



Instruction Manual



AquaJet XT[®]

Automatic TouchFree Rollover

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Table of Contents

Table of Contents	i
List of Figures	iv
1. Introduction	1
1.01. Using This Manual	1
Icons	2
Instructions and Lists	2
1.02. Common terms	3
Orientation	3
2. Safety Guidelines	5
SAFETY INSTRUCTIONS	1
3. System Components	7
3.01. Basic Components	7
Control	7
Gantry	8
Support Devices	8
3.02. Mechanical Components	9
3.02.1. Frame	9
3.02.2. Drive System	10
3.02.3. HubScrub	14
3.02.4. Contour Dryer	16
3.02.5. AquaDri [®] On-board Dryers	20
3.02.6. Free-standing Dryer	24
3.02.7. High Pressure Top Boom	26
3.02.8. LCD Sign	29
3.02.9. LCD System Operation and Service	30
3.02.10. Skins, Cladding Elements, Signage, Display	42
3.03. Pneumatic System	44
3.03.1. Description	44
3.03.2. Pneumatic Components	45
3.04. Fluid System	47
3.04.1. Low Pressure Water/Chemical Distribution	47
3.04.2. High Pressure System	54

3.05.	Electrical	61
3.05.1.	Main Electrical Enclosure	61
3.05.2.	Mechanical Side Junction Box	63
3.05.3.	Operating unit (CP0)	64
3.05.4.	Equipment in Wash bay and Equipment room	65
4.	Equipment Set-up and Commission	69
4.01.	Commissioning	69
4.02.	Dismantling	72
4.03.	Disposal	72
5.	Wash Operation	73
5.01.	Safety instructions	73
5.02.	Preparation	75
5.03.	Procedures for Emergency Stops and Malfunctions	76
6.	Settings and Adjustments	77
6.01.	Adjusting Compressed Air	77
	Main incoming air pressure	77
	Low pressure chemical systems:	77
6.02.	Bleeding the Suction Line at the Dosing Pumps	78
6.03.	Adjusting Dosing Pump	78
6.04.	Reading and Setting the Water Flow Pressure for the Low Pressure Chemical Manifold	79
6.05.	Setting Air Pressure for TriFoam Generation	81
7.	Maintenance and Care	82
7.01.	Safety Instructions	82
7.02.	Care	83
7.02.1.	Lime-scale removal	84
7.02.2.	Cleaning of the system	84
7.02.3.	Cleaning of the floor	85
7.02.4.	Cleaning of Plexiglas	86
7.02.5.	Cleaning of the ABS Panels	87
7.02.6.	Special treatment	88
7.03.	Maintenance	89
7.03.1.	Immediate Maintenance	89
7.03.2.	Weekly maintenance	89
7.03.3.	Monthly maintenance	90

7.03.4.	Annual Maintenance	92
	Maintenance – Feeds	93
	Maintenance – Door control	94
8.	Operating Unit	95
8.01.	Operating terminal CP0	96
8.02.	Startup of the terminal	98
8.03.	Start of wash programs	98
8.04.	Manual operation with control buttons	99
	Wash mode	99
	Control mode	99
8.05.	Service programs	102
	Access and Termination	102
	Modification of values/parameters	103
	Service program menus	105
	Menu 00> Wash counter	105
	Menu 03 Machine Settings	109
9.	Auxiliary Equipment	119
9.01.	Coin boxes	119
9.02.	Door control	120
10.	Technical Data	123
10.01.	Dimensions	123
10.02.	Weight	127
10.03.	Technical Data	128
	Recommended Bay Size	129
	Recommended Track Length	129
11.	Appendix	130
11.01.	Mechanical Schematics	131
11.02.	Warranty	146

List of Figures

Figure 1.02-01, Gantry Orientation	3
Figure 3.01-01, Component Diagram.....	7
Figure 3.02.1-01, Frame	9
Figure 3.02.2-01, Drive Systems.....	10
Figure 3.02.2-02, Drive Wheel Assembly.....	12
Figure 3.02.2-03, Idler Wheel Assembly and Pulse Counter	12
Figure 3.02.3-01, AquaJet XT HubScrub	14
Figure 3.02.3-02, HubScrub Components	14
Figure 3.02.3-03, HubScrub Brushes Rotation	15
Figure 3.02.4-01, Contouring Dryer	16
Figure 3.02.4-02, Contour Dryer Lifting Mechanism	18
Figure 3.02.4-03, Fan Rotation	19
Figure 3.02.5-01, AquaDri® E-20i On Board Dryer.....	20
Figure 3.02.5-02, AquaDri® E-30i On Board Dryer.....	21
Figure 3.02.5-03, Nozzle positions and directions relative to gantry.....	22
Figure 3.02.5-04, E-20i's and E-30i's Blowing Directions	23
Figure 3.02.6-01, AquaDri® FS-30 / FS-40 Free Standing Dryer	24
Figure 3.02.7-01, High Pressure Top Boom Module.....	26
Figure 3.02.7-02, High Pressure Top Boom	27
Figure 3.02.7-03, Rotary Actuator assembly.....	27
Figure 3.02.8-01, LCD Display	29
Figure 3.02.9-01, LCD Option Components.....	30
Figure 3.02.9-02, LCD Option Logic Diagram.....	37
Figure 3.02.9-03, Accessing the Compact Flash	40
Figure 3.02.10-01, Front ABS Doors.....	42
Figure 3.03.1-01, Pneumatic System.....	44
Figure 3.04.1-02, Dosing Pump Panel	47
Figure 3.04.1-03, Solenoid Manifold	49
Figure 3.04.2-01, On-board Pumping Station	54
Figure 3.04.2-02, Off-board Pumping Station	55
Figure 3.04-03, Belt Tensioning Diagram	56

Figure 3.04.1-01, Presoak Heater	58
Figure 3.04.3-01, E-Chain Feed System.....	59
Figure 3.05-01, Electrical Control Diagram	61
Figure 3.05-02, Main Electrical Enclosure	62
Figure 3.05-03, Mechanical Side Junction Box.....	64
Figure 3.05-04, CP0 with CAN Communication cable, and E-Stop cable.....	65
Figure 3.05-05, In-bay Junction Box	66
Figure 3.05-06, Main Power Disconnect Switch	66
Figure 3.05-07, Dosing Pump Panel	67
Figure 3.05-08, AXTO 700 Remote Pumping Plant.....	68
Figure 8.00-01, Operating terminal CP0	95
Figure 8.01-01, Symbols displayed on CP0.....	96
Figure 8.01-02, Symbols for CP0 manual operation	97
Figure 8.04-01, Control buttons CP0 and Navigation buttons.....	99
Figure 8.05-01, Access and Termination of Service program menus	102
Figure 8.05-02, Direct call of a service program menu item	103
Figure 8.05-03, Menu Navigation with navigation buttons	104
Figure 8.05-04, Modification of a parameter	105
Figure 9.01-01, Overview of Coinbox Signals.....	120
Figure 10.01-01, AquaJet XT [®] , Machine Dimensions.....	123
Figure 10.01-02, AquaJet XT [®] , Machine Dimensions.....	124
Figure 10.01-03, AquaJet XTO-300, Pumping Station.....	125
Figure 10.01-04, AquaJet XTO-700, Pumping Station.....	126
Figure 11.01-01, Schematic: AXT 700 High Pressure System	131
Figure 11.01-02, Schematic: AXTO 700 High Pressure System	132
Figure 11.01-03, Schematic: AXT 300 High Pressure System	133
Figure 11.01-04, Schematic: AXTO 300 High Pressure System	134
Figure 11.01-05, Schematic: Low Press. Pump System and Dosing Pump Panel	135
Figure 11.01-06, Schematic: Pneumatic Panel.....	136
Figure 11.01-07, Schematic: Tri-Foam Pump Panel.....	137
Figure 11.01-08, Schematic: Presoak 1 & 2	138
Figure 11.01-09, Schematic: Wax 1 & 2	139
Figure 11.01-10, Schematic: BugBuster	140
Figure 11.01-11, Schematic: Wheel Wash.....	141
Figure 11.01-12, Schematic: Spotfree Rinse	142

Figure 11.01-13, Schematic: TriFoam Nozzles..... 143
Figure 11.01-14, Schematic: HubScrub..... 144
Figure 11.01-15, Schematic: Symbol Legend..... 145

1. INTRODUCTION

1.01. Using This Manual

This manual is for use by AquaJet XT owners. It is also intended for use by Mark VII technical support staff, field technicians, and others involved with the maintenance and servicing of the AquaJet XT in-bay, friction, automatic car wash system.

Chapter 3 describes basic information about the machine, different systems and options that are offered for this AquaJet XT machine. The general instruction of how to operate it is presented in Chapter 4.

In Chapter 5, the functions and operations of the machine are explained in detail. This will help to better understand the machine and how it works in principle.

Chapter 6 gives detail about adjustments and settings for the machine. Chapter 7 describes care and maintenance. General maintenance and care instruction and recommendation are provided, so that your roll-over wash system functions well at all times.

Essential list of Error Messages are presented in Chapter 8.

Programming and detailed procedures of the Operation Unit are in Chapter 9. You will learn about the structure and function of your roll-over wash system. This manual will also give you step-by-step instructions to set up the system and how to operate it.

Auxiliary equipments are mentioned in Chapter 10.

Specifications, Warranty and common glossary are also included in the last section of this manual.

Parts lists are presented separately, due to the more frequent information updates. However, relevant illustrations are included throughout this document.

In this manual, voltages refer to U.S. requirements.

Please pay unconditional attention to the warranty specifications on the next three pages.

We strive to provide essential information about this product. If you should have more questions or comments, please don't hesitate to contact our representatives.

While talking about service: in this operating instruction the Mark VII Service is mentioned several times. Mark VII Service means the personnel of the Mark VII Equipment inc. as well as the personnel of our partners

Icons

Icons will be used throughout the Mark VII manuals. They include: Note, Caution, and Warning.



Note

The note icon represents important information, a useful tip, or other information that may supplement the main text. A note may also supply information that applies only in specific cases.



Caution

The caution icon is used to indicate that certain operations may cause damage to the equipment. Specific information on actions to avoid or special handling may require the caution icon.



Warning

The warning icon is used when an action or situation may cause physical harm to employees or customers.

