover w/Screws	1	136132R	136132R	136132R	136132R	136132R	136132R
*	Screws, Motor Cover	2	136133	136133	136133	136133	136133	136133
			SINGLE PHASE 60/50 HZ			THREE PHASE 60/50 HZ		
9	TEFC NEMA J 1/2 HP	1		020691	020691		021011	021011
	TEFC NEMA J 3/4 HP			021008	021008		021012	021012
	TEFC NEMA J 1 HP			021009	021009		020688	020688
	TEFC NEMA J 1-1/2 HP			020692	020692		020647	020647
	TEFC NEMA J 2 HP			020693	020693		020689	020689
	TEFC NEMA J 3 HP			021010	021010		020690	020690

* Not Shown

FORM NO. FW0046
0509
SUPERSEDES 0907
PAGE 4-8A REPAIR PARTS

PRESSURE BOOSTER PUMP REPAIR PARTS

(For Pricing Refer To Repair Parts Price List)



	ITEM	DESCRIPTION	QTY	CAST IRON	POWDER COATED	STAINLESS STEEL	
5 - 7 - 10 - 19 GPM, 60 HZ & 50 HZ	1	Discharge Head 3/4" NPT	1	132000	136905	136640	
	2	Mounting Ring 3/4" NPT	1	132002	136904	136639	
27 - 35 GPM, 60 HZ & 50 HZ	1	Discharge Head 1" NPT	1	136635	137796	139166	See replacement motors, ITEMS 9 & 10
	2	Mounting Ring 1" NPT	1	136634	137794	139100	
55 - 85 GPM, 60 HZ & 50 HZ	1	Discharge Head 2" NPT	1	021585	-	-	
	2	Mounting Ring 2" NPT	1	021584	-	-	
ALL SERIES 60 HZ & 50 HZ	3	Seal, Rotary w/Spring	1	131100 †	131100 †	136682 ‡	
	4	O-Ring	2	131925 ■	131925 ■	136607 ▲	
	*	Hex Head Cap Screws 3/8" x 3/4"	4	121106	121106	121106	

(†) Buna N - Carbon/Silicon Carbide (‡) Viton - Carbon/Silicon Carbide (■) Buna N (▲) Viton (*) Not Shown
(8) 132079 Handle available as an option

60 HZ MODELS

MATERIAL	CAST IRON	CI	PB0508AXXX	PB0512AXXX	PB0516AXXX	PB0712AXXX	PB1014AXXX	PB1016AXXX
	POWDER COATED	PC	PB0508CXXX	PB0512CXXX	PB0516CXXX	PB0712AXXX	PB1014CXXX	PB1016CXXX
	STAINLESS STEEL	SS	PB0508SXXX	PB0512SXXX	PB0516SXXX	PB0712SXXX	PB1014SXXX	PB1016SXXX
ITEM	DESCRIPTION	MATERIAL	PART NUMBER					
5	Cartridge Assembly ‡	CI & PC	135163	132939	138447	134097	134998	135814
		SS		136883	138450	136684	136685	136686
6	Shaft & Coupling Assembly	CI & PC	135161	133336	138446	133336	134996	135813
		SS	136938	136636	138449	136636	136637	136638
7	Barrel/Shell	CI, PC & SS	135162	132003	138448	132003	134997	135815

MATERIAL	CAST IRON	CI	PB1914AXXX	PB2711AXXX	PB2714AXXX	PB3506AXXX	PB3508AXXX	
	POWDER COATED	PC	PB1914CXXX	PB2711CXXX	PB2714CXXX	PB3506CXXX	PB3508CXXX	
	STAINLESS STEEL	SS	PB1914SXXX	PB2711SXXX	PB2714SXXX	PB3506SXXX	PB3508SXXX	
ITEM	DESCRIPTION	MATERIAL	PART NUMBER					
5	Cartridge Assembly ‡	CI & PC	137222	135627	136629	136626	136632	
		SS	139162	139163	138946	139164	139165	
6	Shaft & Coupling Assembly	CI & PC	137221	136624	136628	136625	136631	
		SS	139159	139157	137535	139156	139158	
7	Barrel/Shell	CI, PC & SS	137223	135628	136630	136627	136633	

MATERIAL	CAST IRON	CI	PB5504XX	PB5506XX	PB8504XX	PB8505XX		
ITEM	DESCRIPTION	MATERIAL	PART NUMBER					
5	Cartridge Assembly ‡	CI	022293	022294	022295	022296		
6	Shaft & Coupling Assembly	CI	022289	022287	022288	022287 7		
	Barrel/Shell	CI, PC & SS	022291	022292	138151	022290		

50 HZ MODELS

MATERIAL	CAST IRON	CI	PB0508XXXX	PB0514XXXX	PB0714XXXX	PB1020XXXX	PB1022XXXX	PB1023XXXX
	POWDER COATED	PC	PB0508ZXXX	PB0514ZXXX	PB0714ZXXX	PB1020ZXXX	PB1022ZXXX	PB1023ZXXX
	STAINLESS STEEL	SS	PB0508YXXX	PB0514YXXX	PB0714YXXX	PB1020YXXX	PB1022YXXX	PB1023YXXX
ITEM	DESCRIPTION	MATERIAL	PART NUMBER					
5	Cartridge Assembly ‡	CI & PC	135163	138150	021032	135907		135911
		SS		138682	021033	138683	020280	138684
6	Shaft & Coupling Assembly	CI & PC	135161	138149	138149	135906	020278	135910
		SS	136938	138444	138444	138154	020278	137103
7	Barrel	CI, PC & SS	135162	138151	138151	135098	020094	135912

MATERIAL	CAST IRON	CI	PB1920XXXX	PB2717XXXX	PB3508XXXX	PB3514XXXXT		
	POWDER COATED	PC	PB1920ZXXX	PB2717ZXXX	PB3508ZXXX	PB3514ZXXXT	PB1922ZXXX	
	STAINLESS STEEL	SS	PB1920YXXX	PB2717YXXX	PB3508YXXX	PB3514YXXXT		
ITEM	DESCRIPTION	MATERIAL	PART NUMBER					
5	Cartridge Assembly ‡	CI & PC	020982	020980	136632	021017	139435	
		SS	020095	138949	139165	021026	*	
6	Shaft & Coupling Assembly	CI & PC	020971	020916	136631	021015	139434	
		SS	020093	138948	139158	021020	021425	
7	Barrel	CI, PC & SS	020094	138947	136633	021016	139436	

(‡) Cartridge assembly includes: impellers, diffusers and shaft & coupling assembly. Components not available individually. Sold as assembly only.

SYSTEM START-UP

Do Not Turn On Power Until Directed To Do So

Step 1 ***(Systems w/ high pressure option)*** Flush incoming water line before filling the water tanks on the eFusion. 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 Concentrate Tanks with quality chemicals.

Step 3 If system has high pressure option, remove the tips in the undercarriage bar and high-pressure gantry arch and then flush the lines. To do this, follow the steps listed in the "Test Screen".

Step 4 Turn on the air compressor and set to approximately 100 PSI. Adjust pressure on gantry mounted regulator to 100 PSI.

Step 5 Turn off the Electrical Disconnect Switch on Gantry. Turn on Electrical Disconnect Switch on Electrical Control Center ("ECC") inside Equipment Room. The Red Lion Operator Interface Panel should come on.

Step 6 Press the F7 "Tech Menu" button and scroll to Test Function. 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 Rinse to flush lines then turn off. Continue to test services until you test all functions that apply to your machine. Modify low pressure applications by adjusting air pressure using the regulators inside the low pressure box.

Step 7 Turn on the Manual Operation Toggle Switch located inside the Gantry Control Panel mounted on the gantry. Turn on power at Electrical Disconnect Switch located on Gantry. Check the rotation of the drive motors by pressing the Drive Reverse Switch. This 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 the rotation.

Press the Top Brush Down and it should lower. Use these manual buttons to test all the gantry functions for proper operation. Also use the buttons the check brush rotation and operation***. (SEE ROTATION CHARTS ON PAGES 17 & 18)***

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 End of Track targets. They should have approximately 3/8ths inch clearance.

INITIALIZING THE SYSTEM

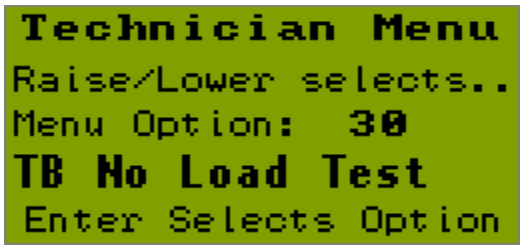
Step 9 First perform a "Wheel test, Side Brush, Top Brush and Boom Test". These tests can be accessed in the "F7 Tech Menu" of the Red Lion Interface Panel. This test will allow the PLC to store the correct length of travel for each of these components. ***THIS MUST BE DONE TO ENSURE PROPER OPERATION***

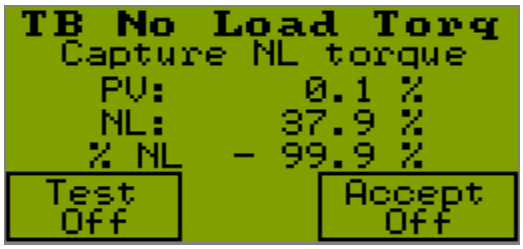
Next you ***MUST*** save the Treadle position that is required for the wheel brush to locate vehicle front wheels. This setting is done in "F2 Adjust Gantry Counts". The best way to accomplish this is to park a vehicle on the treadle plate and with the gantry in manual mode, position the gantry until the wheel brushes are aligned with the exact center of the front wheels. Press the "Wheel Brush Extend" manual push button to confirm alignment. Now press "Save" on the Red Lion Display to store this position.

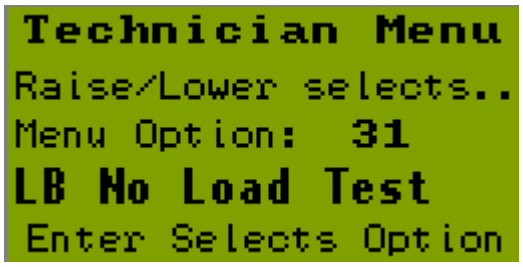
Assigning Recipes: Assign the Recipes in "F1 Recipe Menu" that you wish to use. Factory recipes are listed in your manual for both combination and touchfree wash cycles.

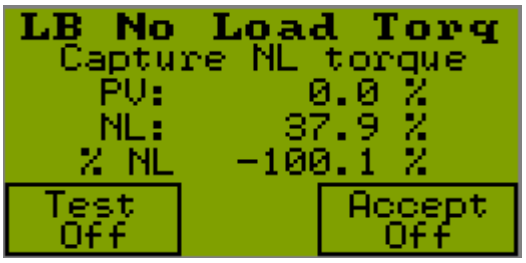
IMPORTANT: Brush No Load Tests

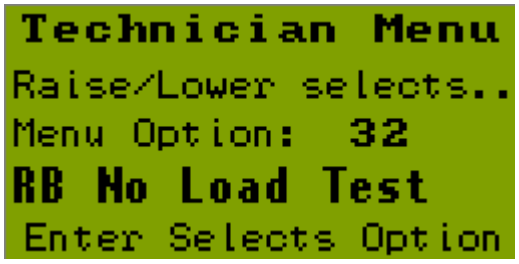
1. Go to "F7-Tech Menu" on your Red Lion. Use the Raise key until you get to Menu Option 30 – "TB No Load Test" and press Enter. See the pictures below.
2. Now you need to switch the Gantry manual toggle switch "On" and **lower the Top Brush** about 18-24" to get the brush **out of the nest** then press the arrow under the display on the Red Lion, where it says "Test". The word "Off" will change to "Testing".
3. The Top Brush will begin to spin and you will see the "PV" value begin to change (PV = Present Value).
4. After about 8 seconds, you will see that the "NL" value has now been set (NL = No Load).
5. If the brush components are in good mechanical condition and **the brushes were not in contact with any surface**, the test is complete. You can now press the arrow under the display, where it says "Accept". The word "Off" will change to "Writing".
6. When the word "Off" returns under "Accept", this brush test is complete.
7. You can now press the "Prev" button then raise up to Menu Option 31 – LB No Load Test and Menu Option 32 – RB No Load Test and repeat the procedures above for each brush.
8. These procedures are required to calibrate the acceptable no load brush torque based on the incoming voltage at your site. **NOTE:** ***These procedures will have to be repeated periodically to recalibrate acceptable no load torque after some time in service due to normal mechanical wear. It is recommended repeat at least once within the first 30 days of operation and as needed thereafter.***

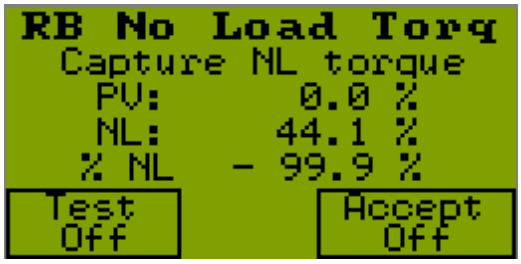












SITE DATA SETTINGS

Step 10 Press F5 and enter the “0wner” password. The default password is “1234”. Then Press F8 and scroll through each option. Set each option to match your equipment. Example; if you have on-board blowers you must enter “Equipped”. If no blowers or if the blowers are free standing, then select “Not equipped”.

Scroll through the remaining screens and select the option that matches your equipment package.

Step 11 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 eFusion 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 eFusion many times to ensure it is functioning properly.
- Refer to “Brush Position Settings” beginning on Page 5 for adjustments to brush positions.
- Check all Prox Switch settings to ensure there is a gap of at least 3/8”.
- Check all Proxes to ensure they are exactly square with their target.

Wheel Scrub Features and Set-up Instructions

You will find a recipe bit titled “Wheel Brushes” in the Program Recipe menu. A custom recipe is required to apply this function to a wash recipe. You cannot perform the wheel brush step on the first pass of a wash recipe. The wheel brush photo eye must first find the rear wheel position.

Air Pressure Adjustments

There are two air regulators to move the brushes in and out, one of them to extend and one to retract. The extend regulator adjustment is very critical and should be adjusted to the lowest possible operating pressure, usually about 20 psi. Very little pressure is required to clean the vehicle wheels and too much air pressure could cause unnecessary load and wear on the wheel brush spindle gearmotors. The retract regulator should be adjusted so the brushes return smoothly but positively into their home position, usually about 30 psi.

Timers

There are also two timers and two counters associated with this option. Under “F2-Timers & Counters” on the Red Lion, go to the “Adjust Timers” menu (Menu Option 0) and press the “Enter” button until you see a timer called “Wheel Brush Dwell”. This timer determines how long the brush will stay engaged in the wheel in each direction (clockwise & counter-clockwise). This is factory set to 3 seconds.

Press the “Next” button to advance to the “Wheel Brush Retract Dwell” timer. This timer determines how long the brush disengages from the wheel between direction changes. This timer is factory set to 1 second. You want the brushes to disengage the wheel slightly while it changes directions. If it does not, you would want to increase this timer value.

Counters

Since we always know where the front tire will be because of the Treadle, we use that to our advantage. Under “F2-Timers & Counters”, go to “Adjust Gantry Counts” menu (Menu Option 1) and press the “Enter” button. There you will see an adjustable counter titled “Treadle Position”.

Setting Front Wheel Counter

To set this counter, put the gantry in manual mode (turn toggle switch in gantry panel ‘on’), and manually position the gantry until the wheel brush is perfectly aligned with the center of the treadle eye. It is best if there is a vehicle parked properly on the treadle plate to achieve the best result. Manually extend the wheel brush to assure you are in the proper position using the manual push buttons for the Wheel Brush located in the gantry control panel.

Once you have achieved this position go back to the Red Lion and press the arrow key that is located directly below the center of the screen, below the word “Off” on the display. This word will then change to “On”. You will see the value under the word “Treadle” change. You have now set where the wheel brush will position at the front tire when the wheel brush function is performed in a wash recipe.

Setting Rear Wheel Counter

The wheel brush photo eye will locate the rear wheel position in pass 1. This position is also adjustable. Watch it wash a variety of vehicles to determine if the rear wheel position should be adjusted.

If you determine that this adjustment must be done, Under “F2-Timers & Counters”, go to “Adjust

Gantry Counts" menu (Menu Option 1) and press the "Enter" button. Now press the "Next" button repeatedly until you see a counter called "Rear Wheel Offset".

If you need to adjust the rear wheel brush position closer to the front of the vehicle, you should decrease this counter. If you need to adjust the rear wheel brush position closer to the rear of the vehicle, you should increase this counter. The counters on the eFusion and the FusionX are incremented in inches. If the Wheel Brush always positions about 2 inches past the center of the rear wheels, you can decrease the counter setting by 2 inches.

FusionX and eFusion

Instructions for loading OMRON PLC and Red Lion memory module

SAVING EXISTING RECIPES and REVENUE *(Recipes and Revenue are stored in the PLC NOT the Red Lion)*

1. With power on to the PLC, insert memory card into the slot in the PLC. Press the F5/Log In Page button and log in using the owner password. Press F6/Memory Card and select Recipe Mode then press Save Recipes twice. Remove the memory card with power still on.
2. ***DO NOT CYCLE POWER ON & OFF***.

RED LION Operator Interface

1. Turn off power to the display. Plug memory card into the slot located on the side of the Red Lion.
2. Turn on power to display. Wait for display to load program from memory card. (Observe text – LOADING CF). Once the screen is back to the main screen make sure the HMI number matches the version number you are loading.
3. After program is loaded, turn off power and remove card from display. Turn power back on.

OMRON PLC (Loading Program Instructions)

1. Turn off power to PLC. Open cover plate (located above the memory card slot) on CJ1G-CPU44 PLC module. Here you'll see 8 switches numbered 1-8 from top to bottom. Turn on DIP SW 7. (push switch to left position). Insert memory card into slot. Card is properly seated when the eject button is even with the top.
2. Turn on power to PLC. Wait for "busy" light to extinguish (about 5 to 10 seconds) and the main screen is up.
3. Turn off power to PLC. Remove memory card. Turn off DIP SW 7 (push switch to right position).
4. Turn on power to PLC.

DOWNLOADING SAVED RECIPES

1. With power on to the PLC, insert the memory card. Press the F5/Log In Page button and log in using the owner password. Press F6/Memory Card and select Recipe Mode then press Load Recipes twice.
2. Remove the memory card with power on***. DO NOT CYCLE POWER ON & OFF***

Fusion - Gantry Counter Values

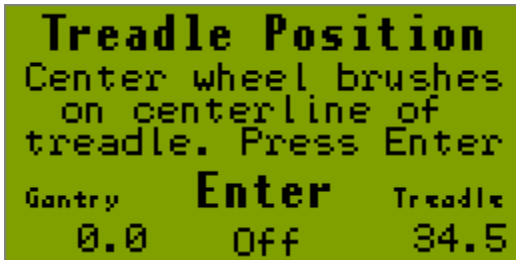
Red Lion Description	eFusion Default Settings	FusionX Default Settings	Red Lion Software Limits	
			Minimum Value	Maximum Value
Start Gantry (Boom, Fx) @ Front	(-12.5)	(-12.5)	-30.0	+0.0
Start Gantry (Boom, Fx) @ Rear	(+40.0)	(+40.0)	+20.0	+60.0
Front Brush Pass	(+17.0)	(+42.0)	+10.0	+50.0
Rear Brush Pass	(+44.0)	(+60.0)	+38.0	+75.0
Start Side Brushes @ Front	(+24.0)	(+48.0)	+15.0	+55.0
Start Side Brushes @ Rear	(+30.0)	(+55.0)	+25.0	+65.0
Start Top Brush @ Front	(-18.0)	(-20.0)	-30.0	+0.0
Start Top Brush @ Rear	(-26.0)	(-18.0)	-35.0	+0.0
Rear TB Pass on Long Vehicles	(-18.0)	(-14.0)	-30.0	+5.0
Start LP Wax @ Front	(+4.0)	(+4.0)	-20.0	+20.0
Start LP Wax @ Rear	(+10.0)	(+10.0)	-20.0	+20.0
Start Trifoam @ Front	(+0.0)	(+22.0)	-30.0	+30.0
Start Trifoam @ Rear	(+10.0)	(+30.0)	+0.0	+75.0
Start Presoak @ Front	(-12.0)	(-12.0)	-30.0	+0.0
Start Presoak @ Rear	(+16.0)	(+20.0)	+0.0	+75.0
Start Rocker Panel @ Front	(-7.0)	(-7.0)	-20.0	+10.0
Start Rocker Panel @ Rear	(+28.5)	(+10.0)	+0.0	+50.0
Start Side Sprays @ Front	(-15.0)	(-5.0)	-30.0	+10.0
Start Side Sprays @ Rear	(+25.0)	(+4.0)	-10.0	+50.0
Start TC (tire cleaner) @ Front	(-5.0)	(+0.0)	-20.0	+10.0
Start TC (tire cleaner) @ Rear	(-2.2)	(+10.0)	-20.0	+30.0
Start SB (side brush) Lube @ Front	(+21.0)	(+45.0)	+0.0	+75.0
Start SB (side brush) Lube @ Rear	(+33.0)	(+58.0)	+0.0	+75.0
Start TB (top brush) Lube @ Front	(-21.0)	(-23.0)	-50.0	+10.0
Start TB (top brush) Lube @ Rear	(-23.0)	(-15.0)	-50.0	+10.0
TB (top brush) Lower Limit @ Rear	(+66.0)	(+66.0)	+0.0	+70.0
Wheel Brush Offset @ Rear	(+0.0)	(+0.0)	-20.0	+20.0
Flip Blower @ Front	(+5.0)	(+5.0)	-50.0	+100.0
Flip Blower @ Rear	(+0.0)	(+0.0)	-50.0	+50.0
Presoak Overlap @ middle of car	+3.0	+3.0	+0.0	+20.0

FusionX Start Up Brush Position Settings

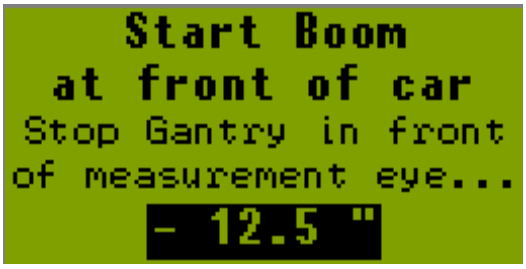
The following settings are based on the center line of the treadle eye being located 70 inches from the entrance end of the home prox target. Any variance in this dimension will require adjustments to the brush start positioners for proper operation. ***See the chart on page 7 for factory default settings.***

These settings are located in the F2 Timers and Counters button on the Red Lion.

First set the wheel brush position for the front wheel. Since we always know the position of the front wheel, we can set this dimension as a fixed distance. Manually move the gantry to where the center of the wheel brush is at the center line of the eye on the treadle. Then press Enter. This will lock in this position for all wash cycles.



This is the position of the high pressure wash boom as it washes the front of the vehicle. Decrease the number to move the gantry toward the exit end of the wash bay.

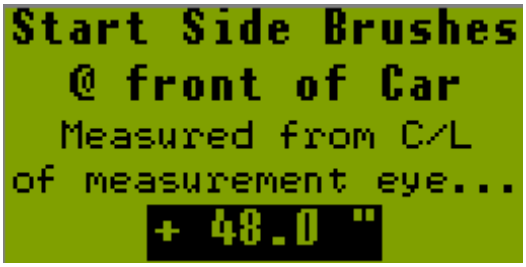


This screen sets the gantry position when the rinse spray starts at the rear of the car. Decrease the number to move the brush closer to the exit end of the wash bay.

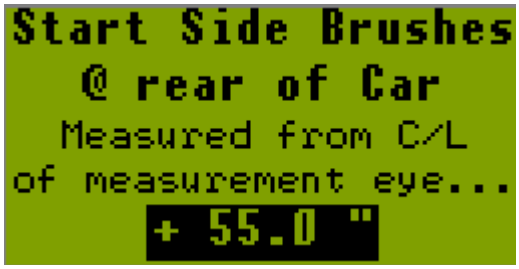
This screen sets the gantry position when the side brushes wash the front of the car. Decrease the number to move the brush closer to the exit end of the wash bay.

This screen sets the gantry position when the side brushes wash the rear of the car. Increase the number to move the brush toward the entrance end of the wash bay.

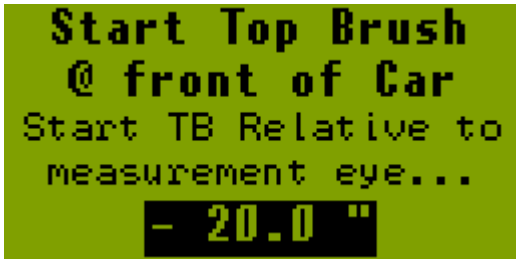
This screen sets the gantry position at the front when the side brushes wash the sides of car. Decrease the number to start the side brushes more towards the exit end of the wash bay.



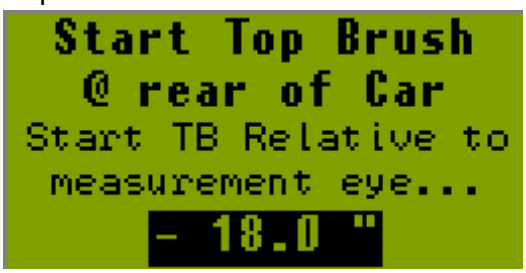
This screen sets the gantry position at the rear when the side brushes wash the sides of car. Increase the number to start the side brushes more towards the entrance end of the wash bay.



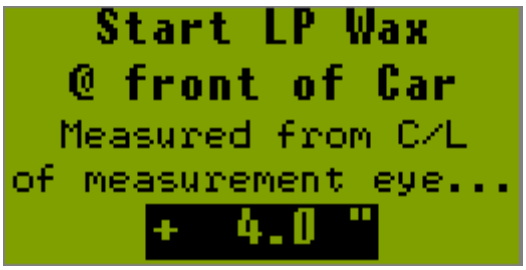
This screen sets the gantry position at the front where the top brush begins to wash the top of the car. Decrease the number to start the top brush more towards the exit end of the wash bay.



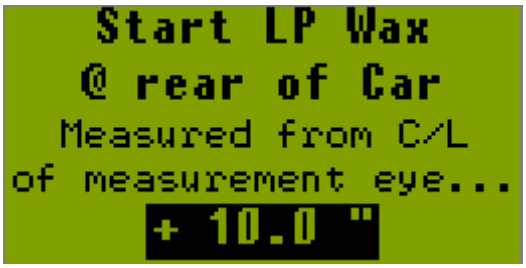
This screen sets the gantry position at the rear where the top brush begins to wash the top of the car. Increase the number to start the top brush more towards the entrance end of the wash bay.



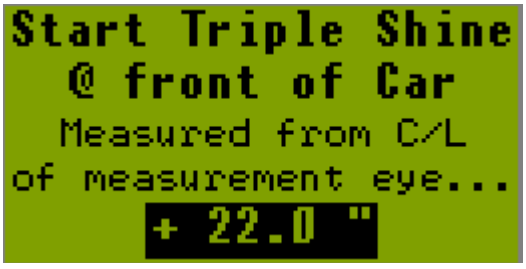
This screen sets the gantry position for the Low Pressure Wax delivery at the vehicle front. Decrease the number to start the LP Wax more towards the exit end of the wash bay.



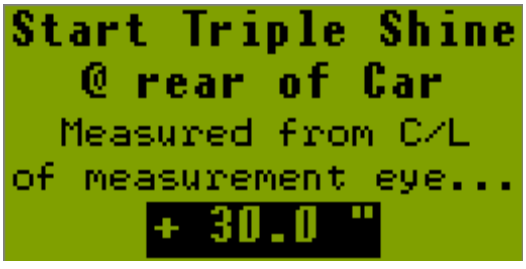
This screen sets the gantry position for the Low Pressure Wax delivery at the vehicle front. Decrease the number to start the LP Wax more towards the exit end of the wash bay.



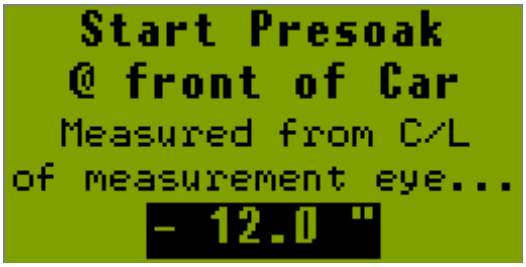
This screen sets the gantry position for the Triple Shine Conditioner delivery at the vehicle front. Decrease the number to start the LP Wax more towards the exit end of the wash bay.



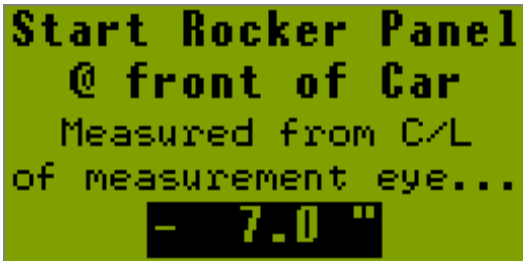
This screen sets the gantry position for the Triple Shine Conditioner delivery at the vehicle rear. Increase the number to start the LP Wax more towards the entrance end of the wash bay.



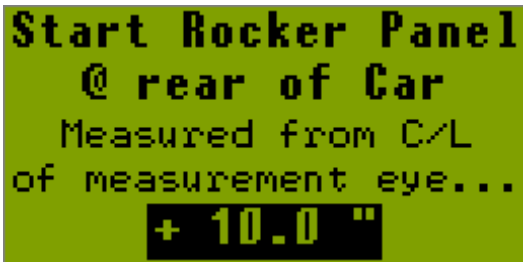
This screen sets the gantry position for the Presoak delivery at the vehicle front. Decrease the number to start the Presoak more towards the exit end of the wash bay.



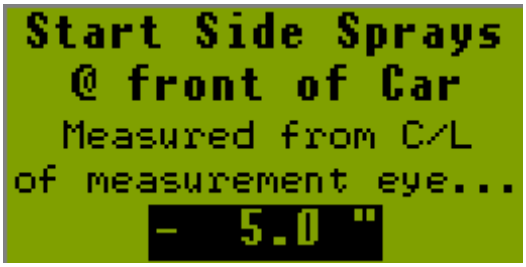
This screen sets the gantry position for the Rocker Panel Sprayers delivery at the vehicle front. Decrease the number to start the RPS more towards the exit end of the wash bay.



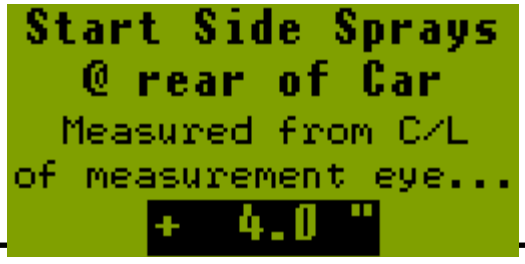
This screen sets the gantry position for the Rocker Panel Sprayers delivery at the vehicle rear. Increase the number to start the RPS more towards the entrance end of the wash bay.



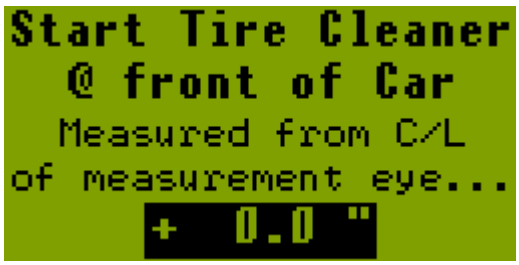
This screen sets the gantry position for the HP Side Spray delivery at the vehicle front. Decrease the number to start the HP Side Spray more towards the exit end of the wash bay.



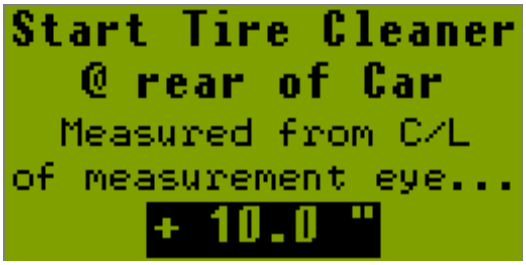
This screen sets the gantry position for the HP Side Spray delivery at the vehicle rear. Increase the number to start the HP Side Spray more towards the entrance end of the wash bay.



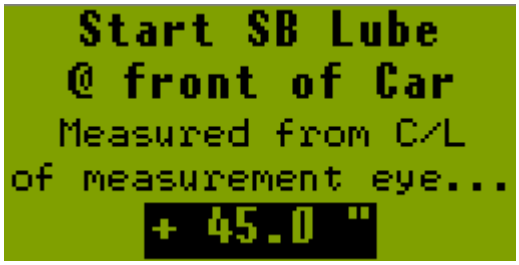
This screen sets the gantry position for the Tire Cleaner delivery at the vehicle front. Decrease the number to start the Tire Cleaner more towards the exit end of the wash bay.



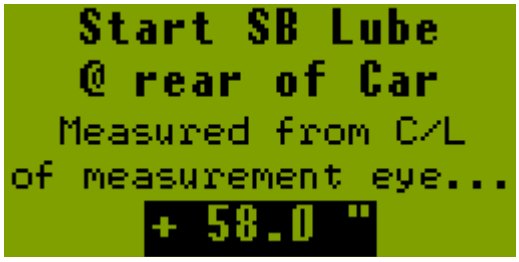
This screen sets the gantry position for the Tire Cleaner delivery at the vehicle rear. Increase the number to start the Tire Cleaner more towards the entrance end of the wash bay.



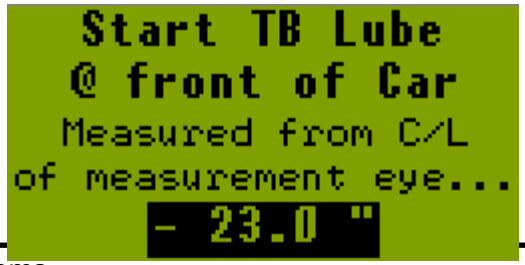
This screen sets the gantry position for the Side Brush Lube delivery at the vehicle front. Decrease the number to start the Side Brush Lube more towards the exit end of the wash bay.



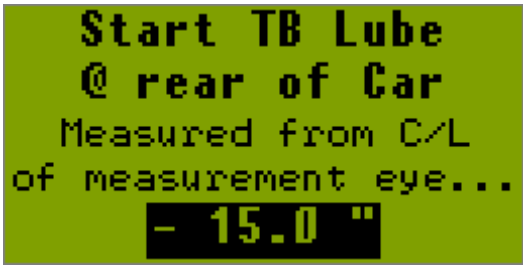
This screen sets the gantry position for the Side Brush Lube delivery at the vehicle rear. Increase the number to start the Side Brush Lube more towards the entrance end of the wash bay.



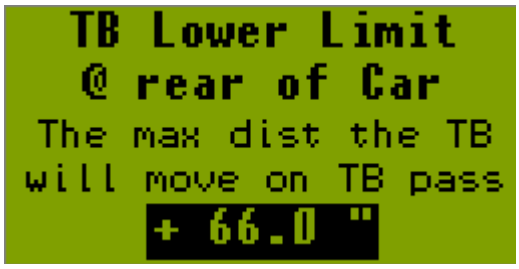
This screen sets the gantry position for the Top Brush Lube delivery at the vehicle front. Decrease the number to start the Top Brush Lube more towards the exit end of the wash bay.



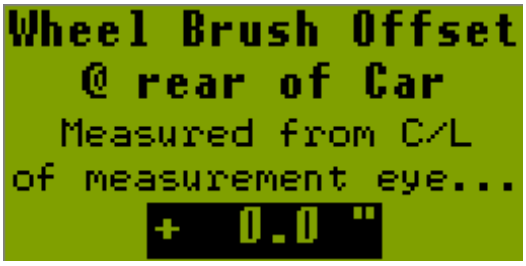
This screen sets the gantry position for the Top Brush Lube delivery at the vehicle rear. Increase the number to start the Top Brush Lube more towards the entrance end of the wash bay.



This screen sets the Top Brush Lower Limit at the rear of the vehicle. This is how far the top brush will lower during a rear brush pass that is accomplished with the top brush (when the side brushes cannot reach the rear of a long vehicle). The distance is counted from the Top Brush home position down.

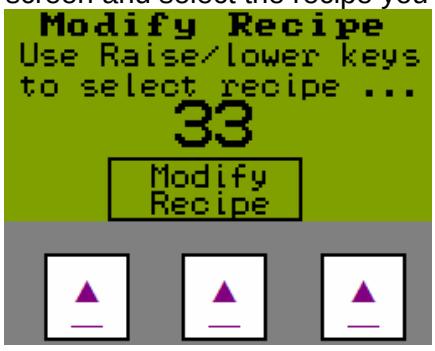


This screen adjusts the Wheel Brush position for the rear wheel only. The front wheels are set according to the treadle position. A negative number moves the wheel brush towards the exit end.

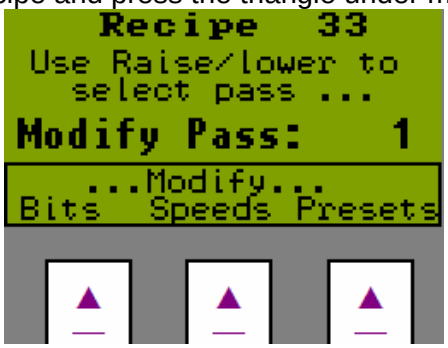


Adjusting High Pressure Boom Travel and Dwell time Presets

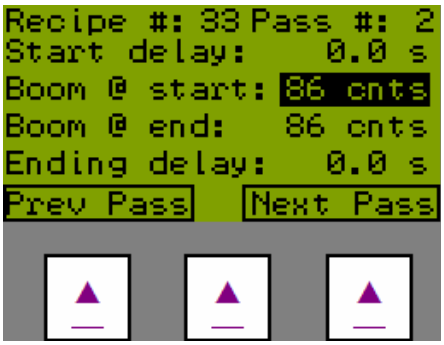
To high boom must be programmed to go down at the front and rear of the car and for any time delay you wish to add. It is possible to lower and raise the boom at the start and the end of each wash pass. Complete travel is 86 counts. Set the boom to travel any number of counts from 0 to 86. To set this distance go to the Program Recipe screen and select the recipe you wish to program.



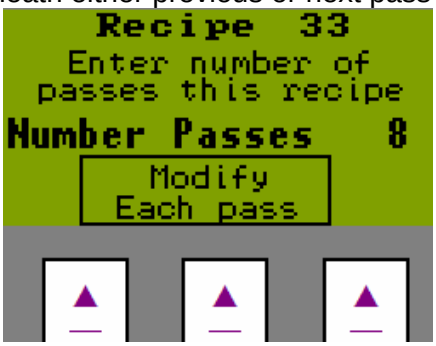
Press the triangle under modify recipe and press the triangle under modify each pass

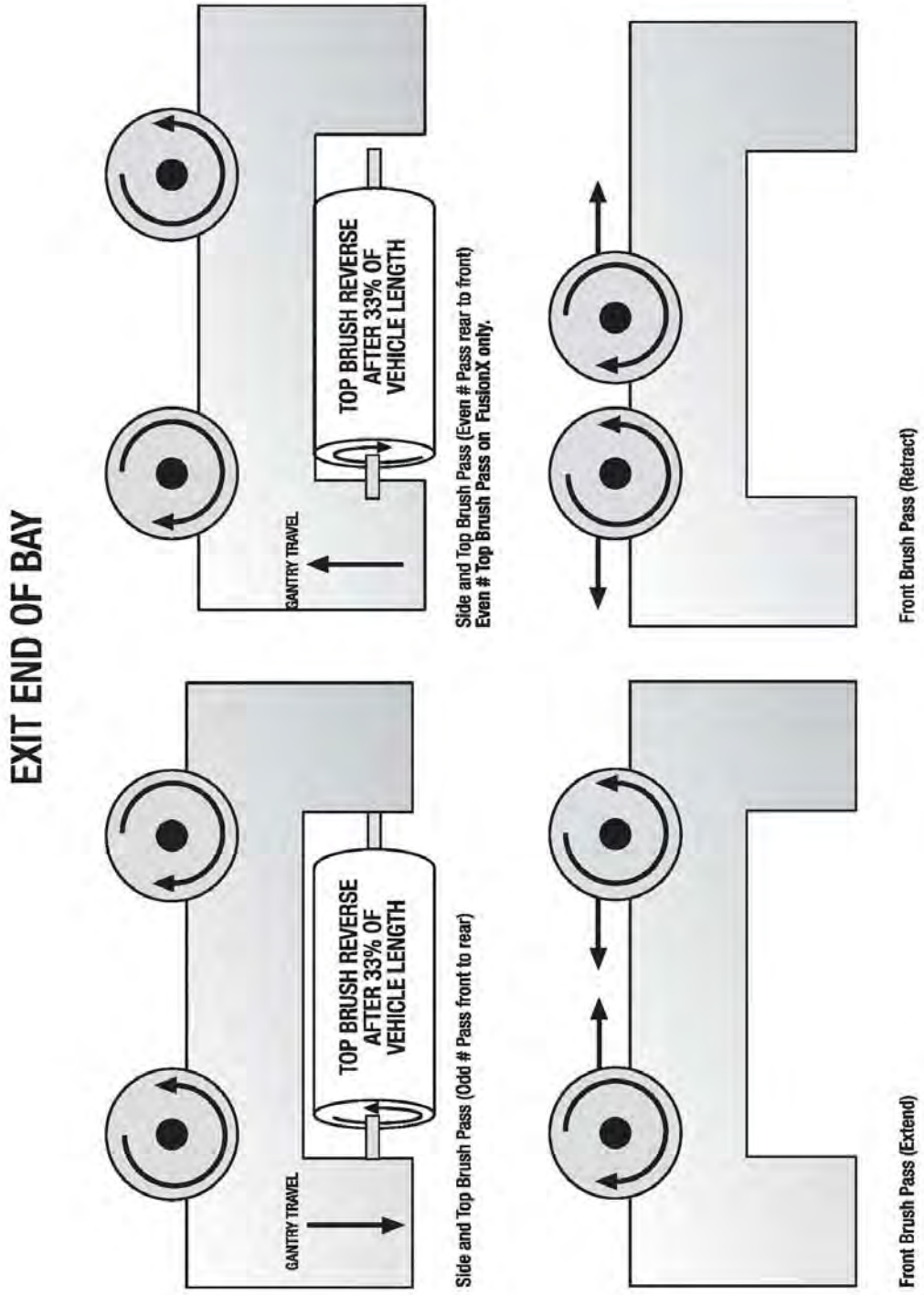


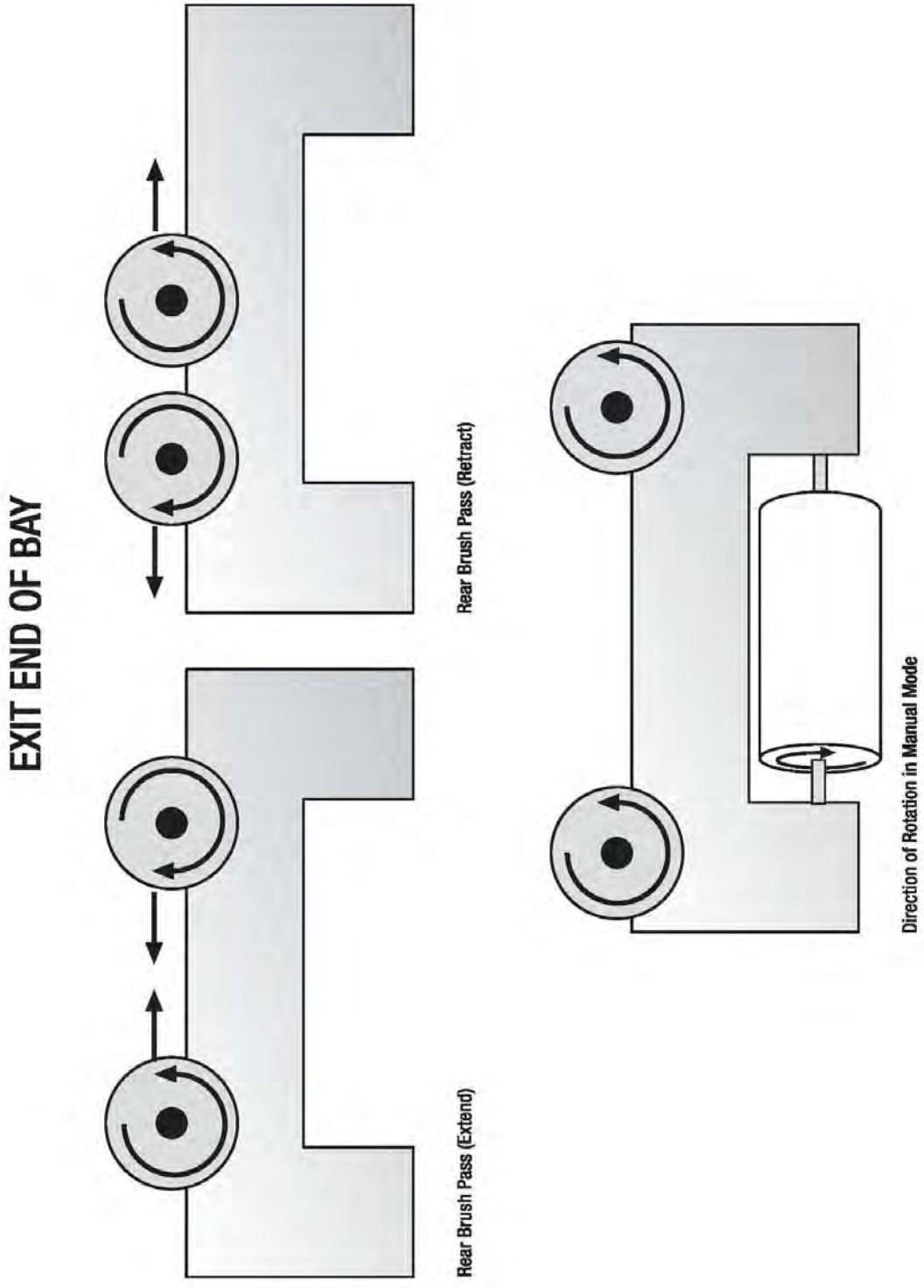
At the next screen you will have the choice to modify each the “Bits (Functions), Speeds and Presets for each pass. Select “Presets”



In the presets you’ll be able to set the amount time delay at the beginning and end of each pass. You also set the distance the boom will travel down at the start and end of each pass. To add boom down to another pass press the triangle beneath either previous or next pass to select.




EXIT END OF BAY
TOP BRUSH REVERSE AFTER 33% OF VEHICLE LENGTH
GANTRY TRAVEL
Side and Top Brush Pass (Even # Pass rear to front)
Even # Top Brush Pass on FusionX only.
Front Brush Pass (Retract)
TOP BRUSH REVERSE AFTER 33% OF VEHICLE LENGTH
GANTRY TRAVEL
Side and Top Brush Pass (Odd # Pass front to rear)
Front Brush Pass (Extend)


EXIT END OF BAY
Rear Brush Pass (Retract)
Rear Brush Pass (Extend)
Direction of Rotation in Manual Mode

Safety Signs

Coleman Hanna Carwash Systems recommends that you have **warning** or **safety signs** at the entrance and exit locations of the automatic wash bay. These signs should be mounted where they are visible from the Entrance and Exit locations of the wash bay. These warning signs should warn people… "*Do not enter the wash bay while the unit is washing a vehicle*".