Instructions and Lists

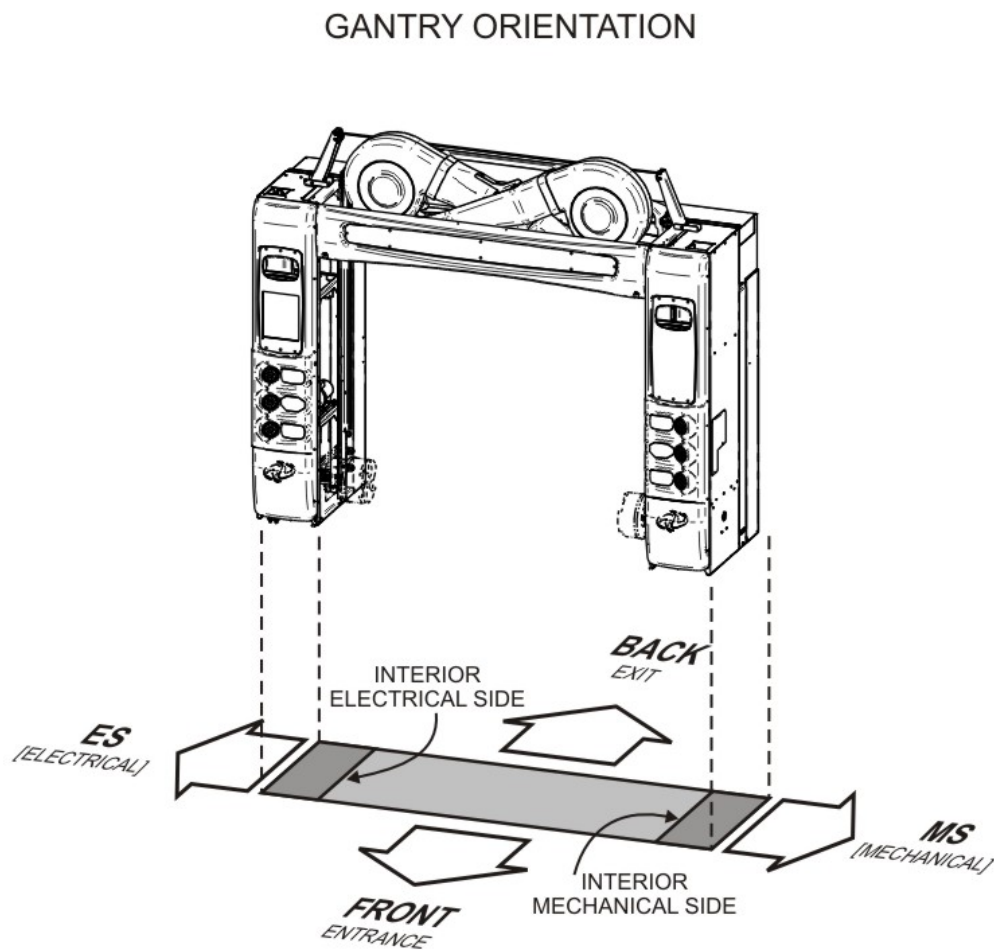
Numbered lists are used for instructions, procedures, and sequential operations. Bulleted lists are used for items that do not require a specific order.

1.02. Common terms

Orientation

In order to denote common terms used throughout this manual, the orientation of the AquaJet XT is determined by the gantry's frame components and its position in the wash bay (see illustration below).

Figure 1.02-01, Gantry Orientation



Front, Back, Electrical Side, Mechanical Side,

All modules in AquaJet XT are separated into three main locations, Column Electrical Side, Column Mechanical Side, and Cross Beam.

Dryer motors and fans rotations

As to specify the motor and fan rotation direction, it is advised to determine the clockwise (CW), counterclockwise (CCW) directions by viewing the motor facing the shaft end.

2. SAFETY GUIDELINES

Mark VII recommends that these general safety guidelines be followed when working on any Mark VII equipment. These are not all-inclusive safety rules. The Caution and Warning icons described above are used throughout this manual to promote safe work practices.



- Turn off the power to machinery, computer, and other electrical equipment prior to working on it, which includes turning off all circuit breakers and following standard lockout/tagout procedures. This may involve disconnecting more than one electrical source.



- Never bypass any safety devices such as overloads on motor starters, high limit thermostats on heaters, fuses on the computer and transformers, or the interlock switch on the electrical panel door.



- Always wear safety glasses when working near running equipment.



- Never lean or climb on the machinery when it is operating.



- Always replace the belt guards after working on belts, pulleys, pumps, or motors.



- Keep your work area clean. Water or soap may cause an employee or customer to slip and fall.



- Be aware of the location of eye wash stations.








- Handle all chemicals properly. Follow label instructions and always consult the Material Safety Data Sheet (MSDS) before using any chemical. The following chemicals are particularly hazardous even at low concentrations:

- Hydrofluoric Acid;
- Bromic Acid;
- Hydrogen Cyanide;
- Hydrochloric Acid;
- Chlorinated Solvents; and
- Any product with a flash point less than 105° F.
- Ammonium Bifluoride,
- Ethonamine,
- D-Limonene



- Never use a product that contains any of these chemicals in connection with the operation of a Mark VII car wash. This list is not all inclusive.

-  • Always comply with the law and use appropriate personal protective equipment, such as protective gloves, safety glasses, face shields, and respirators, when handling a chemical.
-  • Do not hesitate to contact chemical suppliers, the health department, or the Environmental Protection Agency for more information about any car wash product before using it.
-  • Use approved personal protective equipment for any welding operation.
-  • Sharp edges may be present on sheet metal. Use caution when handling metal parts.
-  • Sharp sheet metal edges may be present

SAFETY INSTRUCTIONS

WARNING - WHEN USING ELECTRIC APPLIANCES, BASIC PRECAUTIONS SHOULD ALWAYS BE FOLLOWED, INCLUDING THE FOLLOWING:

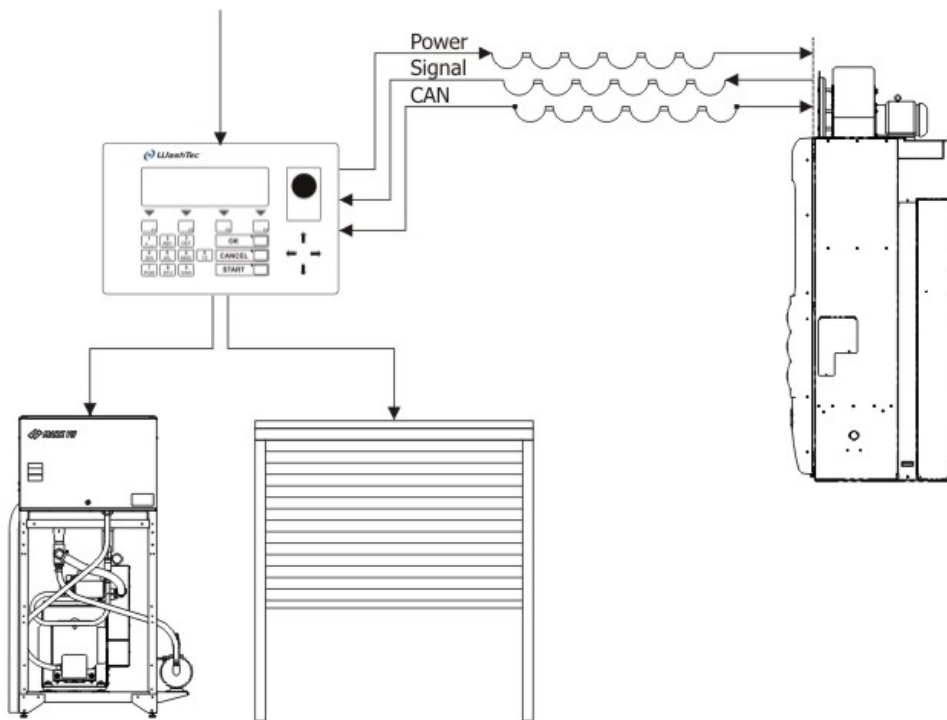
- A) READ ALL THE INSTRUCTIONS BEFORE USING THE APPLIANCE.
- B) TO REDUCE THE RISK OF INJURY, CLOSE SUPERVISION IS NECESSARY WHEN AN APPLIANCE IS USED NEAR CHILDREN.
- C) DO NOT CONTACT MOVING PARTS.
- D) ONLY USE ATTACHMENTS RECOMMENDED OR SOLD BY THE MANUFACTURER.
- E) DO NOT USE OUTDOORS.
- F) TURN THE POWER SWITCH TO THE OFF POSITION WHEN NOT IN USE AND BEFORE SERVICING AND CLEANING.
- G) USE ALL APPROPRIATE LOGOUT/TAGOUT PROCEDURES.

3. SYSTEM COMPONENTS

3.01. Basic Components

The energy provided by the customer is fed into the peripheral distributor. The peripheral distributor distributes the energy to the wash system and to the peripheral devices such as pumps and rolling shutter doors, contains the energy elements and exchanges data between wash system and peripheral devices.

Figure 3.01-01, Component Diagram



Control

CP0

The peripheral distributor CP0 is the basic version. A maximum of 3 signals may be transmitted from the wash system to the peripheral devices.

Gantry

The gantry receives power and signal through the CP0. Chemicals are delivered to the gantry through Umbilical Feed.

Support Devices

Other equipments are controlled by CP0 to work in conjunction with the Gantry for the wash operation. These are, for example, POS, door control, etc.

3.02. Mechanical Components

3.02.1. Frame

The self-supporting stainless-steel frame forms the main framework of the AquaJet XT® rollover wash system.

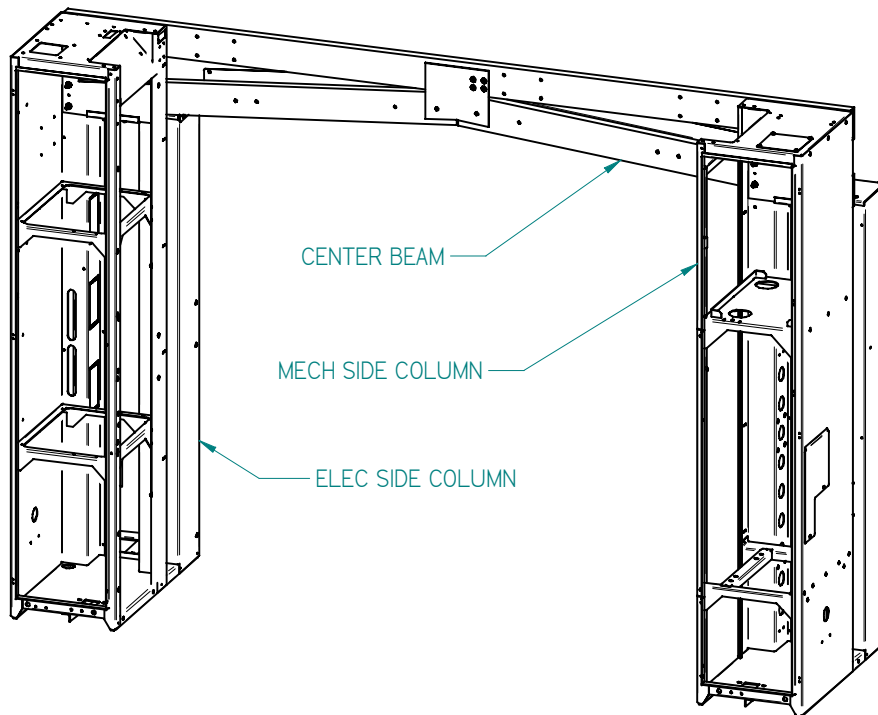
Main electrical control cabinet resides on the driver side frame, which is logically called Electrical Side (ES).