Coleman Hanna Carwash Systems has 12" x 12" signs available at no charge, if you will install them at the automatic bay. Please call (713) 683-9878 to order these important safety signs. Jim Coleman Company will provide two (2) safety signs at no cost (per automatic purchased). Please provide the serial number of the automatic purchased when ordering the signs. The part number of the safety signs is **#38442**.

Mount inside bay

Mount at the entrance

Keeping your customers and others who may be walking nearby aware of operating carwash equipment will help ensure everyone's safety

Thanks for your support.

Normal Operation

Under normal operation the FusionX will perform the following functions.
***(We have used a preprogrammed 8 pass combination wash recipe as an example*):**
***Note**: All gantry speeds are set between max speed of 100% and slow speed at 45% excluding any passes that include a top and/or side brush application.*

1. Customer at the entrance controller 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 FusionX to begin operation.

2. Once the FusionX receives a wash signal the following will happen
   a. The system will perform an eye test before "*Enter Now*" light illuminates. If any of the eyes fails then the proper error code will be displayed on the operator interface (Red Lion) and the unit will continue without certain functions or remain at home until error is corrected and unit is reset.
   b. *"Enter Now"* sign at the entrance of the wash bay will illuminate
   c. *"Drive forward"* sign in the wash bay will illuminate.
   d. *If applicable, Horn will sound twice.*
   e. The Entrance Timer will start.
   f. The Overall Wash Timer will start. (This is set at 13 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 4 seconds.

4. In the event the customer drives past the stop station treadle switch and far enough toward the exit end of the wash bay to break the gantry optics, the back up message will display 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 in position on the treadle plate, the following will happen:
   a. *"Drive Forward"* sign will turn off.
   b. *"Stop"message* will display.
   c. *"Please Wait"* light at the bay entrance will come on.
   d. If applicable, Horn will sound once.
   e. The Entrance timer will reset.

6. The FusionX will have a four second delay before the first wash pass begins.
   This is there to insure the vehicle is stopped before receiving its wash and to allow time for presoak delivery to be fully pressurized.
   a) Definition of a Pass. Each pass begins with the high pressure wash boom and the top and side brushes at their Home position. During the high pressure passes, the Boom will go down and then back up. *The distance the boom travels downward is determined by the boom down counter* (86 is the maximum travel count). This is settable for both the front and rear of the vehicle for each pass. Once the boom completes its travels down and up again, the gantry will *then* travel to the opposite end of the vehicle.

   b) Definition of a Brush Pass. The brushes are controlled by amp sensing. The system monitors the increased amps caused as the brushes contact the vehicle. Both the side and top brushes will contour the vehicle as they travel. If selected in the recipe, the speed is controlled by the CPU program. This is not adjustable by the operator. The operator can choose to have an angled or vertical side brush pass or offer both.

   c) Low Pressure Passes. During Presoak, Hot Wax, Tri Foam and Spot Free Rinse the boom does not drop. Each of these products is delivered through a gantry mounted fixed delivery manifold or nozzles. The presoak has 2 arches in the gantry controlled by separate solenoids to ensure complete coverage.

   d) Start Delay and Boom Down Count. Each pass can have a delay at the start and the end of each pass. Each pass can also have a boom down count at the start and end of each pass.

7. **Pass #1** ***Presoak, Tri Foam and Tire Cleaner*** - The following will happen:
   a. The scrolling sign will read “Presoak”
   b. The Presoak and Tri Foam pumps (if applicable) will start and deliver product.
   c. If applicable, the Tire Cleaner pump will start and spray product to cover the tires and lower Rocker panels.
   d. The Gantry will start to travel down the track toward the back of the vehicle. Gantry speed is set at 100%
   e. The two count up proxes (CTU’s) adjacent to the counting wheel will send signals for the wheel count as the gantry moves down the track.
   f. The measurement eyes are looking for the front of the car. When the eye sees the front of the vehicle it signals the Omron PLC to store the wheel count.
   g. **Locating the Wheels.** It is necessary to locate the vehicle wheels for proper wheel brush application. The front wheel is known since the treadle plate is in a fixed position. The rear wheel is located using a separate set of eyes.
   h. If applicable, the Auto Height Adjustment and/or Contouring eyes are looking for the Height and/or exact profile of the vehicle.
   i. The measurement eyes also look for the rear of the vehicle. When the eye sees the rear of the vehicle it signals the Omron PLC to store the wheel count.
   j. At the rear of the vehicle, Pass 2 is started unless pass one includes a boom down count.
   k. If there is a boom down count for pass #1, the wash boom will travel down the preset count at the rear of the vehicle and then return to the home position.
   l. If there is a start delay time then the gantry will dwell the number of seconds as set on start delay for pass #1. This is true for all subsequent passes as well.

8. **Pass #2 *High Pressure Rinse and Wheel Brush*** - begins at the rear of the vehicle.
   a. High pressure Rinse will be delivered through oscillating nozzles.
   b. The wash boom will travel down based upon the boom down counter setting.
   c. The wash Boom will rise to its home position.
   d. The Gantry will travel toward the front of the vehicle based upon the wheel count. The CTU wheel counts that were collected in pass 1 are now used in the remaining passes. Gantry speed is set at 100%.
   e. Once the gantry reaches the count location of the rear wheel, it will stop and switch the oscillating high pressure to the wheel brush. The wheel brush will rotate, extend and retract cleaning the rear wheels. When finished with the rear wheels the high pressure oscillating rinse will begin again. This process is repeated at the front wheel location.
   f. The gantry will travel a preset distance past the vehicle to position the wash boom nozzles at approximately 14 inches away. This is adjustable by the operator.
   g. The auto height adjustment or contouring optic eyes will again look for the height or profile of the vehicle.
   h. The wash boom will travel down based upon the boom down counter setting then rise to its home position.
   i. If pass #2 has an ending delay, the presoak will dwell for the set amount of seconds at the end of that pass.

9. **Pass #3 Top *and Side Brush* -** begins at the front of the vehicle.
   a. The brushes will rotate at the home position for approximately 10 seconds to establish a base amp setting. It is very important that nothing is in contact with the brush when this is happening.
   b. Scrolling sign will read - Wash
   c. The top brush will lower to an estimated position at full speed and slow down its travel as it comes in contact with the vehicle. Once the preset amp setting is reached, the gantry will travel toward the rear of the vehicle.
   d. The gantry travels until the side brushes are in position to wash the front of the vehicle. At this time, the top brush will raise slightly as the counter rotating side brushes travel across the front of the vehicle. They will nearly touch each other then shift past center to insure proper cleaning. The brushes continue to rotate and then return to their home position.
   e. Once at home, the top brush again lowers and the side brushes contact the side of the vehicle. This happens as the gantry travels toward the rear of the vehicle.
   f. The gantry will travel to the rear of the car based upon the wheel count. Gantry speed is controlled by the CPU according to the brushes amp reading.

10. **Pass #4 *High Pressure Wash*** - begins at the rear of the vehicle.
   a. Scrolling sign will read *Wash*.
   b. High pressure wash will begin as the wash boom begins to lower the preset number of counts. (84 counts is full travel) The high pressure spray will not begin until the boom is lowered and tilted toward the vehicle.
   c. The wash boom will travel down based upon the boom @ start counter.
   d. The wash boom will rise to the home position. If auto height adjustment or contour is on, the wash boom will travel up to the adjusted position as calculated by vehicle profile in memory.
   e. The wash boom will spray High Pressure Wash while raising or lowering.
   f. Then the gantry travels toward the front at a 75% speed as selected in the recipe.

11. Pass #5 *Low Pressure Hot Wax* - begins at the front of the vehicle.
a. The Scrolling sign will read Wax.
b. The system will begin to deliver a low pressure application of Crystal Polymer Glaze or similar product through boom mounted "*Rain Arch*".
c. Gantry will travel toward the rear of the car
d. The wash boom will not travel downward during this pass.

12. Pass #6 *Spot Free Rinse* – begins at the rear of the vehicle.
a. The Scrolling sign will read: Spot Free Rinse
b. The Spot Free Rinse pump will turn on and spray Spot Free rinse water out of the independent gantry mounted nozzles.
c. The gantry will travel toward the front of the vehicle applying Spot Free Rinse.
d. Gantry speed is set at 75%.

13. Pass #7 *Blower* – begins at the front of the vehicle.
a. The Scrolling message sign will read Blower.
b. Blower motors will start alternately.
c. Center blower will rotate 360 degrees for set time to allow air scoop to remove excess water residue from gantry top panel.
d. Gantry will travel toward the rear of the vehicle with center nozzle sweeping back and forth toward the rear of the vehicle.
e. Near the rear of the vehicle and at a set count, the blower nozzle will reverse direction and blow back toward the front effectively drying the rear of the vehicle.

14. Pass #8 *Blower* – begins at the rear of the vehicle.
a. The gantry travels towards the front of the vehicle.
b. Center blower nozzle oscillates back and forth while blower is on.
c. Near the windshield and at a set count, the blower will reverse direction and blow back toward the rear of the vehicle as it continues to the gantry home position.

15. *End of the Wash* – gantry in the home position.
The "Scrolling sign will read *"Exit Slowly".* When the vehicle passes through the eyes on the gantry completely, the FusionX 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.

Requirements for Coleman Hanna High Speed Configuration

Obtain the following information from your Service Provider

Static Public IP Address
Subnet Mask
Default Gateway
Both DNS servers

Please request the ISP (internet service provider) to set their modem in Full Bridged Mode. The NetGear FVS318v3 router provided by Coleman Hanna or purchased from a local retailer will perform all of the firewall functions. If this is a PPoE account, please provide us with user name and password.
The ISP provider can email all the information to tlofton@colemanhanna.com

Coleman Hanna Certified Firewall: NetGear FVS318v3

Coleman Hanna Setup: LAN IP for NetGear: 10.137.0.1 Subnet Mask: 255.255.0.0 UserName: admin Password: magpie5842

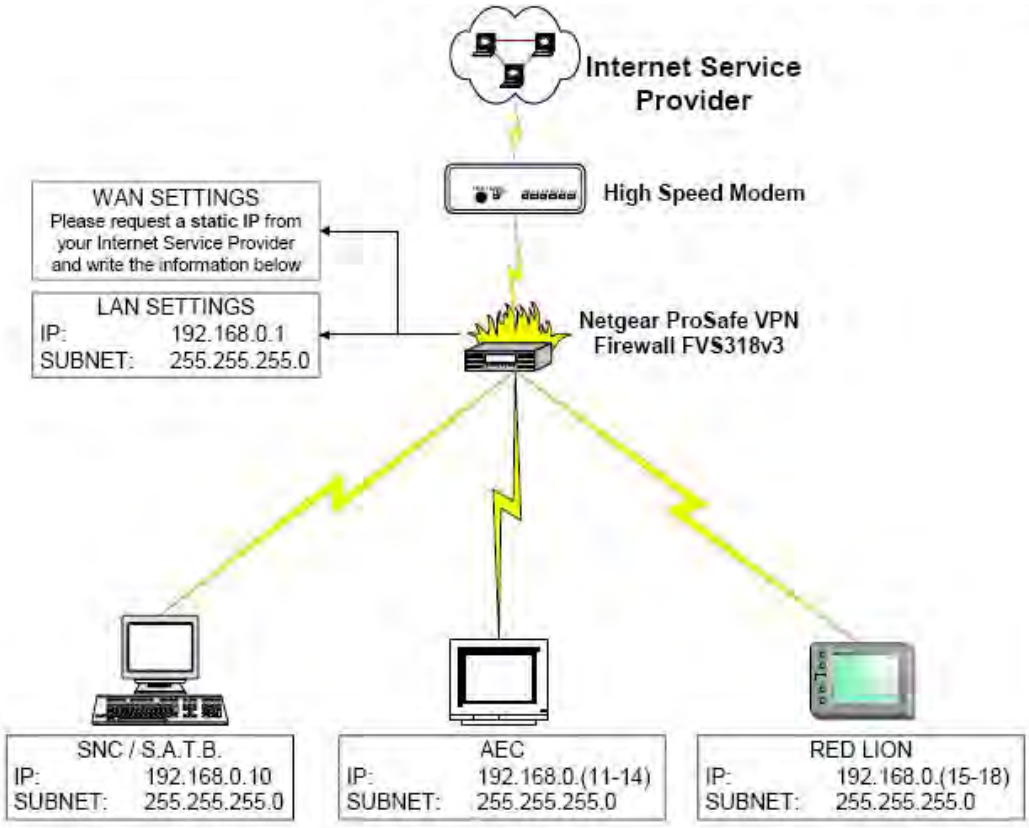
NetGear Default: 192.168.0.1 Subnet Mask: 255.255.255.0 User Name: admin Password: password

Configuration of the LAN side of the network should follow:

IP Redlion 1: 10.137.0.15 or 192.168.0.15
IP Redlion 2: 10.137.0.16 or 192.168.0.16
IP Redlion 3: 10.137.0.17 or 192.168.0.17
Subnet Mask: 255.255.0.0
Gateway: 10.137.0.1 or 192.168.0.1

Either configuration is acceptable for compliance with our standards.

Coleman Hanna High Speed Configuration



Carwash Name: _____

STATIC IP SETTINGS
(from ISP)

IP: _____
SUBNET: _____
GATEWAY: _____

DNS 1: _____
DNS 2 (if any): _____
DNS 3 (if any): _____

Please Contact JCC Technical Support for High Speed Setup

FusionX and eFusion
Red Lion Operator Interface Function Key Descriptions

F1/Recipe Menu	***F2/Timers & Counters***	***F3/Prices & Revenues***	***F4/Wash Data***
0 - Current Recipes	0 - Adjust Timers	0 - View Revenue	0 - Wash Status
1 - Assign Recipes	1 - Adjust Gantry Counter	1 - Set Wash Prices	1 - Washes Today
2 - Program Recipes	2 - View Boom Counters	2 - Best Income	2 - Washes Yesterday
3 - Review Recipes		3 - Last Ten Washes	3 - Boom Status
4 - Copy & Save Recipes		4 - View Total Washes	4 - Display Status
			5 - Wash Time
			6 - Car Measurement
			7 - Car Front Counts
			8 - Car Rear Counts
			9 - Last 5 Car Counts
			10 - Car Front Profile

FusionX and eFusion

Red Lion Operator Interface Function Key Descriptions (cont.)

F5/Log In Page	***F6/Memory Card***	***F7/Tech Menu***	***F8/Site Data***
Insert Password	Recipe Mode Revenue Mode	0 - View PLC Inputs 1 - View PLC Outputs 2 - View Torque 3 - Test Functions 1 4 - Test Functions 2 5 - Test Functions 3 6 - Force PLC Outputs 7 - Wheel Test 8 - Boom Test 9 - Top Brush Test 10 - TB Torque Loop 11 - Left Brush Test 12 - LB Torque Loop 13 - Right Brush Test 14 - RB Torque Loop 15 - Front Rear Test 16 - Photo Sensor 17 - Boom Safety Eyes 18 - Nozzle Test 19 - Freeze Test 20 - Door Status 21 - Entry Door Test 22 - Exit Door Test 23 - Dry Wash Test 24 - Test Pager 25 - Set Time Clock 26 - Scrolling Sign 27 - Display Contrast 28 - Reset Wash 29 - CAT Pump Serviced 30 - TB No Load Test 31 - LB No Load Test 32 - RB No Load Test	0 - Change Passwords 1 - Pager Values 2 - Enter IP Address 3 - On-Board Blower 4 - Type Cashier 5 - Enable Cycle Switches 6 - Recirculating High PH 7 - Recirculating Low PH 8 - Undercarriage Sol 1 9 - Undercarriage Sol 2 10 - Profile Option 11 - Profile Mode 12 - Blower Truck Mode 13 - Horn Mute Mode 14 - Static Blower 15 - Treadle Sensor 16 - Undercarriage Eye 17 - Door Mode 18 - Windy Day Bypass 19 - Flip Blower Front 20 - Flip Blower Rear 21 - Min SB TL Position 22 - Off Board Sign Type 23 - Init Gantry Counts 24 - Spin Freeze Protect

FusionX and eFusion

Instructions for loading OMRON PLC and Red Lion memory module

SAVING EXISTING RECIPES and REVENUE *(Recipes and Revenue are stored in the PLC NOT the Red Lion)*

1. With power on to the PLC, insert memory card into the slot in the PLC. Press the F5/Log In Page button and log in using the owner password. Press F6/Memory Card and select Recipe Mode then press Save Recipes twice. Remove the memory card with power still on. DO NOT CYCLE POWER ON & OFF.

RED LION Operator Interface

1. Turn off power to the display. Plug memory card into the slot located on the side of the Red Lion.
2. Turn on power to display. Wait for display to load program from memory card. (Observe text – LOADING CF). Once the screen is back to the main screen make sure the HMI number matches the version number you are loading.
3. After program is loaded, turn off power and remove card from display. Turn power back on.

OMRON PLC (Loading Program Instructions)

1. Turn off power to PLC. Open cover plate (located above the memory card slot) on CJ1G-CPU44 PLC module. Here you'll see 8 switches numbered 1-8 from top to bottom. Turn on DIP SW 7. (push switch to left position). Insert memory card into slot. Card is properly seated when the eject button is even with the top.
2. Turn on power to PLC. Wait for "busy" light to extinguish (about 5 to 10 seconds) and the main screen is up.
3. Turn off power to PLC. Remove memory card. Turn off DIP SW 7 (push switch to right position).
4. Turn on power to PLC.

DOWNLOADING SAVED RECIPES

1. With power on to the PLC, insert the memory card. Press the F5/Log In Page button and log in using the owner password. Press F6/Memory Card and select Recipe Mode then press Load Recipes twice.
2. Remove the memory card with power on. DO NOT CYCLE POWER ON & OFF

INITIALIZING THE SYSTEM

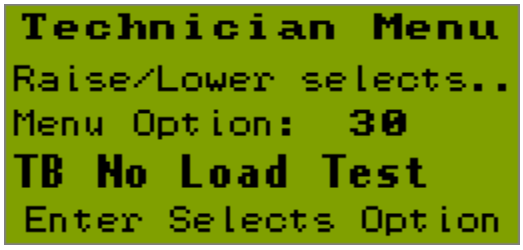
1. Perform a "Wheel, Side Brush, Top Brush and Boom Test". These tests can be accessed in the "F7 Tech Menu" of the Red Lion Interface Panel. This test will allow the PLC to store the correct length of travel for each of these components. ***THIS MUST BE DONE TO ENSURE PROPER OPERATION.***

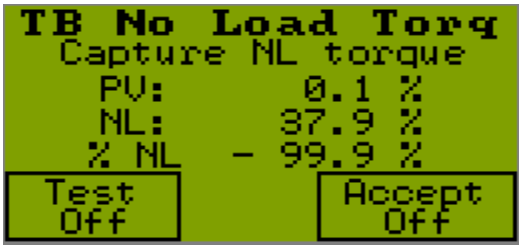
2. Next you ***MUST*** save the Treadle position that is required for the wheel brush to locate vehicle front wheels. This setting is done in "F2 Adjust Gantry Counts". The best way to accomplish this is to park a vehicle on the treadle plate and with the gantry in manual mode, position the gantry until the wheel brushes are aligned with the exact center of the front wheels. Press the "Wheel Brush Extend" manual push button to confirm alignment. Now press "Save" on the Red Lion Display to store this position.

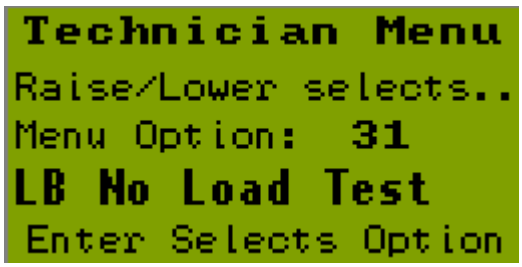
3. Assign the Recipes, in "F1 Recipe Menu", that you wish to use.

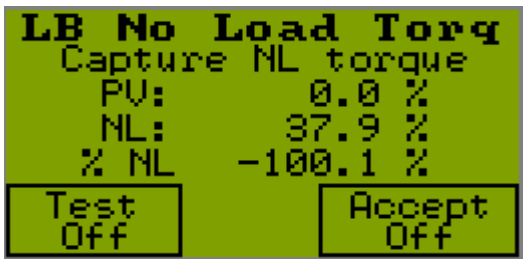
Added Steps necessary for version 3.12 or higher

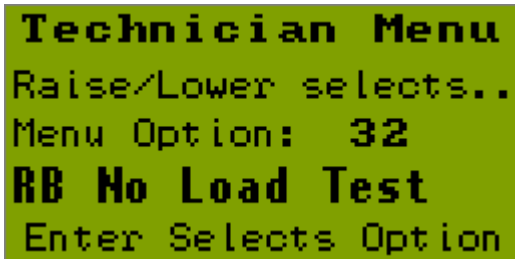
1. Go to “F7-Tech Menu” on your Red Lion. Use the Raise key until you get to Menu Option 30 – “TB No Load Test” and press Enter. See the pictures below.
2. Now you need to switch the Gantry manual toggle switch “On” and **lower the Top Brush** about 18-24” to get the brush **out of the nest** then press the arrow under the display on the Red Lion, where it says “Test”. The word “Off” will change to “Testing”.
3. The Top Brush will begin to spin and you will see the “PV” value begin to change (PV = Present Value).
4. After about 8 seconds, you will see that the “NL” value has now been set (NL = No Load).
5. If the brush components are in good mechanical condition, **the brushes were not in contact with any surface**, the test is complete, you can now press the arrow under the display, where it says “Accept”. The word “Off” will change to “Writing”.
6. When the word “Off” returns under “Accept”, this brush test is complete.
7. You can now press the “Prev” button then raise up to Menu Option 31 – LB No Load Test and Menu Option 32 – RB No Load Test and repeat the procedures above for each brush.
8. These procedures are required to calibrate the acceptable no load brush torque at your site. This addition became necessary due to variations in incoming voltage from one site to the next.

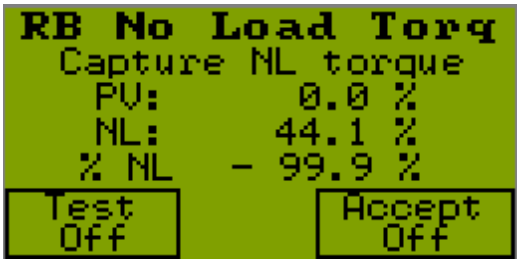












Transferring Programs from Email to Compact Flash Cards

These files are sent in a compressed (zip) file format. This makes them easier to send and receive and reduce the chances of file corruption. Windows XP has a built-in feature that can open a compressed file so the individual files that they contain can be used. There is also software that can be purchased called “WinZip” that can accomplish this task. If you do not use Windows XP and have never used WinZip, you can download a free 45-day evaluation version of WinZip from the Internet that will accomplish this task.

1. Open the email that contains the program updates.
2. Save the compressed file (zip) to your ‘Local Disc(C:)’ on your computer.
3. Create a new folder and rename it, including the program version number such as “Fusion v.3.12” or “WW 2.0 v.2.34”.
4. Move the zip file into this new folder.
5. Open the zip file and save the individual files in this same folder. There will be 8 – 15 program files within the zip file. Four of them are for the Red Lion and the remainder is for the Omron PLC.
6. Place a Compact Flash Card into your card reader and open the window that shows the contents of the card. Make sure that the card does not have other files on it prior to loading the program files onto the card.
7. Hi-light all the individual program files in the new folder that you created and drag & drop them (or copy and paste) onto the Compact Flash window that you have open.
8. Once the status light on your card reader stops flashing, you can now remove the card and follow the Memory Card Loading Instructions that we have provided to update the program in your Red Lion Operator Interface and your Omron PLC.

FusionX - Factory Assigned Recipes

Factory Default Assigned Recipes		This is what is already set in the Red Lion when the unit is first programmed.
For Units with On-Board Blowers		
Cycle	Recipe	
Cycle 1	13 (combi)	
Cycle 2	25 (touchless)	
Cycle 3	18 (combi)	
Cycle 4	23 (combi)	

Factory Assigned Recipes		You must change cycles 1 & 2 if the unit is NOT EQUIPPED with On-Board Blowers.
for Regular Units		
Cycle	Recipe	
Cycle 1	19 (combi)	
Cycle 2	27 (touchless)	
Cycle 3	18 (combi)	
Cycle 4	23 (combi)	

Fusion Recipe Function Bits

Function #	Red Lion Function Description	Recipe Function Bit Explanation
00	Undercarriage	Turn this ON in Pass 1 to clean the under body of vehicles with High Pressure as they enter the bay.
01	Presoak High pH	Turn this ON to apply an alkaline presoak (or a Foam Bath on eFusion) to the vehicle. This is typically done on Pass 1 and/or Pass2
02	Presoak Low pH	Turn this ON to apply an acid presoak to the vehicle, if equipped. This typically is applied after High pH Presoak and occurs during Pass 2 or Pass 3.
03	Tire Cleaner	Turn this ON to apply a Tire/Wheel Cleaner product to the lower part of the vehicle, if equipped. This is typically applied during a Presoak Pass in Pass 1 or 2.
04	Front Brush Pass	Turn this ON to scrub the front of the vehicle with the brushes. This function is always performed by the Side Brushes.
05	Rear Brush Pass	Turn this ON to scrub the rear of the vehicle with the brushes. This function is performed with the Side Brushes unless the Gantry cannot position far enough behind the vehicle for this to take place. In that case, the unit would automatically scrub the rear of the vehicle with the Top Brush.
06	SB Tilt Solenoid	This would only be turned ON in one Side Brush pass if there are two separate Side Brush passes in your recipe. Turning this ON will hold the Side Brushes vertical to better scrub the lower portion of the vehicle but the upper part of the vehicle will not be cleaned by the brushes.
07	Side Brush Pass	Turn this ON to scrub both sides of the vehicle. This can successfully be done in a single pass provided the "SB Tilt Solenoid" bit is turned OFF.
08	Top Brush Pass	Turn this ON to scrub the top surface of the vehicle. On an eFusion this is required to be done in an odd numbered pass, from front to rear, due to the process used for pick-up truck detection. A FusionX can do this in an even numbered pass, from rear to front, because the boom profile eyes are used for truck detection but we recommend that you do the Top Brush pass in an odd numbered pass whenever possible.
09	Wheel Brushes	Turn this ON to scrub the vehicle wheels. This cannot be done in Pass 1 because the unit has not located the rear wheel until the first pass is complete. We recommend turning this ON during a high pressure pass to limit the number of times the high pressure pump motor is started during a wash.
10	Rocker Panel	Turn this ON to clean the lower portion of the vehicle with high pressure water. (not available on eFusion)
11	High Pressure Wash	Turn this ON to clean/rinse the entire vehicle with high or low pressure water, depending on installed options. Turning this ON will also cause the scrolling sign, if equipped, to display "Washing". This is typically done following the last Presoak or Brush pass.

Function #	Red Lion Function Description	Recipe Function Bit Explanation
12	High Pressure Rinse	Turn this ON to rinse the entire vehicle with high or low pressure water, depending on installed options.
13	High Pressure Wax	Turn this ON to deliver a wax product via the high pressure pump, if equipped. This is commonly done on the pass following a Tri-Foam (conditioner) pass in the latter part of the recipe.
14	Bug Pass	Turn this ON in any high pressure pass, in which the wash boom will be going down in the front and/or the rear. This causes the wash boom to repeat the lower 1/3 of its travel two times in one boom pass (completely down, partially up, completely down, then completely up). This is only needed in a touchless wash recipe, to better clean the front or rear of the vehicle with high pressure water.(not available on the eFusion)
15	MedPress Solenoid	Turn this ON to lower the pressure of the high pressure water, if equipped with the "High Pressure Option". This can be used during a High Pressure Wax pass to improve the delivery of the wax.
16	Reclaim Solenoid	Turn this ON to provide a supply of reclaim water to the high pressure pump, if equipped with the "High Pressure Option". If not equipped, a valve will open to supply reclaim water to the Gantry at low pressure. This is typically used in the early portion of the wash recipe in conjunction with any high pressure function.
17	Cold H2O Solenoid	Turn this ON to provide a supply of cold water to the high pressure pump, if equipped with the "High Pressure Option" and the "Hot Water Option". This is typically used in the latter portion of the wash recipe in conjunction with any high pressure function.
18	Spot Free Rinse	Turn this ON to deliver Spot Free water to the Gantry as a final rinse.
19	Tri-Foam	Turn this ON to deliver a Tri-Color Foam product to the Gantry. If you choose to use Tri-Color Foam Detergent, you would apply this early in the wash recipe, typically during a Presoak pass. This configuration will decrease the cycle time of your recipes due to the decrease in necessary passes. If you choose to use a Tri-Color Foam Conditioner, you would apply this near the middle of your recipe to allow other passes to rinse the product off of the vehicle.
20	Low Pressure Wax	Turn this ON to deliver a wax product, through a low pressure pump, to the Gantry. This is typically done preceding the Spot Free Rinse pass.
21	Blower	Turn this ON to activate either On-Board Blowers or Free-Standing Blowers, if equipped.
22	Side Brush Lube	Turn this ON during a Side Brush, Front Brush or Rear Brush passes to wet the vehicle surface just ahead of the Side Brush travel.
23	Top Brush Lube	Turn this ON during a Top Brush pass to wet the vehicle surface just ahead of the Top Brush travel.

Function #	Red Lion Function Description	Recipe Function Bit Explanation
24	Rotate HP Rocker	Turn this ON to use the Wheel Brush to remain retracted, rotate and deliver high pressure, if equipped, to the lower portion of the vehicle.
25	Glass Treatment (Windshield Chem)	Turn this ON to deliver a Glass Treatment product (RainX or similiar product) through the Wax Arch on the Gantry. If equipped with this option, the wax rain arch is replaced by an arch that has (6) Fan Type Wax Nozzles.
26	Pipe Rack Mode	Turn this ON, in pass 1, if you wish to create a TOUCHLESS wash recipe where the boom will not contour during the entire duration of that wash, though the boom will come down during front and rear boom passes. This is used to offer a wash recipe for your customers who have pipe or ladder racks on their trucks. Signage would need to be posted at the autocashier to instruct these customers to select ONLY this wash for their vehicle, with the pipe or ladder rack.
27	Rinse Side Only	Turn this ON during a High Pressure Wash, Rinse or Wax pass to deliver through the side High Pressure nozzles only. This can be used to increase the deliver pressure at the vehicle if equipped with the 15 hp High Pressure Option or the Low Pressure configuration on the eFusion.
28	Rinse Top Only	Turn this ON during a High Pressure Wash, Rinse or Wax pass to deliver through the top high pressure nozzles only. This can be used to increase the deliver pressure at the vehicle if equipped with the 15 hp High Pressure Option or the Low Pressure configuration on the eFusion.
29	Tire Glaze	Turn this ON in Pass 1 to activate the Tire Glaze System, if equipped, at the end of the wash.
30	Static Blower	Turn this ON in the last pass if you wish to use your On-Board Blower unit to operate as if it had Free-Standing Blowers. Your customers must drive through the Gantry at the end of the wash rather than the Gantry traveling over the vehicle. This is not commonly used.
31	Rear Top Brush Pass	Turn this ON in any brush pass where you want the Top Brush to scrub the rear of the vehicle. This can be used alone to clean the rear or used in conjunction with the "Rear Brush Pass", which uses the Side Brushes to scrub the rear.

FusionX Factory Recipes (Quantity-20)

(14 Combi & 6 Touchless)

If you assign a recipe with "Tri-Foam" selected in pass #1, we recommend that you use a Tri-Color Foaming Detergent (det.), not a foaming conditioner (cond.)or wax.

To write a custom recipe you must assign it a recipe number from 30 to 59. If there is a factory recipe that is very similar to your desired wash recipe, you can use the "Copy & Save Recipe" feature in the Red Lion. Once you save the factory recipe to a number between 30 & 59, you can then go to "Program Recipes" and enter that number. You can then make the changes you want without having to program an entire recipe.

Recipe # 10 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH presoak, Tire Cleaner, TriFoam (det.)	100%	3.0 sec	0 counts	0 counts	5.0 sec.
2	HP Wash, Reclaim Sol.	100%	0.0 sec.	60 counts	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush Tilt Sol, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
4	Side Brush, SB Lube	75%	0.0 sec.	0 counts	0 counts	0.0 sec.
5	Wheel Brush, HP wash, Reclaim Sol.	75%	0.0 sec.	86 counts	86 counts	0.0 sec.
6	HP Rinse, Cold H2O Sol.	100%	0.0 sec.	0 counts	0 counts	0.0 sec.
7	Rocker Panel, Cold H2O Sol, Low Press Wax	100%	2.0 sec	0 counts	0 counts	0.0 sec.
8	Spot Free Rinse	100%	2.0 sec	0 counts	0 counts	0.0 sec.
9	Blower (on-board)	50%	5.0 sec.	0 counts	0 counts	0.0 sec.
10	Blower (on-board)	60%	5.0 sec.	0 counts	0 counts	0.0 sec.

Recipe # 11 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	**100%**	**3.0 sec**	0 counts	0 counts	**5.0 sec.**
2	Rocker Panel, Reclaim Sol.	**100%**	0.0 sec.	0 counts	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	Wheel Brush, HP wash, Reclaim Sol.	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	TriFoam (cond.)	**100%**	**2.0 sec**	0 counts	0 counts	**2.0 sec**
6	HP Rinse, Cold H2O Sol.	**100%**	0.0 sec.	0 counts	0 counts	0.0 sec.
7	Low Press Wax	**100%**	**2.0 sec**	0 counts	0 counts	0.0 sec.
8	Spot Free Rinse	**100%**	**2.0 sec**	0 counts	0 counts	0.0 sec.
9	Blower (on-board)	**50%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.
10	Blower (on-board)	**60%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 12 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	100%	3.0 sec.	0 counts	0 counts	0.0 sec.
2	Hi pH Presoak, Rocker Panel, Reclaim Sol.	100%	0.0 sec.	0 counts	0 counts	5.0 sec.
3	Wheel Brush, HP wash, Reclaim Sol.	75%	0.0 sec.	86 counts	86 counts	0.0 sec.
4	Side Brush, SB Lube	75%	0.0 sec.	0 counts	0 counts	0.0 sec.
5	Front Brush, Rear Brush, Side Brush Tilt Sol, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
6	TriFoam (cond.)	100%	2.0 sec.	0 counts	0 counts	2.0 sec.
7	HP Wax	75%	3.0 sec.	80 counts	80 counts	0.0 sec.
8	Spot Free Rinse	75%	2.0 sec.	0 counts	0 counts	0.0 sec.
9	Blower (on-board)	50%	5.0 sec	0 counts	0 counts	0.0 sec.
10	Blower (on-board)	60%	5.0 sec.	0 counts	0 counts	0.0 sec.

Recipe # 13 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH presoak, Tire Cleaner, TriFoam (det.)	**100%**	**3.0 sec**	0 counts	0 counts	**5.0 sec.**
2	HP Wash, Reclaim Sol.	**100%**	0.0 sec.	**60 counts**	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	HP Rinse, Cold H2O Sol, wheel brush	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Rocker Panel, Cold H2O Sol, Low Press Wax	**100%**	**2.0 sec**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse	**100%**	**2.0 sec**	0 counts	0 counts	0.0 sec.
7	Blower (on-board)	**50%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.
8	Blower (on-board)	**60%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 14 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	**100%**	**3.0 sec**	0 counts	0 counts	**5.0 sec.**
2	Rocker Panel, Reclaim Sol.	**100%**	0.0 sec.	0 counts	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	Wheel Brush, HP Wash	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Low Press Wax	**100%**	**2.0 sec**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse	**75%**	**2.0 sec**	0 counts	0 counts	0.0 sec.
7	Blower (on-board)	**50%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.
8	Blower (on-board)	**60%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 15 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	**100%**	**3.0 sec.**	0 counts	0 counts	**5.0 sec.**
2	Wheel Brush, HP wash, Reclaim Sol.	**75%**	0.0 sec.	**60 counts**	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush Tilt Sol, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	Side Brush, SB Lube	**75%**	0.0 sec.	0 counts	0 counts	0.0 sec.
5	Rotating HP Rocker, Cold H2O Sol.	**75%**	0.0 sec.	0 counts	0 counts	0.0 sec.
6	High Press. Rinse, Cold H2O Sol.	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
7	Low Press Wax	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
8	Spot Free Rinse, Blower (free standing)	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 16 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	High pH Presoak, Tire Cleaner	**100%**	**3.0 sec.**	0 counts	0 counts	**5.0 sec.**
2	Wheel Brush, HP wash, Reclaim Sol.	**75%**	0.0 sec.	0 counts	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush Tilt Sol, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	Side Brush, SB Lube	**75%**	0.0 sec.	0 counts	0 counts	0.0 sec.
5	TriFoam (cond.)	**100%**	**2.0 sec.**	0 counts	0 counts	**2.0 sec.**
6	HP Rinse, Cold H2O Sol.	**60%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
7	Low Press Wax	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
8	Spot Free Rinse, Blower (free standing)	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 17 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH presoak, Tire Cleaner, TriFoam (det.)	**100%**	**3.0 sec.**	0 counts	0 counts	**5.0 sec.**
2	Wheel Brush, HP wash, Reclaim Sol.	**75%**	0.0 sec.	**60 counts**	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	HP Rinse, Cold H2O Sol.	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Rocker Panel, Cold H2O Sol, Low Press Wax	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse, Blower (free standing)	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 18 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	**100%**	**3.0 sec.**	0 counts	0 counts	**5.0 sec.**
2	Wheel Brush, HP wash, Reclaim Sol.	**100%**	0.0 sec.	**60 counts**	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	**50%**	0.0 sec.	0 counts	0 counts	0.0 sec.
4	Reclaim Sol, Trifoam, Rotating HP Rocker	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
5	HP Wax	**50%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
6	Spot Free Rinse	**75%**	**2.0 sec**	0 counts	0 counts	0.0 sec.

Recipe # 19 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH presoak, Tire Cleaner, TriFoam (det.)	100%	**3.0 sec.**	0 counts	0 counts	**5.0 sec.**
2	Wheel Brush, HP wash, Reclaim Sol.	75%	0.0 sec.	**60 counts**	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
4	HP Rinse	75%	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Rocker Panel, Cold H2O Sol, Low Press Wax	100%	**2.0 sec**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse, Blower (free standing)	100%	**2.0 sec**	0 counts	0 counts	0.0 sec.

Recipe # 20 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Hi pH Presoak, Tire Cleaner	100%	**3.0 sec.**	0 counts	0 counts	**5.0 sec.**
2	Side Brush, SB Lube	75%	0.0 sec.	0 counts	0 counts	0.0 sec.
3	Front Brush, Rear Brush, Side Brush Tilt Sol, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
4	HP Rinse	75%	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Low Press Wax	100%	**2.0 sec**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse	100%	**2.0 sec**	0 counts	0 counts	0.0 sec.

Recipe # 21 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Hi pH Presoak, Tire Cleaner	100%	3.0 sec.	0 counts	0 counts	5.0 sec.
2	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
3	Rotating HP Rocker, Wheel Brush	100%	0.0 sec.	0 counts	0 counts	0.0 sec.
4	HP Rinse, Cold H2O Sol.	75%	0.0 sec.	86 counts	86 counts	0.0 sec.
5	HP Wax	100%	3.0 sec.	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse	100%	2.0 sec	0 counts	0 counts	0.0 sec.

Recipe # 22 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Hi pH Presoak, Tire Cleaner	100%	3.0 sec.	0 counts	0 counts	5.0 sec.
2	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
3	HP Rinse	40%	0.0 sec.	86 counts	86 counts	0.0 sec.
4	Spot Free Rinse	75%	3.0 sec.	0 counts	0 counts	0.0 sec.

Recipe # 23 (Combi)

Pass #	Active "Bits"	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Hi pH Presoak	100%	3.0 sec.	0 counts	0 counts	5.0 sec.
2	Front Brush, Rear Brush, Side Brush, Top Brush, SB Lube, TB Lube	50%	0.0 sec.	0 counts	0 counts	0.0 sec.
3	HP Rinse	40%	0.0 sec.	86 counts	86 counts	0.0 sec.
4	Spot Free Rinse	75%	3.0 sec.	0 counts	0 counts	0.0 sec.

Touchless Wash Recipes

Recipe # 24 (Touchless Wash)

Pass #	Active Functions	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	**100%**	**3.0 sec.**	0 counts	0 counts	0.0 sec.
2	Hi pH Presoak, Rocker Panel, Reclaim Sol.	**100%**	0.0 sec.	0 counts	0 counts	**5.0 sec.**
3	Wheel Brush, HP Wash, Bug Pass, Reclaim Sol.	**75%**	0.0 sec.	**86 counts**	0 counts	0.0 sec.
4	HP Rinse, Cold H20 Sol.	**75%**	0.0 sec.	**86 counts**	0 counts	0.0 sec.
5	TriFoam (cond.)	**100%**	**2.0 sec.**	0 counts	0 counts	**2.0 sec.**
6	HP Rinse, Cold H20 Sol.	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
7	Low Press Wax	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
8	Spot Free Rinse	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
9	Blower (on-board)	**50%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.
10	Blower (on-board)	**60%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 25 (Touchless Wash)

Pass #	Active Functions	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH presoak, Tire Cleaner, TriFoam (det.)	**100%**	**3.0 sec.**	0 counts	0 counts	0.0 sec.
2	Hi pH Presoak, Rocker Panel, Reclaim Sol.	**100%**	0.0 sec.	0 counts	0 counts	**5.0 sec.**
3	Wheel Brush, HP Wash, Bug Pass, Reclaim Sol.	**60%**	0.0 sec.	**86 counts**	0 counts	0.0 sec.
4	HP Rinse, Cold H20 Sol.	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Low Press Wax	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
7	Blower (on-board)	**50%**	**5.0 sec**	0 counts	0 counts	0.0 sec.
8	Blower (on-board)	**60%**	**5.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 26 (Touchless Wash)

Pass #	Active Functions	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH Presoak, Tire Cleaner	**100%**	**3.0 sec.**	0 counts	0 counts	0.0 sec.
2	Hi pH Presoak, Rocker Panel, Reclaim Sol.	**100%**	0.0 sec.	0 counts	0 counts	**5.0 sec.**
3	Wheel Brush, HP Wash, Bug Pass, Reclaim Sol.	**75%**	0.0 sec.	**86 counts**	0 counts	0.0 sec.
4	HP Rinse, Cold H20 Sol.	**75%**	0.0 sec.	**86 counts**	0 counts	0.0 sec.
5	TriFoam (cond.)	**100%**	**2.0 sec.**	0 counts	0 counts	**2.0 sec.**
6	HP Rinse, Cold H20 Sol.	**75%**	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
7	Low Press Wax	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.
8	Spot Free Rinse, Blower (free standing)	**100%**	**2.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 27 (Touchless Wash)

Pass #	Active Functions	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Undercarriage, Hi pH presoak, Tire Cleaner, TriFoam (det.)	100%	**3.0 sec.**	0 counts	0 counts	0.0 sec.
2	Hi pH Presoak, Rocker Panel, Reclaim Sol.	100%	0.0 sec.	0 counts	0 counts	**5.0 sec.**
3	Wheel Brush, HP Wash, Bug Pass, Reclaim Sol.	60%	0.0 sec.	**86 counts**	0 counts	0.0 sec.
4	HP Rinse, Cold H20 Sol.	75%	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	Low Press Wax	100%	**2.0 sec.**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse, Blower (free standing)	100%	**2.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 28 (Touchless Wash)

Pass #	Active Functions	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Hi pH Presoak, Tire Cleaner	100%	**3.0 sec.**	0 counts	0 counts	**8.0 sec.**
2	Rocker Panel, Reclaim Sol.	75%	0.0 sec.	0 counts	0 counts	0.0 sec.
3	Wheel Brush, HP Wash, Bug Pass, Reclaim Sol.	75%	0.0 sec.	**86 counts**	0 counts	0.0 sec.
4	HP Rinse, Cold H20 Sol.	75%	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
5	HP Wax, Med Press Sol.	100%	**3.0 sec.**	0 counts	0 counts	0.0 sec.
6	Spot Free Rinse	100%	**2.0 sec.**	0 counts	0 counts	0.0 sec.

Recipe # 29 (Touchless Wash)

Pass #	Active Functions	Gantry Speed	Preset Values			
			Start Delay	Boom @ Start	Boom @ End	End Delay
1	Hi pH Presoak	100%	**3.0 sec.**	0 counts	0 counts	**8.0 sec.**
2	HP Wash, Reclaim Sol.	50%	0.0 sec.	**86 counts**	**86 counts**	0.0 sec.
3	HP Rinse, Cold H20 Sol.	75%	0.0 sec.	**86 counts**	0 counts	0.0 sec.
4	Spot Free Rinse	75%	**3.0 sec.**	0 counts	0 counts	0.0 sec.

MAINTENANCE PROGRAM OUTLINE

Regular lubrication is the easiest, least expensive prevention maintenance. Read the FusionX 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 all eyes on gantry with a soft cloth
- Clean the optic sensor eyes on the stop and entrance stations
- Check SparkleSoft brush material for damage or wear.
- Observe the unit washing a vehicle and check for proper operation
- Grease the Boom Shaft and Brush Carriage Bearings
- Inspect the Pulley & Boom Belts
- Tighten Allen Screws on Oscillating Shaft Collars
- Check the Lovejoy couplings on the Boom & Drive for Wear and Alignment
- Check 10 Position Sign and replace bulbs as necessary (if applicable)
- Check 2 position sign and replace bulbs as necessary
- Check water hardness
- Check all Proximity Switches for proper adjustments
- Check Cashier Operation
- Wheel Count Test Front ____ Rear _____

Monthly

- Grease the Wall and Gantry boom arm bearings.
- Grease the water swivel on top boom arm (use just a small amount of grease)
- Titrate Presoak
- Check and clean all strainers inside the chemical tanks
- 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 replace as needed all Hydrominder hoses
- Check all Hydrominder foot valves

The Baldor Gear Boxes on the FusionX 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: _____

ŏ	✕	FUNCTION	COMMENTS
_____	_____	Grease All Bearings	_____
_____	_____	Clean Eyes on Gantry	_____
_____	_____	Clean Eyes on Entrance &Stop Station	_____
_____	_____	Observe FusionX wash a vehicle and check for proper operation	_____
_____	_____	Clean Contouring Eyes	_____
_____	_____	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	_____
_____	_____	Wheel Count Test Front ____ Rear _____	

Notes:

_____

_____

Alarm Codes & Date: _____

Car Count on FusionX: _____

Unit checked by: _____

Monthly Maintenance Checklist

Date: _____

ŏ	✕	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 (*use a very small amount*)	
		Titrate Pre-Soak	
		Check oil level on large Cat Pump & oil plunger wicks	
		Check All Proximity Switches for proper adjustments	
		Observe FusionX 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 FusionX: _____

Unit checked by: _____

Semi-Annual Maintenance Checklist

Date: _____

ǒ	✕	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 FusionX 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 FusionX: _____

Unit checked by: _____

NOTES

NOTES

Pump Stand

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Pump Stand Description

The FusionX 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 cold-water rinse tank with a low level float switch that connects into the SRT2-ID16 in the ECC. If the tank runs out of water the car wash will shut down and the Auto Cashier will say “Out of service”.