The other cabinet on the passenger side contains the main mechanical systems. This side will be called Mechanical Side (MS).

These two columns support elements for the upper frame, which will be called Cross Beam (CB) or Overhead.

Raceways are assembled behind the Cross Beam

Figure 3.02.1-01, Frame



FRAME, AXT

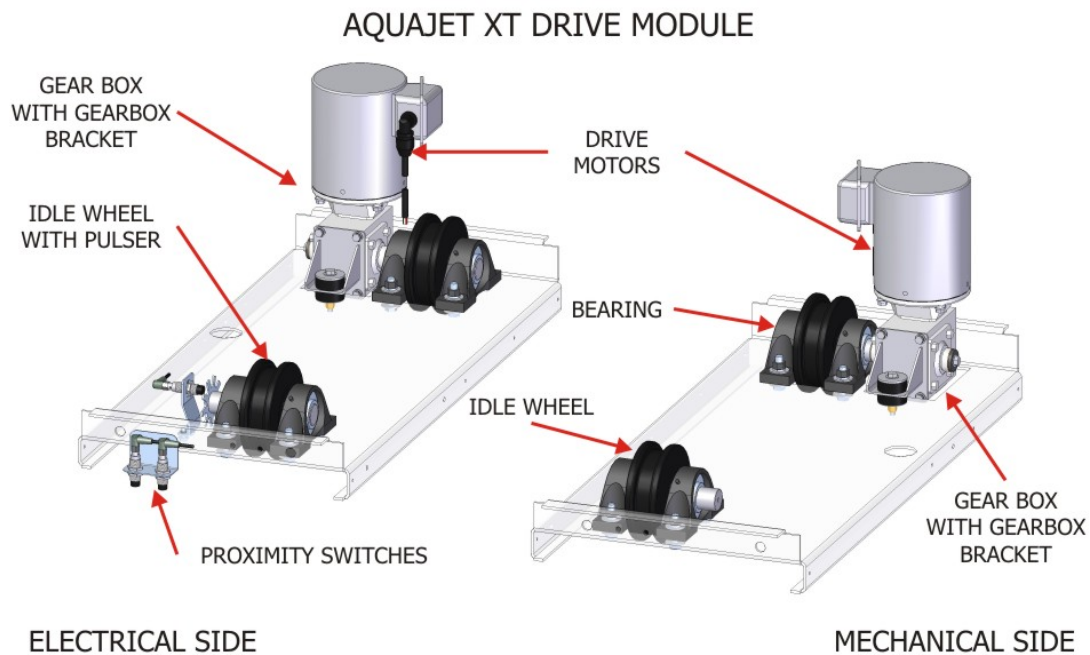
3.02.2. Drive System

A direct drive system is used to move the gantry back and forth along the tracks. The gantry is 2 wheel drive, one drive assembly on each side of the gantry. Each contains a motor, gearbox, and a wheel/axle assembly.

The drive system uses 3-phase, 1/2 horsepower (hp) motors that are highly resistant to corrosion and moisture. Each motor housing has a weep hole in the bottom to let water drain out.

The drive motors are special inverter duty, totally enclosed, wash down type. Each motor has a stainless steel shaft with a water slinger, special coated windings for inverter drive controllers and has a watertight junction box.

Figure 3.02.2-01, Drive Systems



The drive system also includes 2 idler wheel assemblies, one on each side of the gantry; and an AC inverter, which reconfigures the incoming power and supplies it to the drive motors to control the speed and direction of the gantry travel. The AC inverter is located on the main electrical panel in the main electrical enclosure.

For AquaJet XT, the idle wheel is approximately 5.73" in diameter. One revolution of the wheel (on the track) is equal to 18" of travel. There are 9 spokes on the pulse wheel which allows the machine to locate and travel with 1" incremental accuracy.

Components

Component	Reference
3-phase ½ hp motors (2)	Figure 3.02.2-02
Drive wheel assembly (2)	Figure 3.02.2-02
Drive gearbox (2)	Figure 3.02.2-02
Idler wheel assembly (2)	Figure 3.02.2-03
AC inverter	Not shown (on main electrical panel – see Section 3.05)
Thermal overloads	Not shown (on main electrical panel – see Section 3.05)

Operation

The controller sends signals to drive the gantry, specifying the direction (forward or reverse) and speed. The AC inverter then supplies the appropriate power to the drive motors to move the gantry accordingly.

Drive Wheel Assembly

Each drive wheel assembly consists of a wheel/axle assembly, a drive motor, and a hollow shaft right angle gearbox with a 40:1 reduction ratio. The motor drives the gearbox, which in turn drives the wheel/axle assembly in the required direction and at the specified speed.

NOTE

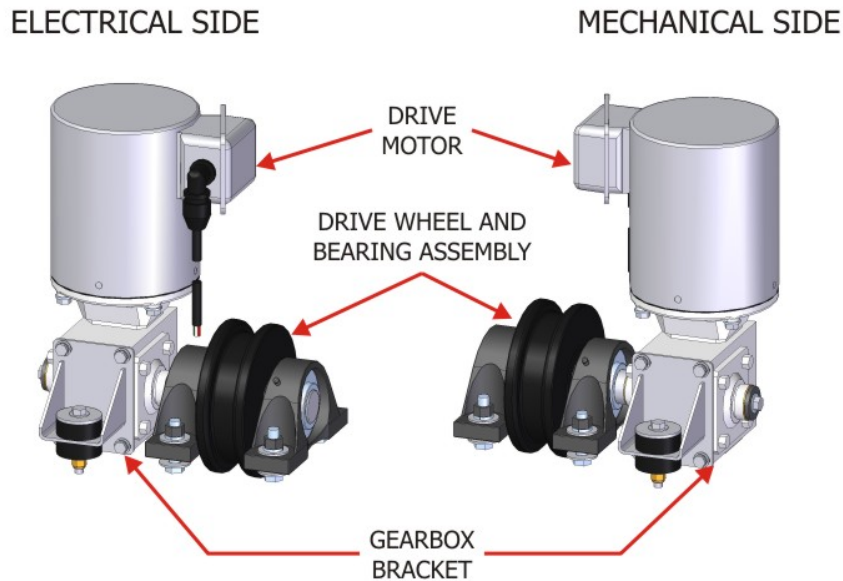
A hollow-shaft gearbox is a gearbox that allows the axle to pass through it without the need for a coupling.

Motors are placed in an upright position for better water drainage and protection and is a space saving advantage.

Figure 3.02.2-2 shows the drive wheel assembly, including the motor, gear reduction box, axle assembly, and bearings.

The power cords from connection boxes drop below the connection box on the motor (drip loops). This is to help keep water from entering the motor.

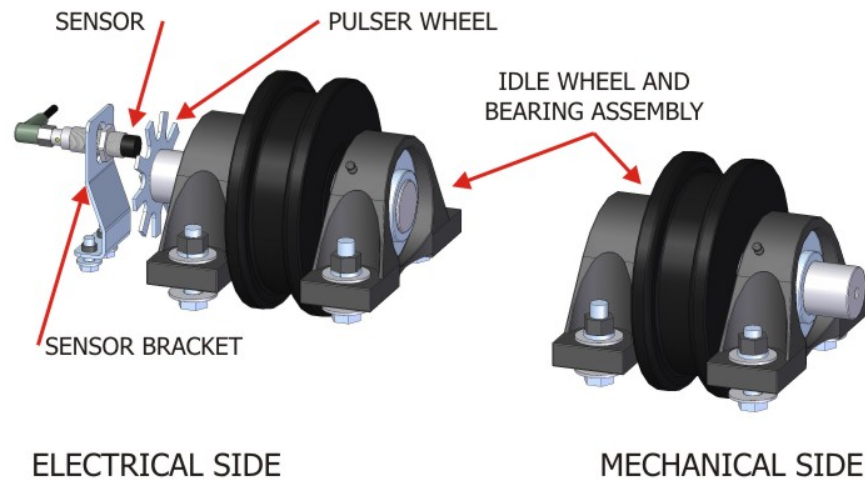
Figure 3.02.2-02, Drive Wheel Assembly



Idler Wheel Assembly

The idler wheel assembly uses a shorter axle, the same size wheel, and the same bearings as the drive wheel assembly. Idle wheels are positioned in the front of the gantry on both sides. A pulse counter is located at the idler wheel on the electrical side of the gantry. The sensor detects continuous pulses from the pulser wheel that are used to reference the measurement of the vehicle, and the position of the gantry as it moves along the tracks.

Figure 3.02.2-03, Idler Wheel Assembly and Pulse Counter



AC Inverter

The AC inverter is mounted in the main electrical panel and controlled by the K100. It converts source power to the variable frequencies used by the drive motors. This enables the gantry to move in both forward and reverse at any speed. The AC inverter also monitors the current flowing into and through the drive motors.

For more information on the AC inverter, refer to the AC Inverter Technical Manual furnished with the system.

Thermal Overloads

Each motor has a separate thermal overload to protect the motor from overheating due to such events as a gearbox failure, an obstruction on the track, or a wiring failure. Thermal overloads are located in the Main Electrical Panel adjacent to inverter.



The inverter also monitors the conditions at the motors. It is unable to distinguish which motor is having a problem but does provide error codes to assist in diagnosing the failure. Care should be given when an inverter is tripping due to an output related fault. Continued exposure to the fault without repair may cause damage to the inverter. Reference the inverter manual for additional troubleshooting information.



Warning: It is important to install track locks to the machine. Failure to keep track locks on may cause damage.