- Input 2014.15: Low level on water tank

For a complete pump stand wiring diagram for the float switches and solenoids refer to Fx2.0.A diagram.

Pump Stand Wire Color Chart

FLOATS & SOLENOIDS				
JUNCTION BOX 1	**COLOR**	**FUNCTION**	**ID16**	**ROC16**
1	Red	Medium Pressure		2005.03
2	Gray	Undercarriage		2005.02
3	Brown	High Pressure Soap		2005.00
4	Pink	High Pressure Wax		2005.01
5	Tan	Pre-Soak Float	2014.14	
6	Purple	Tire Cleaner Float	2014.08	
7	Black	Wax Float	2014.09	
8	Orange	Water Tank Float	2014.15	
9	Yellow	Circulating Pre-Soak		2005.10
10	Blue	24VDC (-)		
11	Red/Yellow	Triple Foam (yellow)		2006.06
12	Red/Black	Triple Foam (blue)		2006.05
13	Red/Green	Triple Foam (red)		2006.04
14	Orange/Black	Reclaim (optional)		2005.09
15	Gray/White	Cold Water Solenoid		2006.03
16	White	Neutral 24VAC		
17	Green	Ground		

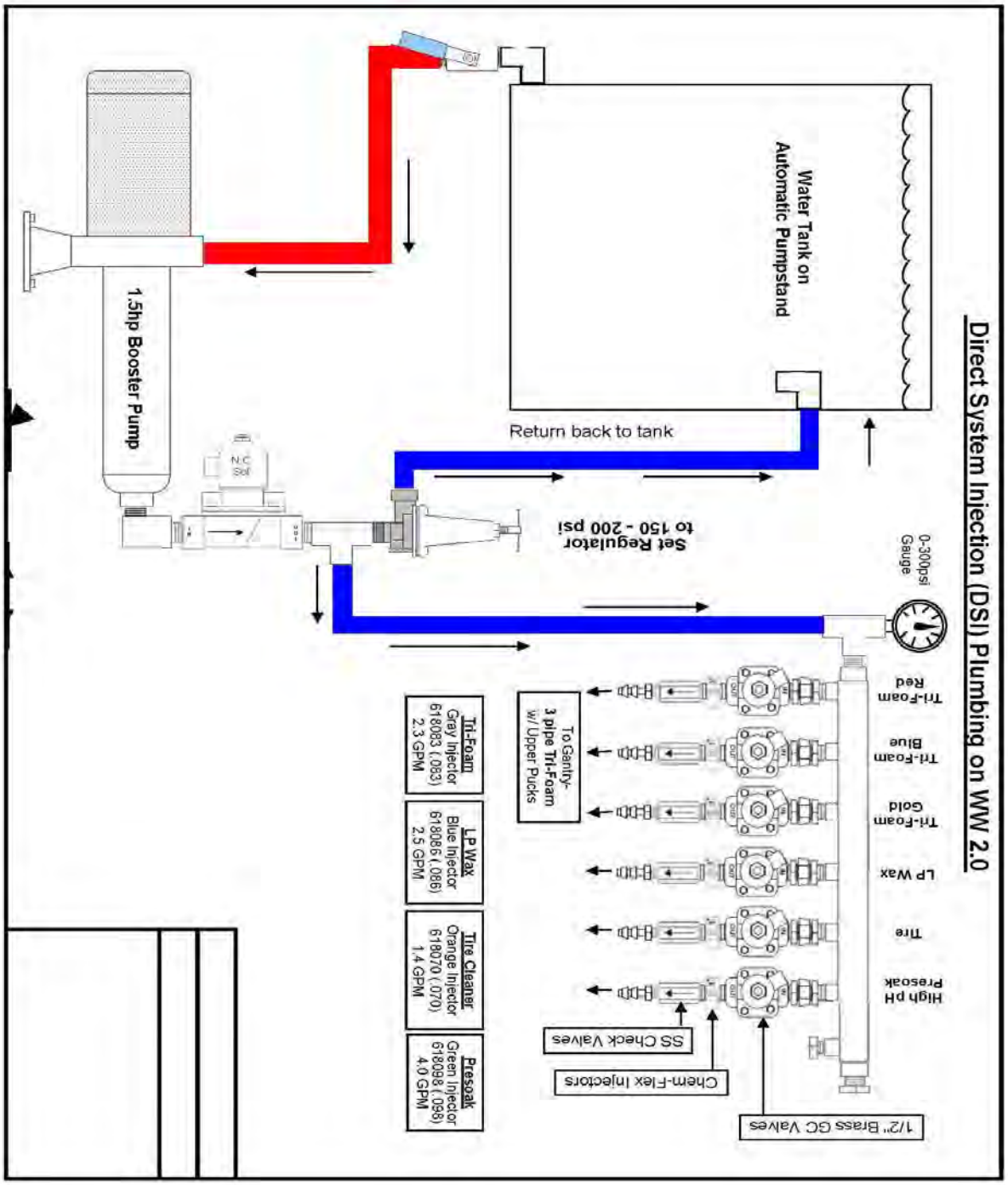
The cold-water tank also uses a float valve to fill the tank with clean water.

DEMA Valves on Pump Stand

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.

DSI Chemical Delivery System



Description of Operation

The DSI system consist of a 1 1/2hp pump that you can adjust the pressure at the pressure regulator. We recommend that the pressure is set at 175 psi. Do not exceed 190 psi on this system. When the pump is running excess water from the pump regulator is being returned back to the tank.

Each Chemical has a separate solenoid that turns on when the Gantry is delivering the chemical. The water flows through the solenoid and then through an injector. The injector creates the suction to draw the chemical. The Injectors are available in different sizes based upon flow rates. The chart below shows the recommended injector for the Water Wizard and Fusion units. Each injector has a suction hose and hose barb. When you pull off the suction hose you can screw in a metering tip to change the dilution of the chemicals. There are two styles of tips that are available the standard lean tips and the Ultra Lean tips. Please note the GPM flow rates for the different functions on this machine, the injector flow rate is sized to be less than the cumulative flow thru the tips or nozzles for that function. If the cumulative flow of the nozzles is less than the flow rate of the injector it will not work or draw chemical properly. This creates back pressure and stops the suction.

The dilution that you get with your chemicals will vary based upon the viscosity of the chemicals. Your Chemical supplier will set up your machine with the proper tips and dilution ratios for the chemicals you are using.

DSI System on Automatics using Chemicals

Low Pressure Product Name	HFI Injector Color	HFI Injector Size - GPM	Listed Ratio on Tip Chart	Metering Tip Color	
High pH Presoak	Green	.098 - 4.0 GPM	102:1	Tan	
Low pH Presoak	Green	.098 - 4.0 GPM	143:1	Burgundy	ultra-lean
Brush Lube	Gray	.083 - 2.3 GPM	230:1	Pumpkin	ultra-lean
Tire Cleaner	Red	.057 - 1.0 GPM	75:1	Orange	
Red Tri-Foam, Std. puck	Blue	.086 - 2.5 GPM	60:1	Turquoise	
Blue Tri-Foam, Std. puck	Blue	.086 - 2.5 GPM	60:1	Turquoise	
Gold Tri-Foam, Std. puck	Blue	.086 - 2.5 GPM	60:1	Turquoise	
Red Tri-Foam, 3 pipe	Red	.057 - 1.0 GPM	60:1	Turquoise	
Blue Tri-Foam, 3 pipe	Red	.057 - 1.0 GPM	60:1	Turquoise	
Gold Tri-Foam, 3 pipe	Red	.057 - 1.0 GPM	60:1	Turquoise	
Low Press. Wax	Blue	.086 - 2.5 GPM	102:1	Tan	
Glass Treatment (RainX)	Gray	.083 - 2.3 GPM	102:1	Tan	

Troubleshooting the DSI System

Chemical is not being drawn up the suction tube.

1. Go to the Red lion controller and turn on the chemical that you are having a problem with.
2. Does water flow out the tips on the gantry.
3. If yes then the water solenoid is on and water is flowing through the injector.
4. Pull off the suction hose on the chemical and remove the lean or ultra-lean tip. Make sure the lean or ultra-lean tip is not clogged. Check to see that all of the nozzles are spraying properly and not causing back pressure. Clean Nozzles as required.
5. The best method is to install a vacuum gauge with a short hose on the hose barb and see if the injector is creating suction. If you have 20" of suction then the injector is working properly and the lean tip is clogged or the chemical is too thick to draw properly.
6. If you are not getting any suction or less than 10" there are two causes of the problem. The injector has to flow the proper amount of water to create the suction.
   Example:

If the injector is Blue and is sized for 2.5 gallons per minute the tips on the gantry have to be sized to flow at least 2.5 gpm. If some of the tips are clogged then the tips are only flowing 2.0 gpm and then the injector will not create any suction.

a. Check to see if the injector is clogged

b. Check to make sure there are no tips on the gantry that are clogged.

c. If no tips are clogged then go to the gantry and remove one of the tips and turn on and see if the injector has suction.

d. Under the barb of the injector is a built in check valve with Teflon ball and spring.

e. Remove the barb very carefully to make sure you don't lose the ball, spring or o-ring and clean as necessary.

Notes: When technicians are having a problem with the injector not drawing up the correct amount of chemical they usually want to increase the size of the injector. This does not solve the problem and only makes the problem worse. The tips or hockey puck foamer have to be sized to dispense more water that the injector is rated to flow. If the tips are too small then there will be back pressure and it will cause the injectors to stop drawing chemicals.

Tip Color	Ratio	Style	Tip Color	Ratio	Style
Copper	230:1	Ultra Lean	Green	16:1	Lean
Pumpkin	175:1	Ultra Lean	Blue	13:1	Lean
Burgundy	143:1	Ultra Lean	Yellow	9:1	Lean
Lime	100:1	Ultra Lean	Black	6:1	Lean
Tan	102:1	Lean	Purple	15:1	Lean
Orange	75:1	Lean	Gray	4:1	Lean
Turquoise	60:1	Lean	None	3.6 :1	Lean
Pink	43:1	Lean			
Light Blue	33:1	Lean			
Brown	28:1	Lean			
Red	22:1	Lean			
White	18:1	Lean			

Ratio is based upon water thin products. Field test to determine the actual ratio.

CAT Pump

The FusionX 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.

General Unloader YU5221

GENERAL PUMP *A member of the Interpump Group*

YU5221

Trapped Pressure Unloader Valve

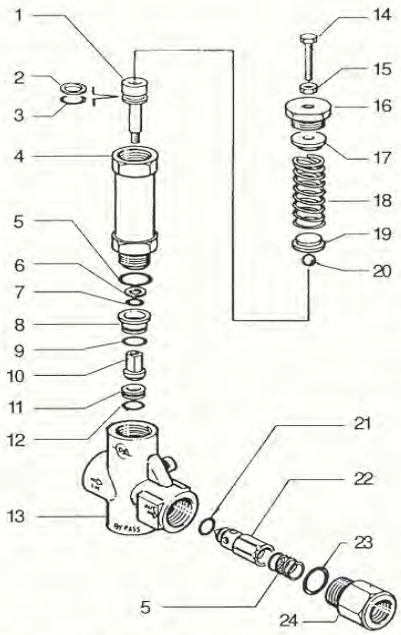
General Pump recommends using a safety relief device in conjunction with this unloader valve when installed on a positive displacement pump. A safety relief device is mandatory on systems operating above 5000 PSI. General Pump is not liable and assumes no responsibility for this valve when used in a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

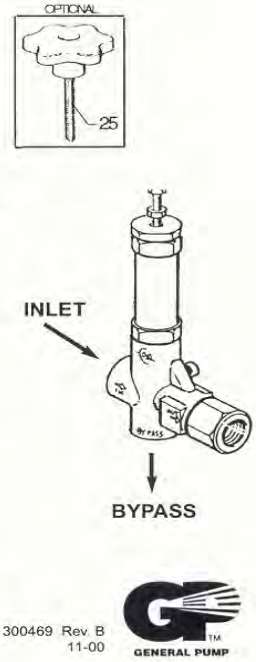
SPECIFICATIONS

Part Number	YU5221
Maximum Volume	52.5 GPM
Maximum Discharge Pressure	2175 PSI
Maximum Temperature	194˚F
Port Sizes	1" - 11-1/2 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

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300469 Rev. B
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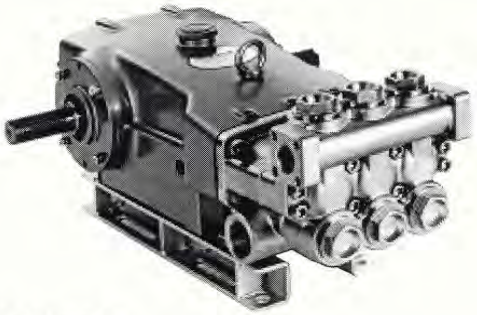
GENERAL PUMP

Cat Pump 35 Frame Plunger Pump

CAT PUMPS



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 [Incids: Pulleys, Belts, Hubs, Key] Tech Bulletin 03.

DETERMINING THE PUMP R.P.M. Rated G.P.M. / Rated R.P.M. = "Desired" G.P.M. / "Desired" R.P.M.

DETERMINING THE REQUIRED H.P. GPM x PSI / 1460 = Electric Brake H. P. Required

DETERMINING MOTOR PULLEY SIZE Motor Pulley O.D. / Pump R.P.M. = Pump Pulley O.D. / Motor R.P.M.

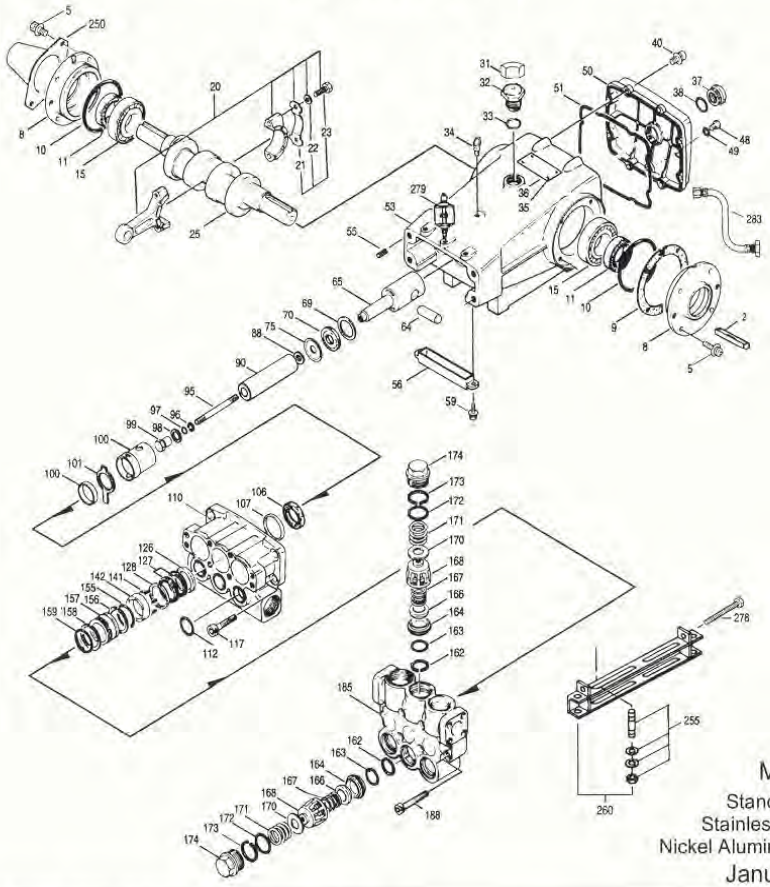
Note: Consult engine manufacturer when using gas or diesel engine.
Refer to pump Service Manual for important Inlet Condition Check-List, Start-up Procedure, Tech Bulletins and Pump Maintenance information.

"Customer confidence is our greatest asset"

PARTS LIST

ITEM	PART NUMBER 3535	MATL	3531	MATL	3537	MATL	DESCRIPTION	QTY	
● 2	*30055*	*STL*	*30055*	*STL*	*30055*	*STL*	*Key (M10x6x32)*	*1*	●
●	*34021*	*STL*	*34021*	*STL*	*34021*	*STL*	*Key (M10x8x70)*	*1*	●
5	118824	S	118824	S	118824	S	Screw, Sems HHC (M8x25)	8	
8	44542	AL	44542	AL	44542	AL	Cover, Bearing	2	
	701138	*F*	*701138*	*F*	*701138*	*F*	*Cover, Bearing (Use w/701137,39,40,45,47)*	*2*	
9	44543	FBR	44543	FBR	44543	FBR	Shim, Split Bearing Cover	4	
10	12398	NBR	12398	NBR	12398	NBR	O-Ring, Bearing Cover - 70D	2	
11	13296	NBR	13296	NBR	13296	NBR	Seal, Oil, Crankshaft	2	
15	29326	STL	29326	STL	29326	STL	Bearing	2	
20	46611	HS	46611	HS	46611	HS	Rod, Connecting Assy (Inclds: 44941,43641,88155)	3	
21	44940	STZP	44940	STZP	44940	STZP	Locking Washer (M10) ┐	3	
22	43641	STL	43641	STL	43641	STL	Washer (M10) ├ Replace as a set	6	
23	88155	STL	88155	STL	88155	STL	Screw, HH (M10x60F) ┘	3	
25	29325	FCM	29325	FCM	29325	FCM	Crankshaft, Dual End	1	
31	*828710*		*828710*		*828710*		*Protector, Oil Cap*	*1*	
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)*	*1*	
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	
	701139	*F*	*701139*	*F*	*701139*	*F*	*Cover, Crankcase (Use w/701137,38,40,45,47)*	*1*	
51	16612	NBR	16612	NBR	16612	NBR	O-Ring, Crankcase Cover - 70D	1	
● 53	44559	AL	44559	AL	44559	AL	Crankcase	1	●
●	*701137*	*F*	*701137*	*F*	*701137*	*F*	*Crankcase (Use w/701138,39,40,45,47)*	*1*	●
55	27488	S	27488	S	27488	S	Pins, Guide	2	
56	27790	POP	27790	POP	27790	POP	Pan, Oil	1	
57	—		**19933**	**S**	**19933**	**S**	Washer (M6)	2	
58	—		**15849**	**S**	**15849**	**S**	Lockwasher, Split (M6)	2	
59	—		**89618**	**S**	**89618**	**S**	Screw, HH (M6x10)	2	
59	**92538**	**S**	—		—		Screw, Sems HHC (M6x16)	2	
64	43864	S	43864	S	43864	S	Pin, Rist	3	
65	† 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	
	44739	*FPM*	*44739*	*FPM*	*44739*	*FPM*	*Seal, Oil, Crankcase*	*3*	
75	43865	S	43865	S	43865	S	Slinger, Barrier	3	
88	45676	SS	45676	SS	45676	SS	Washer, Keyhole (M16)	3	
90	43921	CC	43921	CC	43921	CC	Plunger (M40x145)	3	
95	89778	SS	89778	SS	89778	SS	Stud, Plunger Retainer (M10x135)	3	
96	20189	PTFE	20189	PTFE	20189	PTFE	Back-up-Ring, Plunger Retainer	3	
97	11345	NBR	11345	NBR	11345	NBR	O-Ring, Plunger Retainer - 70D	3	
	11375	*FPM*	*11375*	*FPM*	*11375*	*FPM*	*O-Ring, Plunger Retainer*	*3*	
	◆ *701490*	*EPDM*	◆ *701490*	*EPDM*	◆ *701490*	*EPDM*	*O-Ring, Plunger Retainer*	*3*	
98	44085	SS	44085	SS	44085	SS	Gasket, Retainer	3	
99	44084	SS	44084	SS	44084	SS	Retainer, Plunger (M10)	3	
100	814279	PVDF	814279	PVDF	814279	PVDF	Retainer, Seal, 2 Pc.	3	
101	44112		44112		44112		Wick, Long Tab	3	
106	44113	NBR	44113	NBR	44113	NBR	Seal, LPS w/SS-Spg	3	
	44740	*FPM*	*44740*	*FPM*	*44740*	*FPM*	*Seal, LPS w/SS-Spg*	*3*	
	◆ *46955*	*EPDM*	◆ *46955*	*EPDM*	◆ *46955*	*EPDM*	*Seal, LPS w/SS-Spg*	*3*	
107	**43925**	**BB**	**45381**	**SS**	**44115**	**NAB**	Spacer, Lo-Pressure Seal	3	
● 110	**46392**	**FBB**	**45365**	**SS**	**45124**	**N**	Manifold, Inlet	1	●
112	11379	NBR	11379	NBR	11379	NBR	O-Ring, Inlet Manifold - 70D	3	
	14183	*FPM*	*14183*	*FPM*	*14183*	*FPM*	*O-Ring, Inlet Manifold*	*3*	
	◆ *701491*	*EPDM*	◆ *701491*	*EPDM*	◆ *701491*	*EPDM*	*O-Ring, Inlet Manifold*	*3*	
117	44585	S	44585	S	44585	S	Screw, HSH (M14x40)	4	
126	**43926**	**BB**	**48391**	**D**	**48391**	**D**	Adapter, Female	3	
	—		***45367***	***SS***	† ***45367***	***SS***	*Adapter Female*	*3*	
127	44609	STG	44609	STG	44609	STG	V-Packing	6	
	44741	*SFG*	*44741*	*SFG*	*44741*	*SFG*	*V-Packing*	*6*	
	44609	*STG*	*44609*	*STG*	*44609*	*STG*	*V-Packing (Alternate-EPDM)*	*6*	
128	**43928**	**BB**	**45368**	**SS**	† **45368**	**SS**	Adapter, Male	3	
141	45113	SS	45113	SS	45113	SS	Springs, Coil	6/18	
142	**46352**	**BB**	**45382**	**SS**	† **45382**	**SS**	Spacer, w/Coil Springs	3	
155	18697	NBR	18697	NBR	18697	NBR	O-Ring, V-Packing-Spacer - 70D	3	
	20137	*FPM*	*20137*	*FPM*	*20137*	*FPM*	*O-Ring, V-Packing-Spacer - 70D*	*3*	
	◆ *701492*	*EPDM*	◆ *701492*	*EPDM*	◆ *701492*	*EPDM*	*O-Ring, V-Packing-Spacer*	*3*	
156	48362	D	48362	D	48362	D	Back-up-Ring, Spacer	3	
157	45369	SS	45369	SS	† 45369	SS	Spacer, V-Packing	3	
158	48362	D	48362	D	48362	D	Back-up-Ring, V-Packing-Spacer	3	
159	18697	NBR	18697	NBR	18697	NBR	O-Ring, V-Packing-Spacer - 70D	3	
	20137	*FPM*	*20137*	*FPM*	*20137*	*FPM*	*O-Ring, V-Packing-Spacer - 70D*	*3*	
	◆ *701492*	*EPDM*	◆ *701492*	*EPDM*	◆ *701492*	*EPDM*	*O-Ring, V-Packing-Spacer*	*3*	
162	48363	D	48363	D	48363	D	Back-up-Ring, Valve Seat	6	
163	26142	NBR	26142	NBR	26142	NBR	O-Ring, Seat	6	
	14330	*FPM*	*14330*	*FPM*	*14330*	*FPM*	*O-Ring, Seat*	*6*	
	◆ *701493*	*EPDM*	◆ *701493*	*EPDM*	◆ *701493*	*EPDM*	*O-Ring, Seat*	*6*	
164	**44727**	**S**	**44612**	**SS**	**44612**	**SS**	Seat, Stepped	6	
166	**43932**	**S**	**44108**	**SS**	**44108**	**SS**	Valve	6	
167	44109	SS	44109	SS	44109	SS	Spring	6	
168	44728	PVDF	44728	PVDF	44728	PVDF	Retainer, Spring	6	
170	44729	SS	44729	SS	44729	SS	Washer, Spring Retainer	6	
171	44644	SS	44644	SS	44644	SS	Coil Spring (70kg), Valve Plug	6	
172	89827	NBR	89827	NBR	89827	NBR	O-Ring, Valve Plug - 90D	6	
	11747	*FPM*	*11747*	*FPM*	*11747*	*FPM*	*O-Ring, Valve Plug - 90D*	*6*	
	◆ *701494*	*EPDM*	◆ *701494*	*EPDM*	◆ *701494*	*EPDM*	*O-Ring, Valve Plug - 90D*	*6*	

EXPLODED VIEW



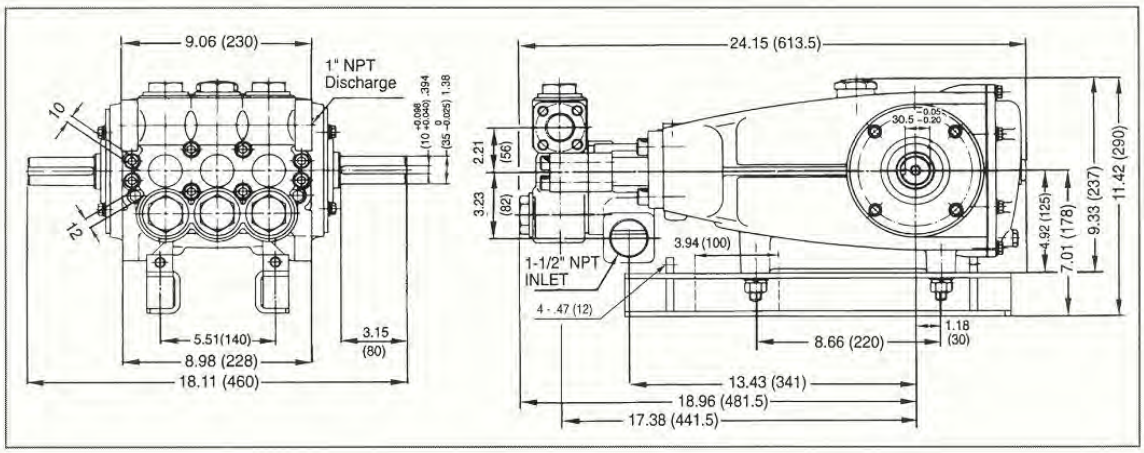
Models
Standard - 3535
Stainless Steel - 3531
Nickel Aluminum Bronze - 3537
January 2000

	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	●
●	*701140*	*F*	*701140*	*F*	*701140*	*F*	*Protector, Shaft (Use w/701137,38,39,45,47)*	*1*	●
● *255*	*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 (Inclds: 97,106,112,127,155,156,158,159)*	*1*	
	33055	*FPM*	*33055*	*FPM*	*33055*	*FPM*	*Kit, Seal (Inclds: 97,106,112,127,155,156,158,159)*	*1*	
	◆ *33262*	*EPDM*	◆ *33262*	*EPDM*	◆ *33262*	*EPDM*	*Kit, Seal (Inclds: 97,106,112,127,155,156,158,159)*	*1*	
310	***34235***	***NBR***	***34017***	***NBR***	***34017***	***NBR***	*Kit, Valve (Inclds: 162,163,164,166,167,168,170,172,173)*	*2*	
	31255	*FPM*	*31255*	*FPM*	*31255*	*FPM*	*Kit, Valve (Inclds: 162,163,164,166,167,168,170,172,173)*	*2*	
	◆ *31252*	*EPDM*	◆ *31252*	*EPDM*	◆ *31252*	*EPDM*	*Kit, Valve (Inclds: 162,163,164,166,167,168,170,172,173)*	*2*	
● —	*819000*	*F*	*819000*	*F*	*819000*	*F*	*Crankcase Assy (Inclds: 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 (Not Part of Part Number): AL=Aluminum BB=Brass CC=Ceramic D=Delryn® EPDM=Ethylene Propylene Diene Monamer 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 Jan 2000 12907

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Cat Pump 35PFR Plunger Pump Service Manual

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.

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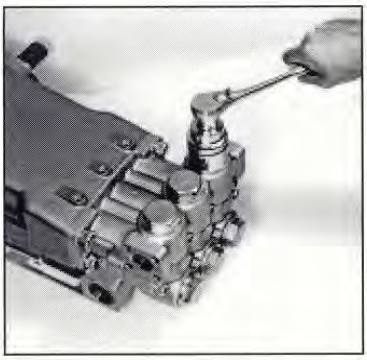
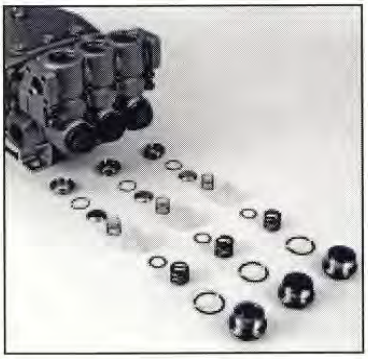
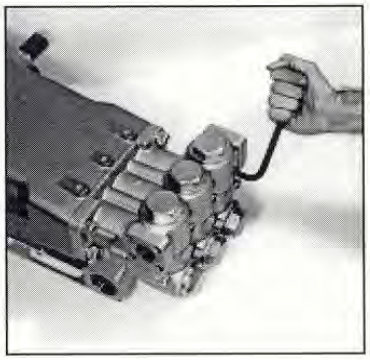




SERVICING THE VALVES

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

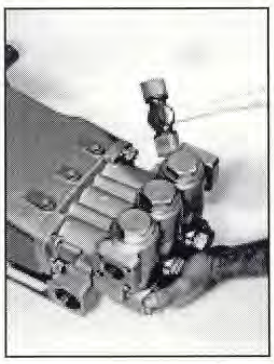
DISASSEMBLY OF THE V-PACKINGS

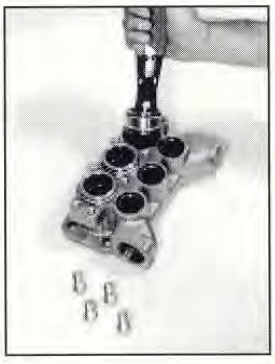
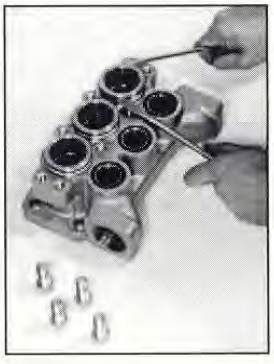
1. Place the **crankcase side** of the Inlet Manifold **down** on the work surface.
2. First remove the V-Packing Spacer. These may stay in either the Inlet or Discharge Manifold ports when the Discharge Manifold is removed. If they are extremely dirty or dry, remove the exposed O-Ring and Back-up-Ring 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.

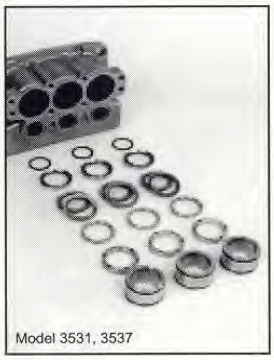
REASSEMBLY OF THE V-PACKINGS

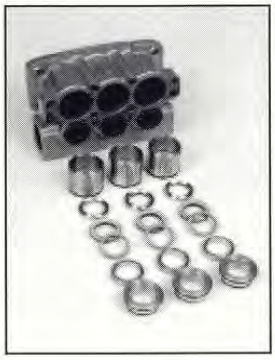
NOTE: For certain applications apply liquid gasket to the o-ring crevices and seal surfaces. See Tech Bulletin #053 for model identification.

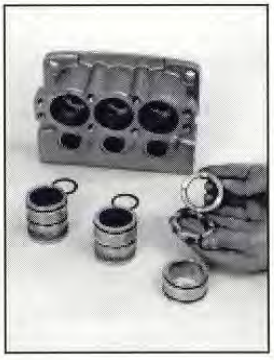
1. Lubricate outer surface of V-Packing Cylinder and install new O-Ring in groove (3520, 3521, 3527). Press V-Packing Cylinder with **O-Ring end down** into the manifold chamber until completely seated.
2. Insert the Female Adapter into the V-Packing Cylinder (3520, 3521, 3527) or manifold chamber (3535, 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.

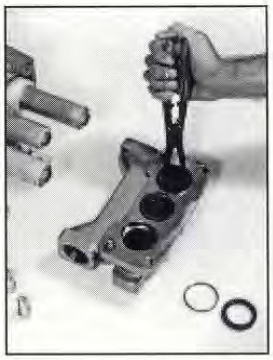



Model 3531, 3537







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.

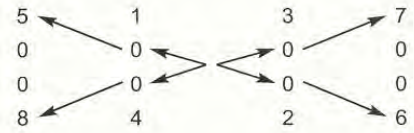
SERVICING THE PLUNGERS

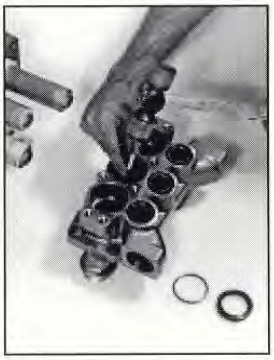
DISASSEMBLY

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.





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.

DIAGNOSIS AND MAINTENANCE

PROBLEM	PROBABLE CAUSE	SOLUTION
• Pulsation	• Faulty Pulsation Dampener • Poor inlet and discharge plumbing	• 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.
• Low Pressure	• 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	• 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.
• Pump runs extremely rough, pressure low	• Restricted inlet or air entering the inlet plumbing • Stuck or worn inlet or discharge valves • Leaking V-Packings	• Proper size inlet plumbing; check for air tight seal. • Clean out foreign material, replace worn valves. • Repair with Seal Kit.
• Water leakage from under the manifold	• Worn or damaged Lo-Pressure seals • Worn male and female adapter	• Repair with Seal Kit. • Install new male and female adapter. • Lubricate and replace o-rings in seal area.
• Oil leak between crankcase and pumping section	• Worn crankcase oil seals	• Replace crankcase oil seals and change oil in crankcase.
• Oil leaking in the area of crankshaft	• Worn or improperly installed crankshaft or cut or worn o-ring on bearing case • Bad bearing	• Replace damaged o-ring and/or oil seals. • Replace bearing.
• Excessive play in the end of the crankshaft pulley	• Worn main bearing from excessive tension on drive belt	• Replace bearing. Properly tension belt. Use correct type and length.
• Water in crankcase	• 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	• 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.
• Oil leaking from under-side of crankcase	• Worn crankcase oil seals	• Replace seals.
• Oil leakage from drain plug	• Loose drain plug or worn drain plug o-ring	• Tighten drain plug or replace o-ring.
• Loud knocking noise in pump	• Pulley loose on crankshaft • Broken or worn bearing • Stressful inlet conditions	• Check key and tighten set screw. • Replace bearing. • Install C.A.T. and/or booster pump.
• Frequent or premature failure of the packing	• Scored plungers • Excessive inlet pressure • Abrasive material in the liquid being pumped • Excessive temperature of pumped liquid • Running pump dry	• 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.
• Strong surging at the inlet and low pressure on the discharge side	• Foreign particles in the inlet or discharge valve or worn inlet and/or discharge valves • Stressful inlet conditions	• 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

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

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.

Electrical Control Center (ECC)

The Electrical Control Center (ECC) on the FusionX is the main control center for the automatic. It is a cabinet constructed of 14-gauge stainless steel. Inside the box is the CPU controller (CJ1M-CPU44), multiple input and output cards, power supply, transformer, terminal strips, and the safety disconnect switch. The 3 phase electrical power supply ties to L1, L2, and L3 of the safety switch. The Electrical Control Center supplies power to the gantry motors, gantry input/output cards, prox sensors, and eye sensors

The door of the ECC 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.

Control Center Door w/Red Lion

Electrical Control Center

Input Selections on Gantry

CONFIGURATION - October 2, 2007 **Fusion**

Gantry Inputs

Gantry Inputs - SRT2-ID16's

Gantry Address 0		FusionX & eFusion Inputs	
I_MeasurementEye	2008.00	measurement eye on gantry	eye
I_LeftBrush_EncoderProx1	2008.01	prox 1 left brush encoder, INNER PROX	prox
I_LeftBrush_EncoderProx2	2008.02	prox 2 left brush encoder, OUTER PROX	prox
I_RightBrush_EncoderProx1	2008.03	prox 1 Right brush encoder, INNER PROX	prox
I_RightBrush_EncoderProx2	2008.04	prox 2 Right brush encoder, OUTER PROX	prox
I_TopBrush_EncoderProx1	2008.05	prox 1 top brush encoder, LOWER PROX	prox
I_TopBrush_EncoderProx2	2008.06	prox 2 top brush encoder, UPPER PROX	prox
I_Gantry_ExitProx	2008.07	home position of the gantry	prox
I_Gantry_EntranceProx	2008.08	reverse limit on gantry	prox
I_Gantry_EncoderProx1	2008.09	prox 1 gantry encoder, LOWER PROX	prox
I_Gantry_EncoderProx2	2008.10	prox 2 gantry encoder, UPPER PROX	prox
I_VacationHomeProx	2008.11	second home prox - for secondary home prox location	prox
I_CenterLimitProx	2008.12	center limit prox, for side brushes	prox
I_WheelPositionEye	2008.13	finds tire position for Wheel Brush	eye
	2008.14		
	2008.15		

Gantry Address 2		FusionX & eFusion Inputs	
I_LeftBrushHomeLimit	2009.00	left brush limit prox sensor - RETRACTED LIMIT	prox
I_LeftBrushExtendedLimit	2009.01	left brush limit prox sensor - EXTENDED LIMIT	prox
I_RightBrushHomeLimit	2009.02	right brush limit prox sensor - RETRACTED LIMIT	prox
I_RightBrushExtendedLimit	2009.03	right brush limit prox sensor - EXTENDED LIMIT	prox
I_TopBrushHomeLimit	2009.04	top brush limit prox sensor - UPPER LIMIT	prox
I_TopBrushLowerLimit	2009.05	top brush limit prox sensor - LOWER LIMIT	prox
I_WheelBrushes_Retracted	2009.06	prox sensor - sensing BOTH cylinders in retracted position	prox
I_gantry_fault	2009.07	gantry drive faulted	contact
I_SideBrush_Fault	2009.08	left or right brush positioner or spindle faulted	contact
I_TopBrush_Fault	2009.09	top brush positioner or spindle faulted	contact
I_Oscillator/WheelBrush_Fault	2009.10	oscillating motor or wheel brush spindle faulted	contact
I_Blower_Fault	2009.11	on-board blower fault (any one of the MS's or VFD)	contact
I_Blower Prox Fwd	2009.12	blower osc prox in forward direction	prox
I_Blower Prox Rev	2009.13	blower osc prox in reverse direction	prox
	2009.14		
	2009.15		

Input Selections on Gantry (cont.)

Gantry Address 4		FusionX & eFusion Inputs	
I_JogFwd	2010.00	jog drive forward	sw
I_JogRev	2010.01	jog drive reverse direction	sw
I_JogBoom_Up	2010.02	jog boom up direction	sw
I_JogBoom_Down	2010.03	jog boom down direction	sw
I_JogOscillateMotor	2010.04	jog the oscillator motor	sw
I_JogTilt_Fwd	2010.05	jog the tilt forward	sw
I_JogTilt_Rev	2010.06	jog the tilt arm reverse direction	sw
I_JogLeftBrush_Extend	2010.07	extend left brush	sw
I_JogLeftBrush_Retract	2010.08	retract left brush	sw
I_JogRightBrush_Extend	2010.09	extend right brush	sw
I_JogRightBrush_Retract	2010.10	retract right brush	sw
I_JogTopBrush_Up	2010.11	jog top brush up	sw
I_JogTopBrush_Down	2010.12	jog top brush down	sw
I_JogWheelBrushes	2010.13	jog the wheel brush - bring cylinder forward, spin motor	sw
I_JogWheelVFDs	2010.14	jog the wheel VFDs	sw
I_JogEnable	2010.15	enable switch for jog's	sw

Gantry Address 6		FusionX ONLY	
I_CanEye	2011.00	gantry safety eye in can	eye
I_BoomSafetyRear	2011.01	rear boom safety eye, attached to boom rear direction	eye
I_BoomSafetyFront	2011.02	front boom safety eye, attached to boom front direction	eye
I_Boom_EncoderProx1	2011.03	prox 1 boom encoder, LOWER PROX	prox
I_Boom_EncoderProx2	2011.04	prox 2 boom encoder, UPPER PROX	prox
I_BoomHomeLimit	2011.05	boom limit prox - UPPER LIMIT	prox
I_BoomLowerLimit	2011.06	boom limit prox - LOWER LIMIT	prox
I_BoomBeltSafety	2011.07	detects slack on boom belt	prox
I_height_first	2011.08	top eye at top of boom	eye
I_height_second	2011.09	2nd eye from top	eye
I_height_third	2011.10	3rd eye from top	eye
I_height_fourth	2011.11	bottom eye, 4th from top	eye
I_boom_fault	2011.12	boom faulted	contact
	2011.13		
I_3phPowerDetection	2011.14	detects loss of 3 phase power	contact
	2011.15		

ECC Input Selections

Control Panel Inputs			
Control Panel, Address 12		**FusionX & eFusion Inputs**	
I_Treadle_sw	2014.00	switch on floor	eye
I_ExitDoorEye	2014.01	senses door area clear to close exit door	eye
I_EstopSw	2014.02	emergency stop switch	sw
I_ResetSw	2014.03	reset switch on control panel	sw
I_UnderCarriageEye	2014.04	front entrance switch to turn on undercarriage wash	eye
I_TempSwitch	2014.05	closes on rise in temperature, door controller	sw
	2014.06		
I_FreezeTstat	2014.07	freeze thermostat - closes when temp falls	sw
I_TireCleaner_Level_OK	2014.08	level OK in tire cleaner vessel	sw
I_Wax_Level_OK	2014.09	level OK on foaming conditioner tank	sw
I_CashierCycle1	2014.10	pulse from auto cashier, cycle 1	contact
I_CashierCycle2	2014.11	pulse from auto cashier, cycle 2	contact
I_CashierCycle3	2014.12	pulse from auto cashier, cycle 3	contact
I_CashierCycle4	2014.13	pulse from auto cashier, cycle 4	contact
I_PreSoak_Level_OK	2014.14	level OK in presoak vessel	sw
I_H20_Level_OK	2014.15	water tank level OK	sw

Control Panel, Address 14		**FusionX & eFusion Inputs**	
I_ManualWash1	2015.00	manually select wash 1	sw
I_ManualWash2	2015.01	manually select wash 2	sw
I_ManualWash3	2015.02	manually select wash 3	sw
I_ManualWash4	2015.03	manually select wash 4	sw
I_BillChanger1Fault	2015.04	bill changer 1 faulted	contact
I_BillChanger2Fault	2015.05	bill changer 2 faulted	contact
I_AutoCashierFault	2015.06	auto cashier faulted	contact
I_ExitDoorOpenProx	2015.07	senses exit door is opened	prox
I_ReclaimTankLevel	2015.08	detects low level in reclaim/cold water tank	sw
I_Blwr Nozzle Prox	2015.09	blower osc nozzle prox	prox
	2015.10		
	2015.11		
I_ExtBlowerShutOff	2015.12	photo to shut off blowers if customer leaves early	eye
	2015.13		
I_25hp OverloadTripped	2015.15	25 hp Overload Tripped	contact

Output Selections on Gantry

CONFIGURATION - Dec. 27, 2007 **Fusion**

GANTRY OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs	
Address 0		**Volts**	**Com**		
O_Blower1		24ac	0	2000.00	blower #1, center blower
O_BlowerOsc CW		24dc-	1	2000.01	Blower osc motor, CW Direction
O_Blower2		24ac	0	2000.02	blower #2, outboard blower
O_BlowerOsc CCW		24dc-	1	2000.03	Blower osc motor, CCW Direction
O_Rocker_Sol		24ac	2	2000.04	rocker solenoid valve
O_PreSoak_Sol_1		24ac	3	2000.05	presoak air & liquid solenoids, reverse direction
O_PreSoak_Sol_2		24ac	2	2000.06	presoak air & liquid solenoids, forward direction
O_TireCleaner_Sol		24ac	3	2000.07	tire cleaner solenoid
O_TriColorFoam_Sol		24ac	4	2000.08	Triple Foam air & liquid solenoids
O_Side Spray Sol.		24ac	5	2000.09	side spray rinse solenoid
O_LowPressWax_Sol		24ac	4	2000.10	low pressure wax solenoid
O_Blower3		24ac	5	2000.11	blower #3, outboard blower
			6	2000.12	spare
			7	2000.13	spare
			6	2000.14	spare
			7	2000.15	spare

GANTRY OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs	
Address 2		**Volts**	**Com**		
O_TopSprayer_Sol		24ac	0	2001.00	top sprayer solenoid
O_SideBrushLube, Rev		24ac	1	2001.01	side brush friction lubricant solenoid, reverse direction
O_SideBrushLube, Fwd		24ac	0	2001.02	side brush friction lubricant solenoid, forward direction
O_TopBrushLube, Rev		24ac	1	2001.03	top brush friction lubricant solenoid, reverse direction
O_TopBrushLube, Fwd		24ac	2	2001.04	top brush friction lubricant solenoid, forward direction
O_AirPurge_Sol		24ac	3	2001.05	air purge sol
O_Tilt_Brushes_Sol		24ac	2	2001.06	tilt side brushes
O_SpotFreeAirPurge		24ac	3	2001.07	spot free air purge solenoid
O_Wheel_Sol		24ac	4	2001.08	extend wheel brush
O_WheelBrushCW		24dc-	5	2001.09	Wheel brush CW direction
O_Wheel_HP_Sol		24ac	4	2001.10	High pressure water solenoid for wheel brushes
O_WheelBrushCCW		24dc-	5	2001.11	Wheel brush CCW direction
O_ScrollingSignA	24	neut	6	2001.12	white/red wire
O_ScrollingSignB	24	neut	7	2001.13	tan wire
O_ScrollingSignC	24	neut	6	2001.14	yellow wire
O_ScrollingSignD	24	neut	7	2001.15	brown wire
Alternate 2001 Outputs					
O_DriveForwardLight		24dc+	6	2001.12	Green Light, On-Board 3 position sign
O_StopLight		24dc+	7	2001.13	Red Light, On-Board 3 position sign
O-BackUpLight		24dc+	6	2001.14	Yellow Light, On-Board 3 position sign
O_		24dc+	7	2001.15	spare

Output Selections on Gantry (cont.)

GANTRY OUTPUTS - SRT2-OD16			FusionX & eFusion Outputs	
Address 4	**Volts**	**Com**		
O_LeftBrushExtend	24dc-		2002.00	left brush extend direction
O_LeftBrushRetract	24dc-		2002.01	left brush retract direction
O_RightBrushExtend	24dc-		2002.02	Right brush extend direction
O_RightBrushRetract	24dc-		2002.03	Right brush retract direction
O_LeftBrushSpindleCW	24dc-		2002.04	left brush spindle drive - CW direction
O_LeftBrushSpindleCCW	24dc-		2002.05	left brush spindle drive - CCW direction
O_RightBrushSpindleCW	24dc-		2002.06	right brush spindle drive - CW direction
O_RightBrushSpindleCCW	24dc-		2002.07	right brush spindle drive - CCW direction
w_PhotoSensorCR	24dc-		2002.08	turn off photo sensors -thru NC contact on relay.
O_Reset_VFDs	24dc-		2002.09	reset contact to the VFDs
O_TopBrushUp	24dc-		2002.10	Top brush upper direction
O_TopBrushDown	24dc-		2002.11	Top brush down direction
O_TopBrushSpindleCW	24dc-		2002.12	Top brush spindle drive - CW direction
O_TopBrushSpindleCCW	24dc-		2002.13	Top brush spindle drive - CCW direction
O_GantryFwd	24dc-		2002.14	move carriage to front of car
O_GantryRev	24dc-		2002.15	move carriage to rear of car

GANTRY OUTPUTS - SRT2-ROC08			FusionX ONLY, Outputs	
Address 6	**Volts**	**Com**		
O_BoomUp	24dc-	0	2003.00	run boom up direction
O_BoomDown	24dc-	1	2003.01	run boom down direction
O_Oscillator_VFD	24dc-	0	2003.02	run oscillator motor VFD
	24dc-	1	2003.03	spare dc (-) output
O_Tilt_Boom_Front	24ac	2	2003.04	tilt front direction
O_Tilt_Boom_Rear	24ac	3	2003.05	tilt rear direction
NOW VACANT	24ac	2	2003.06	spare, was side spray which moved to 2000.09
O_WaterDumpValve	24ac	3	2003.07	water dump valve on top of boom
CONTROL PANEL OUTPUTS, SRT2-ROC08			**FusionX & eFusion Outputs**	
Address 8	**Volts**	**Com**		
O_OpenEntryDoor	?	0	2004.00	entrance door
O_OpenExitDoor	?	1	2004.01	open exit door
O_CloseEntryDoor	?	0	2004.02	close entrance door
O_CloseExitDoor	?	1	2004.03	close exit door
O_Glass Treatment MS	**24vac**	**2**	**2004.04**	**Glass Treatment Motor Starter**
O_TireGlazeMS	24ac	3	2004.05	Motor Starter to spin Tire Glaze Brush
O_TireGlazeLiquidSol	24ac	2	2004.06	Liquid Product Solenoid to dispense Tire Glaze
O_TireGlazeAirCylSol	24ac	3	2004.07	Solenoid to extend Tire Glaze Air Cylinder

ECC Output Selections

CONTROL PANEL OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs
Address 10	**Volts**	**Com**		
O_HP_Wash	24ac	0	2005.00	soap (wash) solenoid
O_HiPressWax	24ac	1	2005.01	hi pressure wax solenoid
O_UnderCarriageSol	24ac	0	2005.02	under carriage solenoid
O_MedPressSol	24ac	1	2005.03	medium pressure solenoid
O_SpotFreeMS	24ac	2	2005.04	spot free motor starter
O_PSoakHi_pH_MS	24ac	3	2005.05	high pH presoak MS
O_TireCleanerMS	24ac	2	2005.06	tire cleaner motor starter
O_PreSoakHeater	24ac	3	2005.07	presoak heater contactor
O_TripleShineMS	24ac	4	2005.08	triple shine motor starter
O_ReclaimWaterSol	24ac	5	2005.09	reclaim water solenoid
O_PreSoakRecircSol1	24ac	4	2005.10	Hi pH presoak recirculation sol
O_PSoakLoPH_MS	24ac	5	2005.11	Lo pH presoak MS
O_PhotoSensorCheckPanel	24dc-	6	2005.12	photo sensor safety check relay in control panel
O_PresoakLowPH_recirc	24ac	7	2005.13	low ph presoak recirculation solenoid
O_EW_Reset	24dc-	6	2005.14	reset the Entry Wizard cashier
O_BlowerTimer	24ac	7	2005.15	blower digital timer

CONTROL PANEL OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs
Address 12	**Volts**	**Com**		
O_EnterNowLight	24dc+	0	2006.00	drive forward light at entrance to wash
O_LPWaxMS	24ac	1	2006.01	low pressure wax motor starter
O_PleaseWaitLight1	24dc+	0	2006.02	please wait at entrance of wash
O_ColdWaterSol	24ac	1	2006.03	cold water reservior
O_Sol1TripleShine	24ac	2	2006.04	solenoid 1 for tiple shine
O_So2TripleShine	24ac	3	2006.05	solenoid 2 for triple shine
O_Sol3TripleShine	24ac	2	2006.06	solenoid 3 for trile shine
O_InTankWaterHeater	24ac	3	2006.07	Water Heater inside Water Tank
O_FrictionLubeMS	24ac	4	2006.08	Brush Lube Pump MS
O_BlwrNozCW	24dc-	5	2006.09	Blwr Noz CW rotation
O_BlowerExternal(MS2-3)	24ac	4	2006.10	external blower motor starters # 2 & 3 (24vac)
O_BlwrNozCCW	24dc-	5	2006.11	Blwr Noz CCW rotation
O_AlarmHorn	24ac	6	2006.12	announce car on treadle (24vac)
O_PumpMain	120ac or 24ac	7	2006.13	25 HP motor starter (110V) **(change com7 to 24vac on eFusion)**
O_BlowerExternal(MS1)	24ac	6	2006.14	external blower motor starter # 1 (24vac)
O_CashierReset	120ac or 24ac	7		auto cashier reset (110V)**(change com7 to 24vac on eFusion)**

ECC Output Selections (cont.)

CONTROL PANEL OUTPUTS, SRT2-VOM16			FusionX & eFusion Outputs	
Optional 10 Position Sign				
Address 14	Volts	Com		
O_StopLight	120ac		2007.00	stop light
O_EnterLight	120ac		2007.01	drive forward light inside wash bay
O_BackupLight	120ac		2007.02	backup light
O_PresoakLight	120ac		2007.03	presoak light
O_RockerLight	120ac		2007.04	rocker panel light
O_ClearCoatLight	120ac		2007.05	clear coat light
O_TripleShineLight	120ac		2007.06	triple shine light
O_SpotFreeLight	120ac		2007.07	spot free light
O_ExitLight	120ac		2007.08	exit light
O_CleanCarLight	120ac		2007.09	clean car is a happy car light
O_PleaseWaitLight	120ac		2007.10	please wait at entrance of car wash
O_LP_WaxLight	120ac		2007.11	spare
O_2004_12			2007.12	spare
O_2004_13			2007.13	spare
O_2004_14			2007.14	spare
O_2004_15			2007.15	spare

CONTROL PANEL OUTPUTS, SRT2-VOM16 -		FusionX & eFusion Outputs	
Optional 10 Position Sign	Channnel 2007 Address 14		
Address 14	Volts		
O_StopLight	120ac	2007.00	stop light
O_EnterLight	120ac	2007.01	drive forward light inside wash bay
O_BackupLight	120ac	2007.02	backup light
O_PresoakLight	120ac	2007.03	presoak light
O_RockerLight	120ac	2007.04	rocker panel light
O_ClearCoatLight	120ac	2007.05	clear coat light
O_TripleShineLight	120ac	2007.06	triple shine light
O_SpotFreeLight	120ac	2007.07	spot free light
O_ExitLight	120ac	2007.08	exit light
O_CleanCarLight	120ac	2007.09	clean car is a happy car light
O_PleaseWaitLight	120ac	2007.10	please wait at entrance of car wash
O_LP_WaxLight	120ac	2007.11	spare
O_2004_12		2007.12	spare
O_2004_13		2007.13	spare
O_2004_14		2007.14	spare
O_2004_15		2007.15	spare

ECC Output Selections (cont.)

Channel 2027 Output Card - connected to the analog SRM21 module

Optional ROC-08 located in ECC panel in bottom row Address = 14			Com. Term.	Voltage
O_ScrollingSign A	Vac neu	com 0	2027.00	"off-board" scrolling sign output A
O_ScrollingSign B	Vac neu	com 1	2027.01	"off-board" scrolling sign output B
O_ScrollingSign C	Vac neu	com 0	2027.02	"off-board" scrolling sign output C
O_ScrollingSign D	Vac neu	com 1	2027.03	"off-board" scrolling sign output D
		com 2	2027.04	
		com 3	2027.05	
		com 2	2027.06	
		com 3	2027.07	

Analog Outputs and Inputs

BUS-S Comm Channel 2		
SRT2-AD041 (Mod 1)	Address 0	
Analog Inputs		
I_LeftSpindleTorquePV	2208	Left Brush Motor - Torque output
I_RightSpindleTorquePV	2209	Right Brush Motor - Torque output
I_TopSpindleTorquePV	2210	Top Brush (Horizontal) - Torque output
I_GantryTorquePV	2211	Gantry Motor - Torque output
SRT2-DA021 (Mod 2)	Address 0	
Analog Outputs		
O_LeftBrushAxisSP	2200	Left Brush Positioner - speed command
O_RightBrushAxisSP	2201	Right Brush Positioner - speed command
SRT2-DA021 (Mod 3)	Address 2	
Analog Outputs		
O_TopBrushAxisSP	2202	Top Brush Positioner - speed command
O_GantryAxisSP	2203	Gantry Positioner - speed command

GANTRY

Table of Contents

Description of Gantry

The FusionX uses a rollover design to enable us to wash cars faster. The 3 Sparklesoft brushes and the high pressure combine to clean better than any machine on the market today. Standard features include rocker panel, separate pre-soak nozzles, high-pressure wax, oscillating spray bars, top boom drop with oscillating nozzles and the brushes.

Optional features include tri-foam or single-foam wax, tire cleaner, two-step pre-soak, and low pressure hot wax.

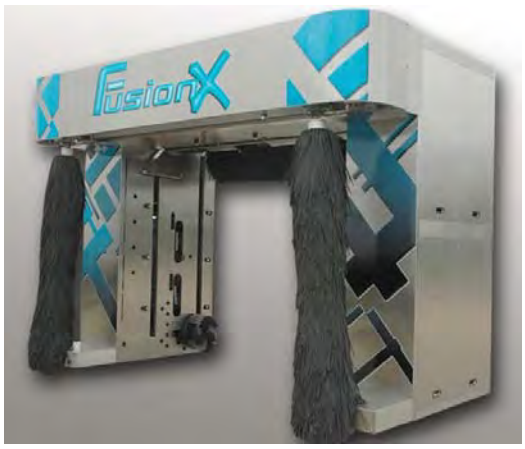
The frame is constructed of 1½" stainless steel square tubing which limits corrosion. The wheels on the FusionX are plated to give the operator more corrosion-free operation than other competitors. Nylon bearings are on all oscillators and on the boom shaft.

Also, on the gantry, is a low-pressure chemical manifold located on the driver's side 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 Center (ECC) inside equipment to perform different functions. This electrical box also contains the motor starters, variable frequency drives (VFDs) 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. You can then move the gantry forward and back, move the boom up and down, oscillate the oscillating motors, tilt the boom, position and spin the brushes.

FusionX Entrance View



FusionX Exit View

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.

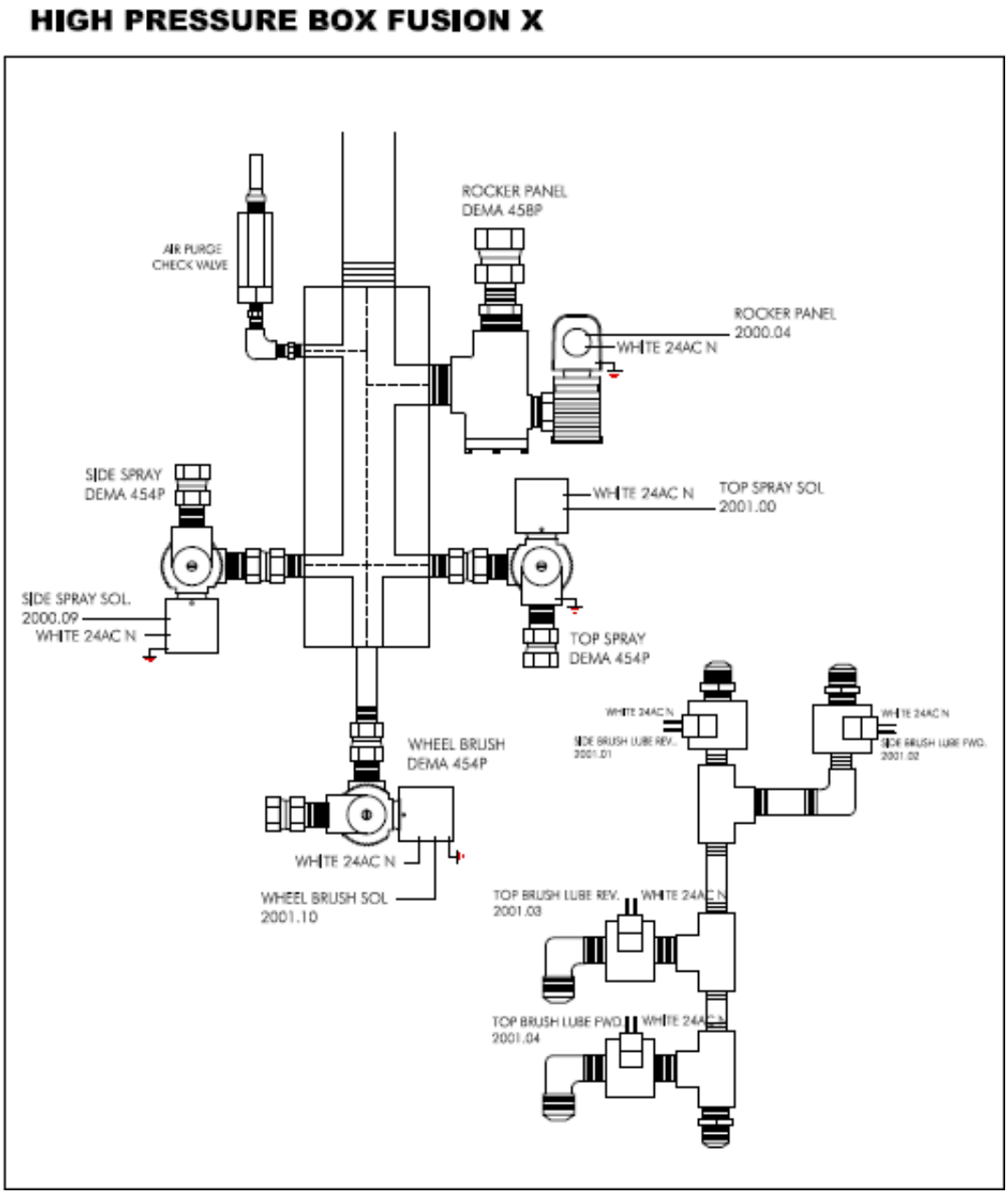
We use four DEMA Valves in this box, one DEMA 458P and three DEMA 454P. The 458P DEMA valve is used for the gantry mounted rocker panel sprayers. One 454P is used for the high pressure on the wheel brushes. One 454P DEMA valve controls the high pressure in the rocker arms in the top boom. The other 454P 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 output location chart for the high-pressure cabinet. The "Brush Lube" solenoids are also mounted in this cabinet although they deliver a low-pressure product.

SOLENOIDS IN HIGH PRESSURE BOX (24AC)	
SOLENOID	**ROC16**
HP Side Spray	2000.09
HP Top Spray	2001.00
Rocker Panel Spray	2000.04
HP Wheel Brush Spray	2001.10
Side Brush Lube Rev	2001.01
Side Brush Lube Fwd	2001.02
Top Brush Lube Rev	2001.03
Top Brush Lube Fwd	2001.04

High Pressure Box

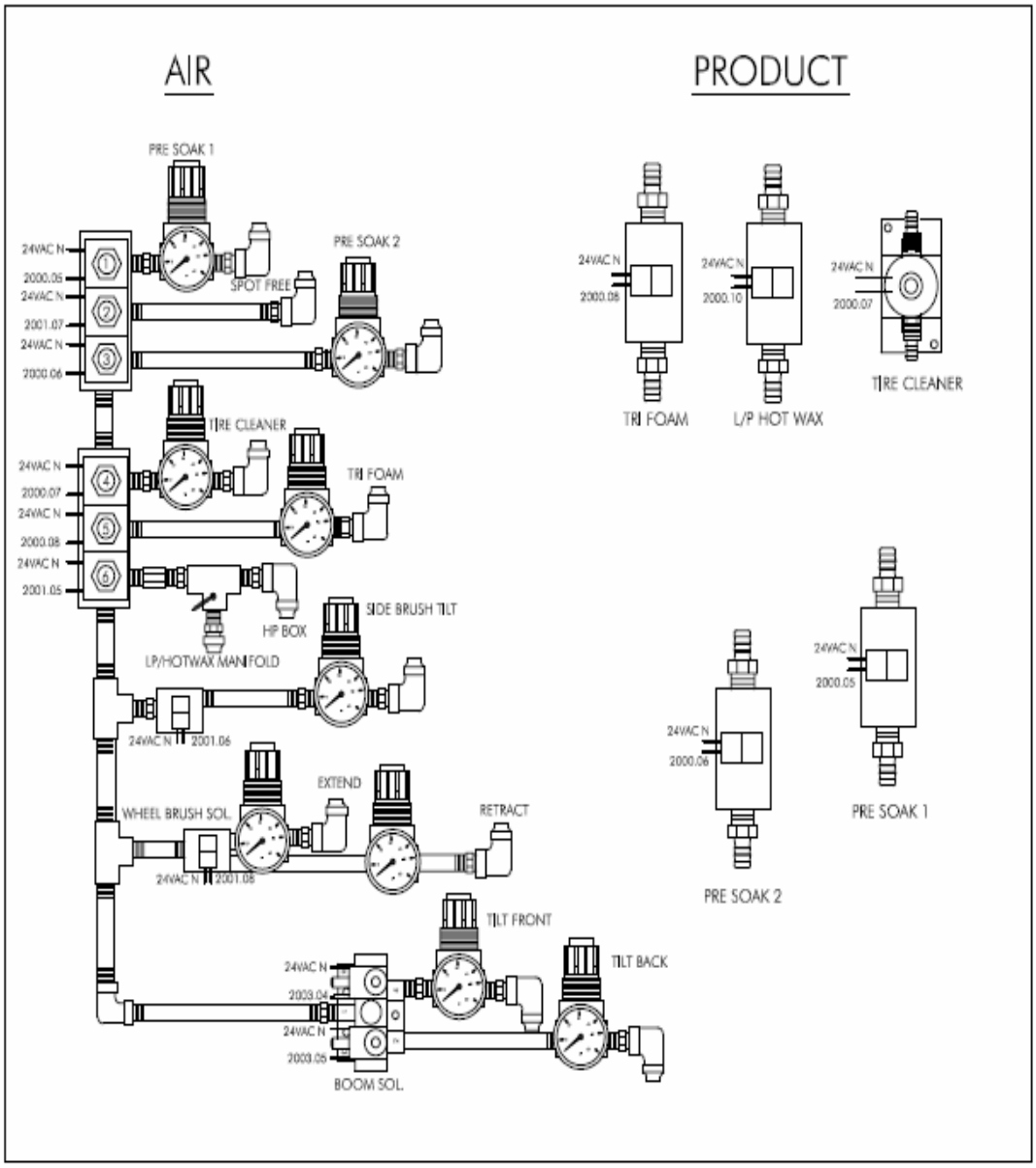
Dema Solenoid Valves



Low Pressure Box

Dema Solenoid Valves

LOW PRESSURE BOX FUSION X



Low Pressure Box (con't.)

There is one low-pressure cabinet located on the driver side end of gantry. Inside the cabinet you will find two rows of solenoids - the product solenoid on the right side, and the air solenoids on the left side. The product solenoids are single solenoids so that different chemicals do not get mixed with each other. On the left is a bank of air solenoids with one common inlet. Each air solenoid has a regulator with a gauge mounted to it, with the exception of the 2 air purge solenoids. 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		
WIRE COLOR	**SOLENOID**	**ROC16**
White	Neutral	
White	Neutral	
Tan	Presoak Air & Product #1	2000.05
Blue	Presoak Air & Product #2	2000.06
Pink	Spot Free Purge	2001.07
Orange	Tire Cleaner	2000.07
Purple	Tri Foam Air & Product	2000.08
Black	Air Purge	2001.05
Yellow	Side Brush Tilt	2001.06
	Wheel Brush Solenoid	2001.08
Gray	Tilt Forward	2003.04
Red	Tilt Back	2001.13
Brown	Low Pressure Wax	2001.08
Green	Ground	

Proximity Switches

There are several prox switches on the gantry as listed below. To operate properly, each prox switch should be located approximately 3/8" to 1/2" from the metal plate it is sensing. ***Note: Be sure to fill screw on prox cable connection with dielectric grease to eliminate moisture from creating conductivity problems.***

Below is a chart of the prox switches and their purpose:

PROX / CABLE LOCATION	SRT2-ID16 INPUT
Gantry	**Address 0**
Left Brush Count - Inner	2008.01
Left Brush Count - Outer	2008.02
Right Brush Count - Inner	2010.03
Right Brush Count - Outer	2008.04
Top Brush Count - Lower	2008.05
Top Brush Count - Upper	2008.06
Gantry Home Prox	2008.07
Gantry End of Track	2008.08
Gantry Wheel Counting Prox 1	2008.09
Gantry Wheel Counting Prox 2	2008.10
Vacation Home prox	2008.11
Center Limit for side brushes	2008.12
Gantry	**Address 2**
Left Brush Home Limit	2009.00
Left Brush Extend Limit	2009.01
Right Brush Home Limit	2009.02
Right Brush Extend Limit	2009.03
Top Brush Home Limit	2009.04
Top Brush Extend Limit	2009.05
Wheel Brushes Retract Limit	2009.06
Blower Nozzle Prox 1 Fwd	2009.12
Blower Nozzle Prox 2 Rev	2009.13
Gantry	**Address 6**
HP Boom Counter #1- Lower	2011.03
HP Boom Counter #2- Upper	2011.04
HP Boom Limit - Upper	2011.05
HP Boom Limit - Lower	2011.06
HP Boom Belt Safety	2011.07
Located in ECC	**Address 14**
Exit Door Open Prox	2015.07
Blower Nozzle Osc Prox	2015.09

Gantry Eyes and Scrolling Sign Outputs

Location	Eye #	SRT2-ID16 Input
Rear Boom Safety	1	2011.01
Front Boom Safety	2	2011.02
Top Contour Eye	3	2011.08
2nd Contour Eye	4	2011.09
3rd Contour Eye	5	2011.10
4th Contour Eye	6	2011.11
Safety Can Eye	7	2011.00
Measurement Eye	8	2008.00
Wheel Brush Position Eye	9	2008.13

Fusion On-Board Scrolling Sign Outputs/Messages

	Displayed Messages	Output	Wire Color	Scrolling Sign Wire Color
1.	**Welcome** Message, user programmable	None		
2.	**Wash**	2001.**12**	Brown	Brown
3.	**Rinse**	2001.**13**	Red	Red
4.	**Presoak**	2001.**14**	Orange	Orange
5.	**Stop**	2001.**15**	Blue	Yellow
6.	**Rocker Panel Blaster**	14 & 15		Black = 24vac hot
7.	**Back Up**	13 & 15		White = 24 vac neutral
8.	**Clearcoat Protectant**	13 & 14		Green = ground
9.	**Drive Forward**	12 & 15		
10.	**Tire Cleaner**	12 & 14		
11.	**Wax**	12 & 13		
12.	**Exit Slowly**	13, 14 & 15		
13.	**Triple Shine**	12, 14 & 15		
14.	**Soaking**	12, 13 & 15		
15.	**Spot Free Rinse**	12, 13 & 14		
16.	**Blower**	12, 13, 14 & 15		

10 Position Sign Outputs

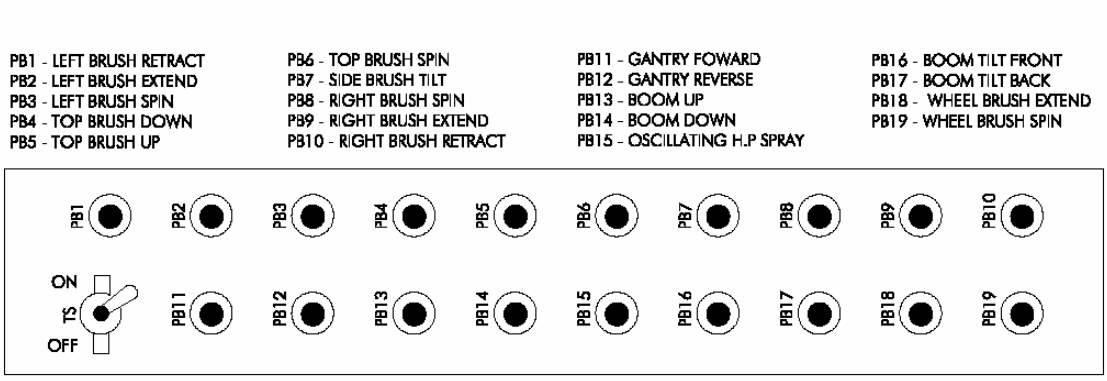
10 Position Sign Outputs - *OPTIONAL*		
ECC - SRT2-VOM16 Address 14		
	Displayed Messages	**Output**
1.	**Stop**	2007.00
2.	**Drive Forward**	2007.01
3.	**Back Up**	2007.02
4.	**Presoak**	2007.03
5.	**Rocker Panel**	2007.04
6.	**Clear Coat**	2007.05
7.	**Triple Foam**	2007.06
8.	**Spot Free**	2007.07
9.	**Exit**	2007.08
10.	**Clean Car**	2007.09

Manual Operation Override

Inside the Gantry Control Panel on the gantry are manual push buttons to manually operate the various mechanical functions of the FusionX system.

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.



YASKAWA

YASKAWA AC Drive
Compact V/f Control Drive
J1000

100 V CLASS, SINGLE-PHASE INPUT: 0.1 to 1.1 kW
200 V CLASS, THREE-PHASE INPUT: 0.1 to 5.5 kW
200 V CLASS, SINGLE-PHASE INPUT: 0.1 to 2.2 kW
400 V CLASS, THREE-PHASE INPUT: 0.2 to 5.5 kW

Reliable and Smart

Parameter List

Refer to J1000 Installation & Start-Up Manual for details.

Function	No.	Name	Range	Default
Initialization Parameters	A1-01	Access Level Selection	0, 2	2
	A1-03	Initialize Parameters	0 to 3330	0
	A1-04	Password 1	0 to 9999	0
	A1-05	Password 2	0 to 9999	0
Operation Mode Selection	b1-01	Frequency Reference Selection	0 to 3	1
	b1-02	Run Command Selection	0 to 2	1
	b1-03	Stopping Method Selection	0, 1	0
	b1-04	Reverse Operation Selection	0, 1	0
	b1-07	LOCAL/REMOTE Run Selection	0, 1	0
	b1-08	Run Command Selection while in Programming Mode	0 to 2	0
	b1-14	Phase Order Selection	0, 1	0
	b1-17	Run Command at Power Up	0, 1	0
DC Injection Braking	b2-02	DC Injection Braking Current	0 to 75	50%
	b2-03	DC Injection Braking Time/ DC Excitation Time at Start	0.00 to 10.00	0.00 s
	b2-04	DC Injection Braking Time at Stop	0.00 to 10.00	0.50 s
Acceleration and Deceleration Times	C1-01	Acceleration Time 1	0.0 to 6000.0	10.0 s
	C1-02	Deceleration Time 1	0.0 to 6000.0	10.0 s
	C1-03	Acceleration Time 2	0.0 to 6000.0	10.0 s
	C1-04	Deceleration Time 2	0.0 to 6000.0	10.0 s
	C1-09	Fast-Stop Time	0.0 to 6000.0	10.0 s
S-Curve Characteristics	C2-01	S-Curve Characteristic at Accel Start	0.00 to 10.00	0.20 s
	C2-02	S-Curve Characteristic at Accel End	0.00 to 10.00	0.20 s
	C2-03	S-Curve Characteristic at Decel Start	0.00 to 10.00	0.20 s
	C2-04	S-Curve Characteristic at Decel End	0.00 to 10.00	0.00 s
Slip Compensation	C3-01	Slip Compensation Gain	0.0 to 2.5	0.0
	C3-02	Slip Compensation Primary Delay Time	0 to 10000	2000 ms
Torque Compensation	C4-01	Torque Compensation Gain	0.00 to 2.50	1.00
Carrier Frequency	C6-01	Normal/Heavy Duty Selection	0, 1	1
	C6-02	Carrier Frequency Selection	1 to F	*2
	C6-03	Carrier Frequency Upper Limit	1.0 to 15.0	*3
	C6-04	Carrier Frequency Lower Limit	1.0 to 15.0	*3
	C6-05	Carrier Frequency Proportional Gain	00 to 99	*3
Frequency Reference	d1-01	Frequency Reference 1	0.00 to 400.00	0.00 Hz
	d1-02	Frequency Reference 2		0.00 Hz
	d1-03	Frequency Reference 3		0.00 Hz
	d1-04	Frequency Reference 4		0.00 Hz
	d1-05	Frequency Reference 5		0.00 Hz
	d1-06	Frequency Reference 6		0.00 Hz
	d1-07	Frequency Reference 7		0.00 Hz
	d1-08	Frequency Reference 8		0.00 Hz
	d1-17	Jog Frequency Reference		6.00 Hz
Frequency Upper and Lower Limits	d2-01	Frequency Reference Upper Limit	0.0 to 110.0	100.0%
	d2-02	Frequency Reference Lower Limit	0.0 to 110.0	0.0%
Jump Frequency	d3-01	Jump Frequency 1	0.0 to 400.0	0.0 Hz
	d3-02	Jump Frequency 2	0.0 to 400.0	0.0 Hz
	d3-04	Jump Frequency Width	0.0 to 20.0	1.0 Hz
Frequency Reference Hold	d4-01	Frequency Reference Hold Function Selection	0, 1	0
V/f Pattern Characteristics	E1-01	Input Voltage Setting	155 to 255	200 V*1
	E1-03	V/f Pattern Selection	F	F
	E1-04	Max Output Frequency	40.0 to 400.0	60.0 Hz
	E1-05	Max Output Voltage	0.0 to 255.0	200.0 V*1
	E1-06	Base Frequency	0.0 to E1-04	60.0 Hz*1
	E1-07	Mid Output Frequency	0.0 to E1-04	3.0 Hz
	E1-08	Mid Output Frequency Voltage	0.0 to 255.0	16.0 V*1
	E1-09	Minimum Output Freq.	0.0 to 400.0	1.5 Hz
	E1-10	Minimum Output Freq. Voltage	0.0 to 255.0	12.0 V*1

Function	No.	Name	Range	Default
Motor Parameters	E2-01	Motor Rated Current	10 to 200% of drive rated current	*2
	E2-02	Motor Rated Slip	0.00 to 20.00	*2
	E2-03	Motor No-Load Current	0 to less than E2-01	*2
	E2-05	Motor Line-to-Line Resistance	0.000 to 65.000	*2
Multi-Function Digital Inputs	H1-01	Multi-Function Digital Input Terminal S1 Function Selection	1 to 67	40
	H1-02	Multi-Function Digital Input Terminal S2 Function Selection	1 to 67	41
	H1-03	Multi-Function Digital Input Terminal S3 Function Selection	0 to 67	24
	H1-04	Multi-Function Digital Input Terminal S4 Function Selection	0 to 67	14
	H1-05	Multi-Function Digital Input Terminal S5 Function Selection	0 to 67	3 (0) *4
Multi-Function Digital Outputs	H2-01	Terminal MA, MB and MC Function Selection (relay)	0 to 13D	E
Analog Inputs	H3-01	Terminal A1 Signal Level Selection	0 to 3	0
	H3-03	Terminal A1 Gain Setting	-999.9 to 999.9	100.0%
	H3-04	Terminal A1 Bias Setting	-999.9 to 999.9	0.0%
	H3-13	Analog Input Filter Time Constant	0.00 to 2.00	0.03 s
Multi-Function Analog Outputs	H4-01	Multi-Function Analog Output Terminal AM	000 to 999	102
	H4-02	Multi-Function Analog Output Terminal AM Gain	-999.9 to 999.9	100.0%
	H4-03	Multi-Function Analog Output Terminal AM Bias	-999.9 to 999.9	0.0%
MEMOBUS/Modbus Communications	H5-01	Drive Slave Address	0 to FFH	1F
	H5-02	Communication Speed Selection	0 to 5	3
	H5-03	Communication Parity Selection	0 to 2	0
	H5-04	Stopping Method After Communication Error	0 to 3	3
	H5-05	Communication Fault Detection Selection	0, 1	1
	H5-06	Drive Transmit Wait Time	10 to 65	10 ms
	H5-07	RTS Control Selection	0, 1	1
	H5-12	Run Command Method Selection	0, 1	0
	H5-13	MEMOBUS Frequency Reference and Frequency Monitor Unit	0 to 3	0
Motor Protection Functions	L1-01	Motor Overload Protection Selection	0 to 2	1
	L1-02	Motor Overload Protection Time	0.1 to 5.0	1.0 min
	L1-13	Continuous Electrothermal Operation Selection	0, 1	1
Momentary Power Loss	L2-01	Momentary Power Loss Operation Selection	0 to 2	0
Stall Prevention Functions	L3-01	Stall Prevention Selection during Acceleration	0, 1	1
	L3-02	Stall Prevention Level during Acceleration	0 to 150	*5
	L3-04	Stall Prevention Selection during Deceleration	0, 1, 4	1
	L3-05	Stall Prevention Selection during Run	0 to 2	1
	L3-06	Stall Prevention Level during Run	30 to 150	*5
Frequency Detection	L4-01	Speed Agreement Detection Level	0.0 to 400.0	0.0 Hz
	L4-07	Frequency Detection Conditions	0, 1	0
Fault Reset	L5-01	Number of Auto Restart Attempts	0 to 10	0
Overtorque Detection	L6-01	Torque Detection Selection 1	0 to 4	0
	L6-02	Torque Detection Level 1	0 to 300	150%
	L6-03	Torque Detection Time 1	0.0 to 10.0	0.1 s
Hardware Protection	L8-01	Internal Dynamic Braking Resistor Protection Selection (ERF type)	0, 1	0
	L8-05	Input Phase Loss Protection Selection	0, 1	0
	L8-10	Heatsink Cooling Fan Operation Selection	0, 1	0
	L8-12	Ambient Temperature Setting	-10 to 50	30°C
	L8-18	Soft CLA Selection	0, 1	1
	L8-35	Installation Method Selection	0 to 3	*2
	L8-38	Carrier Frequency Reduction	0 to 2	*2
Hunting Prevention	n1-02	Hunting Prevention Gain Setting	0.00 to 2.50	1.00
High-Slip Braking	n3-13	Overexcitation Deceleration Gain	1.00 to 1.40	1.10
Display Settings	o1-02	User Monitor Selection After Power Up	1 to 4	1
	o1-03	Digital Operator Display Selection	0, 1	0
Operator Keypad Functions	o2-02	STOP Key Function Selection	0, 1	1
	o2-04	Drive Model Selection	0 to FF	*2
	o2-05	Frequency Reference Setting Method Selection	0, 1	0
	o2-06	Operation Selection when Digital Operator is Disconnected	0, 1	0
	o2-09	Initialization Mode	0 to 3	dep. on drive spec.
Copy Functions	o3-01	Copy Function Selection	0 to 3	0
	o3-02	Copy Allowed Selection	0, 1	0
Maintenance Period	o4-01	Accumulated Operation Time Setting	0 to 9999	0 h
	o4-02	Accumulated Operation Time Selection	0, 1	0
	o4-03	Cooling Fan Operation Time Setting	0 to 9999	0 h
	o4-05	Capacitor Maintenance Setting	0 to 150	0%
	o4-07	Soft Charge Bypass Relay Maintenance Setting	0 to 150	0%
	o4-09	IGBT Maintenance Setting	0 to 150	0%
	o4-11	U2 Initialize Selection	0, 1	0

*1 : Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

*2 : Default setting value is dependent on parameter o2-04, Drive Model Selection.

*3 : Default setting value is dependent on parameter C6-02, Carrier Frequency Selection.

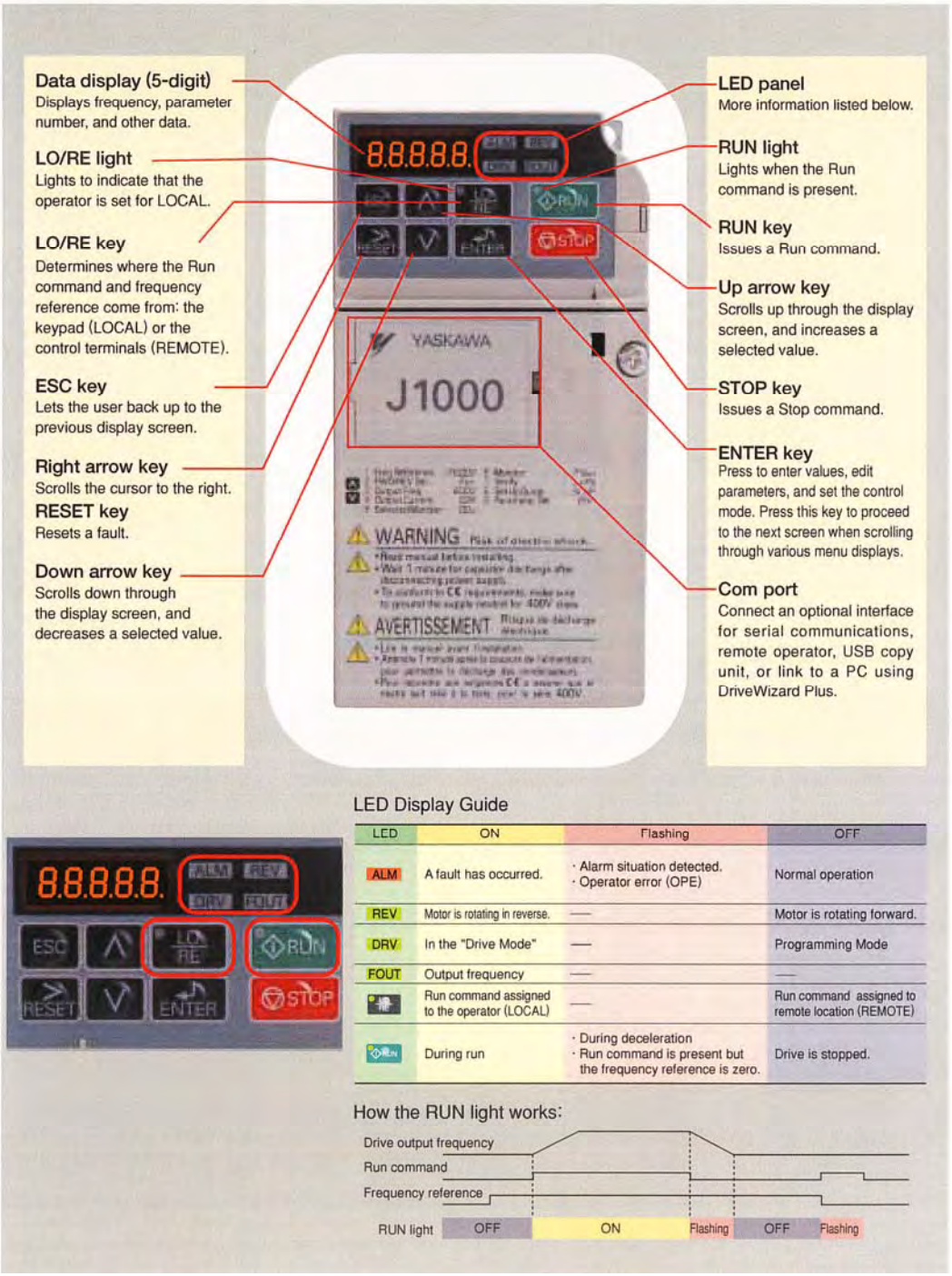
*4 : Value in brackets indicates default when 3-wire initialization is performed (A1-03 = 3330).

*5 : Default setting value is dependent on C6-01 and L8-38 settings.

Basic Instructions

Quick Setup, Easy to Operate

Operator Names and Functions



LED Display Guide

LED	ON	Flashing	OFF
ALM	A fault has occurred.	· Alarm situation detected. · Operator error (OPE)	Normal operation
REV	Motor is rotating in reverse.	—	Motor is rotating forward.
DRV	In the "Drive Mode"	—	Programming Mode
FOUT	Output frequency	—	—
	Run command assigned to the operator (LOCAL)	—	Run command assigned to remote location (REMOTE)
	During run	· During deceleration · Run command is present but the frequency reference is zero.	Drive is stopped.

How the RUN light works:

Operation Example

Using the LED Operator to Run the Drive

Steps	Key	Result/Display
1 Turn the power on.		F 0.00
2 Set the drive for LOCAL. The frequency reference is displayed.	LO/RE	LO should light. F 0.00
3 Displays the direction (forward).	∧	For
4 Displays the output frequency.	∧	0.00
5 Displays the output current.	∧	0.00A
6 Displays the output voltage.	∧	0.0u
7 Displays the beginning of the Monitor Menu.	∧	flashing MOn
8 Displays the top of the Verify Menu.	∧	flashing urFY
9 Displays the top of the Setup Mode.	∧	flashing STUP
10 Displays the top of the parameter settings menu.	∧	PAr
Returns back to the frequency reference display.	∧	

Value will flash when it is possible to change the setting.

Drive Mode: Run and Stop commands, displays operation status such as the frequency reference, output frequency, output current, output voltage, etc.

How to Monitor the Frequency Reference

Steps	Key	Result/Display
Use the arrow keys to select the digits to set.	ENTER RESET ∧ ∨ Increase or decrease the value displayed.	F00.00 F00.00 F06.00 "End" appears while the drive saves the new data.
Press enter to save the new value.	ENTER	F06.00 DRV DRV lights up.

Monitor Mode: Displays operation status and information on faults.

Steps	Key	Result/Display
Selecting a Monitor for Display	ENTER	U1-01
Displays U1-01, the frequency reference monitor.	ENTER	6.00
Re-select the monitor display menu.	ESC ∧ ⋮ ∧	U1-01 U1-02 ⋮ U1-26
Back up to the top of the Monitor Menu.	ESC Press once.	MOn

Verify Menu: Displays parameters changed from the default settings.

Steps	Key	Result/Display
Lists parameters that have been changed in order.	ENTER	C1-01
Pressing Enter displays the parameter value.	ENTER	0003.0
Parameters that have been changed from their default values are listed in order.	ESC ∧ ENTER ⋮ ∧	C1-01 C1-02 ⋮ C6-02
Returns to the top of the Verify Menu.	ESC Press once.	urFY

Press ESC to go back to the previous display screen.

Setup Mode

The Setup Mode allows you to view and set up the minimum-required parameters to run the drive.

Steps	Key	Result/Display
Parameter check	ENTER ∧	b1-01 C1-01
Setting change	ENTER RESET ∧ ENTER	00100 00100 00200 C1-01
	∧ Scroll using the up arrow key and see which parameters have been selected.	

Setup Mode Parameters

No.	Name	No.	Name
b1-01	Frequency Reference Selection 1	d1-17	Jog Frequency Reference
b1-02	Run Command Selection 1	E1-01	Input Voltage Setting
b1-03	Stopping Method Selection	E1-04	Max Output Frequency
C1-01	Acceleration Time 1	E1-05	Max Output Voltage
C1-02	Deceleration Time 1	E1-06	Base Frequency
C6-01	Normal/Heavy Duty Selection	E1-09	Minimum Output Freq.
C6-02	Carrier Frequency Selection	E2-01	Motor Rated Current
d1-01	Frequency Reference 1	H4-02	Multi-Function Analog Output Terminal AM Gain
d1-02	Frequency Reference 2	L1-01	Motor Overload Protection Selection
d1-03	Frequency Reference 3	L3-04	Stall Prevention Selection during Deceleration
d1-04	Frequency Reference 4	–	–

Basic Instructions

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J Standard Specifications

Parameter C6-01 sets the drive for Normal Duty or Heavy Duty performance.

200 V Class (Three-Phase/Single-Phase)

Value in brackets is for a single-phase drive.

Model	Three-Phase CIMR-JA2A		0001	0002	0004	0006	0008	0010	0012	0018	0020
	Single-Phase*1 CIMR-JABA		0001	0002	0003	0006	–	0010	–	–	–
Max. Applicable Motor Capacity*2 kW		Normal Duty	0.2	0.4	0.75	1.1	1.5	2.2	3.0	3.7	5.5
		Heavy Duty	0.1	0.2	0.4	0.75	1.1	1.5	2.2	3.0	3.7
Input	Rated Input Current*3 A	Three-phase Normal Duty	1.1	1.9	3.9	7.3	8.8	10.8	13.9	18.5	24.0
		Three-phase Heavy Duty	0.7	1.5	2.9	5.8	7.0	7.5	11.0	15.6	18.9
		Single-phase Normal Duty	2.0	3.6	7.3	13.8	–	20.2	–	–	–
		Single-phase Heavy Duty	1.4	2.8	5.5	11.0	–	14.1	–	–	–
Output	Rated Output Capacity*4 kVA	Normal Duty	0.5	0.7	1.3	2.3	3.0	3.7	4.6	6.7	7.5
		Heavy Duty	0.3	0.6	1.1	1.9	2.6	3.0	4.2	5.3	6.7
	Rated Output Current A	Normal Duty*5	1.2	1.9	3.5(3.3)	6.0	8.0	9.6	12.0	17.5	19.6
		Heavy Duty	0.8*6	1.6*6	3.0*6	5.0*6	6.9*7	8.0*7	11.0*7	14.0*7	17.5*7
	Overload Tolerance		Normal Duty Rating: 120% of rated output current for 60 s. Heavy Duty Rating: 150% of rated output current for 60 s. (Derating may be required for repetitive loads)								
	Carrier Frequency		2 kHz (user-set, up to 15 kHz possible)								
	Max. Output Voltage		Three-phase power supply: three-phase 200 to 240 V (relative to input voltage) Single-phase power supply: three-phase 200 to 240 V (relative to input voltage)								
	Max. Output Frequency		400 Hz (user-set)								
Power	Rated Voltage/Rated Frequency		Three-phase power supply: three-phase 200 to 240 V 50/60 Hz Single-phase power supply: single-phase 200 to 240 V 50/60 Hz								
	Allowable Voltage Fluctuation		−15 to +10%								
	Allowable Frequency Fluctuation		±5%								
	Power Supply kVA	Three-phase Normal Duty	0.5	0.9	1.8	3.3	4.0	4.9	6.4	8.5	11.0
		Three-phase Heavy Duty	0.3	0.7	1.3	2.7	3.2	3.4	5.0	7.1	8.6
		Single-phase Normal Duty	0.5	1.0	1.9	3.6	–	5.3	–	–	–
		Single-phase Heavy Duty	0.4	0.7	1.5	2.9	–	3.7	–	–	–

*1: Drives with a single-phase power supply input have three-phase output. Single-phase motors cannot be used.
*2: The motor capacity (kW) refers to a Yaskawa 4-pole, 60 Hz, 200 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.
*3: Assume operation at rated output current. This value may fluctuate based on the power supply side impedance, as well as the input current, power supply transformer, input side reactor, and wiring conditions.
*4: Rated output capacity is calculated with a rated output voltage of 220 V.
*5: This value assumes a carrier frequency of 2 kHz. Increasing the carrier frequency requires a reduction in current.
*6: This value assumes a carrier frequency of 10 kHz. Increasing the carrier frequency requires a reduction in current.
*7: This value assumes a carrier frequency of 8 kHz. Increasing the carrier frequency requires a reduction in current.