3.02.3. HubScrub

Figure 3.02.3-01, AquaJet XT HubScrub

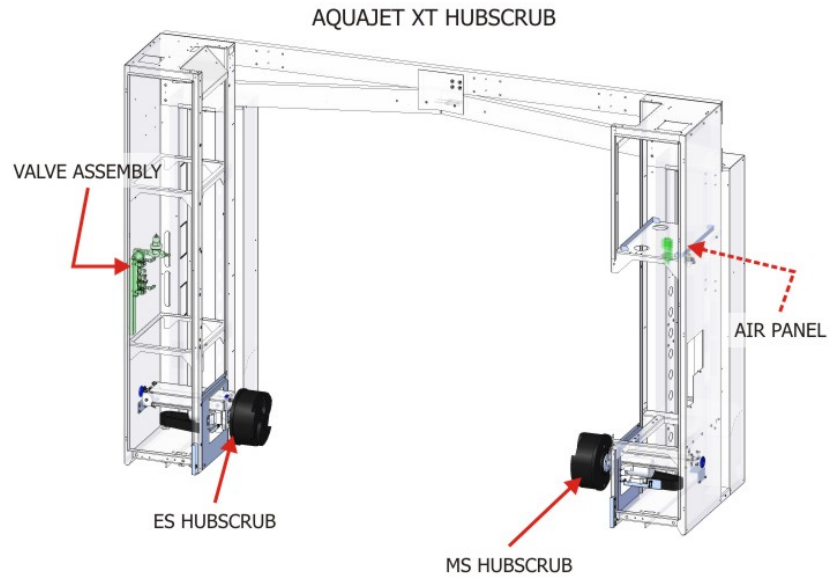
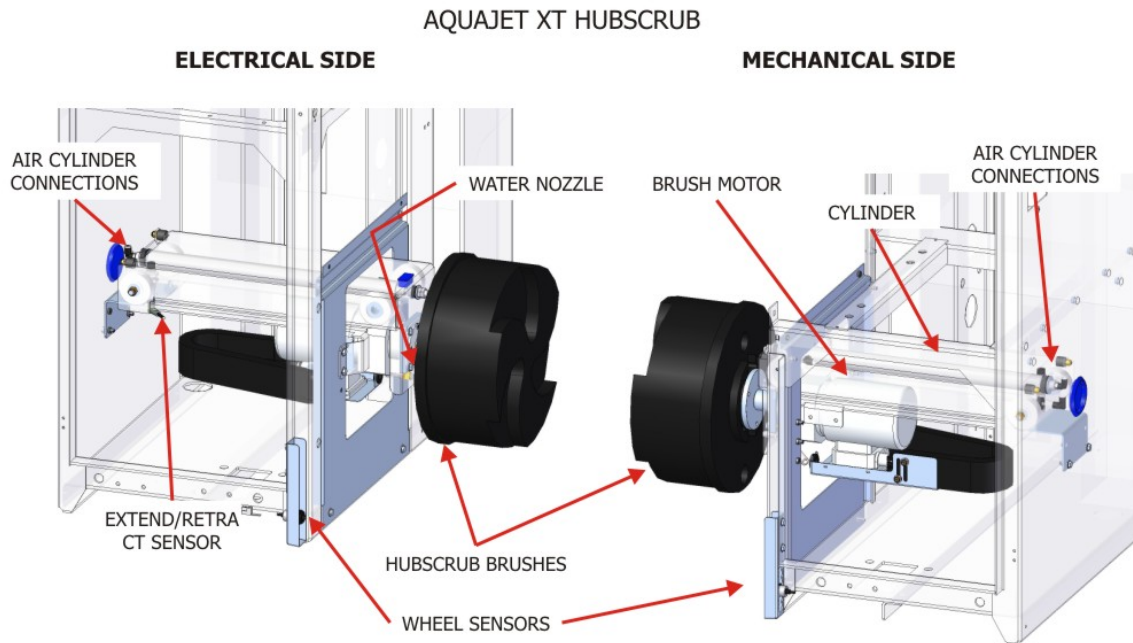


Figure 3.02.3-02, HubScrub Components



The HubScrub brushes are integrated in both side elements and are driven directly. A pair of wheel sensor photo eyes detects the wheel.

The wheel washing stage takes place during the forwards wash in the following sequence:

- The photo eye detects the wheel
- The gantry comes to a standstill
- The wheel wash brush is extended
- The wheel is washed
- The wheel wash brush returns to its starting (or home) position
- The gantry starts again

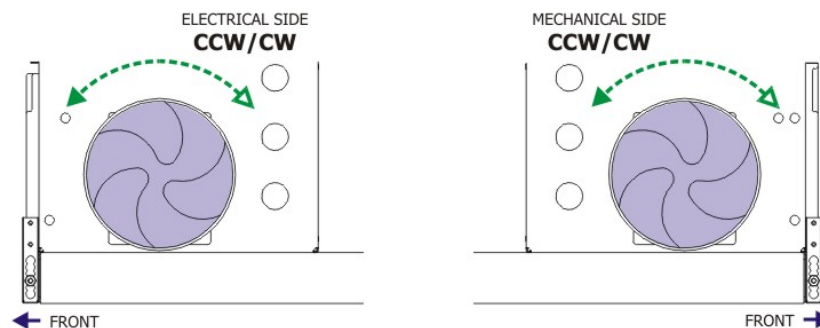


Vehicles with rear wheel cladding may be damaged in automatic operating mode.

Brush rotation

During the HubScrub cycle, the brushes rotate alternately in both directions. Both brushes on the Electrical and Mechanical sides will rotate simultaneously in the same direction.

Figure 3.02.3-03, HubScrub Brushes Rotation



HUBSCRUB BRUSH ROTATION
(VIEW FROM INTERIOR)

3.02.4. Contour Dryer

There are three types of dryers available for AquaJet XT[®]: contouring dryer, on-board and freestanding.

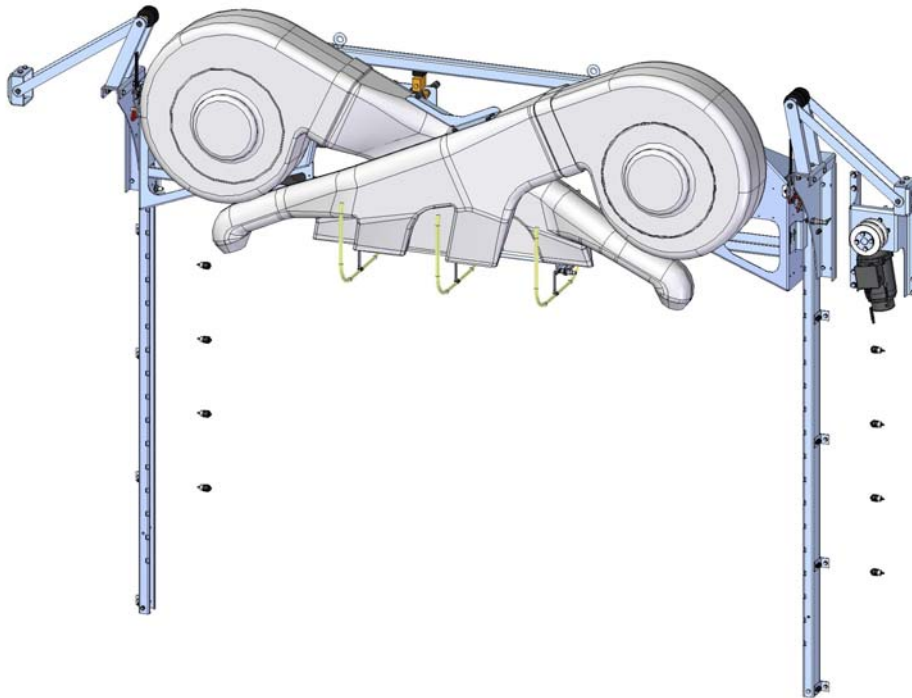
AquaDri[®] C-15 (Contouring Dryer)

Exclusively designed for the XT Series, the AquaDri[®] C-15 space-saving contour Dryer sits atop the cross beam of the gantry behind the front overhead skin. Two fan-motor housings, with 7.5 HP motors produce high velocity air, (over 140 mph wind speed at nozzle), through interlocking dryer nozzles.

The dryer nozzle assemblies are mounted onto a stainless steel frame. The contouring dryer assembly is mounted on guide rails. Up and down movements are driven by a gear motor and flat belts.

The contour dryer frame also provides space for overhead high pressure top boom manifold.

Figure 3.02.4-01, Contouring Dryer



The dryer is designed to track vehicle at a distance of 18"-24" from the vehicle surface. This distance is maintained to reduce the chance of accidental contact with the vehicle.

Components

The rotomolded dryer nozzles are positioned and interlocked across each other. The 7.5 Hp, 3480 rpm motors are attached to the fans so that the depth of the motor is partially in the fan, this makes the whole producer assembly require much less space.

Each nozzle assembly is mounted on the stainless steel frame.

The lifting belts are attached to the dryer frame and thread through a series of pulleys on the lifting mechanism assemblies. The wheels on each side of the frame slide onto gripping guide rails attached to the gantry interior columns. Bolts are inserted at the lower ends of each rail to prevent the dryer assembly from falling off the track.

During the drying stage, the control system uses the vehicle contour it has memorized during the first pass over the vehicle.

The sensor ring assembly is attached to the dryer frame. This assembly prevents the dryer from striking the car.

The contouring dryer frame also provides space for the overhead high pressure manifold.

Up and down movements are driven by a gear motor and flat belts.

Power cables and control cables are connected to the gantry through an energy chain in the middle of the dryer frame.