400 V Class (Three-phase)

Model CIMR-JA4A			0001	0002	0004	0005	0007	0009	0011
Max. Applicable Motor Capacity*1 kW		Normal Duty	0.4	0.75	1.5	2.2	3.0	3.7	5.5
		Heavy Duty	0.2	0.4	0.75	1.5	2.2	3.0	3.7
Input	Rated Input Current*2 A	Normal Duty	1.2	2.1	4.3	5.9	8.1	9.4	14.0
		Heavy Duty	1.2	1.8	3.2	4.4	6.0	8.2	10.4
Output	Rated Output Capacity*3 kVA	Normal Duty*4	0.9	1.6	3.1	4.1	5.3	6.7	8.5
		Heavy Duty*5	0.9	1.4	2.6	3.7	4.2	5.5	7.0
	Rated Output Current A	Normal Duty*4	1.2	2.1	4.1	5.4	6.9	8.8	11.1
		Heavy Duty*5	1.2	1.8	3.4	4.8	5.5	7.2	9.2
	Overload Tolerance		Normal Duty Rating: 120% of rated output current for 60 s. Heavy Duty Rating: 150% of rated output current for 60 s. (Derating may be required for repetitive loads)						
	Carrier Frequency		2 kHz (user-set, up to 15 kHz possible)						
	Max. Output Voltage		Three-phase 380 to 480 V (relative to input voltage)						
	Max. Output Frequency		400 Hz (user-set)						
Power	Rated Voltage/Rated Frequency		Three-phase 380 to 480 V 50/60 Hz						
	Allowable Voltage Fluctuation		−15 to +10%						
	Allowable Frequency Fluctuation		±5%						
	Power Supply kVA	Normal Duty	1.1	1.9	3.9	5.4	7.4	8.6	13.0
		Heavy Duty	1.1	1.6	2.9	4.0	5.5	7.5	9.5

*1: The motor capacity (kW) refers to a Yaskawa 4-pole, 60 Hz, 400 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.
*2: Assume operation at rated output current. This value may fluctuate based on the power supply side impedance, as well as the input current, power supply transformer, input side reactor, and wiring conditions.
*3: Value displayed is for when operating at the rated output current. Rated output capacity is calculated with a rated output voltage of 440 V.
*4: This value assumes a carrier frequency of 2 kHz. Increasing the carrier frequency requires a reduction in current.
*5: This value assumes a carrier frequency of 8 kHz. Increasing the carrier frequency requires a reduction in current.

Common Specifications

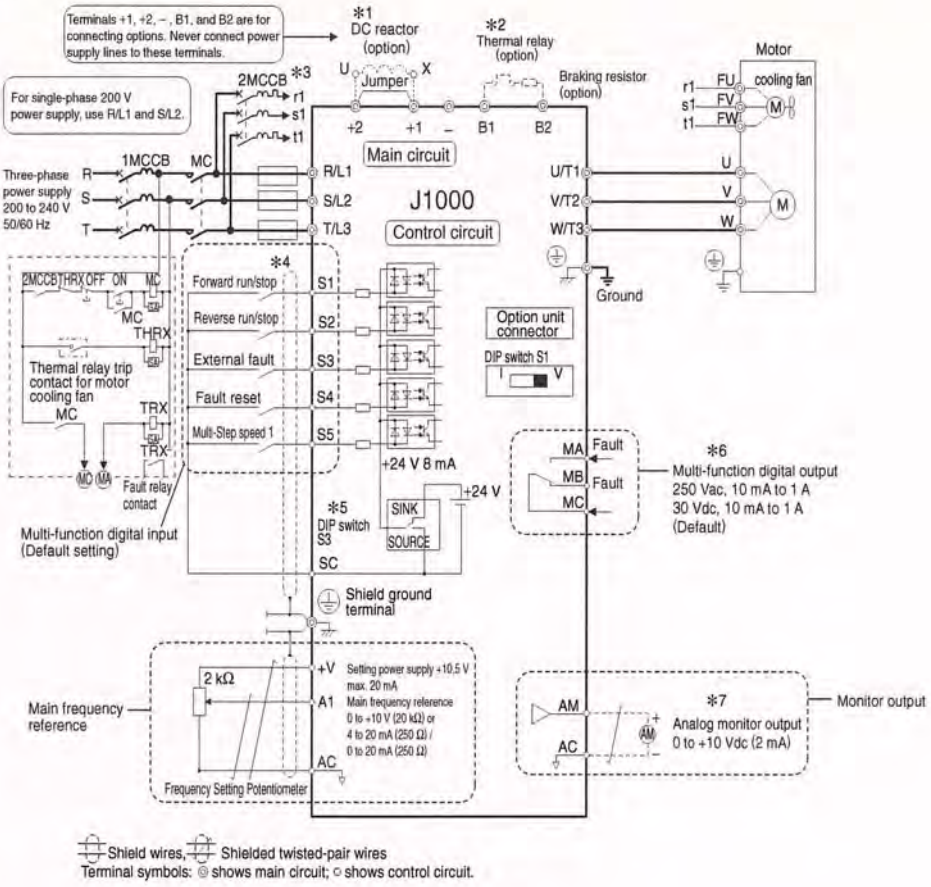
	Item	Specifications
Control Characteristics	Control Method	V/f Control
	Frequency Control Range	0.01 to 400 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital input: within ±0.01% of the max. output frequency (–10 to +50°C)
		Analog input: within ±0.1% of the max. output frequency (25°C ±10°C)
	Frequency Setting Resolution	Digital input: 0.01 Hz
		Analog input: 1/1000 of max. frequency
	Output Frequency Resolution	20 bit resolution at maximum output frequency
	Frequency Setting Resolution	Main frequency reference : 0 to +10 Vdc (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω)
	Starting Torque	150% / 3 Hz
	Speed Control Range	1:20 to 1:40
	Accel/Decel Time	0.0 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings)
	Braking Torque	① Short-time decel torque*1: over 150% for 0.1/0.2 kW motors, over 100% for 0.4/ 0.75 kW motors, over 50% for 1.5 kW motors, and over 20% for 2.2 kW and above motors. ② Continuous regen. torque: approx. 20% (approx. 125% with dynamic braking resistor option*2: 10% ED, 10 s, internal braking transistor)
	V/f Characteristics	User-selected programs, V/f preset patterns possible
	Main Control Functions	Momentary power loss ride-thru, Speed search, 9-step speed (max), Accel/decel time switch, S-curve accel/decel, 3-wire sequence, Cooling fan on/off switch, Slip compensation, Torque compensation, Frequency jump, Upper/lower limits for frequency reference, DC injection braking at start and stop, Overexcitation braking, Fault restart ...
Protection Function	Motor Protection	Motor overheat protection based on output current
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200% of Heavy Duty Rating
	Overload Protection	Drive stops after 60 s at 150% of rated output current (Heavy Duty Rating)*3
	Overvoltage Protection	200 V class: Stops when DC bus exceeds approx. 410 V 400 V class: Stops when DC bus exceeds approx. 820 V
	Undervoltage Protection	Stops when DC bus voltage falls below the following levels: Three-phase 200 V class: approx. 190 V, single-phase 200 V class: approx. 160 V, three-phase 400 V class: approx. 380 V, three-phase 380 V class: approx. 350 V
	Momentary Power Loss Ride-Thru	Stops after approx. 15 ms (default).
	Heatsink Overheat Protection	Protection by thermistor
	Braking Resistance Overheat Protection	Overheat sensor for braking resistor (optional ERF-type, 3% ED)
	Stall Prevention	Separate settings allowed during acceleration and during run. Enable/disable only during deceleration.
	Ground Fault Protection	Protection by electronic circuit *4
	Charge LED	Charge LED remains lit until DC bus has fallen below approx. 50 V
Operating Environment	Area of Use	Indoors
	Ambient Temperature	–10 to +50°C (open chassis), –10 to +40°C (NEMA Type 1)
	Humidity	95 RH% or less (no condensation)
	Storage Temperature	–20 to +60°C (short-term temperature during transportation)
	Altitude	Up to 1000 meters
	Shock	10 to less than 20 Hz (9.8 m/s²) max., 20 to 55 Hz (5.9 m/s²) max.
Safety Standard		UL508C
Protection Design		IP20 open-chassis, NEMA 1 enclosure (option)

*1: Momentary average deceleration torque refers to the deceleration torque from 60Hz down to 0 Hz. This may vary depending on the motor.
*2: Parameter L3-04 should be disabled when a Braking Resistor or Braking Resistor Unit is connected.
*3: Overload protection may be triggered at lower levels if output frequency is below 6 Hz.
*4: Protection may not be provided under the following conditions as the motor windings are grounded internally during run:
- Low resistance to ground from the motor cable or terminal block.
- Drive already has a short-circuit when the power is turned on.

J Standard Connection Diagram

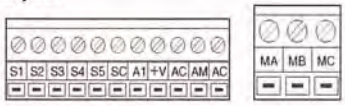
Standard Connection Diagram

Example: 200 V Class



*1: Remove the jumper between terminals +1 and +2 when installing an optional DC reactor.
*2: The MC on the input side of the main circuit should open when the thermal relay is triggered.
*3: Self-cooled motors do not require separate cooling fan motor wiring.
*4: Connected using sequence input signal (S1 to S5) from NPN transistor.
Default: sink mode (0 V com)
*5: Sinking mode requires an internal 24 V power supply. Source mode requires an external power supply. Refer to J1000 Installation & Start-Up Manual for details.
*6: Minimum load: 5 Vdc, 10 mA (reference value)
*7: Monitor outputs work with devices such as analog frequency meters, current meters, voltmeters and watt meters. They cannot be used in a control system requiring feedback.

Control Circuit and Terminal Layout



Terminal Functions

Main Circuit Terminals

Terminal	Terminal Name	Function (Signal Level)
R/L1	Main circuit power supply input	Connects line power to the drive. Drives with single phase 100 V input or single phase 200 V input power use terminals R/L1 and S/L2 only (do not use T/L3).
S/L2		
T/L3		
U/T1	Drive output	Connects to the motor.
V/T2		
W/T3		
B1	Braking resistor	Available for connecting a braking resistor.
B2		
+1	DC reactor connection	These terminals are shorted for shipment. Remove the jumper creating the short to install a DC choke.
+2		
+1	DC power supply input	For connecting a DC power supply. Note: DC power supply input terminals (+1, –) are not UL/cUL and CE certified.
–		
⏚ Two terminals	Ground	Grounding terminal Grounding resistance for 100 V and 200 V class: 100 Ω or less Grounding resistance for 400 V class: 10 Ω or less

Control Circuit Input Terminals

Terminal	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	
Multi-function digital input	S1	Multi-function input 1	Closed: Forward run (default) Open: Stop	Photocoupler 24 Vdc, 8 mA Note: Drive preset to sinking mode. When using source mode, set DIP switch S3 to allow for a 24 Vdc (±10%) external power supply.
	S2	Multi-function input 2	Closed: Reverse run (default) Open: Stop	
	S3	Multi-function input 3	External fault, N.O. (default)	
	S4	Multi-function input 4	Fault reset (default)	
	S5	Multi-function input 5	Multi-step speed reference 1 (default)	
	SC	Multi-function input common (Control common)	Sequence common	
Main frequency reference input	+V	Analog input power supply	+10.5 V (max. allowable current 20 mA)	
	A1	Main frequency reference	Input voltage or input current 0 to +10 Vdc (20 kΩ) resolution: 1/1000 4 to 20 mA or 0 to 20 mA (250 Ω) resolution: 1/500	
	AC	Frequency reference common	0 V	
Multi-function digital output*	MA	N.O. output	Fault (default)	Digital output 30 Vdc, 10 mA to 1 A 250 Vac, 10 mA to 1 A
	MB	N.C. output	Fault (default)	
	MC	Digital output common		
Monitor output	AM	Analog monitor output	0 to 10 Vdc (2 mA or less) Resolution: 1/256	
	AC	Monitor common	0 V	

*: Refrain from assigning functions to terminals MA and MB that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).

OMRON Information

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VFD Parameters

***** 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.

FusionX - VFD Parameters Parameters for Left Brush Positioner Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	2-wire init
b2-04	to	1.0	DC Inj.@ Stop
C1-01	to	1.2	Accel 1
C1-02	to	0.8	Decel 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
H3-03	to	30	Ana.Freq.Ref.Gain
L1-01	to	2	O/L Protect
L2-01	to	0	Pwr.Loss Ride Thru=Disabled
L5-01	to	2	# auto restarts=2

VFD Parameters (cont.)

FusionX - VFD Parameters			
Parameters for Top Brush Positioner Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b2-04	to	5.0	**DC Inj.@ Stop**
C1-01	to	1.2	**Accel 1**
C1-02	to	0.8	**Decel 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**
H4-01	to	103	**Monitor Current Output**
L1-01	to	2	**O/L Protect**
L2-01	to	0	**Pwr.Loss Ride Thru=Disabled**
L5-01	to	2	**# auto restarts=2**

FusionX - VFD Parameters			
Parameters for Right Brush Positioner Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	2-wire init
b2-04	to	1.0	DC Inj.@ Stop
C1-01	to	1.2	Accel 1
C1-02	to	0.8	Decel 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
H3-03	to	30	Ana.Freq.Ref.Gain
L1-01	to	2	O/L Protect
L2-01	to	0	Pwr.Loss Ride Thru=Disabled
L5-01	to	2	# auto restarts=2

VFD Parameters (cont.)

FusionX - VFD Parameters Parameters for Left Brush Spindle Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b1-01	to	0	**Freq Reference = d1-01**
C1-01	to	0.8	**Accel 1**
C1-02	to	1.5	**Decel 1**
d1-01	to	55.0	**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**
H4-01	to	103	**Monitor Current Output**
L1-01	to	2	**O/L Protect**
L2-01	to	0	**Pwr.Loss Ride Thru=Disabled**
L5-01	to	2	**# auto restarts=2**

FusionX - VFD Parameters Parameters for Top Brush Spindle Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b1-01	to	0	**Freq Reference = d1-01**
C1-01	to	0.8	**Accel 1**
C1-02	to	1.5	**Decel 1**
d1-01	to	55.0	**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**
H4-01	to	103	**Monitor Current Output**
L1-01	to	2	**O/L Protect**
L2-01	to	0	**Pwr.Loss Ride Thru=Disabled**
L5-01	to	2	**# auto restarts=2**

VFD Parameters (cont.)

FusionX - VFD Parameters			
Parameters for Right Brush Spindle Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b1-01	to	0	**Freq Reference = d1-01**
C1-01	to	0.8	**Accel 1**
C1-02	to	1.5	**Decel 1**
d1-01	to	55.0	**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**
H4-01	to	103	**Monitor Current Output**
L1-01	to	2	**O/L Protect**
L2-01	to	0	**Pwr.Loss Ride Thru=Disabled**
L5-01	to	2	**# auto restarts=2**

VFD Parameters (cont.)

FusionX - VFD Parameters			
Parameters for Wheel Brush Spindle Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b1-01	to	0	**Freq Reference = d1-01**
C1-01	to	0.5	**Accel 1**
C1-02	to	0.5	**Decel 1**
C6-01	to	0	**0 = Heavy Duty Application**
d1-01	to	60.0	**Freq. Ref.1**
E1-04	to	70.0	**Max Freq.**
For 380 - 415 volt Applications ONLY			
E1-05	to	230	**Volt.Max** (for 380-415v)
E1-08	to	12	**Volt.Mid** (for 380-415v)
E1-10	to	12	**Volt.Min** (for 380-415v)
E2-01	to	4.0	**Mtr. Rated Current** (for 380-415v)
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	0	**O/L Protect**
L5-01	to	2	**# auto restarts=2**

VFD Parameters (cont.)

FusionX - VFD Parameters Parameters for Gantry Drive Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
C1-01	to	0.5	**Accel 1**
C1-02	to	0.5	**Decel 1**
C6-01	to	0	**0 = Heavy Duty Application**
d1-01	to	55.0	**Freq. Ref.1**
E1-04	to	75.0	**Max Freq.**
E2-01	to	5.2	**Mtr. Rated Current**
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	0	**Pwr.Loss Ride Thru=Disabled**
L5-01	to	2	**# auto restarts=2**

VFD Parameters (cont.)

FusionX - VFD Parameters Parameters for Wash Boom Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b1-01	to	0	**Freq Reference = d1-01**
b2-04	to	5.0	**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	0	**Pwr.Loss Ride Thru=Disabled**
L3-04	to	4	Decel Stall Prev. = Overexcit Decel
L5-01	to	2	# auto restarts in 10min=2
n3-13	to	1.30	Overexcit Decel Gain (up to 1.40)

VFD Parameters (cont.)

FusionX - VFD Parameters Parameters for Oscillator Motor VFD			
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**
For 380 - 415 volt Applications ONLY			
E2-01	to	1.5	**Mtr. Rated Current** (for 380-415v)
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**
L5-01	to	2	**# auto restarts=2**

FusionX - VFD Parameters Parameters for Blower Oscillator Motor VFD			
Yaskawa J1000 Drive			**Parameter Descriptions**
A1-03	to	2220	**2-wire init**
b1-01	to	0	**Freq Reference = d1-01**
C1-01	to	0.4	**Accel 1**
C1-02	to	0.4	**Decel 1**
d1-01	to	15.0	**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**
L5-01	to	2	**# auto restarts=2**

FusionX Spray Tip Chart

FusionX Spray Tip Chart		
Location	**Tip #**	**Quantity**
Top Boom - 0* Osc.Nozzles	23504-06 inserts	6
Top Sides	0503	6
Bottom Sides	0504	6
Opt'l - 0* Osc. Nozzles for Top & Bottom Sides	23504-06 inserts	8
Rocker Panel	1508	10
Opt'l - 0* Rocker Panel	23504-08 inserts	10
Tire Cleaner	4003	4
Presoak - upper positions	KY-9510	6
Presoak - lower positions	KY-9515	2
Spot Free - Top	9013 SpiralJet	2
Spot Free - Sides	K-15 FloodJet	4
Undercarriage	6508	5

Input Selections on Gantry

CONFIGURATION - October 2, 2007 **Fusion**

Gantry Inputs

Gantry Inputs - SRT2-ID16's

Gantry Address 0		FusionX & eFusion Inputs	
I_MeasurementEye	2008.00	measurement eye on gantry	eye
I_LeftBrush_EncoderProx1	2008.01	prox 1 left brush encoder, INNER PROX	prox
I_LeftBrush_EncoderProx2	2008.02	prox 2 left brush encoder, OUTER PROX	prox
I_RightBrush_EncoderProx1	2008.03	prox 1 Right brush encoder, INNER PROX	prox
I_RightBrush_EncoderProx2	2008.04	prox 2 Right brush encoder, OUTER PROX	prox
I_TopBrush_EncoderProx1	2008.05	prox 1 top brush encoder, LOWER PROX	prox
I_TopBrush_EncoderProx2	2008.06	prox 2 top brush encoder, UPPER PROX	prox
I_Gantry_ExitProx	2008.07	home position of the gantry	prox
I_Gantry_EntranceProx	2008.08	reverse limit on gantry	prox
I_Gantry_EncoderProx1	2008.09	prox 1 gantry encoder, LOWER PROX	prox
I_Gantry_EncoderProx2	2008.10	prox 2 gantry encoder, UPPER PROX	prox
I_VacationHomeProx	2008.11	second home prox - for secondary home prox location	prox
I_CenterLimitProx	2008.12	center limit prox, for side brushes	prox
I_WheelPositionEye	2008.13	finds tire position for Wheel Brush	eye
	2008.14		
	2008.15		

Gantry Address 2		FusionX & eFusion Inputs	
I_LeftBrushHomeLimit	2009.00	left brush limit prox sensor - RETRACTED LIMIT	prox
I_LeftBrushExtendedLimit	2009.01	left brush limit prox sensor - EXTENDED LIMIT	prox
I_RightBrushHomeLimit	2009.02	right brush limit prox sensor - RETRACTED LIMIT	prox
I_RightBrushExtendedLimit	2009.03	right brush limit prox sensor - EXTENDED LIMIT	prox
I_TopBrushHomeLimit	2009.04	top brush limit prox sensor - UPPER LIMIT	prox
I_TopBrushLowerLimit	2009.05	top brush limit prox sensor - LOWER LIMIT	prox
I_WheelBrushes_Retracted	2009.06	prox sensor - sensing BOTH cylinders in retracted position	prox
I_gantry_fault	2009.07	gantry drive faulted	contact
I_SideBrush_Fault	2009.08	left or right brush positioner or spindle faulted	contact
I_TopBrush_Fault	2009.09	top brush positioner or spindle faulted	contact
I_Oscillator/WheelBrush_Fault	2009.10	oscillating motor or wheel brush spindle faulted	contact
I_Blower_Fault	2009.11	on-board blower fault (any one of the MS's or VFD)	contact
I_Blower Prox Fwd	2009.12	blower osc prox in forward direction	prox
I_Blower Prox Rev	2009.13	blower osc prox in reverse direction	prox
	2009.14		
	2009.15		

Input Selections on Gantry (cont.)

Gantry Address 4		FusionX & eFusion Inputs	
I_JogFwd	2010.00	jog drive forward	sw
I_JogRev	2010.01	jog drive reverse direction	sw
I_JogBoom_Up	2010.02	jog boom up direction	sw
I_JogBoom_Down	2010.03	jog boom down direction	sw
I_JogOscillateMotor	2010.04	jog the oscillator motor	sw
I_JogTilt_Fwd	2010.05	jog the tilt forward	sw
I_JogTilt_Rev	2010.06	jog the tilt arm reverse direction	sw
I_JogLeftBrush_Extend	2010.07	extend left brush	sw
I_JogLeftBrush_Retract	2010.08	retract left brush	sw
I_JogRightBrush_Extend	2010.09	extend right brush	sw
I_JogRightBrush_Retract	2010.10	retract right brush	sw
I_JogTopBrush_Up	2010.11	jog top brush up	sw
I_JogTopBrush_Down	2010.12	jog top brush down	sw
I_JogWheelBrushes	2010.13	jog the wheel brush - bring cylinder forward, spin motor	sw
I_JogWheelVFDs	2010.14	jog the wheel VFDs	sw
I_JogEnable	2010.15	enable switch for jog's	sw

Gantry Address 6		FusionX ONLY	
I_CanEye	2011.00	gantry safety eye in can	eye
I_BoomSafetyRear	2011.01	rear boom safety eye, attached to boom rear direction	eye
I_BoomSafetyFront	2011.02	front boom safety eye, attached to boom front direction	eye
I_Boom_EncoderProx1	2011.03	prox 1 boom encoder, LOWER PROX	prox
I_Boom_EncoderProx2	2011.04	prox 2 boom encoder, UPPER PROX	prox
I_BoomHomeLimit	2011.05	boom limit prox - UPPER LIMIT	prox
I_BoomLowerLimit	2011.06	boom limit prox - LOWER LIMIT	prox
I_BoomBeltSafety	2011.07	detects slack on boom belt	prox
I_height_first	2011.08	top eye at top of boom	eye
I_height_second	2011.09	2nd eye from top	eye
I_height_third	2011.10	3rd eye from top	eye
I_height_fourth	2011.11	bottom eye, 4th from top	eye
I_boom_fault	2011.12	boom faulted	contact
	2011.13		
I_3phPowerDetection	2011.14	detects loss of 3 phase power	contact
	2011.15		

ECC Input Selections

Control Panel Inputs			
Control Panel, Address 12		**FusionX & eFusion Inputs**	
I_Treadle_sw	2014.00	switch on floor	eye
I_ExitDoorEye	2014.01	senses door area clear to close exit door	eye
I_EstopSw	2014.02	emergency stop switch	sw
I_ResetSw	2014.03	reset switch on control panel	sw
I_UnderCarriageEye	2014.04	front entrance switch to turn on undercarriage wash	eye
I_TempSwitch	2014.05	closes on rise in temperature, door controller	sw
	2014.06		
I_FreezeTstat	2014.07	freeze thermostat - closes when temp falls	sw
I_TireCleaner_Level_OK	2014.08	level OK in tire cleaner vessel	sw
I_Wax_Level_OK	2014.09	level OK on foaming conditioner tank	sw
I_CashierCycle1	2014.10	pulse from auto cashier, cycle 1	contact
I_CashierCycle2	2014.11	pulse from auto cashier, cycle 2	contact
I_CashierCycle3	2014.12	pulse from auto cashier, cycle 3	contact
I_CashierCycle4	2014.13	pulse from auto cashier, cycle 4	contact
I_PreSoak_Level_OK	2014.14	level OK in presoak vessel	sw
I_H20_Level_OK	2014.15	water tank level OK	sw

Control Panel, Address 14		**FusionX & eFusion Inputs**	
I_ManualWash1	2015.00	manually select wash 1	sw
I_ManualWash2	2015.01	manually select wash 2	sw
I_ManualWash3	2015.02	manually select wash 3	sw
I_ManualWash4	2015.03	manually select wash 4	sw
I_BillChanger1Fault	2015.04	bill changer 1 faulted	contact
I_BillChanger2Fault	2015.05	bill changer 2 faulted	contact
I_AutoCashierFault	2015.06	auto cashier faulted	contact
I_ExitDoorOpenProx	2015.07	senses exit door is opened	prox
I_ReclaimTankLevel	2015.08	detects low level in reclaim/cold water tank	sw
I_Blwr Nozzle Prox	2015.09	blower osc nozzle prox	prox
	2015.10		
	2015.11		
I_ExtBlowerShutOff	2015.12	photo to shut off blowers if customer leaves early	eye
	2015.13		
I_25hp OverloadTripped	2015.15	25 hp Overload Tripped	contact

Output Selections on Gantry

CONFIGURATION - Dec. 27, 2007 **Fusion**

GANTRY OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs
Address 0		**Volts**	**Com**	
O_Blower1		24ac	0	2000.00 blower #1, center blower
O_BlowerOsc CW		24dc-	1	2000.01 Blower osc motor, CW Direction
O_Blower2		24ac	0	2000.02 blower #2, outboard blower
O_BlowerOsc CCW		24dc-	1	2000.03 Blower osc motor, CCW Direction
O_Rocker_Sol		24ac	2	2000.04 rocker solenoid valve
O_PreSoak_Sol_1		24ac	3	2000.05 presoak air & liquid solenoids, reverse direction
O_PreSoak_Sol_2		24ac	2	2000.06 presoak air & liquid solenoids, forward direction
O_TireCleaner_Sol		24ac	3	2000.07 tire cleaner solenoid
O_TriColorFoam_Sol		24ac	4	2000.08 Triple Foam air & liquid solenoids
O_Side Spray Sol.		24ac	5	2000.09 side spray rinse solenoid
O_LowPressWax_Sol		24ac	4	2000.10 low pressure wax solenoid
O_Blower3		24ac	5	2000.11 blower #3, outboard blower
			6	2000.12 spare
			7	2000.13 spare
			6	2000.14 spare
			7	2000.15 spare

GANTRY OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs
Address 2		**Volts**	**Com**	
O_TopSprayer_Sol		24ac	0	2001.00 top sprayer solenoid
O_SideBrushLube, Rev		24ac	1	2001.01 side brush friction lubricant solenoid, reverse direction
O_SideBrushLube, Fwd		24ac	0	2001.02 side brush friction lubricant solenoid, forward direction
O_TopBrushLube, Rev		24ac	1	2001.03 top brush friction lubricant solenoid, reverse direction
O_TopBrushLube, Fwd		24ac	2	2001.04 top brush friction lubricant solenoid, forward direction
O_AirPurge_Sol		24ac	3	2001.05 air purge sol
O_Tilt_Brushes_Sol		24ac	2	2001.06 tilt side brushes
O_SpotFreeAirPurge		24ac	3	2001.07 spot free air purge solenoid
O_Wheel_Sol		24ac	4	2001.08 extend wheel brush
O_WheelBrushCW		24dc-	5	2001.09 Wheel brush CW direction
O_Wheel_HP_Sol		24ac	4	2001.10 High pressure water solenoid for wheel brushes
O_WheelBrushCCW		24dc-	5	2001.11 Wheel brush CCW direction
O_ScrollingSignA	24	neut	6	2001.12 white/red wire
O_ScrollingSignB	24	neut	7	2001.13 tan wire
O_ScrollingSignC	24	neut	6	2001.14 yellow wire
O_ScrollingSignD	24	neut	7	2001.15 brown wire
Alternate 2001 Outputs				
O_DriveForwardLight		24dc+	6	2001.12 Green Light, On-Board 3 position sign
O_StopLight		24dc+	7	2001.13 Red Light, On-Board 3 position sign
O-BackUpLight		24dc+	6	2001.14 Yellow Light, On-Board 3 position sign
O_		24dc+	7	2001.15 spare

ECC Output Selections

CONTROL PANEL OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs
Address 10	**Volts**	**Com**		
O_HP_Wash	24ac	0	2005.00	soap (wash) solenoid
O_HiPressWax	24ac	1	2005.01	hi pressure wax solenoid
O_UnderCarriageSol	24ac	0	2005.02	under carriage solenoid
O_MedPressSol	24ac	1	2005.03	medium pressure solenoid
O_SpotFreeMS	24ac	2	2005.04	spot free motor starter
O_PSoakHi_pH_MS	24ac	3	2005.05	high pH presoak MS
O_TireCleanerMS	24ac	2	2005.06	tire cleaner motor starter
O_PreSoakHeater	24ac	3	2005.07	presoak heater contactor
O_TripleShineMS	24ac	4	2005.08	triple shine motor starter
O_ReclaimWaterSol	24ac	5	2005.09	reclaim water solenoid
O_PreSoakRecircSol1	24ac	4	2005.10	Hi pH presoak recirculation sol
O_PSoakLoPH_MS	24ac	5	2005.11	Lo pH presoak MS
O_PhotoSensorCheckPanel	24dc-	6	2005.12	photo sensor safety check relay in control panel
O_PresoakLowPH_recirc	24ac	7	2005.13	low ph presoak recirculation solenoid
O_EW_Reset	24dc-	6	2005.14	reset the Entry Wizard cashier
O_BlowerTimer	24ac	7	2005.15	blower digital timer

CONTROL PANEL OUTPUTS, SRT2-ROC16				FusionX & eFusion Outputs
Address 12	**Volts**	**Com**		
O_EnterNowLight	24dc+	0	2006.00	drive forward light at entrance to wash
O_LPWaxMS	24ac	1	2006.01	low pressure wax motor starter
O_PleaseWaitLight1	24dc+	0	2006.02	please wait at entrance of wash
O_ColdWaterSol	24ac	1	2006.03	cold water reservior
O_Sol1TripleShine	24ac	2	2006.04	solenoid 1 for tiple shine
O_So2TripleShine	24ac	3	2006.05	solenoid 2 for triple shine
O_Sol3TripleShine	24ac	2	2006.06	solenoid 3 for trile shine
O_InTankWaterHeater	24ac	3	2006.07	Water Heater inside Water Tank
O_FrictionLubeMS	24ac	4	2006.08	Brush Lube Pump MS
O_BlwrNozCW	24dc-	5	2006.09	Blwr Noz CW rotation
O_BlowerExternal(MS2-3)	24ac	4	2006.10	external blower motor starters # 2 & 3 (24vac)
O_BlwrNozCCW	24dc-	5	2006.11	Blwr Noz CCW rotation
O_AlarmHorn	24ac	6	2006.12	announce car on treadle (24vac)
O_PumpMain	120ac or 24ac	7	2006.13	25 HP motor starter (110V) **(change com7 to 24vac on eFusion)**
O_BlowerExternal(MS1)	24ac	6	2006.14	external blower motor starter # 1 (24vac)
O_CashierReset	120ac or 24ac	7	2006.15	auto cashier reset (110V)**(change com7 to 24vac o eFusion)**

CONTROL PANEL OUTPUTS, SRT2-VOM16			FusionX & eFusion Outputs	
Optional 10 Position Sign				
Address 14	**Volts**	**Com**		
O_StopLight	120ac		2007.00	stop light
O_EnterLight	120ac		2007.01	drive forward light inside wash bay
O_BackupLight	120ac		2007.02	backup light
O_PresoakLight	120ac		2007.03	presoak light
O_RockerLight	120ac		2007.04	rocker panel light
O_ClearCoatLight	120ac		2007.05	clear coat light
O_TripleShineLight	120ac		2007.06	triple shine light
O_SpotFreeLight	120ac		2007.07	spot free light
O_ExitLight	120ac		2007.08	exit light
O_CleanCarLight	120ac		2007.09	clean car is a happy car light
O_PleaseWaitLight	120ac		2007.10	please wait at entrance of car wash
O_LP_WaxLight	120ac		2007.11	spare
O_2004_12			2007.12	spare
O_2004_13			2007.13	spare
O_2004_14			2007.14	spare
O_2004_15			2007.15	spare

CONTROL PANEL OUTPUTS, SRT2-VOM16 -		FusionX & eFusion Outputs	
Optional 10 Position Sign	**Channnel 2007 Address 14**		
Address 14	**Volts**		
O_StopLight	120ac	2007.00	stop light
O_EnterLight	120ac	2007.01	drive forward light inside wash bay
O_BackupLight	120ac	2007.02	backup light
O_PresoakLight	120ac	2007.03	presoak light
O_RockerLight	120ac	2007.04	rocker panel light
O_ClearCoatLight	120ac	2007.05	clear coat light
O_TripleShineLight	120ac	2007.06	triple shine light
O_SpotFreeLight	120ac	2007.07	spot free light
O_ExitLight	120ac	2007.08	exit light
O_CleanCarLight	120ac	2007.09	clean car is a happy car light
O_PleaseWaitLight	120ac	2007.10	please wait at entrance of car wash
O_LP_WaxLight	120ac	2007.11	spare
O_2004_12		2007.12	spare
O_2004_13		2007.13	spare
O_2004_14		2007.14	spare
O_2004_15		2007.15	spare

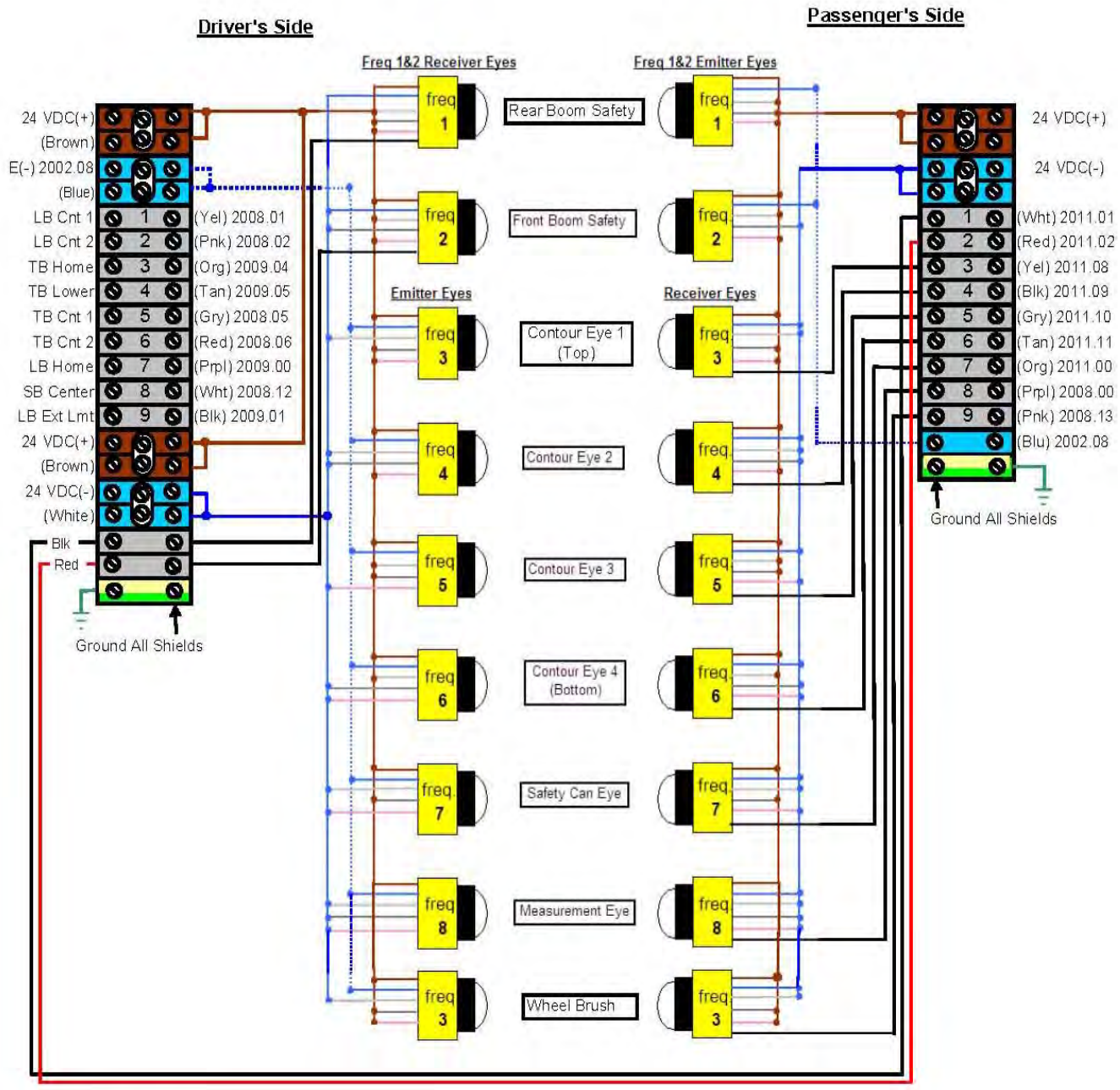
Channel 2027 Output Card - connected to the analog SRM21 module

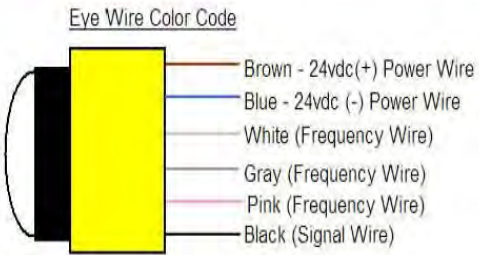
Optional ROC-08 located in ECC panel in bottom row	Address = 14		Com. Term.	Voltage
O_ScrollingSign A	Vac neu	com 0	2027.00	"off-board" scrolling sign output A
O_ScrollingSign B	Vac neu	com 1	2027.01	"off-board" scrolling sign output B
O_ScrollingSign C	Vac neu	com 0	2027.02	"off-board" scrolling sign output C
O_ScrollingSign D	Vac neu	com 1	2027.03	"off-board" scrolling sign output D
		com 2	2027.04	
		com 3	2027.05	
		com 2	2027.06	
		com 3	2027.07	

FusionX On-Board Scrolling Sign Outputs/Messages

	Displayed Messages	FusionX Outputs	Wire Color	Scrolling Sign Wire Color
1.	**Welcome** Message, user programmable	None		
2.	**Wash**	2001**.12**	Brown	Brown
3.	**Rinse**	2001**.13**	Red	Red
4.	**Presoak**	2001**.14**	Orange	Orange
5.	**Stop**	2001**.15**	Blue	Yellow
6.	**Rocker Panel Blaster**	14 & 15		Black= 24vac hot
7.	**Back Up**	13 & 15		White= 24 vac neutral
8.	**Clearcoat Protectant**	13 & 14		Green= ground
9.	**Drive Forward**	12 & 15		**Note**
10.	**Tire Cleaner**	12 & 14		On the channel 2001, ROC-16, the common voltage on **COM 6** and **COM 7** must be **24 volts AC Neutral** for the sign to operate properly.
11.	**Wax**	12 & 13		
12.	**Exit Slowly**	13, 14 & 15		
13.	**Triple Shine**	12, 14 & 15		
14.	**Soaking**	12, 13 & 15		
15.	**Spot Free Rinse**	12, 13 & 14		
16.	**Blower**	12, 13, 14 & 15		

FusionX Gantry Eye Wiring





WIRE THE DRYERS

a) Stand-Alone "Wind Wizard" Dryers with Oscillating Center Nozzle

The Wind Wizard Stand-Alone Dryer is controlled by several outputs from the channel 2006 output card, ROC16. There is also an input signal from a proximity switch on the center oscillating blower nozzle that will be terminated on the channel 2015 input card, ID16. There are eight wires going from the Electrical Control Center (ECC) to the Free-Standing Blower Control Panel. There will be an 18-22 gauge-12 conductor cable provided in the installation kit for Stand-Alone Wind Wizard Dryers for these connections. Terminate these wires according to the following chart:

Wire Color	ECC Connections	Blower Control Panel Connections
White	24 vac Neutral, Term Strip 2	Term.# 96 on the motor overloads
Brown	24 vdc Positive (+), Term Strip 1	Brown wire from prox cable
Blue	24 vdc Negative (-), Term Strip 1	"SC" term on Nozzle VFD & Blue wire from prox cable
Orange	Output 2006.14, ROC16	"A1" on the center motor starter
Red	Output 2006.10, ROC16	"A1" on right and left motor starters
Yellow	Output 2006.09, ROC16	"S1" on Nozzle VFD
Purple	Output 2006.11, ROC16	"S2" on Nozzle VFD
Black	Input 2015.09, ID16	Black wire from prox cable

b) Stand-Alone Dryers from other manufacturers

Other types of stand-alone dryers are controlled by output 2006.14 of the ROC16. We provide both 24 vac and 120 vac signals to operate your dryers.

FOR 24 VAC SIGNAL:
If your dryers require a 24 vac signal to operate, connect your signal wire directly to output 2006.14. You will also need a 24 vac neutral. This connection can be made on Term Strip 2, on one of the terminals labeled "24v neutral". The length of the signal that is sent to your Blower Control Panel is adjustable through the Red Lion interface (F2 – Timers & Counters).

FOR 120 VAC SIGNAL:
If your dryers require a 120 vac signal to operate, connect your signal wire to Term Strip 3, on the terminal labeled "Ext. Blower". You will also need a 120 vac neutral. This connection can also be made on Term Strip 3, on one of the terminals labeled "120v neutral". The length of the signal that is sent to your Blower Control Panel is adjustable through the Red Lion interface (F2 – Timers & Counters).

DIXMOR DIGITAL TIMER WIRING

To wire the Digital timer, you need four wires from the ECC 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.

Terminal 2 24VAC	Terminal 3 120VAC	Wire Color	Dixmor Timer Terminal Strip
	Hot #1	Black	#1
	Neutral #4	White	#2
#10		Purple	#3
#11		Purple	#5

c) On-Board Dryers

Run the 4/4 S. O. cord from the WW ECC 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 green wires to the ground bus of the panel.

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 additional outputs and a set of photo eyes. For the exit door in the ECC, and the outputs and commons come pre-wired to the 24VAC terminal strip #2. The exit door eye signal must be wired to the 24VDC terminal strip #1.

To hook your door controls to the ECC, 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 ECC, hook the wires to the appropriate screws on the **"TERM 2"** terminal strip. See the wiring diagram that follows:

BAY DOOR WIRING DIAGRAM

TERM 2 24VAC	Wire Color	Door Control	SRT2-ROC16
#13	White/Yellow	Entrance Common	COM 0
#14	White/Blue	Entrance Open	2004.00
#15	Red/Black	Entrance Close	2004.02
#16	White/Yellow	Exit Common	COM 1
#17	Red/Yellow	Exit Open	2004.01
#18	Red/Green	Exit Close	2004.03

In addition, there is a **"windy day"** feature that is incorporated in the Red Lion Interface (F8 – Site Data), 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.

Included with the door package is a set of photo eyes. Install the 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 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 from receiver eye only). The Emiiter/Transmitter eye blue wire will terminate on the "Emitter Common" on Term Strip 1, terminal #10. Wiring the emitter this will allow us to detect a short circuit in the receiver eye. Terminate the black wire of the receiver eye cable to Term #3 Screw #17 in the WW ECC. This screw is pre-wired to input #2014.01 of the SRT2-ID16 in the ECC.

WIRE THE FREEZE THERMOSTAT

No Bay Doors or Bay Doors With no Bay Heat

Inputs 2014.05 and 2014.07 **of the SRT2-ID16 of the WW ECC in the equipment room are the two inputs that control the Freeze Blowout and the Bay Door programs. When the temperature rises above the temperature preset on the Thermostat, I**nput 2014.05 **will come on and** Input 2014.07 **will go off (if wired correctly). When the temperature falls below the temperature preset on the thermostat,** Input 2014.05 **will go off and** Input 2014.07 **will come on.** Inputs 2014.05 and 2014.07 **should never be on at the same time.**

When **Input 2014.05** first comes on, the car wash controller sends a 3 second signal to open both Bay Doors. When **Input 2014.07** first comes on, the car wash controller sends a 3 second signal to close both bay doors and execute the blowout program. (See the description of the blowout program below).

To wire the Thermostat**, you will need to run three wires to the** Thermostat **from the** ECC**. Wire one wire to** 24 VDC (-) **in the ECC, one wire to the SRT2-ID16** Input 2014.05**, and one wire to the SRT2-ID16** Input 2014.07**. In the Thermostat, the** 24 VDC (-) **wire goes to the** Common **terminal (**Red screw**). Output 2014.05 of the SRT2-ID16 goes to the** Close on Temperature Rise **contact (White screw), and** Input 2014.07 **of the SRT2-ID16 goes to the** Open on Temperature Rise **contact (**Blue screw**).**

When the **Blowout Program** is activated, the gantry will blowout all the chemical and water lines once after the temperature drops, and then again once **3 minutes** after each wash after the car leaves the

bay and as long as **Input 2009.07** remains lit. The blowout process goes through a sequence of blowing out all the lines on the gantry five times.

The **Blowout Program** will sequence through the following:

Rocker Panel	Side High Pressure Rinse
Top High Pressure Rinse	Tire Cleaner
Presoak	Low Pressure Wax
Tri-foam Wax	Spot Free

NOTE: **The undercarriage hose does not get blown out nor does it have a weep system. To protect the undercarriage from freezing, run some sort of heating system along the hose. If you have the winter wizard system, run the uninsulated copper tube from the rail heat along the side of the undercarriage spray bar. You can also run the hoses for the rail heat along with the undercarraige hose to protect it from freezing. If you do not have rail heat, you can run heat tape or something similar along the hose.**

Bay Doors with Bay Heat

If you have Bay Doors with Bay Heat, and you don't want the gantry to blowout the lines, you can wire the thermostat differently. **In this case, you will need two thermostats**. One thermostat will measure the temperature in the bay, and one thermostat will measure the outside air temperature.

Pull two wires to the thermostat in the bay, and pull three wires to the outside air thermostat. Wire the commons of both thermostats to **24 VDC (-)**. You can bring two wires from the panel, one for each thermostat, or you can bring one wire from the panel to the first thermostat terminating the wire on the **Common terminal (Red screw)** of the first Thermostat. Then run a jumper wire from the first thermostat to the second thermostat, and terminate the jumper wire at each thermostat on the **Thermostat Common terminals (Red screw)**.

For the **Bay Thermostat**, Terminate one wire on the **Open on Temperature Rise** contact of the thermostat **(Blue screw)** and terminate the other end of the wire to **Input 2014.07** of the SRT2-ID16 **(Freeze Thermostat)**.

For the **Outside Air Thermostat**, terminate one wire on the **Close on Temperature Rise** contact of the thermostat **(White screw)**, and terminate the other end of the wire to **Input 2014.05 (Door Thermostat)** of the SRT2-ID16 of the ECC in the equipment room.

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

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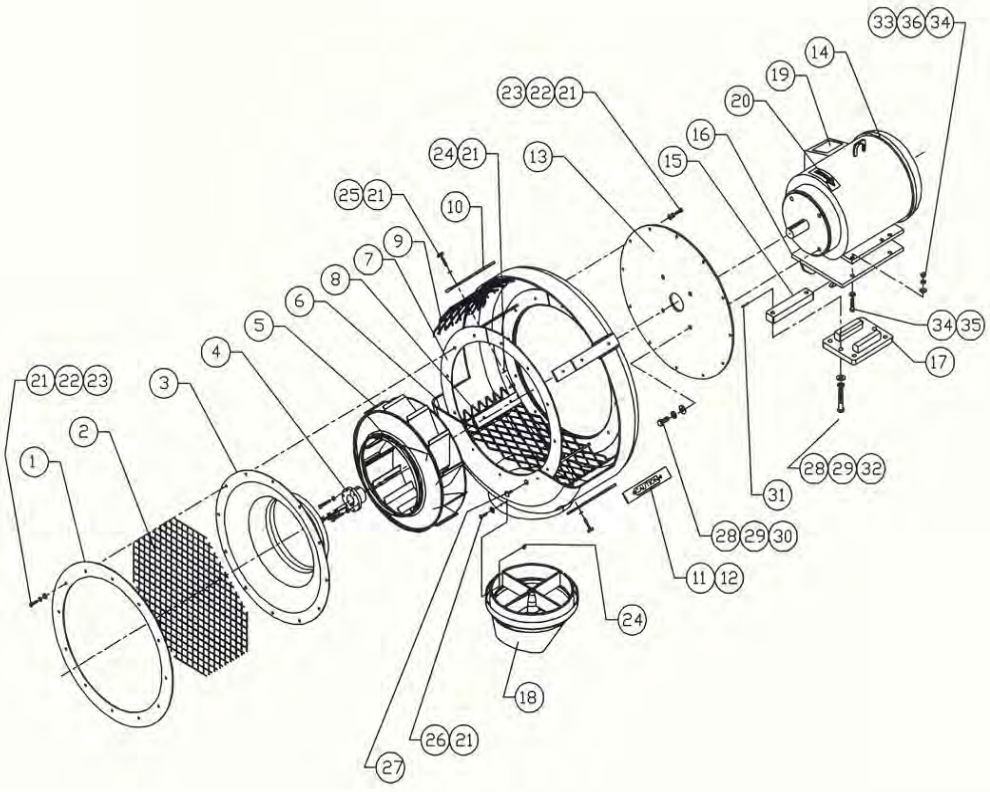
Page #1



MACNEIL WASH SYS.

REV. "B"
JULY 2002
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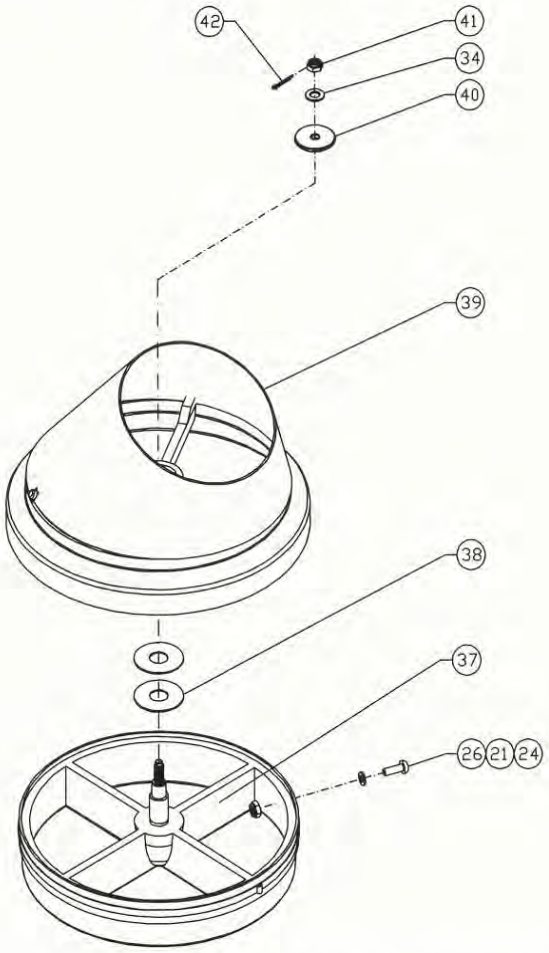
Jim Coleman Producer with Fixed Nozzle

NOZZLE ASSEMBLY (65-725-00-MP)



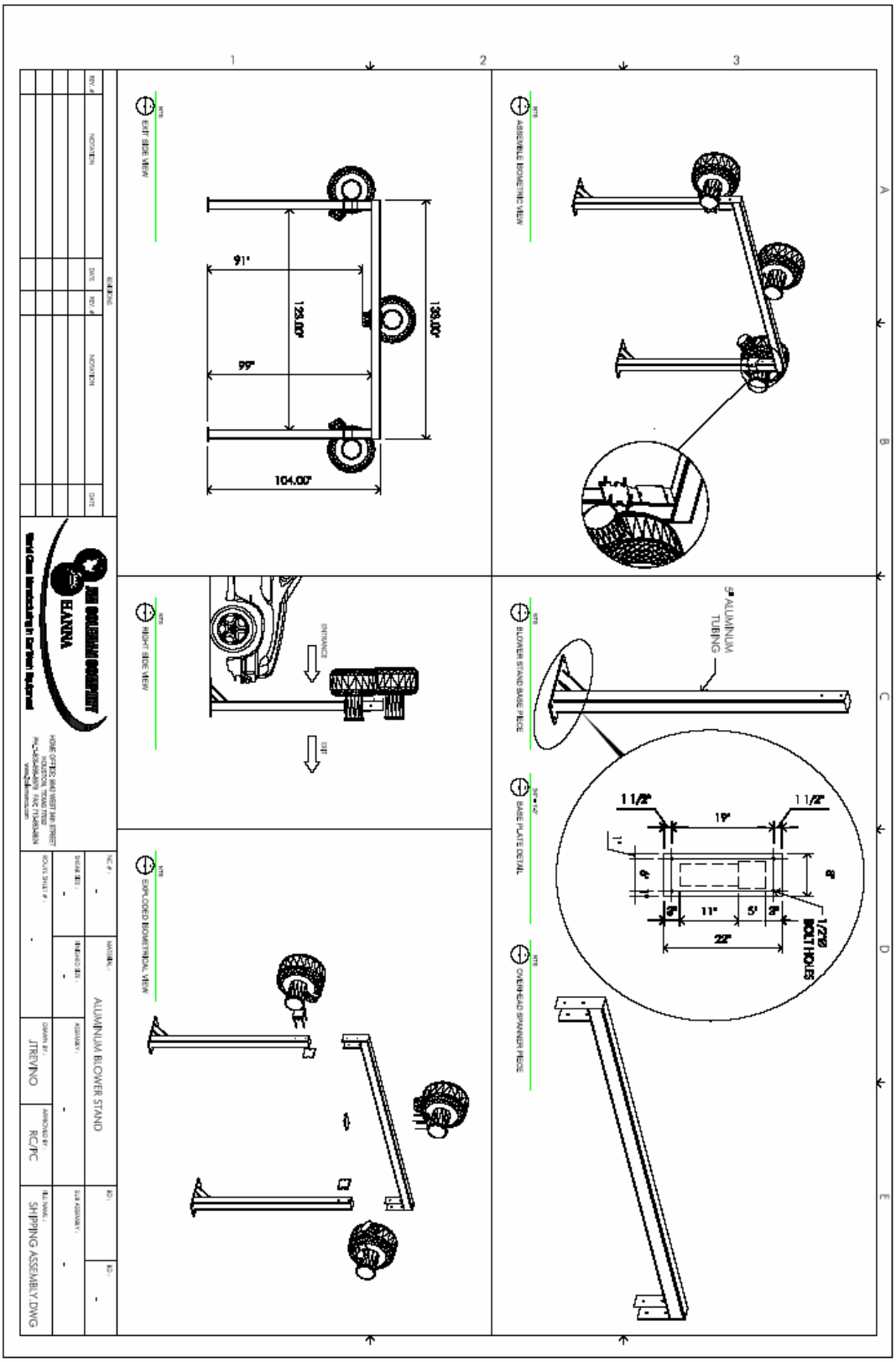
MACNEIL WASH SYS.

Jim Coleman
Producer with Fixed Nozzle

REV. "B"
'JULY 2002
PAGE#4

Item no.	*Req'd*	*Description*	*Part no.*	*Remarks*
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.


EXIT SIDE VIEW
91"
129.00"
99"
139.00"
104.00"
ASSEMBLE ISOMETRIC VIEW
RIGHT SIDE VIEW
ENTRANCE
EXIT
BLOWER STAND BASE PIECE
3" ALUMINUM TUBING
BASE PLATE DETAIL
11 1/2"
19"
11 1/2"
11"
5"
22"
1/2" BOLT HOLES
OVERHEAD SPANNER PIECE
EXPLODED ISOMETRIC VIEW
ALUMINUM BLOWER STAND
JTREVINO
RC/PC
SHIPPING ASSEMBLY.DWG

Winterization

Table of Contents

Winter Wizard Heater Kits

JCC 9 KW ELECTRIC SYSTEM:

- 1 EA. JCC WINTER WIZARD SYSTEM, PRE-PLUMBED & WIRED
- 1 EA. SUPPLY MANIFOLD
- 1 EA. ¾" STREET ELBOW
- 1 EA. ¾" HEX NIPPLE
- 1 EA. THERMOMETER, FOR TANK

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 ¾" x 1" BUSHINGS
- 2 EA. ½" x ¾" BUSHINGS
- 2 EA. ¾" TEE
- 3 EA. ¾" HEX NIPPLE
- 1 EA. ¾" HEX COUPLING
- 1 EA. ¾" HOSE BARB x ¾" MPT
- 20 FT. ¾" 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 hear, 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 230 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.)

Fusion Alarm Log

This information is needed to help us in trying to duplicate problems here at the Jim Coleman Company. Record the information as it is displayed on the Red Lion in the Alarm Record. This information can be accessed by pressing the "Alarms" key in the upper left corner of the Red Lion operator interface. Then press the "Next" key in the lower right corner of the Red Lion. This will take you to the Permanent Alarm Record. Pressing the "Raise" key on the lower right side. Each time you press "Raise", it will display the recorded alarms in chronological order.

There are 16 alarm information blocks below. This will usually be enough information to help us BUT if you are experiencing repetitive alarms. Please record all of the information for at least 4 instances of any repetitive alarm.

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
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Alarm Description:			
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Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time
Alarm Description:			
Wash	Pass	Boom	Gantry

Alm	Day	Date	Time

Alm	Day	Date	Time

Fusion - Program Troubleshooting Worksheet

Fusion Custom Recipe

This information, as well as the gantry counter values, is needed from the customer who is experiencing a problem so we can attempt to duplicate on one of our units.

Distributor:_____ **Unit Model:**_____ **Date:**_____
Site:_____ **Program Version:**_____

Vehicle type, problem usually occurs on:_____ **(if applicable)**
Description of Problem:

Recipe # _____ # of Passes _____

Pass #	Active "Bits"	Gantry Speed in %	Preset Values			
			Start Delay in seconds	Boom counts @ Start	Boom Counts @ End	End Delay in seconds
1				Front	Rear	
2				Rear	Front	
3				Front	Rear	
4				Rear	Front	
5				Front	Rear	
6				Rear	Front	
7				Front	Rear	
8				Rear	Front	
9				Front	Rear	
10				Rear	Front	

Fusion - Program Troubleshooting Worksheet

Counter Values

This information as well as their exact recipe is needed from the customer who is experiencing a problem so we can attempt to duplicate on one of our units.

Distributor:_____ **Unit Model:**_____ **Date:**_____

Site:_____ **Program Version:**_____

Vehicle type problem usually occurs on:_____ **(if applicable)**

Description of Problem:

Red Lion Description	Set Value
Treadle Positon (for Wheel Brush @ Front)	
Start Gantry (Boom, Fx) @ Front	
Start Gantry (Boom, Fx) @ Rear	
Front Brush Pass	
Rear Brush Pass	
Start Side Brushes @ Front	
Start Side Brushes @ Rear	
Start Top Brush @ Front	
Start Top Brush @ Rear	
Rear TB Pass on Long Vehicles	
Start LP Wax @ Front	
Start LP Wax @ Rear	
Start Trifoam @ Front	
Start Trifoam @ Rear	
Start Presoak @ Front	
Start Presoak @ Rear	
Start Rocker Panel @ Front	
Start Rocker Panel @ Rear	
Start Side Sprays @ Front	
Start Side Sprays @ Rear	
Start TC (tire cleaner) @ Front	
Start TC (tire cleaner) @ Rear	
Start SB (side brush) Lube @ Front	
Start SB (side brush) Lube @ Rear	
Start TB (top brush) Lube @ Front	
Start TB (top brush) Lube @ Rear	
TB (top brush) Lower Limit @ Rear	
Wheel Brush Offset @ Rear	
Flip Blower @ Front	
Flip Blower @ Rear	
Presoak Overlap @ middle of car	

Fusion - Program Troubleshooting Worksheet

F8 Site Data

This information as well as their exact recipe is needed from the customer who is experiencing a problem so we can attempt to duplicate on one of our units.

Distributor:_____ **Unit Model:**_____ **Date:**_____
Site:_____ **Program Version:**_____
Vehicle type problem usually occurs on:_____ **(if applicable)**
Description of Problem:

Menu Option #	Red Lion Description	eF current default	Setting	Fx current default
3	On-Board Blower			
4	Type Cashier			
10	Profile Option			
11	Proflie Mode			
14	Static Blower			
15	Treadle Sensor			
16	Undercarriage Eye			
17	Door Mode			
18	Windy Day Bypass			
21	**Min SB TL Position**			

Fusion - Brush Spindle Frequency

This value should be displayed on the VFD while the unit is at idle, without having to check it on "n21"

VFD Description		Set Value	
Left Brush Spindle Frequency (n21) =			
Top Brush Spindle Frequency (n21) =			
Right Brush Spindle Frequency (n21) =			

Fusion - Program Troubleshooting Worksheet

Timer Values

This information as well as their exact recipe is needed from the customer who is experiencing a problem so we can attempt to duplicate on one of our units.

Distributor:_____ **Unit Model:**_____ **Date:**_____
Site:_____ **Program Version:**_____
Vehicle type problem usually occurs on:_____ **(if applicable)**
Description of Problem:

Red Lion Description	Set Value
External Blower (delay after wash)	
External Blower (pulse time)	
Triple Shine	
Entrance Watchdog	
Bottom Blaster (undercarriage total time)	
Bottom Blaster (rear wheel timer)	
Wheel Brushes (extend time)	
External Door Control (pulse time)	
Spot Free Purge Time	
High Pressure Purge	
Presoak Purge Time	
Off-Treadle Watchdog	
Exit Door Reclose	
Start Stacked Wash	
Wheel Brushes (retract time)	
Tire Glaze (spin & extend)	
Tire Glaze (liquid dispensed)	
Tire Glaze (wet brushes, inactive)	

FUSION ALARMS LISTING

Alarm	Description	Stored	Limiting Factors
1	no motion detected on gantry when drive enabled	user	OS
2	3x lockout alarm	user	OS
3	exit door open alarm if doors enabled this wash	perm	advisory
4	wheel B phase prox failure	user	OS
5	wheel A phase prox failure	user	OS
6	motion detected when drives are stopped	user	advisory
7	car measurement too small	user	terminate wash, 3x lockout OS
8	car measurement too large	user	terminate wash, 3x lockout OS
9	drive motor ran too long	user	terminate wash, OS if gantry doesn't return home.
10	boom failed to clear top LS. Rewind the top boom for equivalent time period.	user	limit boom function
11	boom prox A failure	user	limit boom function
12	boom prox B failure	user	limit boom function
13	no downward motion detected on boom.	user	limit boom function
14	no upward motion detected on boom when drive running	user	OS, if boom doesn't return home
15	motion detected when boom drive not running	user	limit boom function
16	boom watchdog, too long to move to SP	user	limit boom function
17	when profiling to rear of car, boom safety eyes sensed obstruction	perm	limit boom function
18	when profiling to front of car, boom safety eyes sensed obstruction	perm	limit boom function
19	rear boom cycle, boom safety eyes saw obstruction	perm	limit boom function
20	front boom cycle, boom safety eyes saw obstruction.	perm	limit boom function
21	rear boom cycle, measurement eye sensed obstruction	perm	limit boom function
22	front boom cycle, measurement eye obstructed	perm	limit boom function
23	rear boom cycle, can safety eye sensed obstruction.	perm	limit boom function
24	front boom cycle, can eye sensed an obstruction	perm	limit boom function
25	top prox was ON even though boom count greater than 10 counts.	user	run boom to 0 count
27	Treadle senses car even though wash was idle for > 12 minutes.	perm	advisory
28	Recipe called for undercarriage wash, but car was not detected by entrance eye	perm	advisory
29	jog enable switch left on for longer than 15 minutes	user	OS, when in jog mode
30	one or more manual jog switches left on for longer than 1 minute	user	advisory
31	e-stop switch on	user	OS
32	Reset switch left on for longer than 1 minute.	user	OS
33	one or more start wash switches left on for longer than 60 seconds	user	advisory
34	bill cashier 1 or 2 faulted	user	advisory
35	Auto-Cashier faulted	user	advisory
36	Tire Cleaner low level warning if low longer than 10 seconds	user	advisory
37	Wax low level warning if low for longer than 10 seconds	user	advisory

38	H2O low level warning and out of service if low for longer than 10 seconds	user	OS, after wash in progress completes
39	PreSoak low level warning and out of service if low for longer than 10 seconds	user	OS, after wash in progress completes
40	Gantry OL tripped	user	OS, if vfd doesn't reset
41	Boom OL tripped	user	OS, if vfd doesn't reset and boom can't return home
42	Osc OL tripped	user	no oscillation if vfd doesn't reset
43	advisory - reset button pressed	perm	advisory
44	Side Brush OL tripped	user	OS if brush cannot return home
45	blower nozzle proxes failed to show motion within 5 seconds of starting rotation VFD	perm	advisory
46	Home Prox Abnormal	user	advisory, other alarms may result limiting operation
47	gantry end of travel prox abnormal	user	advisory, other alarms may result limiting operation
48	Run track test before allowing auto cycles to begin	user	advisory
49	overspeed, gantry encoder	user	advisory
50	track test failed	user	advisory
51	treadle hung at end of wash cycle - reset wash after watchdog timer expires	perm	advisory
52	end of car not found during measurement pass	user	advisory
53	Customer did not leave treadle within 90 seconds	perm	advisory
54	13 minute max wash time exceeded. Cancel remaining wash cycle	user	terminate wash
55	treadle switch was on when car wash was started.	perm	advisory
56	car took too long to reach treadle after starting wash	perm	advisory
57	car off treadle for too long while wash in progress. Cancel remaining wash cycle.	user	terminate wash
58	customer failed to leave wash within 3 minutes after wash was completed.	perm	advisory
59	track test OK	user	advisory
60	top boom prox was not ON at start of wash. Do not allow wash to continue.	user	OS
61	Gantry home sensor was not on at start of wash. Do not allow wash to continue	user	OS
62	bottom boom prox ON at start of boom cycle. No boom cycle will result.	perm	limit boom function
63	main pump > 500 hours operation.	user	advisory
64	Pump OL tripped	user	OS
65	no car seen within 36"	user	terminate wash
66	while wash idle, ganry home prox was OFF for > 60 seconds. OS	user	OS
67	while wash wash idle,top boom prox was OFF for > 60 seconds; OS	user	OS
68	front boom pass, home prox sensed	perm	limit boom function
69	end of track prox sensed on rear boom pass	perm	limit boom function

70	left side brushes - encoder wiring backwards	user	limit brush function
71	right side brushes - encoder wiring backwards	user	limit brush function
72	top brushes - encoder wiring backwards	user	limit brush function
73	wash cycle attempted with job enable switch ON	user	OS when in jog mode
76	Relay for Gantry Eyes test sequence appears abnormal. All eyes were OFF at start of test.	user	OS
77	Relay for control panel eye tests sequence is abnormal. All eyes were OFF at start of test.	user	advisory
78	boom switches are miswired - counts backwards	user	limit boom function
79	gantry count prox switches miswired. Gantry encoder counting backwards	user	OS
80	Profile 1 did not test OFF at start of wash	user	limit boom function
81	Profile 2 did not test OFF at start of wash	user	limit boom function
82	Profile 3 did not test OFF at start of wash	user	limit boom function
83	Profile 4 did not test OFF at start of wash	user	limit boom function
84	Measurement eye did not test OFF at start of wasy	user	OS
85	can eye did not test OFF at start of wash	user	limit boom function
86	rear boom safety eye did not test OFF at start of wash	user	limit boom function
87	front boom safety eye did not test OFF at start of wash	user	limit boom function
88	treadle sensor did not test OFF at start of wash	user	advisory
89	undercarriage eye did not test OFF at start of wash	perm	advisory
90	Exit eye did not test ON at start of wash	perm	advisory
91	WB photo eye not OFF at start of wash	user	
92	TB OL detected	user	limit brush function
93	SB OL detected	user	limit brush function
94	TB no motion detected	user	limit brush function
96	Profile 1 photo (top) was not ON at start of wash	perm	limit boom function
97	Profile 2 photo was not ON at start of wash	perm	limit boom function
98	Profile 3 photo was not ON at start of wash	perm	limit boom function
99	Profile 4 photo was not ON at start of wash	perm	limit boom function
100	Measurement photo was not ON at start of wash cycle	perm	limit boom function
101	Can Eye was not ON at start of wash cycle	perm	limit boom function
102	Rear Boom Safety was not ON at start of wash, 2010.11	perm	limit boom function
103	Front Boom Safety was not ON at start of wash	perm	limit boom function
104	Treadle Eye was not ON at start of wash cycle	perm	advisory
105	UnderCar Eye was not ON at start of wash cycle	perm	advisory
106	exit eye was not ON at start of wash	perm	advisory
107	WB eye not ON at start of wash cycle	user	
108	boom belt safety prox alarm	user	
109	boom prox detected slack in belt	user	
110	pipe rack mode selected this wash	perm	
111	3-phase power fault	user	
112	reclaim water is low level	user	limit solenoid
113	blower tripped out	user	requires manual OL reset for blowers to operate
114	LB no load detected	user	limit brush function
115	RB no load detected	user	limit brush function

116	TB no load detected	user	limit brush function
117	TB home prox not sensed	user	OS
118	LB home prox not sensed	user	OS
119	RB home prox not sensed	user	OS
120	Boom home prox not sensed	user	OS
121	RB no motion detected	user	
122	WB home prox did not test ON at start of wash.	user	
123	Wheel Brush Photo was OFF at the start of wash	user	advisory
124	WB cycle not home	user	
125	gantry EOT prox did not sense at end of track	perm	advisory
126	TB motor current **too high**	**PERM**	limit brush function
127	TB motor current too low	USER	OS, Requires Manual Reset
128	wheel brushes did not return home. Terminate wash. Gantry will not move. OS if brushes don't return home	USER	OS, if brushes don't return home
129	center limit prox on brushes defective	USER	limit brush function
130	LB low torque alarm	USER	OS, Requires Manual Reset
131	LB **high** torque alarm	**PERM**	advisory
132	RB low torque alarm	USER	OS, Requires Manual Reset
133	RB **high** torque alarm	**PERM**	advisory
134	TB lower prox EOT alarm	USER	limit brush function
135	Network Comms Error - Loss or Error in Network Communication occured	USER	OS

JIM COLEMAN COMPANY
HANNA

2007

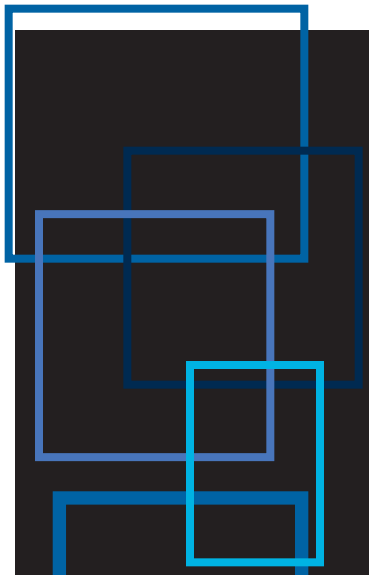
PARTS MANUAL

THIS JIM COLEMAN COMPANY WORLD CLASS CARWASH
EQUIPMENT PARTS MANUAL INCLUDES PICTURES
AND PART NUMBERS FOR THE FOLLOWING EQUIPMENT:

FusionX
COMBINATION WASH

PARTS DEPARTMENT
1.866.927.4229
713.590.6652 FAX
WWW.JCOLEMANCO.COM

(Revised March 2007)



Please Read

The equipment shown on the following pages are from a typical Fusion X product. The purpose of this manual is to simplify the process and increase the accuracy when ordering parts. Please note that with the variety of options available, your equipment may have additional components or not have some of the components shown.

In the interest of product improvement, Jim Coleman Company reserves the right to make equipment modifications at any time and without advance notice

For more infomation on world class car wash equipment and parts manufactured by Jim Coleman Company please contact us at:

1.800.999.9878
5842 W. 34th Street
Houston, Texas 77092
www.jcolemanco.com

Parts Department Direct Line:
1.866.927.4229
Fax: 713.590.6652

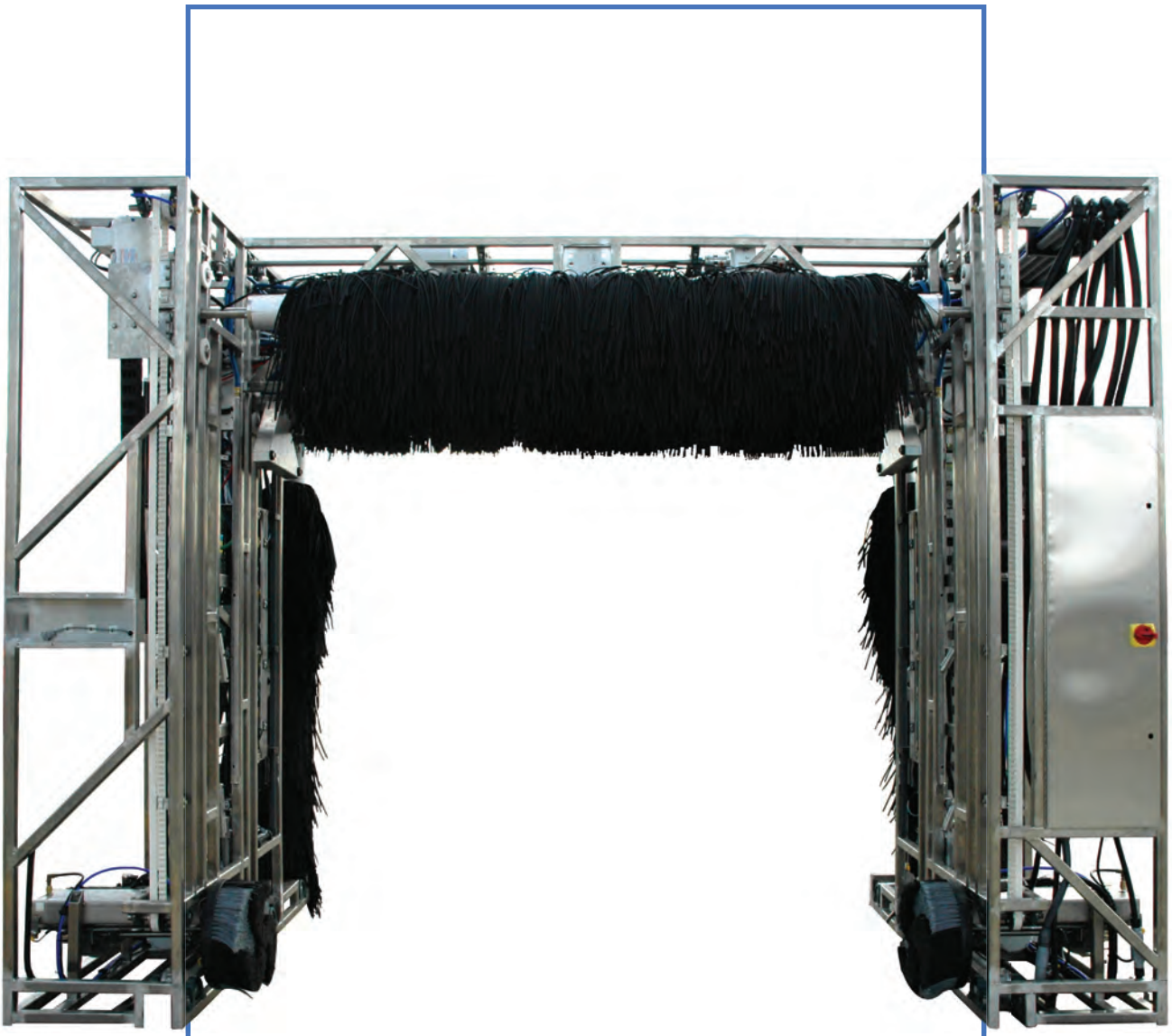
2007 FUSION X PARTS MANUAL

TABLE OF CONTENTS

gantry

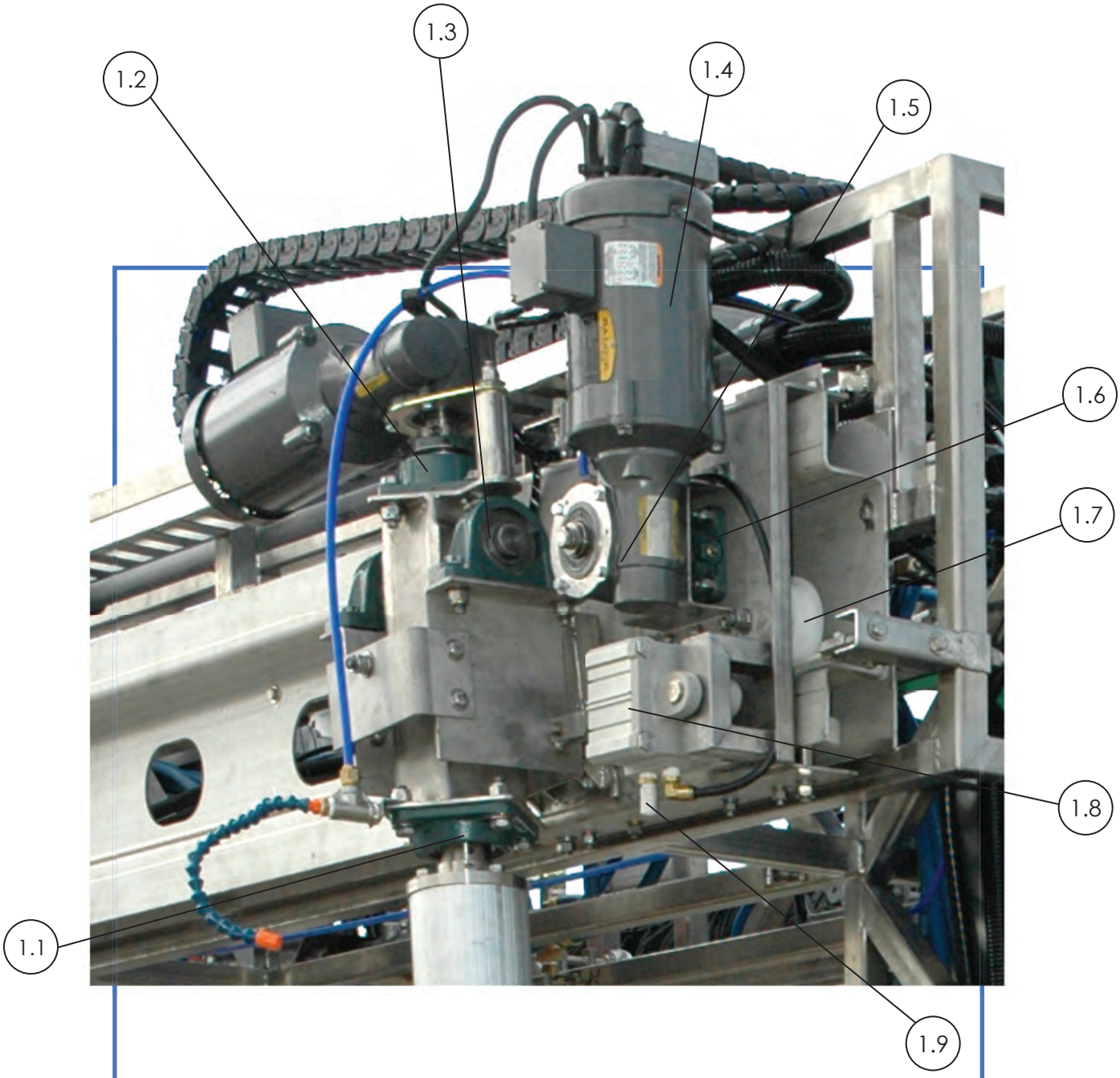
GANTRY ENTRANCE - WITH SKINS

GANTRY EXIT - WITH SKINS



GANTRY ENTRANCE - WITHOUT SKINS

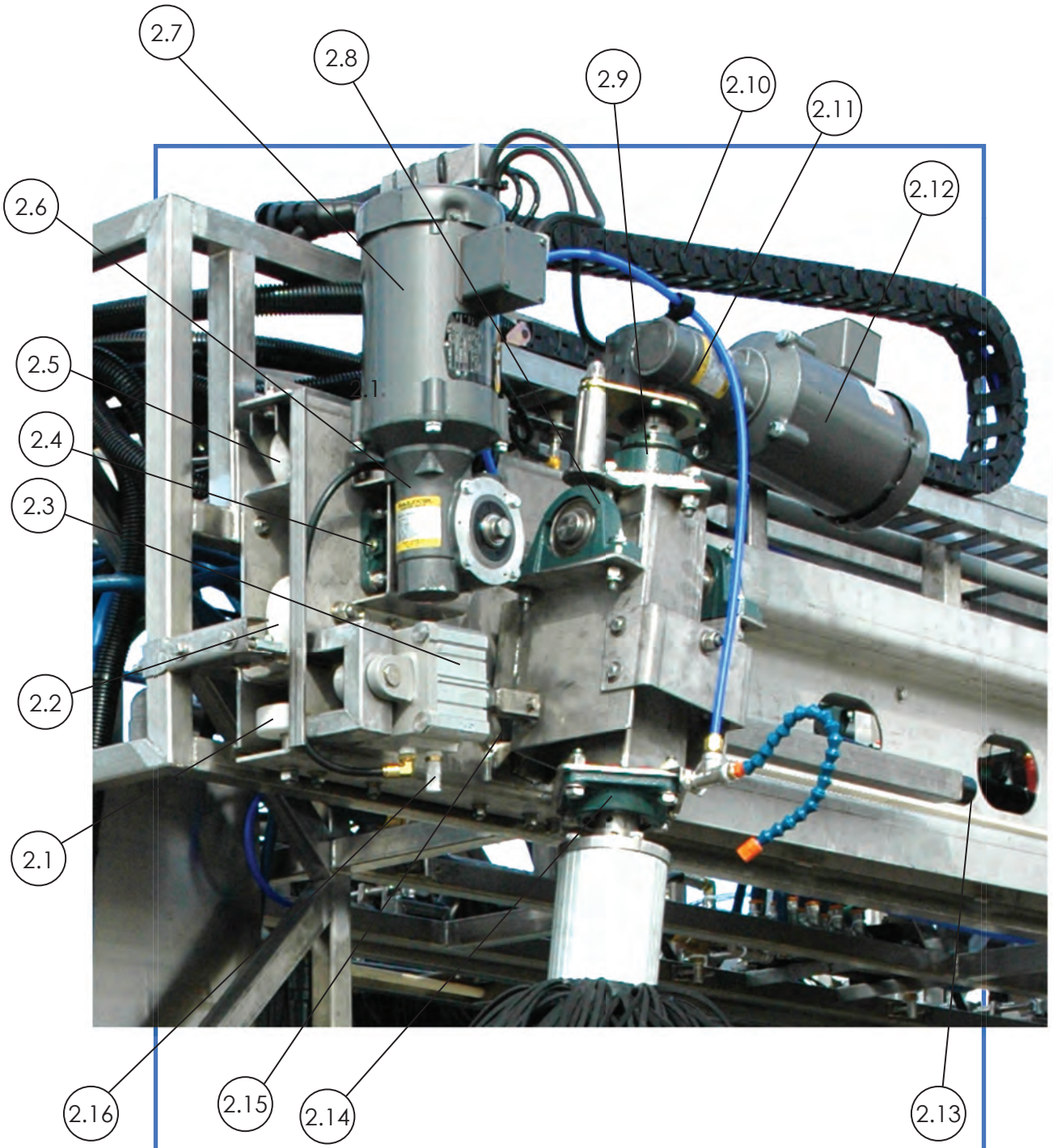
GANTRY EXIT - WITHOUT SKINS



SIDE BRUSH CARRIAGE - RIGHT

GANTRY – SIDE BRUSH CARRIAGE – RIGHT SIDE

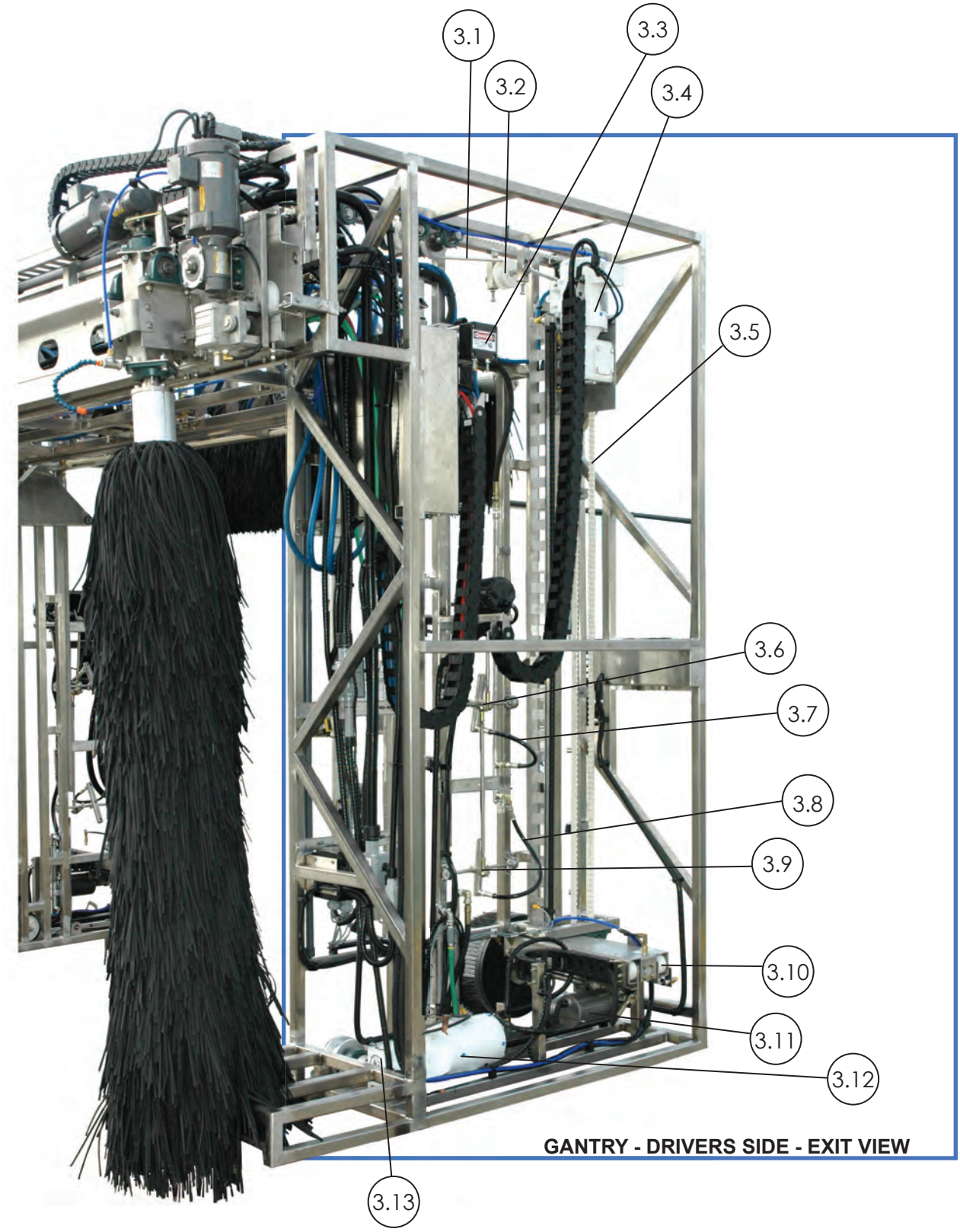
ID#	PART#	DESCRIPTION
1.1	07513	Bearing, Flange 1.5” 4 Bolt
1.2	07514	Bearing, Flange Roller 1.5”
1.3	06851	Pillow Block-Vps-120
1.4	55001	Gear Motor, 10:1 Washdown Hs
1.5	55001	Gear Motor, 10:1 Washdown Hs
1.6	07511	Bearing, Flange 1” 4 Bolt
1.7	MS-AC52	Belt Idler Pulley
1.8	07501	Air Cyl, 100Mm Bore X 25Mm Strncq2D10025Dxc6
1.9	07502	Muffler, Pneumatic



SIDE BRUSH CARRIAGE - LEFT

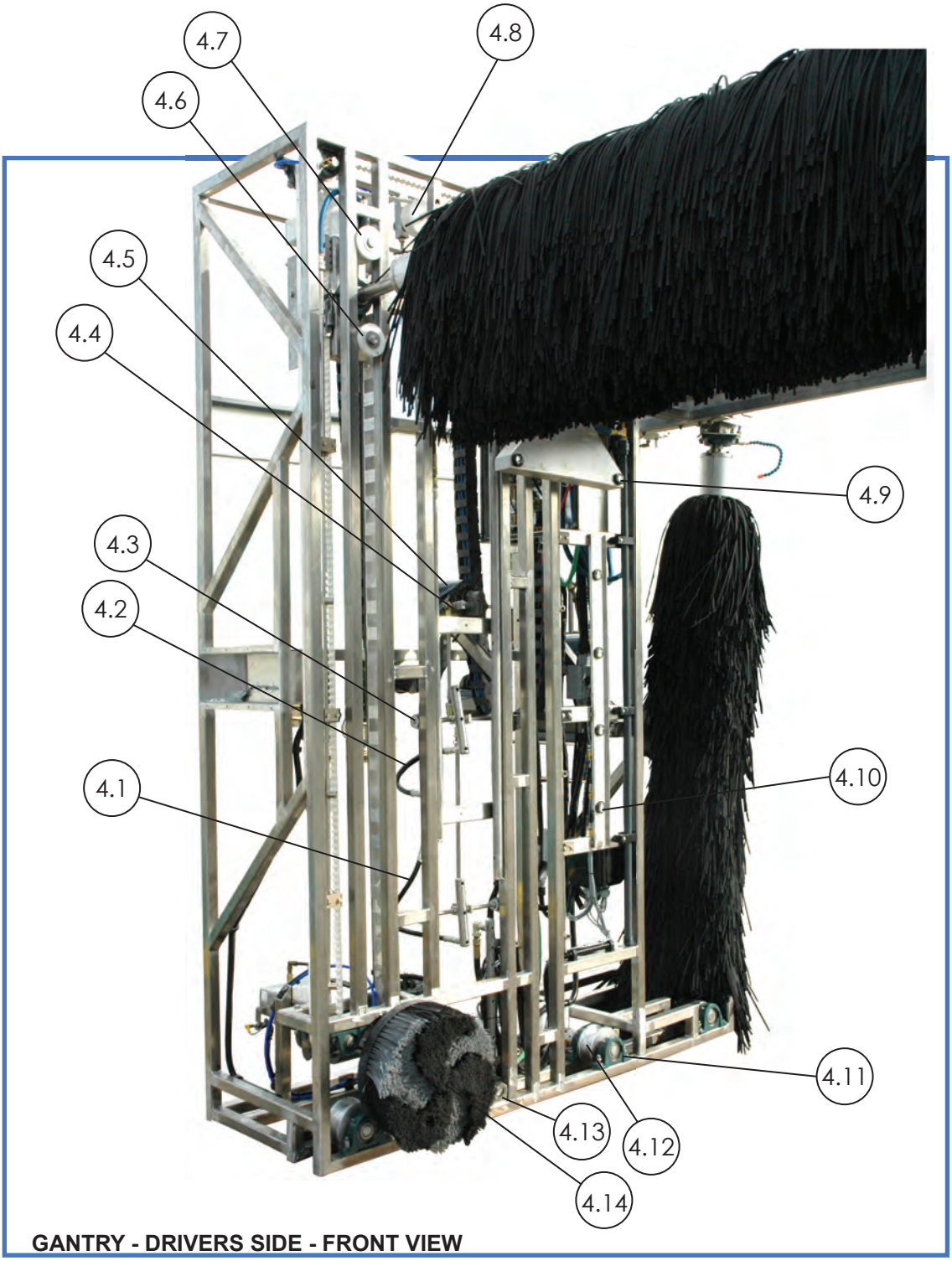
GANTRY – SIDE BRUSH – CARRIAGE – LEFT SIDE

ID#	PART#	DESCRIPTION
2.1	MS - AC51	Side Brush Carriage Rollers
2.2	MS - AC52	Belt Idler Pulley
2.3	07501	Air Cyl, 100Mm Bore X 25Mm
2.4	07511	Bearing, Flange 1” 4 Bolt
2.5	MS - AC51	Side Brush Carriage Rollers
2.6	55001	Gear Motor, 10:1 Washdown Hs
2.7	55001	Gear Motor, 10:1 Washdown Hs
2.8	06851	Pillow Block-Vps-120
2.9	07514	Bearing, Flange Roller 1.5”
2.10	07515	Cable Carrier, 2.25”X1.03”X8’
2.11	55001	Gear Motor, 10:1 Washdown Hs
2.12	55001	Gear Motor, 10:1 Washdown Hs
2.13	07528	Rubber Stopper
2.14	07513	Bearing, Flange 1.5” 4 Bolt
2.15	07528	Rubber Stopper
2.16	07502	Muffler, Pneumatic


3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
3.10
3.11
3.12
3.13
GANTRY - DRIVERS SIDE - EXIT VIEW