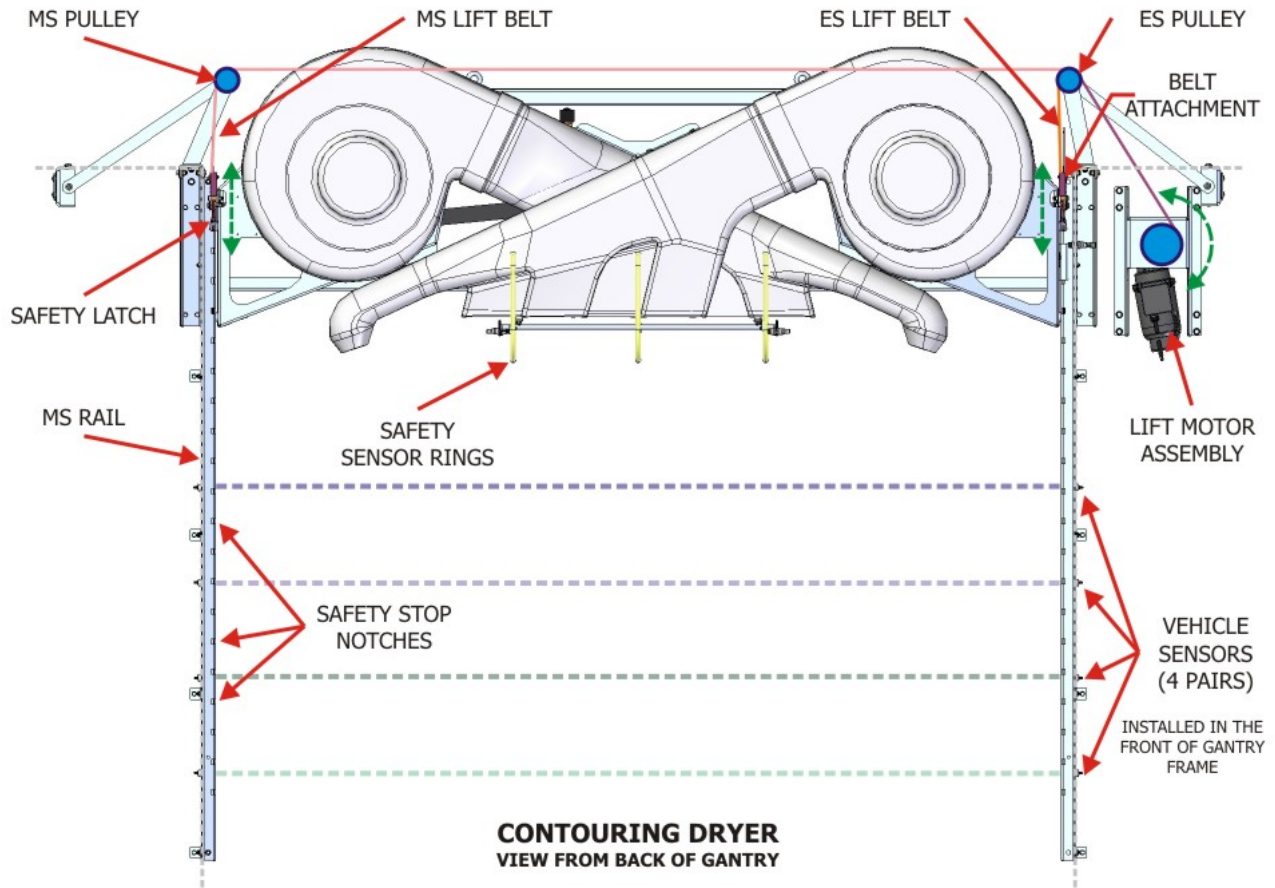
Lifting Contour Dryer

Contouring dryer is raised or lowered by a lifting system, which consists of the lift motor with integrated brake, a lift axle, and two flat belts.

A pulse wheel is fastened to the lift axle on the drive side. This pulse wheel serves together with a proximity switch as a pulse counter. The pulse counter is used to determine the vertical location of the contouring dryer.

The contouring dryer lifting motor assembly is installed in the electrical side of the cross beam. An electrical side pulley assembly is located above the lifting motor assembly. Another pulley assembly is installed on the mechanical side of the cross beam. The flat belts alignment is well adjusted for synchronous and balanced movement.

Figure 3.02.4-02, Contour Dryer Lifting Mechanism

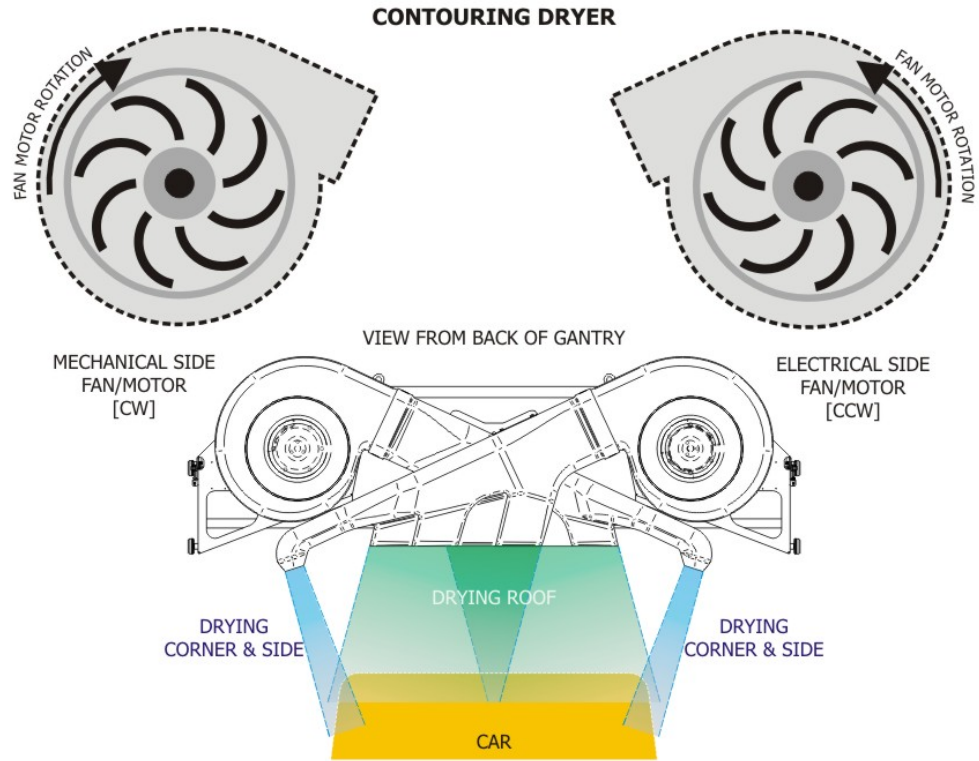


Controlling Dryer

During its operation, the path of contouring dryer is controlled by the vehicle contour that was memorized during the first pass over the vehicle.

Fan rotation

Figure 3.02.4-03, Fan Rotation



3.02.5. AquaDri[®] On-board Dryers

AquaDri[®] on board dryer for AquaJet XT[®] sits atop the cross beam of the gantry between the ES and MS columns. The AquaDri[®] E-Series is pre-wired from factory. There are two products for the AquaDri[®] series of on board dryers: The AquaDri[®] E-20i and the AquaDri[®] E-30i.

Figure 3.02.5-01, AquaDri[®] E-20i On Board Dryer



AquaDri[®] E-20i

The AquaDri[®] E-20i on-board dryer consists of 2 - 10 HP motors with dual-position tilting nozzles attached to each blower. This dryer is installed on brackets attached to the cross beam of the gantry. The electrical control components are on the main electrical panel in the Electrical Side enclosure. The nozzles are aimed toward the vehicle with different angles (see figure 03). This will allow for appropriate coverage when the gantry moves toward the front or the back of the vehicle.

See detail information of the AquaDri[®] E-20i in its instruction manual (part #6370-0462).

AquaDri[®] E-30i

The AquaDri[®] E-30i on-board dryer consists of 3 - 10 HP motors, with one stationary nozzle in the middle, and two dual-position-tilting nozzles on each side. This dryer is installed on brackets attached to the cross beam of the gantry. The electrical control components are on the main electrical panel in the Electrical Side enclosure. The dual-position-tilting nozzles are programmed to aim at the front of the vehicle while the gantry moves toward

it. The nozzles rotate down and aim at the sides of the vehicle when the gantry moves back towards the front of the vehicle.

The movements of the nozzles are activated by a pneumatic valve.

See detail information of this AquaDri® E-30i in its instruction manual (part #6370-0463)

Figure 3.02.5-02, AquaDri® E-30i On Board Dryer



Operation

If the AquaJet XT® is equipped with an On-Board dryer, the dry cycle will start after the Final Rinse (Spot Free) pass is finished. The K100 sends a signal to start the dry cycle, then the first dryer motor comes on, followed 5 seconds later by the second motor, and then the third motor (if equipped with E-30i Onboard dryer).

Dryer cycles

The gantry makes 2 drying passes, going from home position to the rear of the vehicle, blowing water off the top, windshield, hood, and trunk of the vehicle. On the return pass, going from the rear of the vehicle to front, the nozzles point to direct the air flow to dry the sides of the vehicle.

The CP0 can be used to add or subtract passes, and to control the speed of the gantry during each pass.

Onboard Dryer nozzles directions

For AquaDri® E-20i, the nozzles are set to alternately point to the top and side of the vehicle during the different passes.

For the AquaDri® E-30i, the center nozzle direction is stationary. The side nozzles point to top of vehicle during the front-to-rear pass. Then, during the rear-to-front pass, the nozzles point to the sides of the vehicle.