GANTRY – DRIVERS SIDE

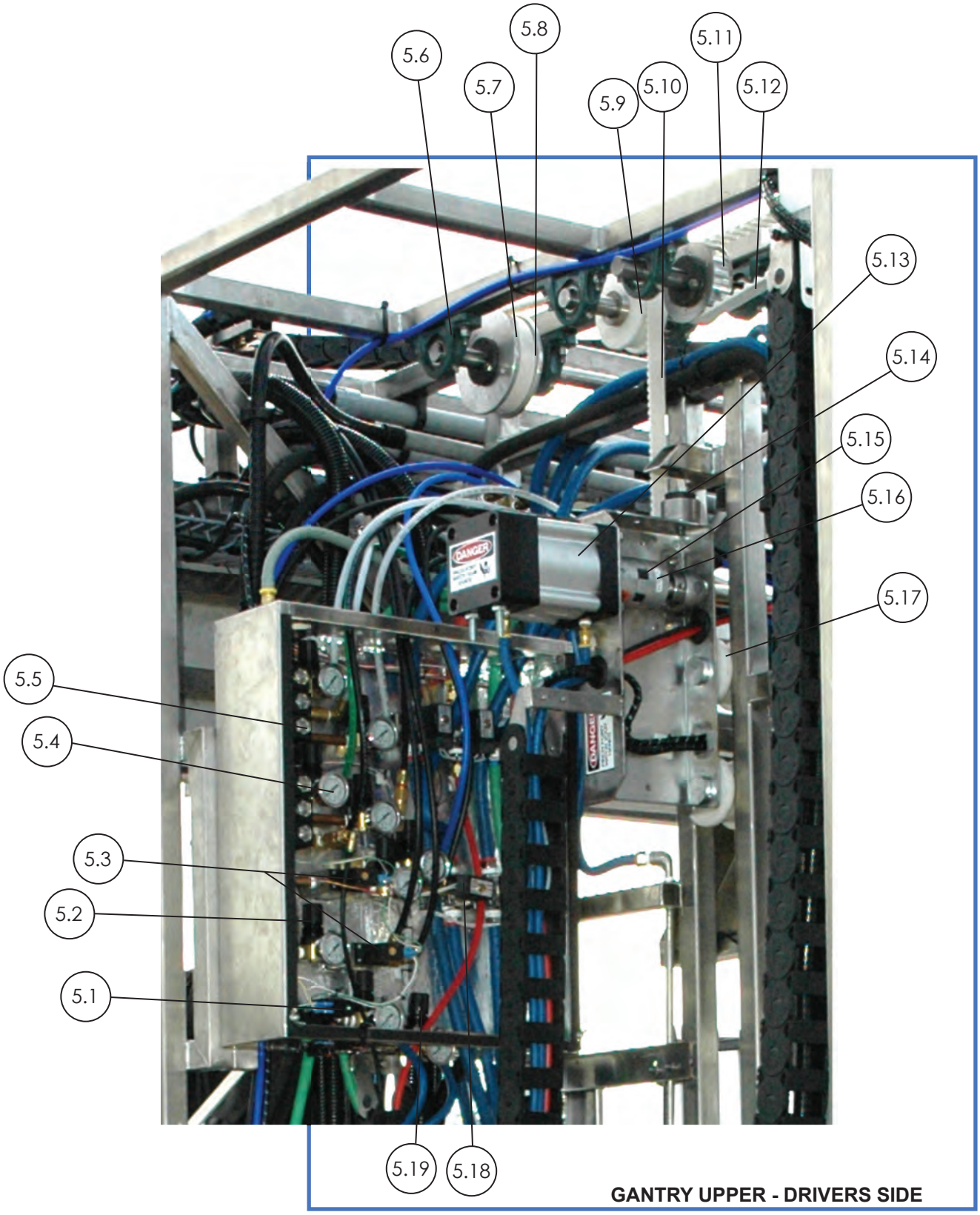
ID#	PART#	DESCRIPTION
3.1	18013	Belt, Timing Ss Endless
3.2	MS–AC52	Belt Idler Pulley
3.3	06857	Rotary Actuator
3.4	55230-2	.5Hp, 3/60, Inv Dty, Washdown
3.5	18012	Belt, Timing Kevlar 50,000Mm
3.6	06838	Rod End-7/16”
3.7	22-00006	Hose, 3/8” Plastic X 19”, 3/8
3.8	22-00007	Hose, 3/8” Plastic X 24”
3.9	06838	Rod End-7/16”
3.10	MS–AC54	Wheel Brush Side Rollers
3.11	55000	Gear Motor, 1/3Hp 30:1 1” Hs
3.12	55230-2	.5Hp, 3/60, Inv Dty, Washdown
3.13	55225-1	Gear Box Lf-918, 30:1 Washdown



GANTRY - DRIVERS SIDE - FRONT VIEW

GANTRY – DRIVERS SIDE – FRONT VIEW

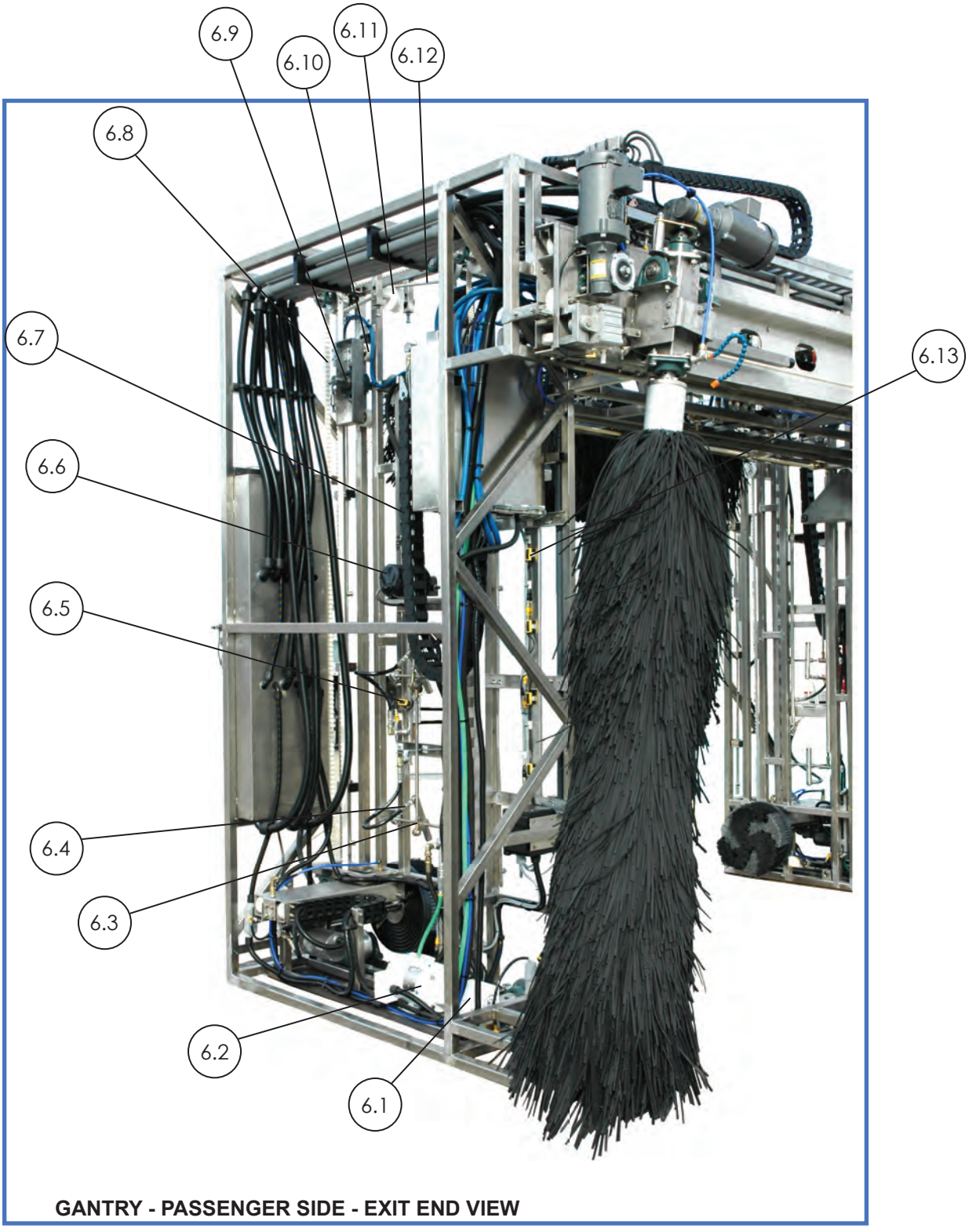
ID#	PART#	DESCRIPTION
4.1	22-00007	Hose, 3/8” Plastic X 24”
4.2	22-00006	Hose, 3/8” Plastic X 19”
4.3	06647	Pillow Block Bearing - 1/2”
4.4	06838	Rod End-7/16”
4.5	55236-1	.13 Oscillating Motor W/Gearbx
4.6	MS-AC56	Guide Roller Halves
4.7	MS-AC56	Guide Roller Halves
4.8	MS-AC52	Belt Idler Pulley
4.9	06712	Emitter, 8-Channel
4.10	06712	Emitter, 8-Channel
4.11	06851	Pillow Block-Vps-120
4.12	06500-W	Wheel, Drive
4.13	06712	Emitter, 8-Channel
4.14	07519	Wheel Brush, Silver/Black



GANTRY UPPER - DRIVERS SIDE

GANTRY UPPER – DRIVERS SIDE

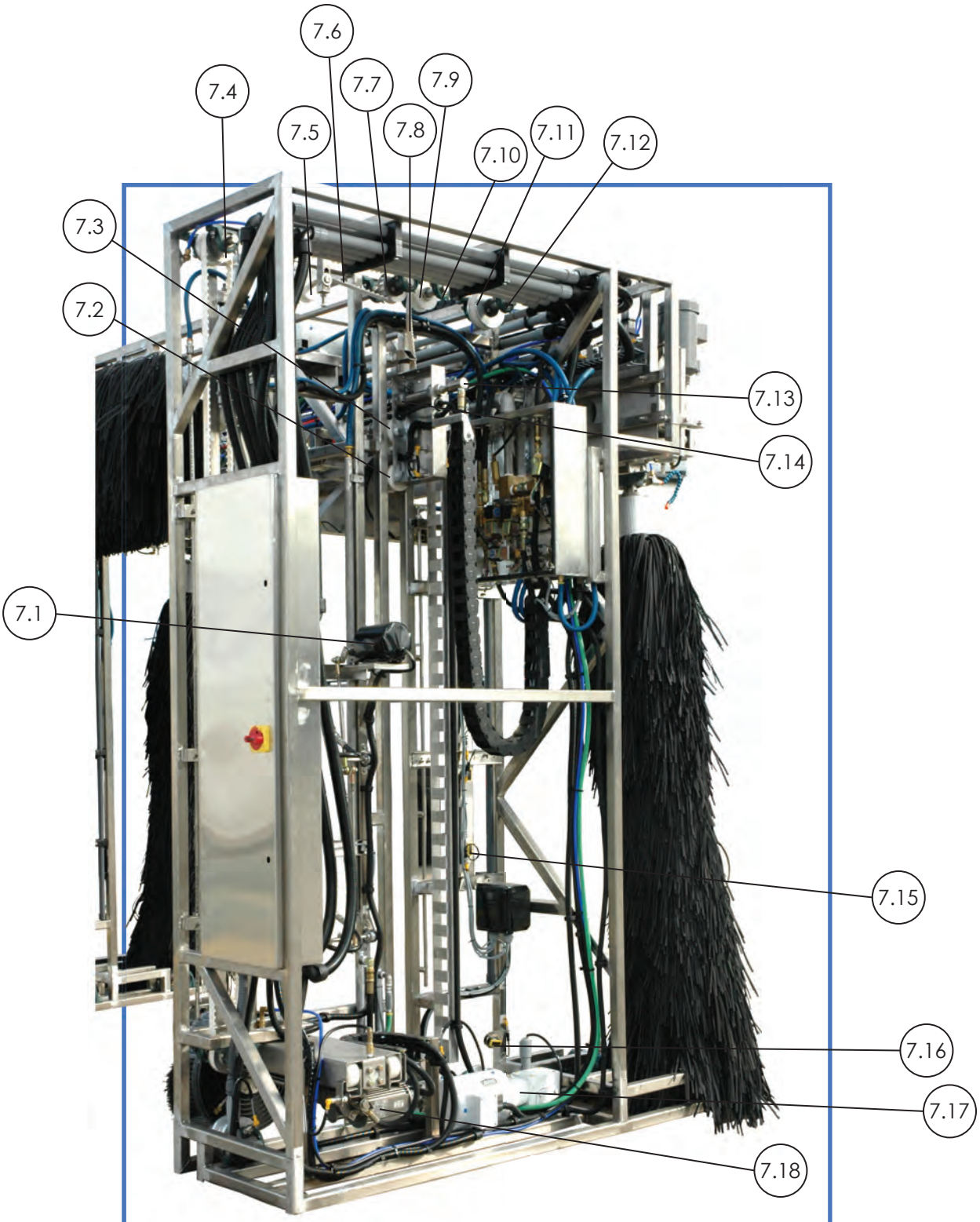
ID#	PART#	DESCRIPTION
5.1	64075-1	Solenoid, Air Auto Dbl Act
5.2	58055	Regulator, Watts 1/4”
5.3	64000	Solenoid, Air 24Vac Coil
5.4	47027	Gauge-Wika 0-100Psi-Automatic
5.5	64021	43211N206-21 3Stage 1/4
5.6	06850	Pillow Blocks-Vps-116
5.7	06605	Pulley, Boom, Alum
5.8	06852	Belt-25At10/50,000-Mk92
5.9	MS-AC53	Belt Idler Pully
5.10	06852	Belt-25At10/50,000-Mk92
5.11	18009	Pulley, Cog 25Mm X 94Mm
5.12	18013	Belt, Timing Ss Endless
5.13	06857	Rotary Actuator
5.14	20053	Boom Stopper-Black Rubber
5.15	06803	Spider 1X406 Black
5.16	06800	Love Joy 1” Coupling
5.17	MS-AC56	Guide Roller Halves
5.18	06520	Solenoid Valve, 1/2”, 24Vac
5.19	58056	Regulator, 3/8 Hi-Flow Mini



GANTRY - PASSENGER SIDE - EXIT END VIEW

GANTRY – PASSENGER SIDE – EXIT END VIEW

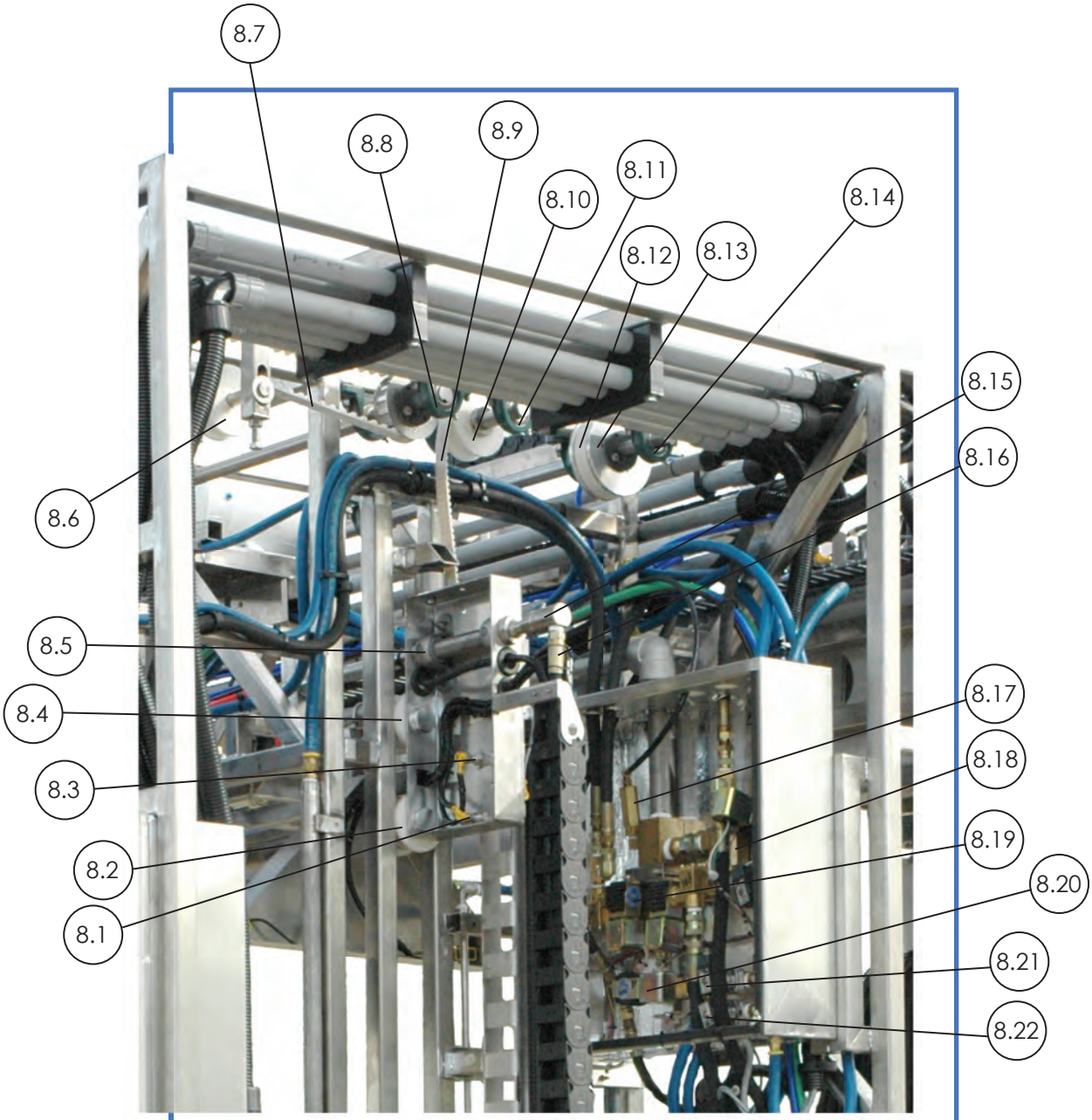
ID#	PART#	DESCRIPTION
6.1	55225-1	Gear Box Lf-918, 30:1 Washdown
6.2	55230-2	.5Hp, 3/60, Inv Dty, Washdown
6.3	06838	Rod End-7/16”
6.4	22-00007	Hose, 3/8” Plastic X 24”
6.5	06711	Reciever, 8-Channel
6.6	55236-1	.13 Oscillating Motor W/Gearbx
6.7	06767	Nylatrac, 2” X 6’
6.8	18012	Belt, Timing Kevlar 50,000Mm
6.9	07512	Bearing, Flange 1.5” 2 Bolt
6.10	MS-AC55	Top Brush Rollers
6.11	MS-AC52	Belt Idler Pulley
6.12	18013	Belt, Timing Ss Endless
6.13	06711	Reciever, 8-Channel



GANTRY - PASSENGER SIDE - FRONT VIEW

GANTRY – PASSENGER SIDE – FRONT VIEW

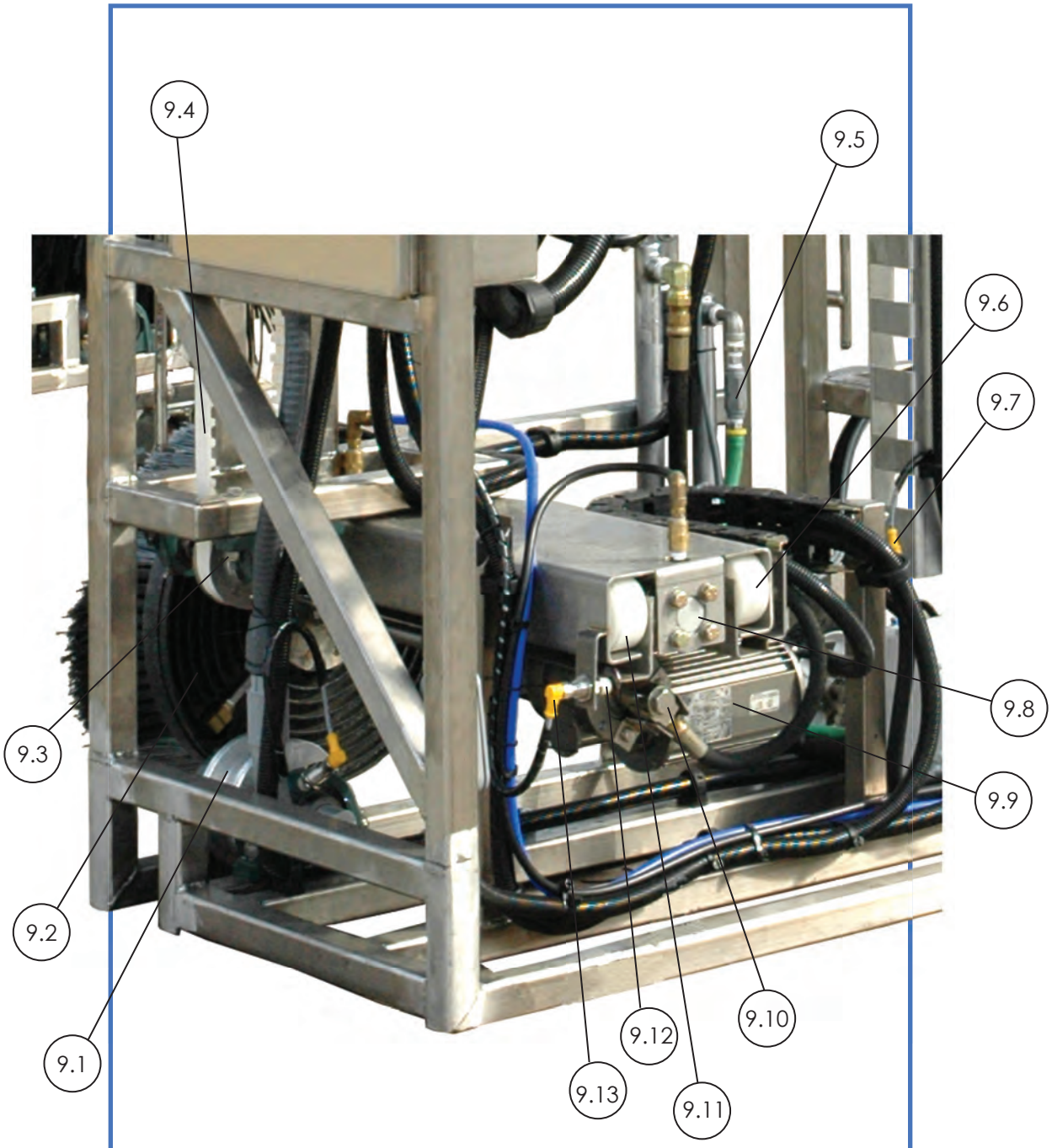
ID#	PART#	DESCRIPTION
7.1	55236-1	.13 Oscillating Motor W/Gearbx
7.2	MS-AC56	Roller Guide Halves
7.3	MS-AC56	Roller Guide Halves
7.4	18010	Pulley, Cog 50Mm X 94Mm
7.5	MS-AC52	Belt Idler Pulley
7.6	18013	Belt, Timing Ss Endless
7.7	18009	Pulley, Cog 25Mm X 94Mm
7.8	06852	Belt-25At10/50,000-Mk92
7.9	MS-AC53	Belt Idler Pulley
7.10	06850	Pillow Blocks-Vps-116
7.11	06605	Pulley, Boom, Alum Am002
7.12	06850	Pillow Blocks-Vps-116
7.13	74005	Swivel-1/2” X 90 Deg
7.14	06645-1	1-1/8” Poly-Hi Bearing
7.15	06711	Reciever, 8-Channel
7.16	06711	Reciever, 8-Channel
7.17	55225-1	Gear Box Lf-918, 30:1 Washdown
7.18	55000	Gear Motor, 1/3Hp 30:1 1” Hs



GANTRY UPPER - PASSENGER SIDE

GANTRY UPPER – PASSENGER SIDE

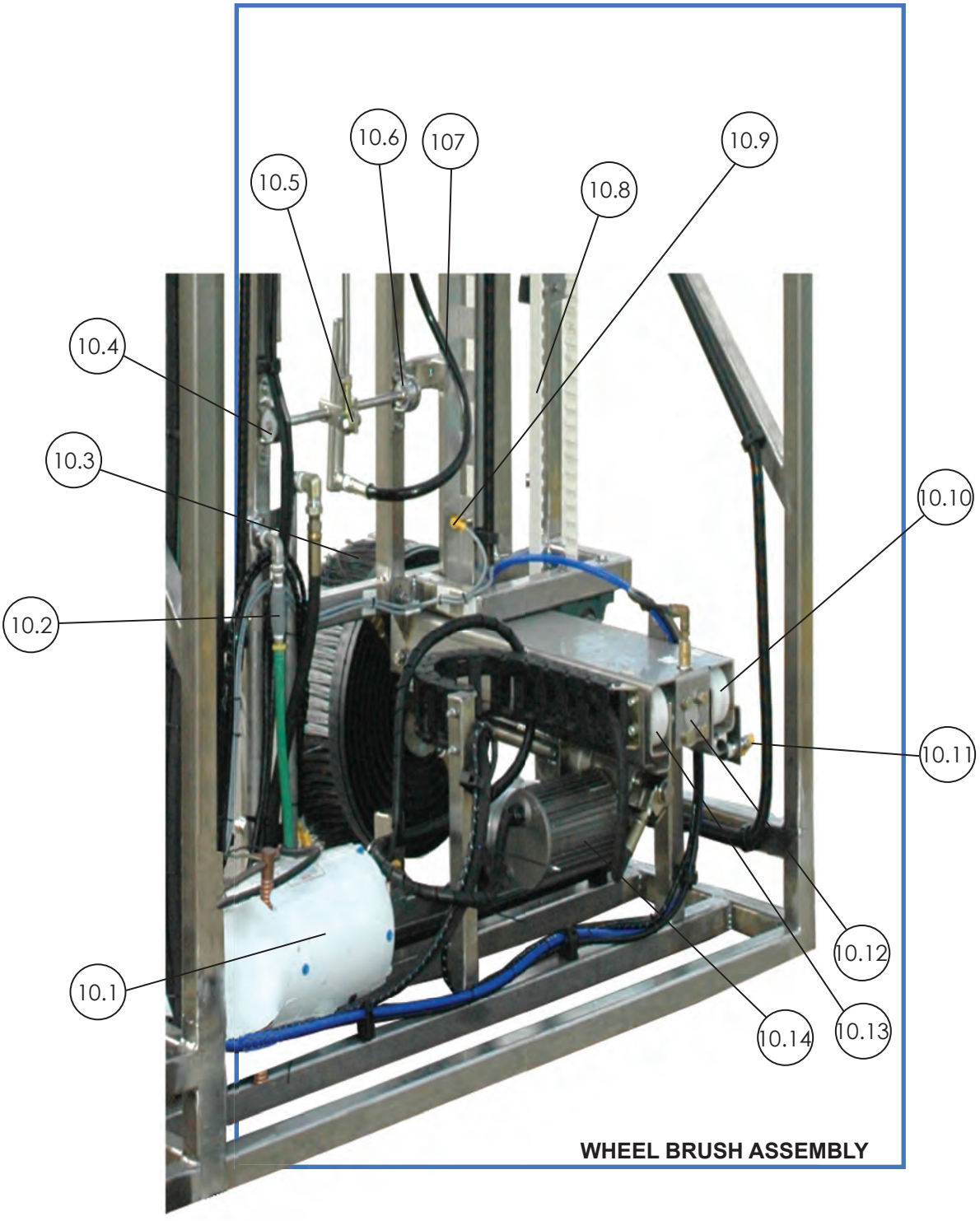
ID#	PART#	DESCRIPTION
8.1	06626	Truck Prox Dc 18Mm
8.2	MS-AC56	Guide Roller Halves
8.3	06626	Truck Prox Dc 18Mm
8.4	MS-AC56	Guide Roller Halves
8.5	06645-1	1-1/8” Poly-Hi Bearing
8.6	MS-AC52	Belt Idler Pulley
8.7	18013	Belt, Timing Ss Endless
8.8	06850	Pillow Blocks-Vps-116
8.9	06852	Belt-25At10/50,000-Mk92
8.10	MS-AC53	Belt Idler Pulley
8.11	06850	Pillow Blocks-Vps-116
8.12	06852	Belt-25At10/50,000-Mk92
8.13	06605	Pulley, Boom, Alum Am002
8.14	06850	Pillow Blocks-Vps-116
8.15	74005	Swivel-1/2” X 90 Deg
8.16	52820	Hose, 1/2” W/B X 87”,1/2M-1/2M
8.17	34000	Check Valve, Brass Super-1/4”
8.18	31040	Dema Valve-458P 24V 1”
8.19	31030	Dema Valve-454P 24V 1/2”
8.20	31030	Dema Valve-454P 24V 1/2”
8.21	06520	Solenoid Valve, 1/2”, 24Vac
8.22	06520	Solenoid Valve, 1/2”, 24Vac



WHEEL BRUSH ASSEMBLY

GANTRY – WHEEL BRUSH ASSEMBLY

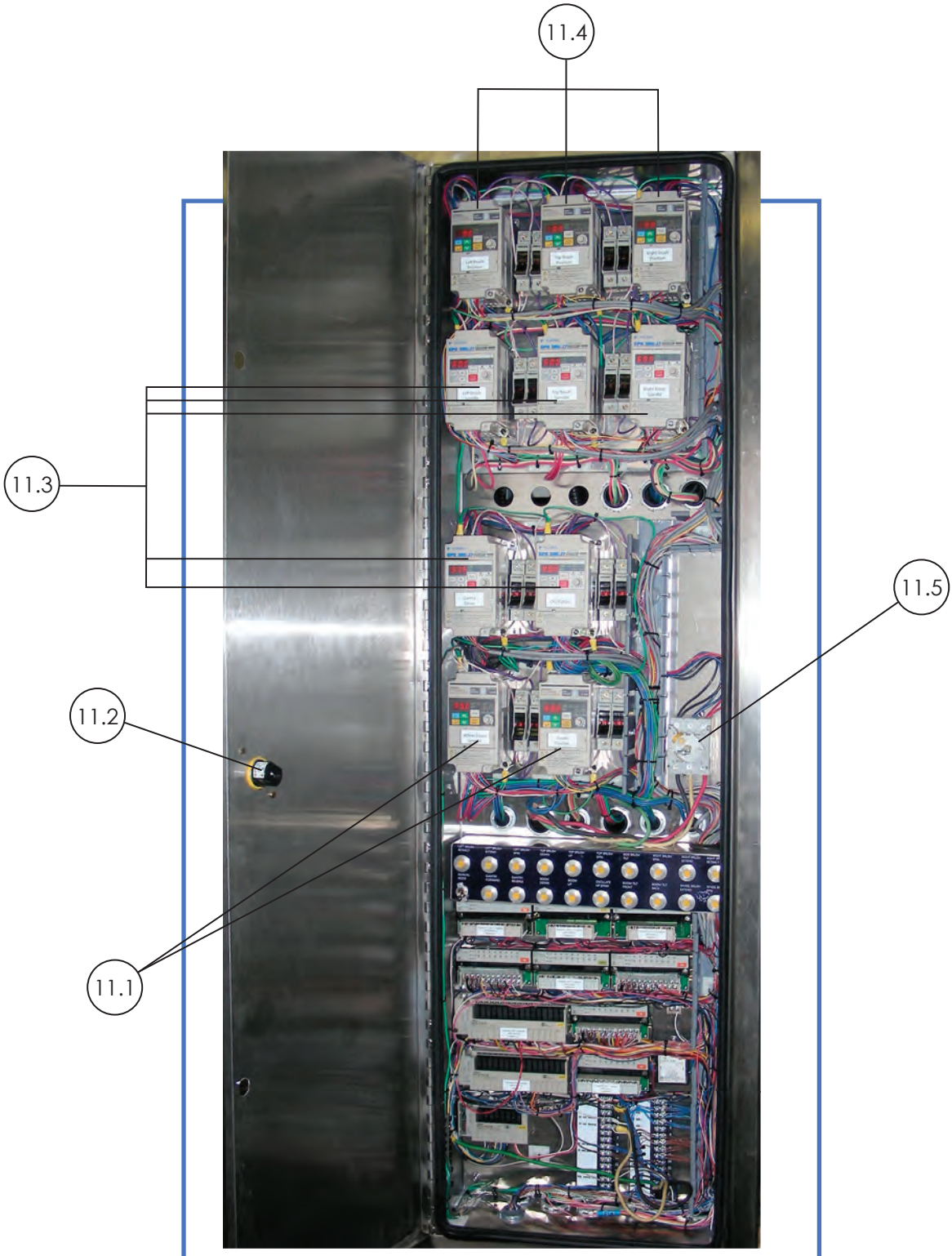
ID#	PART#	DESCRIPTION
9.1	06500-W	Wheel, Drive
9.2	07519	Wheel Brush, Silver/Black
9.3	18009	Pulley, Cog 25Mm X 94Mm
9.4	18012	Belt, Timing Kevlar 50,000Mm
9.5	34025	Check Valve-Poly 1/4”
9.6	MS-AC54	Slide Rollers
9.7	06650-4	Cable Prox Rt Angle 4Mtr 90Deg
9.8	07504	Air Cyl, 2.5” Bore X 18”
9.9	55000	Gear Motor, 1/3Hp 30:1 1” Hs
9.10	74000	Swivel, 3/8” Hp M X F
9.11	MS-AC54	Slide Rollers
9.12	06626	Turck Prox Dc 18Mm
9.13	06650-12	Cable, Prox 15 Meter 90 Deg



WHEEL BRUSH ASSEMBLY

GANTRY – WHEEL BRUSH ASSEMBLY

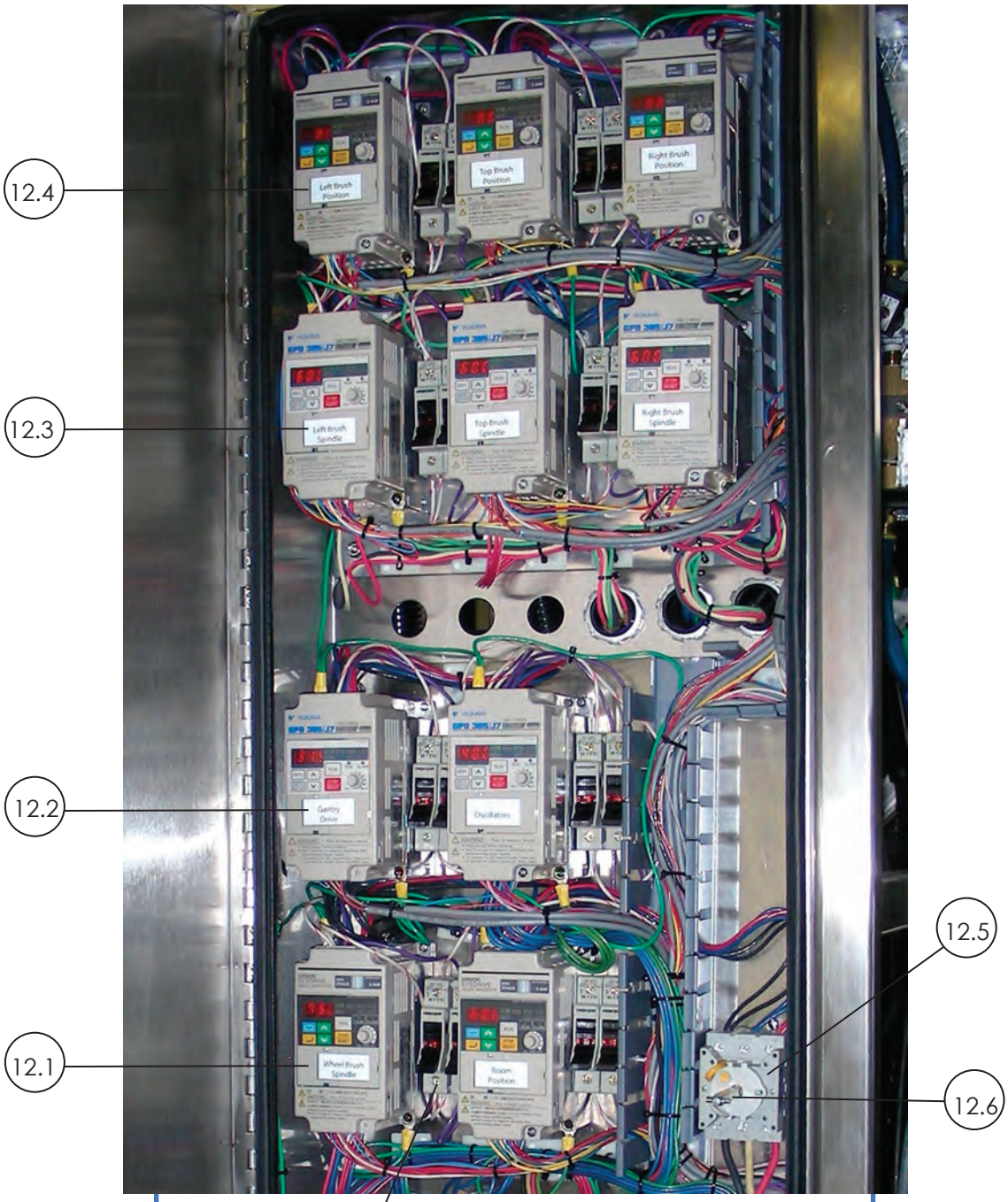
ID#	PART#	DESCRIPTION
10.1	55230-2	.5Hp, 3/60, Inv Dty, Washdown
10.2	34025	Check Valve-Poly 1/4”
10.3	07519	Wheel Brush, Black/Silver
10.4	06647	Pillow Block Bearing - 1/2”
10.5	06838	Rod End-7/16”
10.6	06647	Pillow Block Bearing - 1/2”
10.7	22-00007	Hose, 3/8” Plastic X 24”
10.8	18012	Belt, Timing Kevlar 50,000Mm
10.9	06650-12	Cable, Prox 15 Meter 90 Deg
10.10	MS-AC54	Side Rollers
10.11	06650-4	Cable, Prox Rt. Angle 4Mtr 90Deg
10.12	07504	Air Cyl, 2.5” Bore X 18”
10.13	MS-AC54	Side Rollers
10.14	55000	Gear Motor, 1/3Hp 30:1 1” Hs



GANTRY ELECTRICAL PANEL

GANTRY – ELECTRICAL PANEL

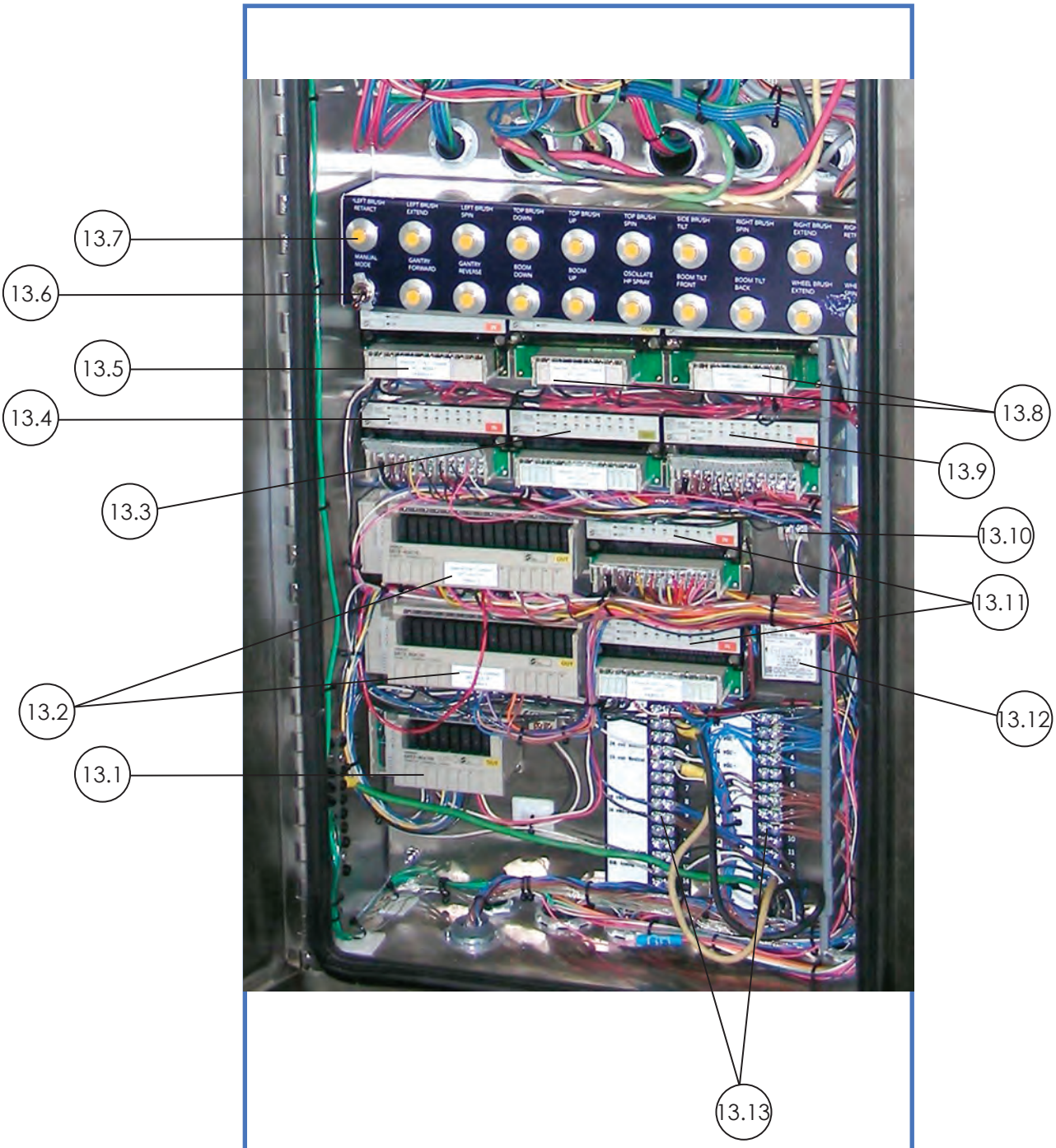
ID#	PART#	DESCRIPTION
11.1	06971	Drive, 3/4Hp/230V/3Ph/50-60Hz
11.2	06997	Switch Handle Assy-Yellow/Red
11.3	06973	Drive, 1Hp/230V/5A/3Ph/50-60Hz
11.4	06971	Drive, 3/4Hp/230V/3Ph/50-60Hz
11.5	06995	63 Amp Disconnect Base Mount



GANTRY ELECTRICAL PANEL - UPPER

GANTRY ELECTRICAL PANEL - UPPER

ID#	PART#	DESCRIPTION
12.1	06971	Drive, 3/4Hp/230V/3Ph/50-60Hz
12.2	06973	Drive, 1Hp/230V/5A/3Ph/50-60Hz
12.3	06973	Drive, 1Hp/230V/5A/3Ph/50-60Hz
12.4	06971	Drive, 3/4Hp/230V/3Ph/50-60Hz
12.5	06995	63 Amp Disconnect Base Mount
12.6	06919	Bracket, Shaft Extension
12.7	40112-30 40032-6	Terminal Block, DI10/17.5Sf Fuse, Midget, 600V