Figure 3.02.5-03, Nozzle positions and directions relative to gantry

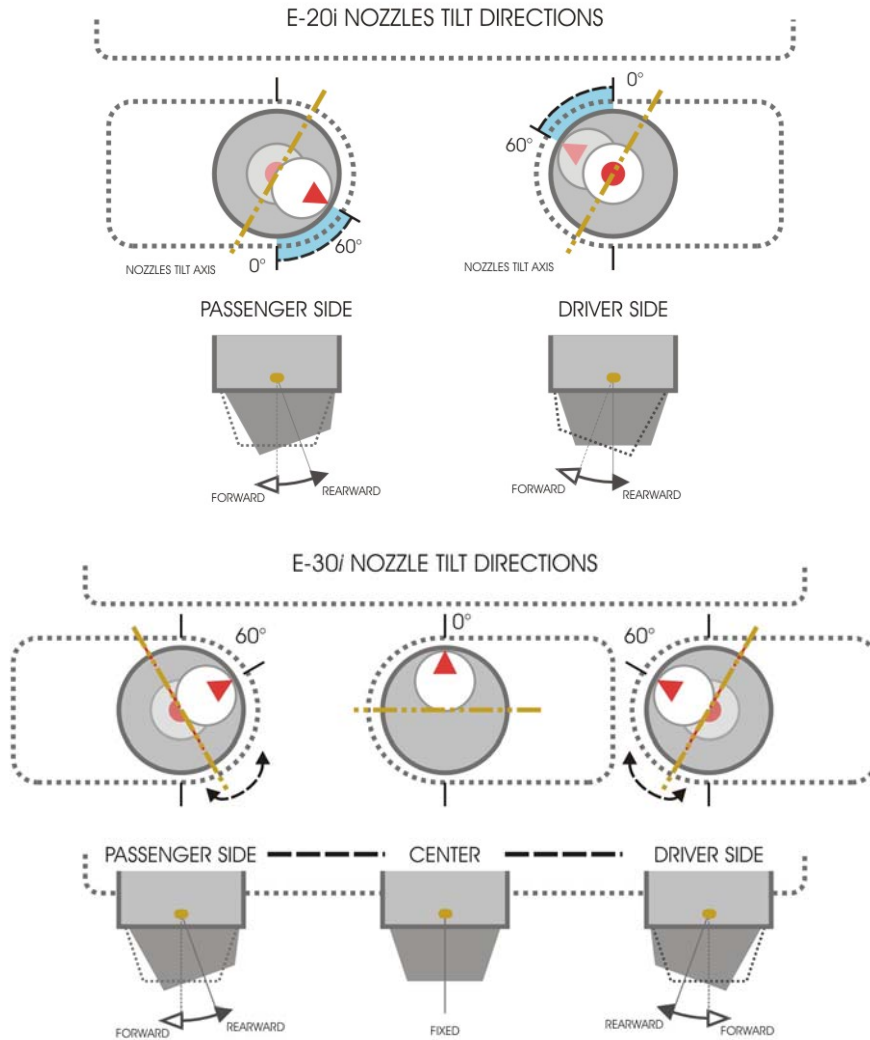
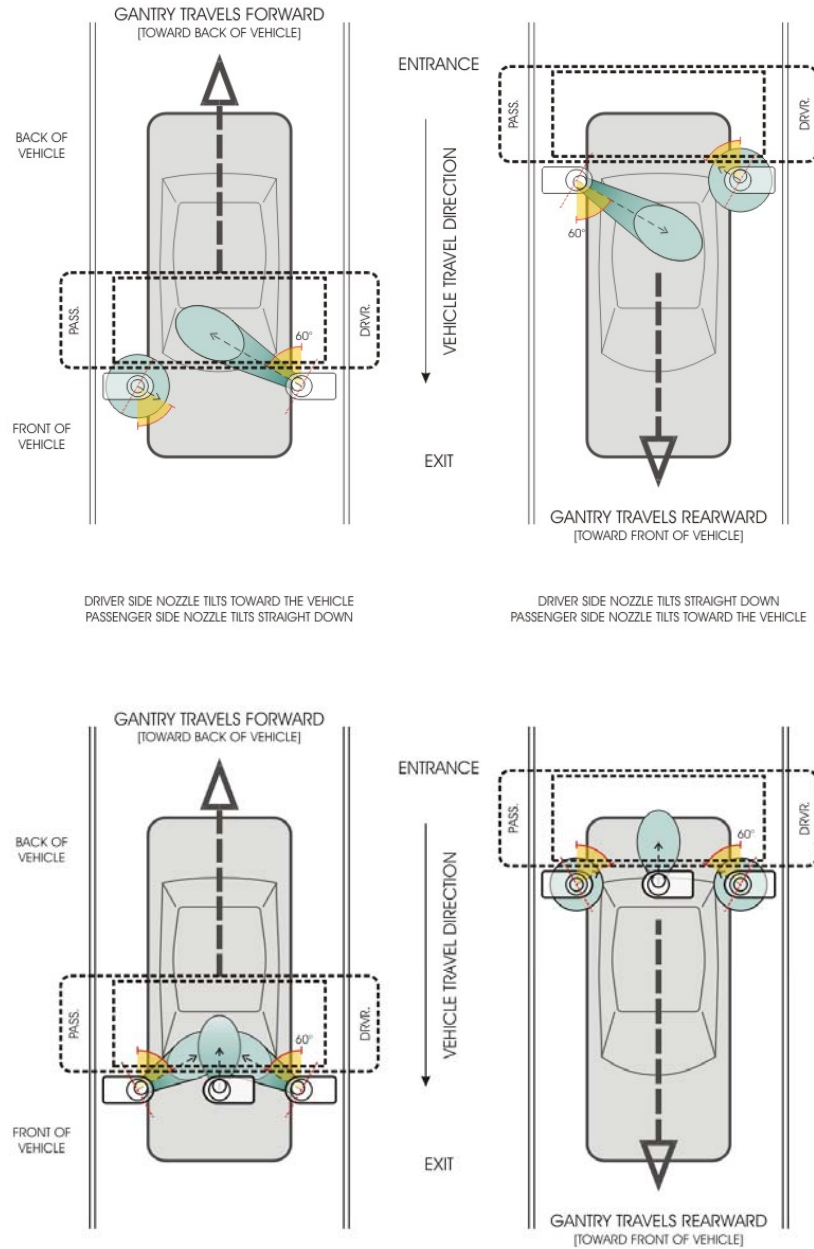


Figure 3.02.5-04, E-20i's and E-30i's Blowing Directions



NOTE

All good dryings require an application of high quality wax or clearcoat protectant prior to the dry cycle. This will greatly aid proper drying by beading the water.

3.02.6. Free-standing Dryer

The freestanding dryer can be installed at the exit end of the wash bay, between the gantry and the exit door. A dry cycle can be added to any wash configuration by using the CP0. Most dryers operate for a preset, selectable period of time as the vehicle is driven through it and out of the car wash bay. Refer to the manufacturer's specifications for additional information.

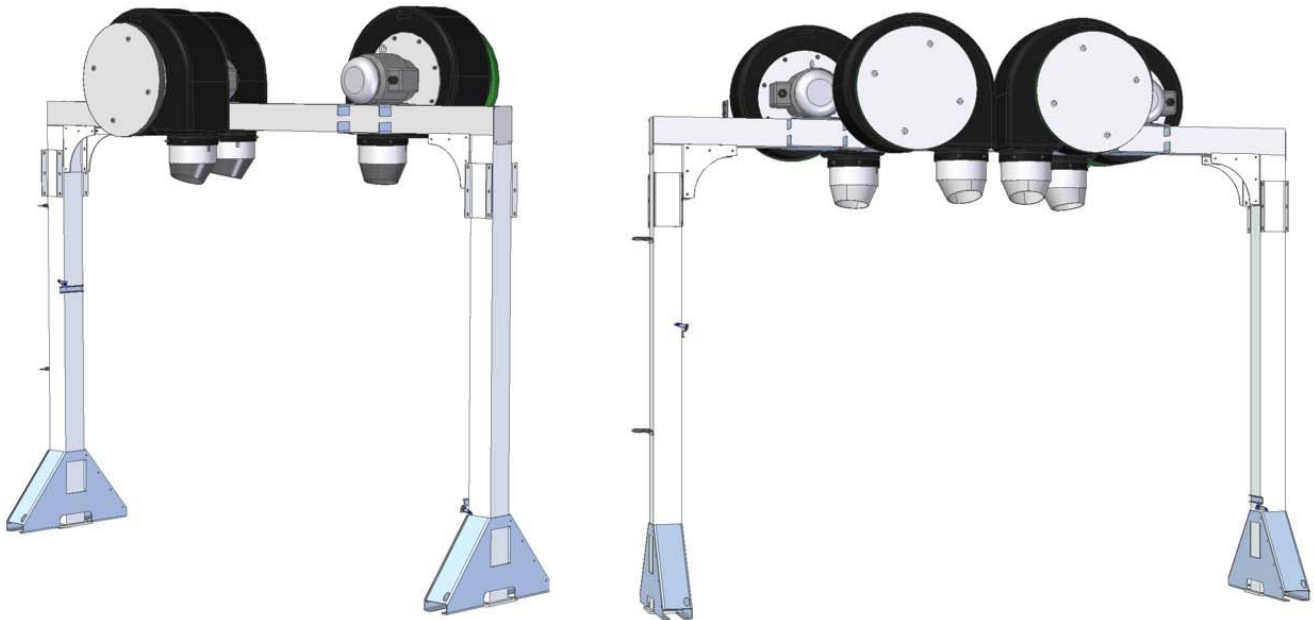
AquaDri® FS-30 and FS-40 Free-standing Dryers

All AquaDri® FS-series free-standing dryers have aluminum square tubing modular frame assemblies, with single cross beam for mounting dryer motors, and brackets. The dryer motor positions are adjustable to benefit the best nozzle directions toward the car for the ultimate dry.

The AquaDri® FS-30 consists of 3-10 HP motors (two side nozzles and one center nozzle). The AquaDri® FS-40 has 4-10 HP motors (two side nozzles, and two center nozzles). All nozzles for the AquaDri® FS-series are stationary, and point at preset angles according to their positions on the arch.

More information about the AquaDri® Free-standing Dryers is available in the instruction manual (part #6370-0525).

Figure 3.02.6-01, AquaDri® FS-30 / FS-40 Free Standing Dryer



Free-Standing Dryer Electrical Control System

At the end of the wash, when the “drive ahead” sign is on, the K100 sends a 1-second pulse to request a dry cycle. The freestanding dryer will start as

soon as the wash cycle is finished. The motors on the dryer will start one at a time 5 seconds after the one another. The motors will remain on until the vehicle moves past the exit dryer sensors, or when the max dry 1 time is reached. Most freestanding dryers have their own electrical control system, housed in an enclosure. There is a separate dryer control panel that, typically, contains the motor starters, overloads, breakers, and a multi-function timer controller for the dryer. Refer to the manufacturer's specifications for additional information.

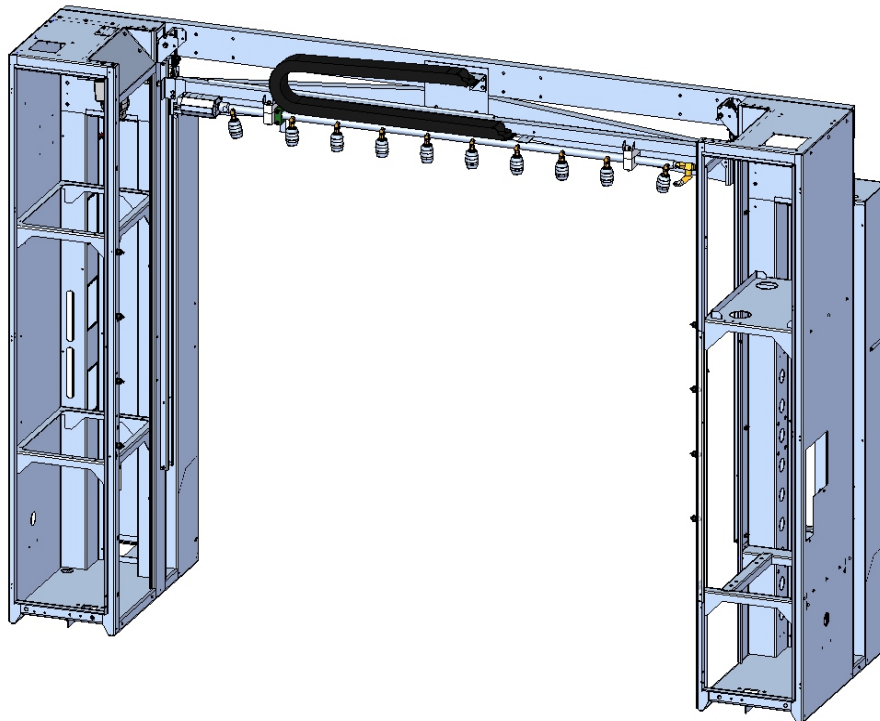


All good dryings require an application of high quality wax or clearcoat protectant prior to the dry cycle. This will greatly aid proper drying by beading the water.

3.02.7. High Pressure Top Boom

High Pressure Boom is standard on the AquaJet XT®. The high pressure top boom is used for washing the front, top, and rear of vehicles.