GANTRY ELECTRICAL PANEL - LOWER

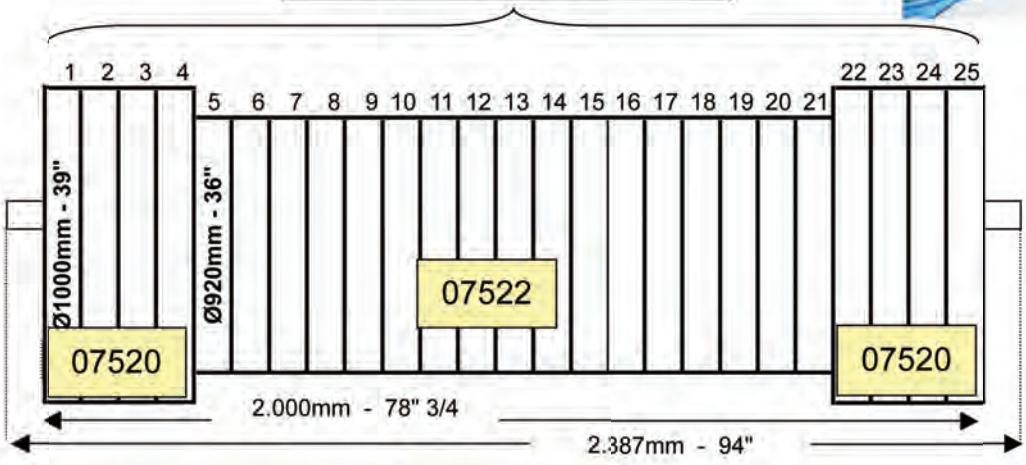
GANTRY ELECTRICAL PANEL - LOWER

ID#	PART#	DESCRIPTION
13.1	06935	Relay Output Card-Srt1 Roc08
13.2	06940	Relay Output Card-Ww Srt2Roc16
13.3	07526	Transistor Output Card
13.4	06920	Input Card-Ww Srt2-Id16
13.5	07524	Analog Input Card
13.6	40069	Switch, Spst (On-Off) 15A/120
13.7	72026	Pushbutton, Yellow
13.8	07525	Analog Output Card
13.9	06920	Input Card-Ww Srt2-Id16
13.10	06950	Resistor,Termination-Ww Drs1-Tdrs1-T
13.11	06920	Input Card-Ww Srt2-Id16
13.12	06785	Filter-3Vk3
13.13	40010-2	Terminal Strip, 15 Pt

sparkleSOFT

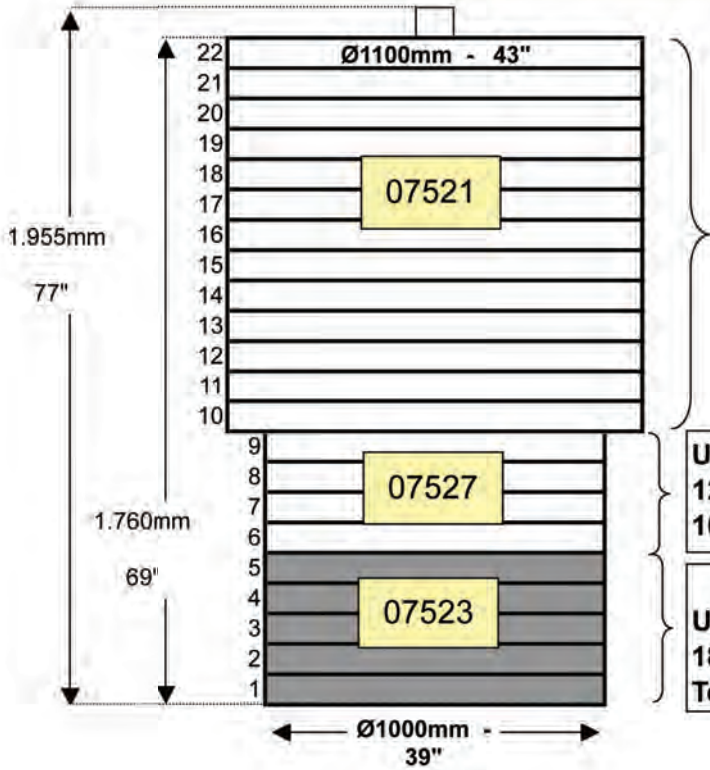
TOP BRUSH WITH 25 UNICA SECTIONS

Unica K121 - 18 ways 50%

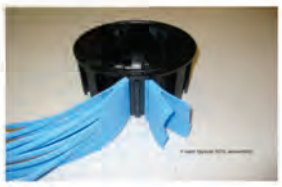


SIDE BRUSH WITH 22 UNICA SECTIONS

*JCC Part Numbers



Unica K121
18 ways 50%



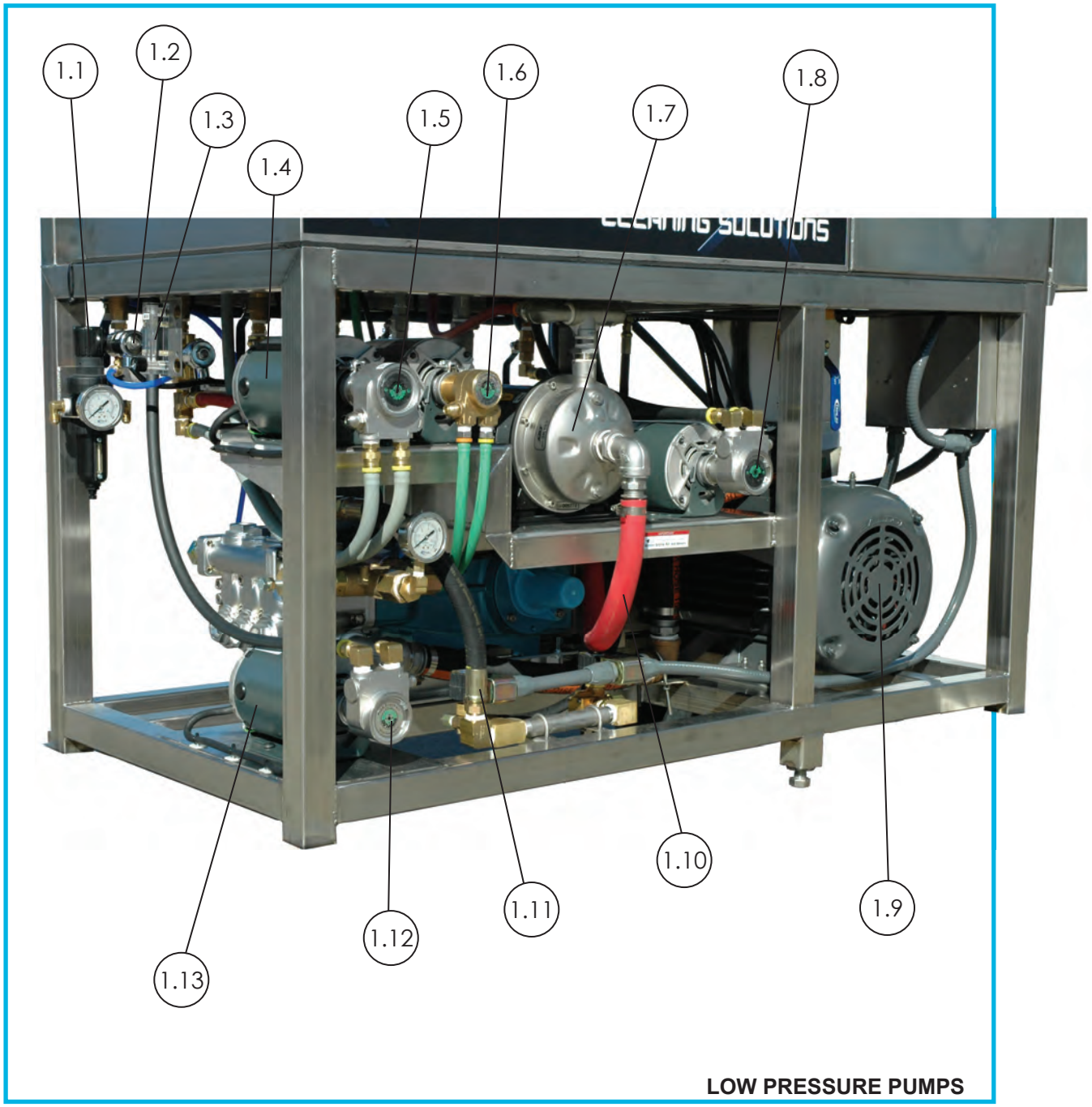
Unica K121
12 ways
100%

MIX
Unica K121
18 ways
Textile+Foam

pumpstand

FUSIONX PUMPSTAND WITH ECC

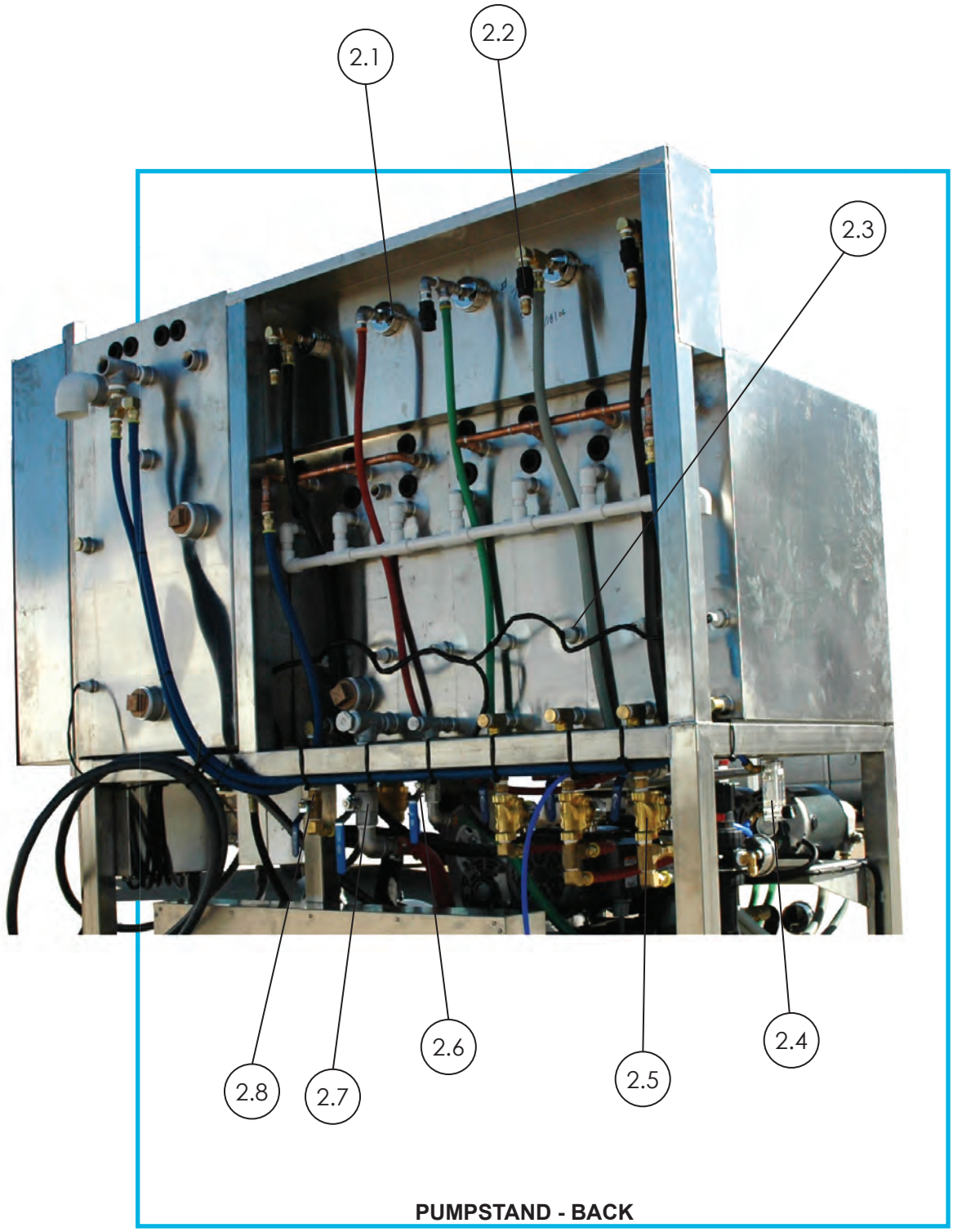
FUSIONX PUMPSTAND



LOW PRESSURE PUMPS

PUMP STAND – LOW PRESSURE PUMPS

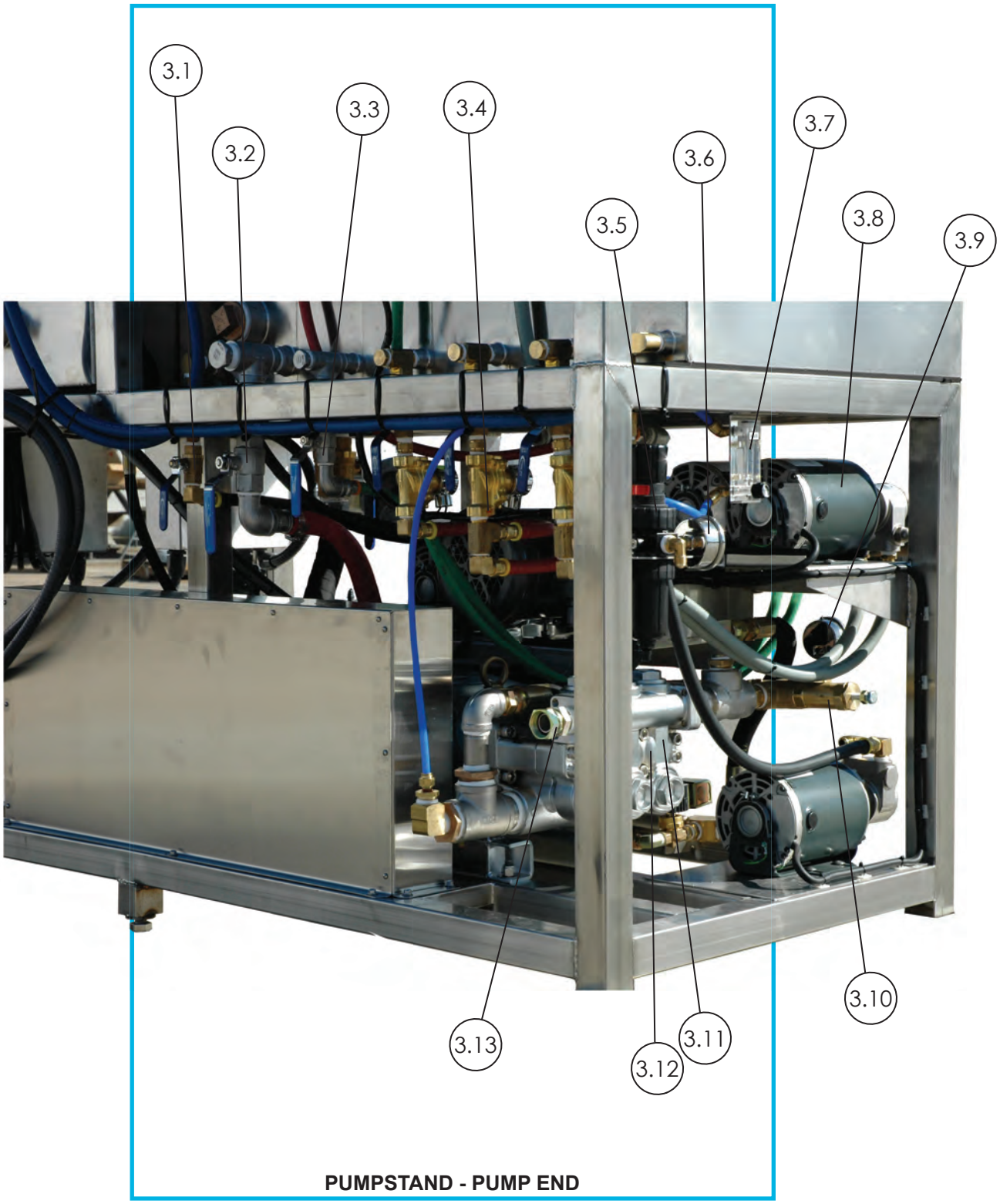
ID#	PART#	DESCRIPTION
1.1	58090-1	Regulator-1/2” Parker
1.2	64071	3Bd7 Sol Valve 0-150 1/4” Ss
1.3	47075	Flow Meter, 4-40 Gpm
1.4	55016	Motor, 1/2 Hp, 1Ph
1.5	57007	Pump, 240Gph, 1/2Hp, S.S.
1.6	57002	Pump, 100Gph, 1/3Hp, Brass
1.7	32-3k133mt3	Pump, 2Hp/3Ph
1.8	57007	Pump, 240Gph, 1/2Hp, S.S.
1.9	55267	Motor 25Hp 1760 3Ph
1.10	52022	Hose-1” Push-Lok-Red Air/Water
1.11	52186	3/4” Wire Braid Hose (Undercarriage inlet)
1.12	57007	Pump, 240Gph, 1/2Hp, S.S.
1.13	55016	Motor, 1/2 Hp, 1 Ph



PUMPSTAND - BACK

PUMPSTAND - BACK

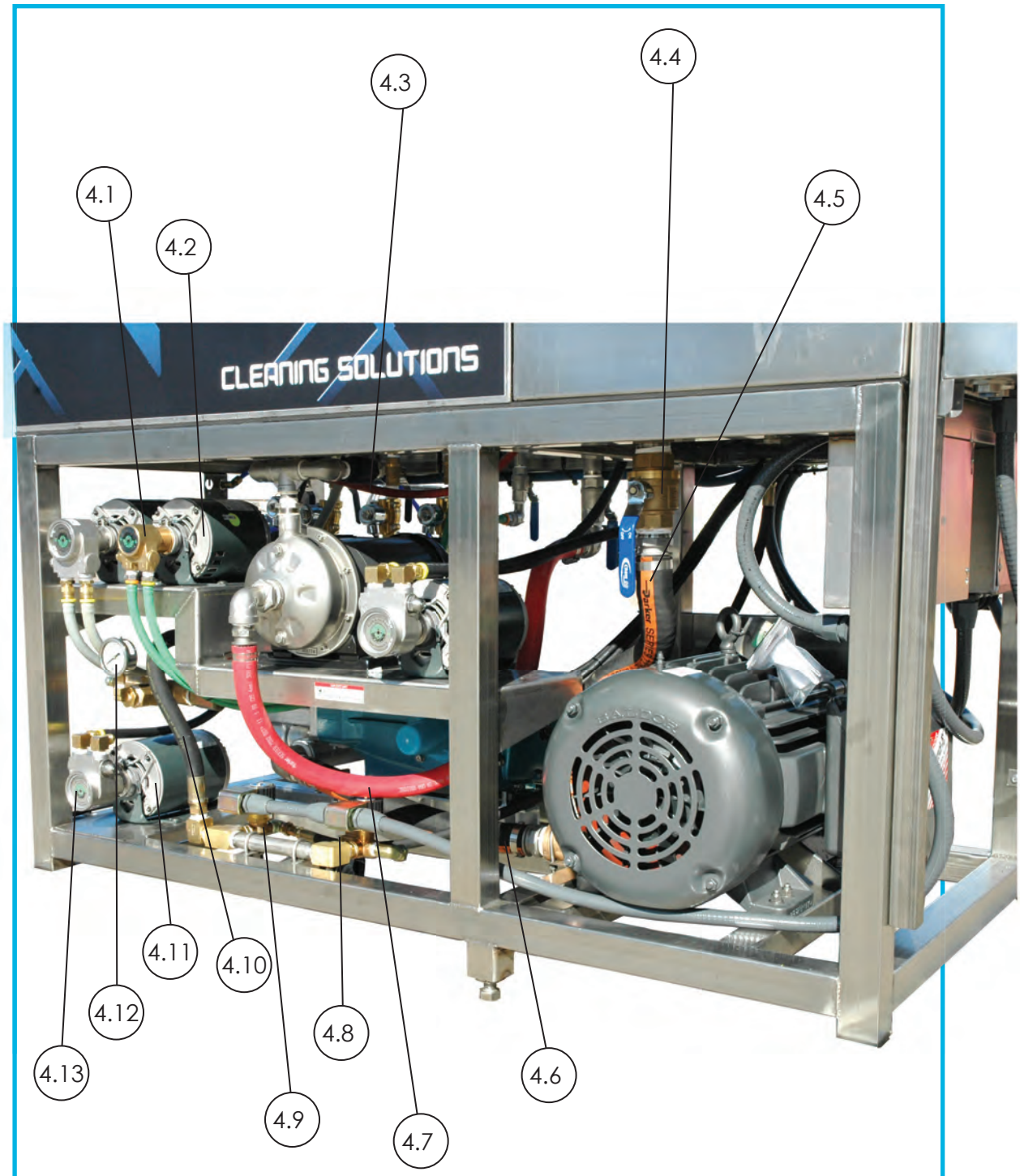
ID#	PART#	DESCRIPTION
2.1	47010	Gauge and Bracket-Pressure 0-300 Panel
2.2	34020	Check Valve, Poly 3/8”
2.3	72050	Switch-Level (Side Mount)
2.4	47075	Flow Meter, 4-40 Gpm
2.5	64070	Solenoid-1/2Npt N.C. 24V
2.6	22450	Valve, Ball-1/2”, 1000Psi
2.7	22101	Valve, Ball, 1”, Full Port
2.8	22-V500P-8	Ball Valve-1/2” Brass



PUMPSTAND - PUMP END

PUMPSTAND – PUMP END

ID#	PART#	DESCRIPTION
3.1	22-V500P-8	Ball Valve-1/2” Brass
3.2	22101	Valve, Ball, 1”, Full Port
3.3	22450	Valve, Ball-1/2”, 1000Psi
3.4	64070	Solenoid-1/2Npt N.C. 24V
3.5	58090-1	Regulator-1/2” Parker
3.6	47010	Gauge-Pressure 0-300 Panel Mt
3.7	47075	Flow Meter, 4-40 Gpm
3.8	55016	Motor, 1/2 Hp, 1 Ph
3.9	47011	Gauge-Pressure 0-300 Stem Mt
3.10	06760	Unloader-1”
3.11	32-3535	Cat 3535-35Pfr Pump 36Gpm
3.12	32-3535	Cat 3535-35Pfr Pump 36Gpm
3.13	22-0107-16-16	1”M To Female Pipe Swivel



PUMPSTAND - MOTOR END

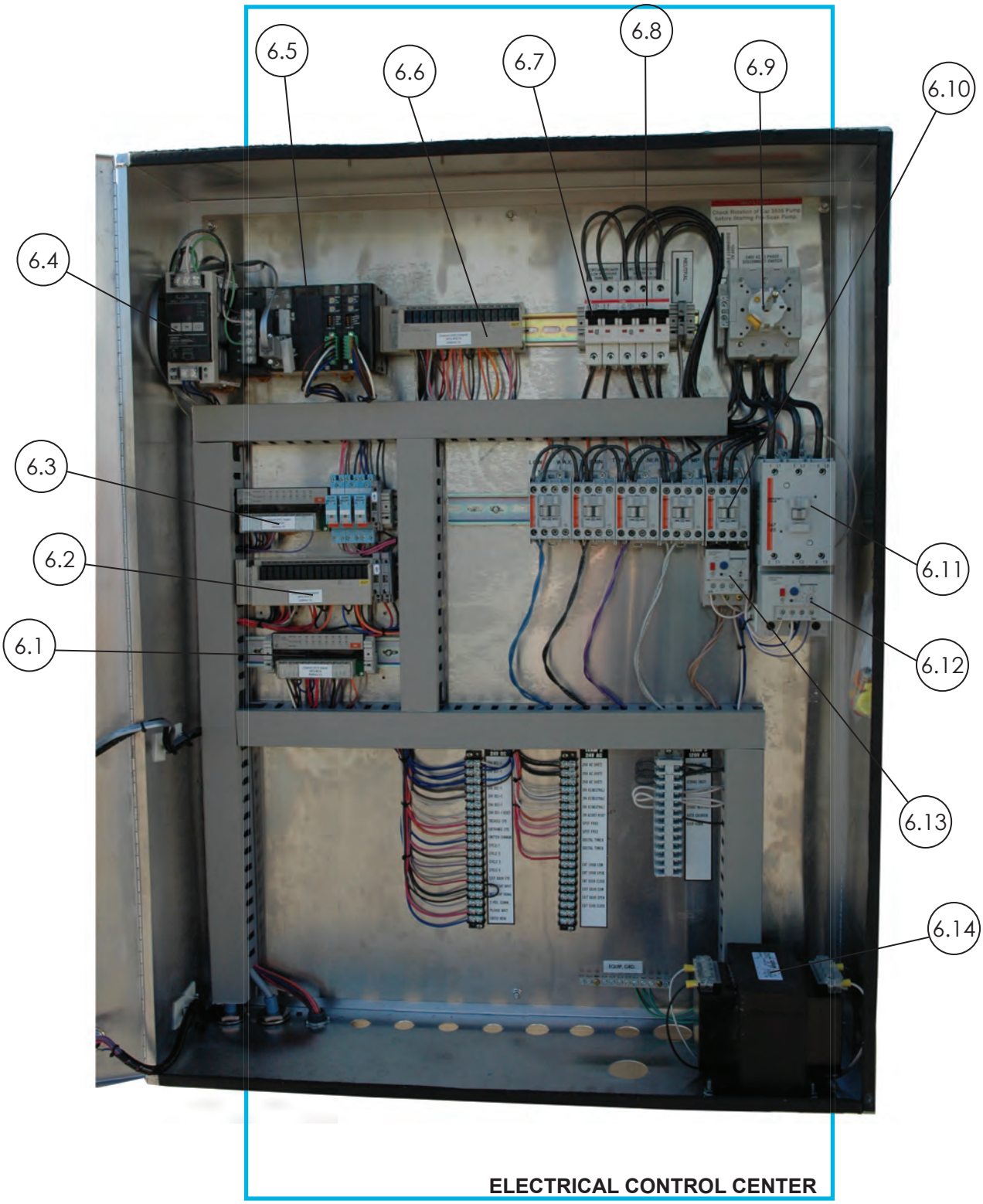
PUMPSTAND – MOTOR END

ID#	PART#	DESCRIPTION
4.1	57002	Pump, 100Gph, 1/3Hp, Brass
4.2	55013	Motor, 1/3 Hp, 1Ph
4.3	22-421-8	1/2” Wire Braid Hose Sae (52017)
4.4	22-V500P-24	Ball Valve-1-1/2”
4.5	52021	Hose, Suction, 1 1/2”
4.6	52021	Hose, Suction, 1 1/2”
4.7	22-801-16-R	Push Lock Hose-1”Red Air/Water
4.8	31030	Dema Valve-454P 24V 1/2”
4.9	31020	Dema Valve-453P 24V 3/8”
4.10	52816	Male Pipe Each End J 412 X 19”
4.11	55016	Motor, 1/2 Hp, 1 Ph
4.12	47020	Gauge-Pressure 0-2000Psi L/Mnt
4.13	57007	Pump, 240Gph, 1/2Hp, S.S.

CONTROL PANEL

PUMPSTAND – CONTROL PANEL

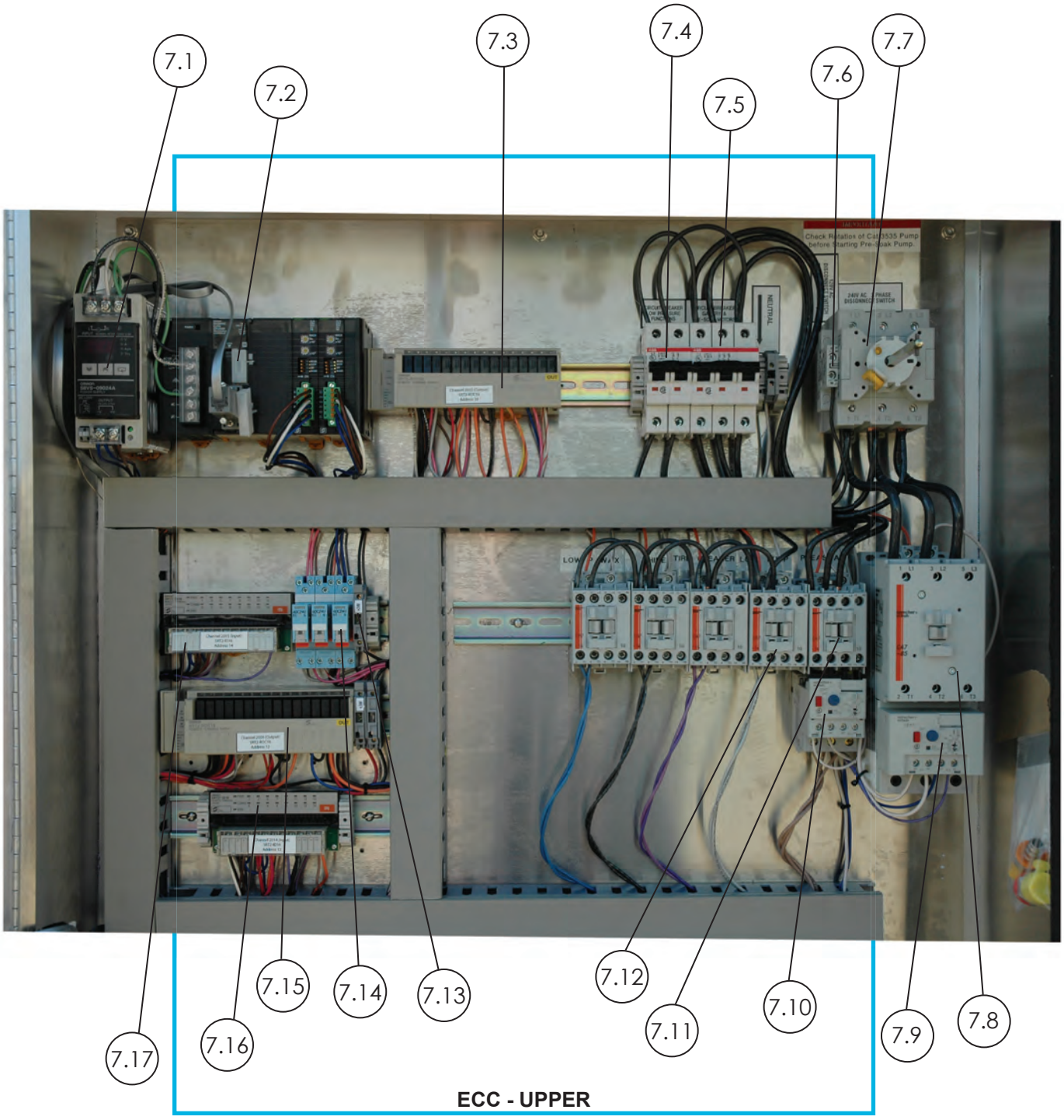
ID#	PART#	DESCRIPTION
5.1	72026	Pushbutton, Yellow
5.2	06681	Op. Interface, 128 X 64 - Red Lion
5.3	06997	Switch Handle Assy-Yellow/Red
5.4	24385	Cam Lock 2 Pos W/1Key,Nut,Wshr



ELECTRICAL CONTROL CENTER

PUMPSTAND – ELECTRICAL CONTROL CENTER

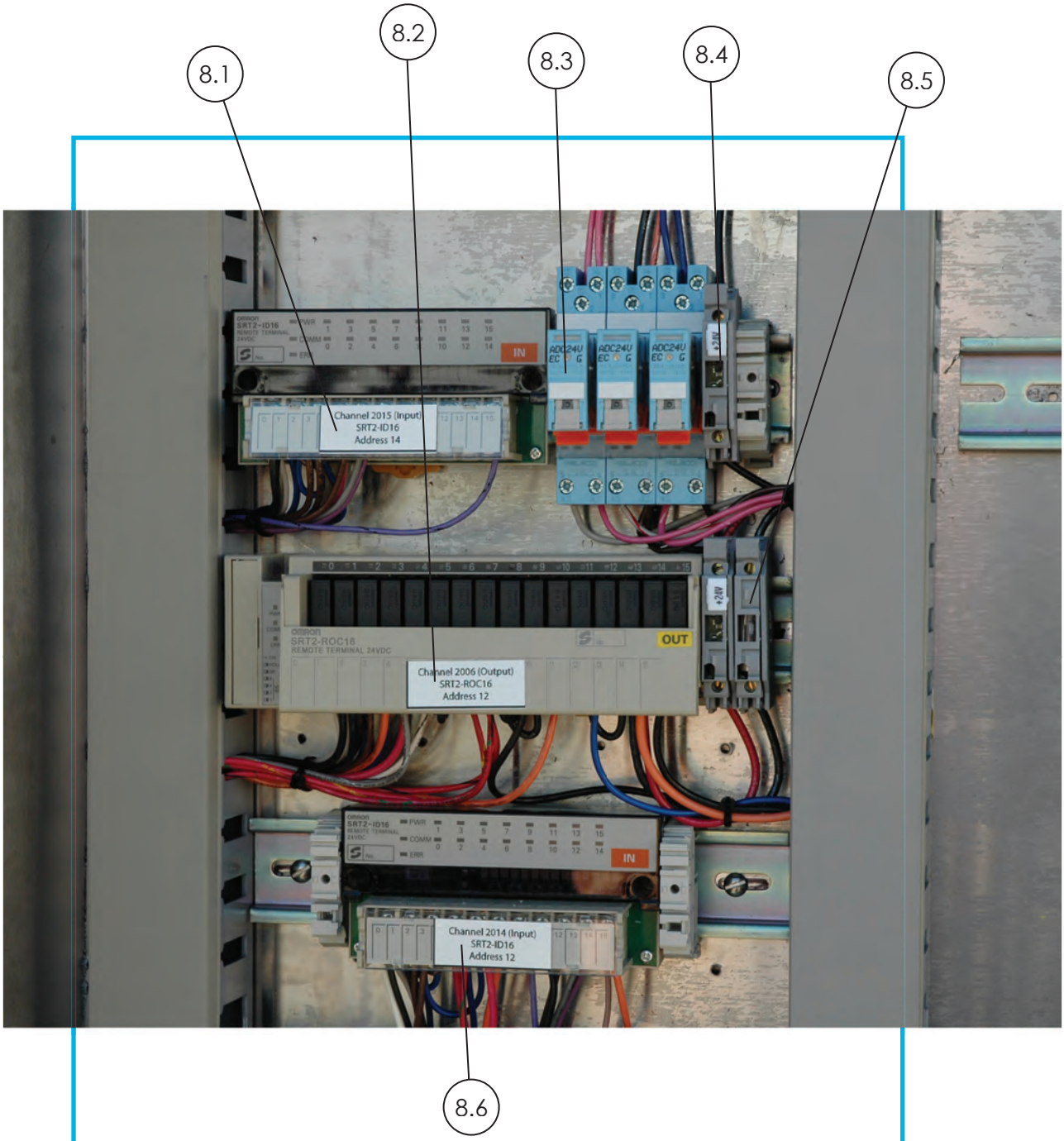
ID#	PART#	DESCRIPTION
6.1	06920	Input Card-Ww Srt2-Id16
6.2	06940	Relay Output Card-Ww Srt2Roc16
6.3	06920	Input Card-Ww Srt2-Id16
6.4	06960	DC Power Supply-Omron
6.5	07503	Cpu (Fusion)
6.6	06940	Relay Output Card-Ww Srt2Roc16
6.7	40074	2P 16A Breaker Ul489
6.8	40027	3P 20A Breaker Ul489
6.9	06919-1	Shaft, Eec Operator
6.10	60056	Contactor, 16Amp 4Pole Ss
6.11	60065	Contactor, 85 Amp, 4 Pole 120V
6.12	60066-1	Overload, 18 - 90Amp
6.13	60062-1	Overload, 3.2 - 16Amp
6.14	40190-5	Transformer 500Va 120/240-24V



ECC - UPPER

PUMPSTAND – ECC - UPPER

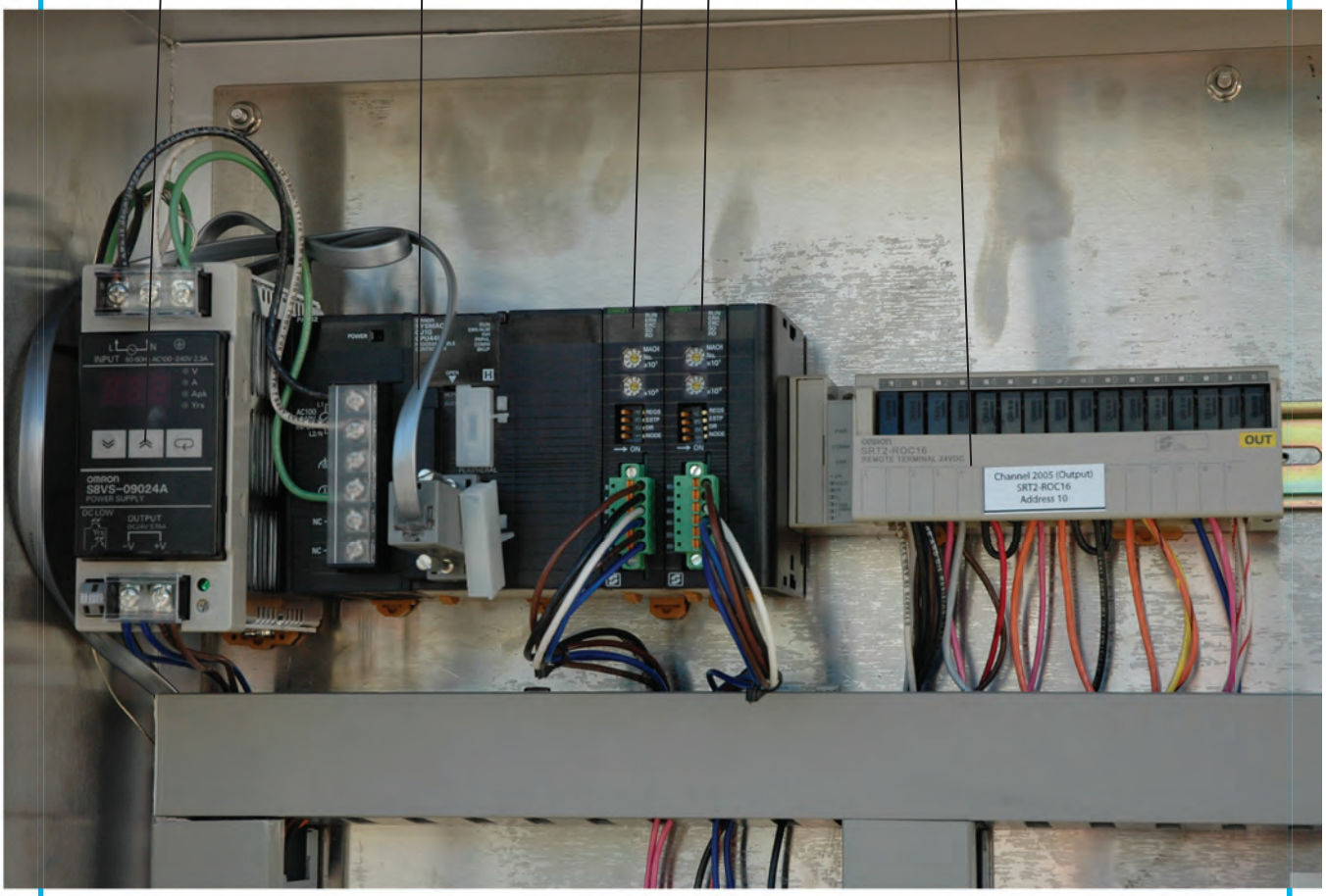
ID#	PART#	DESCRIPTION
7.1	06960	DC Power Supply-Omron
7.2	07503	Cpu (Fusion)
7.3	06940	Relay Output Card-Ww Srt2Roc16
7.4	40074	2P 16A Breaker Ul489
7.5	40027	3P 20A Breaker Ul489
7.6	06996	Aux Relay Contacts
7.7	06994	100 Amp Disconnect Base Mount
7.8	60065	Contactor, 85 Amp, 4 Pole 120V
7.9	60066-1	Overload, 18 - 90Amp
7.10	60062-1	Overload, 3.2 - 16Amp
7.11	60056	Contactor, 16Amp 4Pole Ss
7.12	60056	Contactor, 16Amp 4Pole Ss
7.13	40032-2	Fuse, Glass 10A 250V
7.14	06948	Relay, 24 Vadc-Ac/Dc Coil
7.15	06940	Relay Output Card-Ww Srt2Roc16
7.16	06920	Input Card-Ww Srt2-Id16
7.17	06920	Input Card-Ww Srt2-Id16


8.1
8.2
8.3
8.4
8.5
8.6
IN
Channel 2015 (Input)
SRT2-ID16
Address 14
OUT
Channel 2006 (Output)
SRT2-ROC16
Address 12
IN
Channel 2014 (Input)
SRT2-ID16
Address 12

ECC I/O CARDS

PUMPSTAND – ECC – I/O CARDS

ID#	PART#	DESCRIPTION
8.1	06920	Input Card-Ww Srt2-Id16
8.2	06940	Relay Output Card-Ww Srt2Roc16
8.3	06948	Relay, 24 Vadc-Ac/Dc Coil
8.4	40340-2 40032-2	Block, Terminal Fusehldr 24V 10 Amp Fuse
8.5	40340-1 40032-3	Block, Terminal Fusehldr 120V 3 Amp Fuse
8.6	06920	Input Card-Ww Srt2-Id16



ECC - CPU

PUMP STAND – ECC – CPU

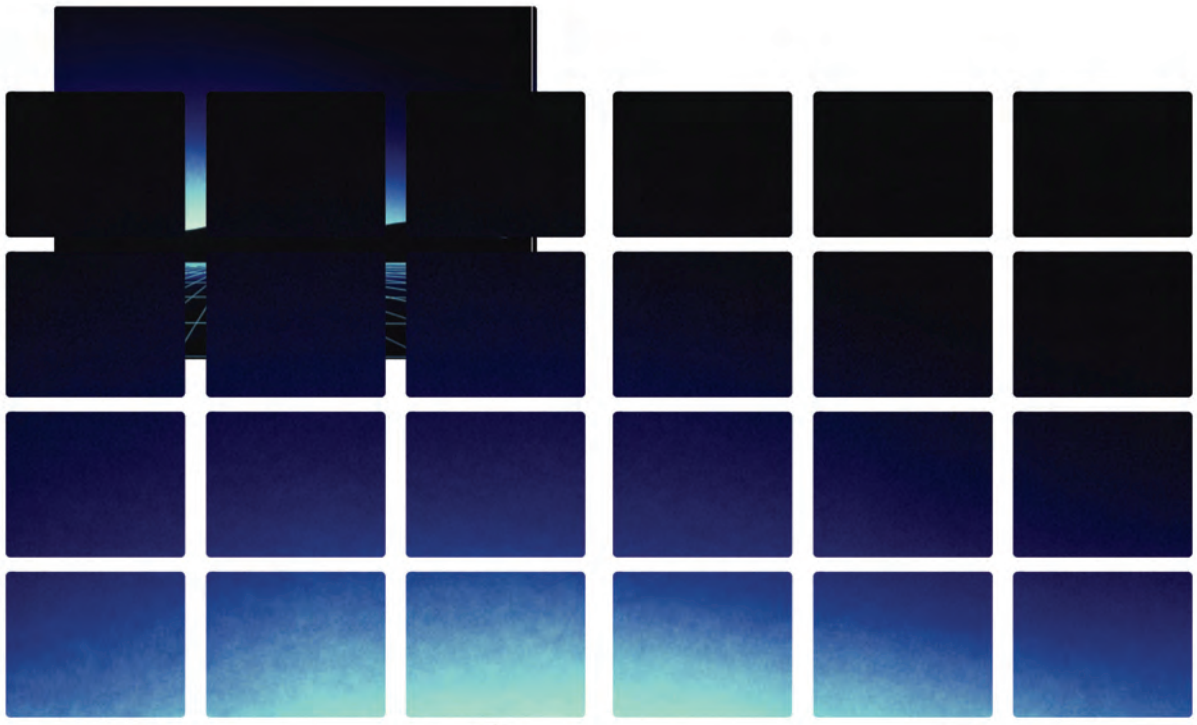
ID#	PART#	DESCRIPTION
9.1	06960	Power Supply-Omron
9.2	06508	Cable, Red Lion to Computer
9.3	06680-2	Cj1 - Compobus/S - Master
9.4	06680-2	Cj1 - Compobus/S - Master
9.5	06940	Relay Output Card-Ww Srt2Roc16

NOTES

For more infomation on all world class car wash
equipment and parts manufactured by
Jim Coleman Company
please contact us at:

1.800.999.9878
5842 W. 34th Street
Houston, Texas 77092
www.jcolemanco.com

Parts Department Direct Line:
1.866.927.4229
Fax: 713.590.6652



JIM COLEMAN COMPANY
HANNA

2007 PARTS MANUAL

THIS JIM COLEMAN COMPANY MANUAL INCLUDES PICTURES AND PART NUMBERS FOR THE FOLLOWING EQUIPMENT:

FUSION X

PARTS DEPARTMENT
1.866.927.4229
713.590.6652 FAX
WWW.JCOLEMANCO.COM

Chemicals

Table of Contents

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:

stock solution used per cycle = amount of cycle per minute
product used per cycle

Bladder Tank Usage Formula:

amount of stock solution used x 60 second = amount of cycle
time between cycles per minute

Standard Cost Formula:

price per box (drum) = cost per ml
ml per box (drum)

Cost Per Car/Cycle Formula:

cost per ml x ml used per cycle = cost per car

Rectangular Volume:

rectangular Volume = Length x Width x .00434 = Gal/Inch

Cylinder Volume:

cylinder Volume = Diameter x Diameter x .0034 = Gal/ Inch

CHEMICALS

Turtle Wax Chemical (Tip Chart)

Chemical	Turtle Wax #	Water Tip	Chemical Tip	Dilution
Presoak	HP 03/5; 16/5	N/A	Brown	75:1
Citrus Prep Presoak (Low pH)	HP 86/5	N/A	Yellow	90:1
*Clear Coat Protectant	HP 73/5; 19/5	N/A	Tan	47:1 In Tank
Poly Triple Shine	HP 20/5; 21/5; 22/5	Orange	Yellow	378:1
Tire Cleaner	HP 78/5	N/A	Tan	42:1
Optional Hot Wax	HP 73	None	Pink	345:1
Lemon Friction Detergent (Brush Lube)	HP 07	None	Purple	

* 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.

Single/Double Tip Dilution For Hydrominder Systems -ONLY-

HP 16/5 and HP 03/5 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

Double Tip Dilution For Hydrominder Systems -ONLY-

HP-20/21/22/5 POLY TRIPLE SHINE
Concentration Factor 8

Dilution	Usage/gal.	Water Tip	Chemical Tip
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

Dilution	Usage/gal.	Water Tip	Chemical Tip
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

Single Tip Dilution Hydrominder System -ONLY-

HP-78/5 Foaming Whitewall Cleaner
Concentration Factor 4.2

Dilution	Usage/gal.	Tip
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

Tip	Dilution
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.

Turtle Wax Technical Fact Sheets

TurtleWax® 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

TurtleWax® TECHNICAL FACT SHEET

{PRIVATE }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 repellant) 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^{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.

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

TurtleWax TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE NEW & IMPROVED TRIPLE SHINE RED (HP-20), BLUE (HP-21), & GOLD (HP-22).**{**PRIVATE **}**

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

TurtleWax TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Super Foaming Sealer Wax
(HP 73)**{**PRIVATE **}**

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

TurtleWax TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Foaming Whitewall Tire Cleaner (HP-78)**{**PRIVATE **}**

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

TurtleWax TECHNICAL FACT SHEET

NAME: FLEX-PAK HYPER-CONCENTRATE Acid Pre-Soak Frictionless Detergent (HP-86)**{**PRIVATE **}**

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

FJ 9/26/01

turtle wax, inc.

5655 West 73rd St.
Chicago, Illinois 60638-6211

Material Safety Data Sheets

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

CHEMICAL NAME (Synonyms)	CAS No.	PERCENT	PEL/TLV/TWA OSHA	PEL/TLV/TWA ACGIH	CARCINOGEN (OSHA,NPT,IARC)
Tetrasodium ethylene-diamine tetraacetate (Na_4EDTA)	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
Specific Gravity: 1.144
Solubility In Water: complete
Evaporation Rate: n/av
Coefficient of Oil/Water Distribution: n/av
Appearance and Odor: Dark Red Liquid. Odor: Slightly acrid

Melting Point: n/av
Vapor Pressure: n/av
Vapor Density (Air=1): n/av
% Non-volatile: 29.0%
pH: 13.0+

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: CO_2, CO, NO_x, SO_2, Hydrocarbons.

1-2816-64-8

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.

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 OSHA	PEL/TLV/TWA ACGIH	CARCINOGEN (OSHA,NPT,IARC)
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: 1.012
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^{o}F, (93^{o}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: Precautions: None
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: None Known
Hazardous Decomposition Product: CO_2, CO, NO_x, HCl, Hydrocarbons.

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.

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

CHEMICAL NAME (Synonyms)	CAS No.	PERCENT	PEL/TLV/TWA OSHA	PEL/TLV/TWA ACGIH	CARCINOGEN (OSHA,NPT,IARC)
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: 1.008 g/cc
Solubility In Water: Complete
Evaporation Rate: n/av
Coefficient of Oil/Water Distribution: n/av
Appearance and Odor: Dark Blue 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^{o}F, (93^{o}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: CO_2, CO, NO_x, HCl, Hydrocarbons.

1-2821-64-7

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.

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

CHEMICAL NAME (Synonyms)	CAS No.	PERCENT	PEL/TLV/TWA OSHA	PEL/TLV/TWA ACGIH	CARCINOGEN (OSHA,NPT,IARC)
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
Specific Gravity: 0.950
Solubility In Water: Complete
Evaporation Rate: n/av
Coefficient of Oil/Water Distribution: n/av
Appearance and Odor: Yellow Liquid. Odor: Citrus

Melting Point: n/av
Vapor Pressure: n/av
Vapor Density (Air=1) n/av
% Non-volatile: 36%
pH: 7.5

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: CO_2, CO, NO_x, HCl, Hydrocarbons.

1-2873-64-6

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.

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

CHEMICAL NAME (Synonyms)	CAS No.	PERCENT	PEL/TLV/TWA OSHA	PEL/TLV/TWA ACGIH	CARCINOGEN (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
Melting Point: n/av
Vapor Pressure: n/av
Vapor Density (Air=1): n/av
% Non-volatile: 25%
pH: 1.0
Appearance and Odor: Dark Orange Water Thin Liquid. Odor: Typical 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, 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: Precautions: None
Hazardous Polymerization Occurs: Does Not Occur: X
Incompatibility: Strong alkalis cause heat and possible spattering.
Hazardous Decomposition Product: If burned: CO_2, 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.

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 OSHA	PEL/TLV/TWA ACGIH	CARCINOGEN (OSHA,NPT,IARC)
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^{o}F, (93^{o}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: CO_2, CO, NO_x, HCl, Hydrocarbons.

1-2822-64-7.
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.

LIMITED WARRANTY

The Manufacturer warrants any component or part of the Coleman Hanna Car Wash Systems LLC 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. Coleman Hanna Car Wash Systems LLC does not warrant loss of income should there be any during such time repairs are being made. Coleman Hanna Car Wash Systems LLC 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.