Figure 3.02.7-01, High Pressure Top Boom Module

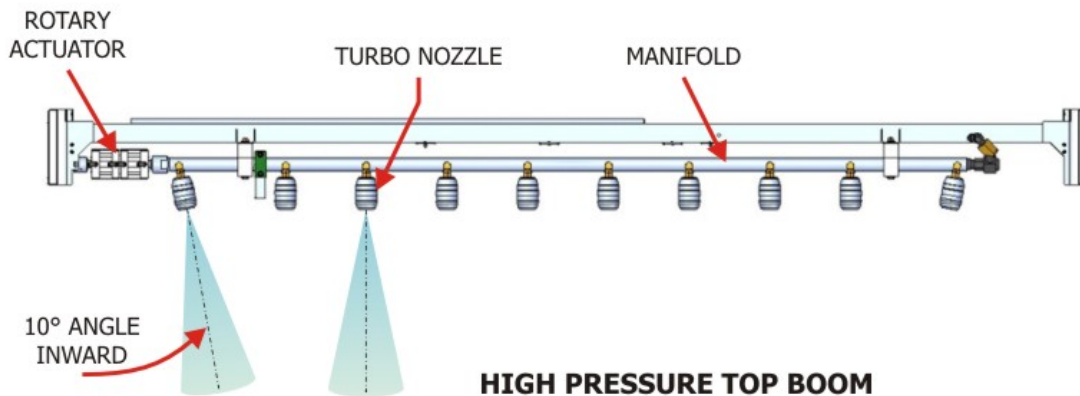


The High Pressure Top Boom is fed with high pressure water from the pumping plant. The water pressure should be approximately 1000psi. The water is directed through a series of hoses, valves, and fittings. The HP Boom on the AXT700 profiles the contour of a vehicle's surface. This contour is detected during the first pass over the vehicle using infrared transmitters and receivers on the columns of the machine. There is a standard offset or distance between the HP Boom and a vehicle's surface (default is 5 "clicks" or fingers on the pulser wheel). This distance will vary slightly as the belt coil diameter increases or decreases on the lifting motor pulleys but will remain within an 18-24" range of the vehicle surface. The HP Top Boom and High Pressure Side Manifolds will spray simultaneously during the wash pass resulting in only one high pressure pass needed.

The AXT300 High Pressure Top Boom descends at the front and rear of the vehicle. As its ascending or descending, the rotary actuators rotate the HP Boom Manifold to spray the front or rear of the vehicle. During the wash pass, only the High Pressure Top Boom or High Pressure Side Manifolds will spray. This results in two passes needed to spray the entire vehicle.

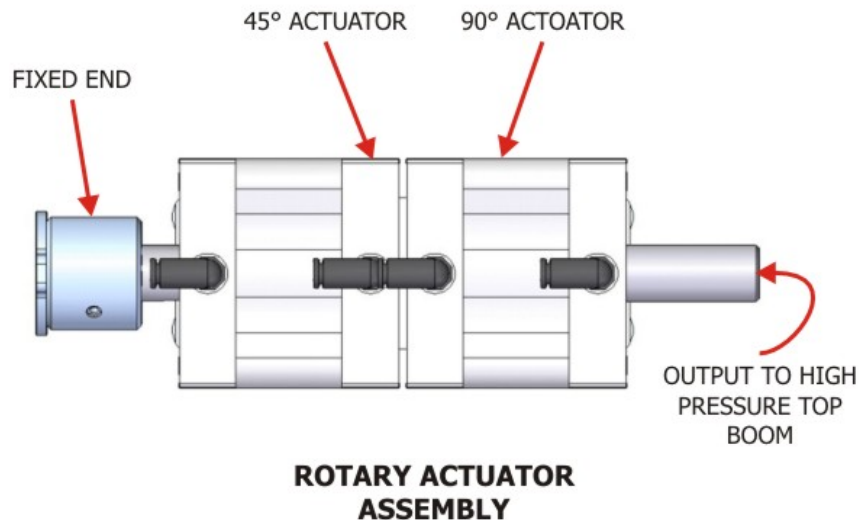
The vertical lifting force is providing by an electric motor and gearbox combination with the lifting motion transferred through steel reinforced rubber belts and pulleys. The belts attach to the high pressure boom carriage at each end. A durable plastic slide at each end provides smooth movement in the guide rails. There are ten Turbo nozzles attached to the high pressure top boom manifold. Each nozzle focuses an intense, zero degree high pressure spray rotating in a 24° cone. Each cone overlaps slightly, ensuring complete coverage on the vehicle surfaces. The two outermost nozzles are angled in at 10 degrees to help clean the upper corners on all vehicles.

Figure 3.02.7-02, High Pressure Top Boom



A pair of rotary actuators are used to rotate the boom. The actuator on the left rotates 45° while the right one rotates 90°. This combination provides 4 spraying positions; 0°, 45°, 90°, and 135° for cleaning the front, top, and rear vehicle surfaces.

Figure 3.02.7-03, Rotary Actuator assembly



High Pressure Side Manifolds

On both the AXT 300 and 700, High Pressure Side Manifolds are standard equipment. The primary purpose of the Side Manifolds is to spray the driver and passenger side of vehicles.

There are two different configurations available for the High Pressure Side manifolds; standard and dually. The standard configuration has the nozzles along with the manifold pipe fastened in an exterior trough on the machine. This trough protects the nozzles and manifold from physical damage. There is also a “Dually” option for the High Pressure Side Manifolds. The Manifold and Nozzles are mounted inside the columns of the machine. This allows for the nozzle spray pattern to still overlap, resulting in the sides of wider vehicles (i.e. dually pickups) to be fully sprayed. The Dually option is available on both the AXT300 and 700 models.

On the AXT700 version, there is a valve located at the top of each Manifold to turn water on or off. For the AXT300, there is no valve. The Side Manifolds are controlled by a three-way ball valve in the Mechanical Column high pressure cabinet.

High pressure water (aprox. 1000psi) is directed through a series of hoses, valves, and fittings to the desired end use. On the AquaJet 700, the High Pressure Side Manifolds and High Pressure Top Boom run simultaneously, resulting in one pass needed to spray a vehicle. On The AquaJet 300, the Side Manifolds and Top Boom Manifold spray independently resulting in two passes needed to fully spray a vehicle.

Turbo Nozzles

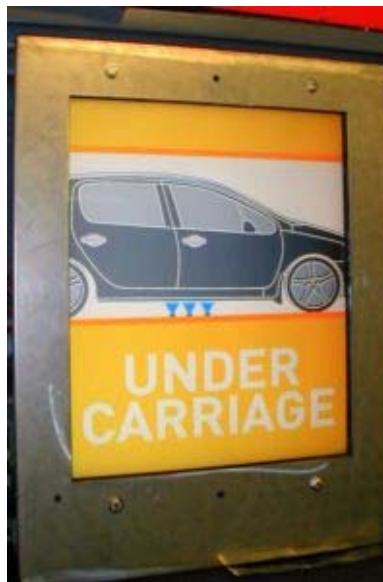
The turbo nozzles on the top boom spray high pressure water through a zero degree orifice rotating in a 24° cone pattern. Each nozzle is fitted with a 40 mesh strainer. This strainer must be checked and/or cleaned regularly to ensure proper functioning of the nozzle. A special tool for easy removal of these strainers is available from your Mark VII representative. The nozzle is connected to the wand via BSP threads and therefore requires an o-ring on the wand fitting instead of Teflon tape or pipe dope.

3.02.8. LCD Sign

LCD Display

The LCD display option provides flexible ways to convey visual information to the car wash user. It is designed to interface directly to the SoftWash XT. It is capable of operating in the car wash environment, which includes ambient light, water, chemicals and temperature. This device can display the many carwash options in a fun, moving presentation that can be customized to the site. The multifunction display can display animated .gif, .jpg and .avi files to announce several options or combination of options.

Figure 3.02.8-01, LCD Display



The LCD display assembly from Mark VII consists of several components. A waterproof housing enclosing the display, embedded controller, power supply and interface components. All the programming is stored in one CF (Compact Flash) card plugged directly into the embedded controller. This system draws power from the main electrical panel and is universal voltage from 100 to 240 VAC and is controlled via the regular lighting outputs (plug K17) of the K100 controller. So no special wiring or programming of the K100 controller is needed.

Normal operation is simply applying power to the LCD display; all sign functions are automatically processed from the signals coming from the K100 lighting outputs.

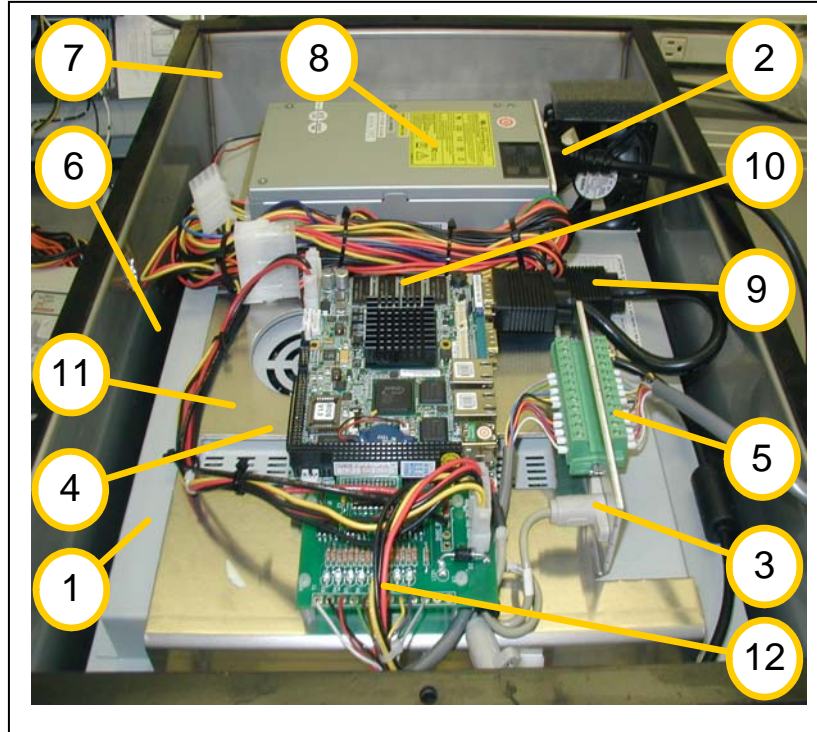
The LCD display is equipped with an Automatic dimming system for the graphics, as the lighting conditions change, the display will adjust the backlight brightness. The ambient light sensor is located at the lower left hand corner of the display; therefore do not block this sensor.

The LCD display operates on 110 to 240 VAC - 50/60 Hz - 250 watts.

3.02.9. LCD System Operation and Service

System Components

Figure 3.02.9-01, LCD Option Components



ITEM	PART#	DESCRIPTION
1	5100-0439	LCD Display 19"
2	-	Power Supply Connection
3	-	Keyboard Connection
4	0600-1036	CF Memory Card 1GB
5	-	Lighting Board (K100) Connection
6	3940-0269	Duravue lens
7	3920-2725	Enclosure Front
8	0043-1305	Power supply PC 250watt
9	5100-0452	Cable VGA
10	0041-0047	Computer/Embedded PC
11	3920-3021	Enclosure Mid/Mounting
12	7040-4012	Circuit Interface lighting to parallel port

Operation

Sequence of operation:

- 1 Boot up: It occurs upon power up sequence or reset. This screen will be rotated at 90 degrees, and is a little hard to read, however it is very similar to the boot up screen viewed on most personal computers. The duration varies between 15 to 30 seconds. BIOS
- 2 Copyright screen: This screen shows the version numbers and copyright screens of all the software installed. It is also rotated 90 degrees. This screen lasts 5 seconds. BATCH
- 3 Graphics Hello Screen: This screen shows Hello From Mark VII, then white, green, blue and red screens with the name of the color in the middle of the screen in black. This allows a quick summary of the display and that all colors are working. This screen is oriented to read correctly. Each screen lasts about 2 seconds. BATCH
- 4 Home screen: This screen is the graphic that runs when the wash is not engaged in cleaning a car. From the factory, it is the Mark VII logo, however, other default screens may be preloaded. This graphic (by default) automatically loops for 45 seconds or until the wash cycle starts. The graphic file being played is <Z.gif> QV & LCDVIEW
- 5 Random screens: While the wash remains idle for more than 45 seconds, the wash will now display randomly graphic files <r.gif> thru <y.gif>. This feature lets you display other files that may or may not be carwash related. This feature is programmable to show the Z logo indefinitely by the setting of the LCDVIEW.INI file, <logo=0>.
- 6 As the carwash starts and the different cycles occur, when each sign is turned on by the K100 controllers (Undercarriage, Wax, RO, etc) the corresponding graphic file is selected.

NOTE

Copyright Notice:



Datalight is a registered trademark of Datalight, Inc.
ROM-DOS is a trademark of Datalight, Inc.
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QV and QuickView player is a trademark of MultimediaWare.com,
Wolfgang Hesseler, Rossbach Germany
QV program is copyrighted 1994-2008 by Wolfgang Hesseler, all rights reserved.



Mark VII is a registered trademark of Mark VII Inc.
All software copyrighted 2000-2008

Program Operation:

The Parallel Port Monitor board (PortMon) can watch up to 8 sign outputs (Plug K17) sent from the SoftWash. The PortMon watches 8 bits in the K100. *For a detailed description of these defaults, refer to SoftWash Technical Manual P20 (p/n 6370-0603), module SGN – 071.*

Theory of Operation:

The LCD view program can select 26 displays (a~z). The PortMon device can present us with 8 bits of data. The table above lists a default set of signs as well as additional signs. If a bit of intelligence is used in setting up the sign settings, multiple sign set can be used. Specifically – Make signs E~H to be some very common signs – and make signs A~D to be signs that will come on/off during the wash process (i.e. wax, hub, Trifoam). In doing so, when they come on in conjunction with signs E~H, they will take precedent and will display during that operation.

Playback Rules:

Rule 0 – all bits are off:

When the PortMon bits have been off for 15 seconds, the file associated with the letter 'z' will display.

When the input bits have been off for 60 seconds, it will go into "Idle Loop Playback". This will randomly play file letters 'r' thru 'y', unless the LCDVIEW.INI file <logo=0>, then it will only play the z file forever.

Rule 1 – A single sign on:

When only 1 sign is on, the files associated with the letter for that index (a~h) will play.

Rule 2 – Multiple low-order bits on (not all hi bits are on):

Multiple bits active in the low-order nibble are undefined and the input status will be treated as 0 bits on (treat as Rule 0).

Rule 3 - Multiple high-order bits on:

When one or more bits are on in the high-order (but not all the bits), the high-order nibble is treated as 0 and only the low order nibble is used. The starting index letter in this situation is 'i'.

Rule 4 – All High-order bits on:

When all the high-order bits are on (0xF*), treat the low-order bits as the index into the alphabet, starting at letter 'm'.

i.e. 0xF0='m', 0xF1 = 'n', 0xF2 = 'o', 0xF3 = "p", 0xF4 = "q"

The K100 software can be enhanced with a <mumble, mumble> "LCD Lighting Protocol". When implemented, the setup will be via a parameter in the 071 SGN sign package. When set to the LCD protocol, the lighting map can throw out smarter bits – and do its own mapping. This would enable it to display the 4 wash packages as one of the 26 GIF's.

Translation Table:

The following is a table of lighting outputs from the K100 and the associated files played by the LCD display.

Pbmap.txt

This table can be changed by altering the entries to the Pbmap.txt file. This file loads on boot-up and will redirect the lighting outputs (expressed in hex or decimal) to the A thru Z files to be played. Thereby allowing any of the 255 combinations of lighting signals to call up specific display files. An entry to this text file would look like this.

```
// Pbmap.txt
// This is an override map for the LCD display system
// Assign any of 1-255 combinations to any letter
0x28=F
0x38=F
0x18=E
5=B
7=C
```

This is the factory default table

PLAYBACK FILE	PORT INDEX	BITMAP 8765 4321	K100 SIGN	DESCRIPTION
spotfree.gif	1	0000 0001	X17:1	Spot Free Rinse
wax1.gif	2	0000 0010	X17:2	Clear Coat / Wax 1
totltur.gif	4	0000 0100	X17:3	RainX/TotalTurtle/Wax 2
softwash.gif	8	0000 1000	X17:4	SoftWash
FoamPre.gif	16	0001 0000	X17:5	Foam Prewash
HubScrub.gif	32	0010 0000	X17:6	HubScrub
triple.gif	64	0100 0000	X17:7	Trifoam
HPressW.gif	128	1000 0000	X17:8	High Pressure Rinse
M7Logo.gif	0	0000 0000		Advert 6
CLogo.gif	0	0000 0000		Default Sign 1 (Logo)

Programming

Initial Setup

From the factory, there is no setup. All functions and graphic displays have already been preloaded and tested.

File Structure

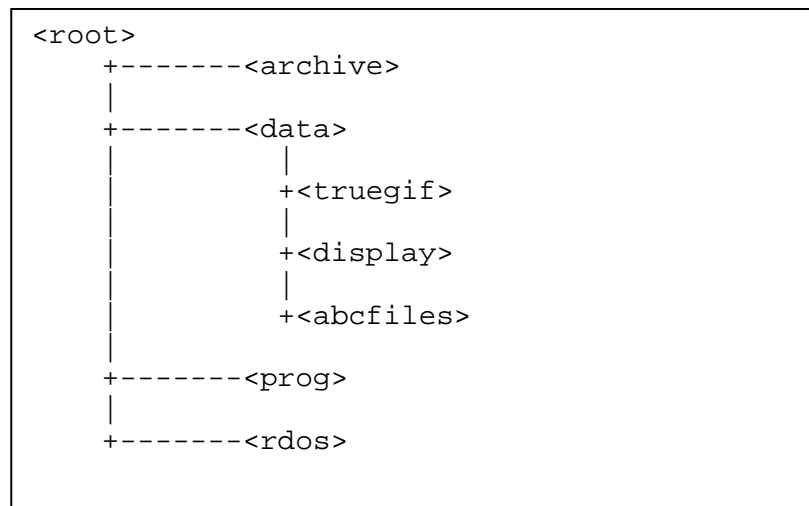
The root directory is where the system, batch and LCDView.exe application located, this program interfaces to the K100 lighting controller.

Archive directory is where the backup of the display files resides.

The rdos directory is where all the ROMDOS 7.1 support resides.

The prog directory is where the QV.exe program resides; this program displays the graphic files on the LCD screen.

The data/display directory is where the all the running graphic files and playback.txt reside.



Programming – Directory Structure

Graphic File Format

The LCD display supports many graphic file types, however the display is optimized for animated gif files in an 800 x 600 format with 8 bit color (256). While the file will playback higher color depths, for the most part these subtle color changes are lost in the high output display.

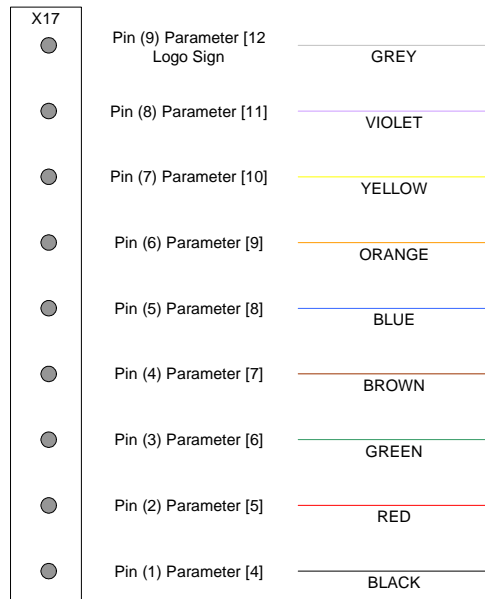
The display comes preloaded with the following default animated .gif graphics:

Undercarriage, Wash, Wax,

Furthermore, it is highly recommended that each file be the same type and graphic resolution, this will speed up loading or change over time from one display to the next.

GIF files of 10 megabyte or smaller are also recommended.

The K100 controller has 9 lighting channels on plug X17; they are numbered 1(pin 1) from the bottom to 9 (pin 9) on the top.



The 9th channel is not use in the LCD display and is reserved to drive the on board 'Logo' sign if installed.

The K100 addresses each of these pins with a set of parameters defined in sign module [071] parameter [4] thru parameter [12]. Each of these parameters has a value associated with it; these values reflect what sign will turn on when it occurs in a wash. For example, if parameter [4] is set to value [13] then pin (1) it will turn on when the undercarriage is in operation. The power from pin 1, which is associated with parameter [4], this signal will be decoded at the LCD display and call the graphic file linked to that pin.

The values for each of these parameters are as follows:

Value	Function
01	Switched Off
02	Stop Sign
03	Drive Ahead Sign
04	Back Up Sign
05	Rinse
06	Wax 1
07	Wax 2
08	SoftWash/Brush Washing

- 09 Foam Bath/Shampoo
- 10 HubScrub
- 11 Logo Sign
- 12 TRIFOAM
- 13 Dryer
- 14 Undercarriage
- 15 Wheel Cleaner
- 16 Bug Buster
- 17 High Pressure Wash

Default graphics

Default .gif and .jpg files included with LCD system (these are in directory C:\data\display)

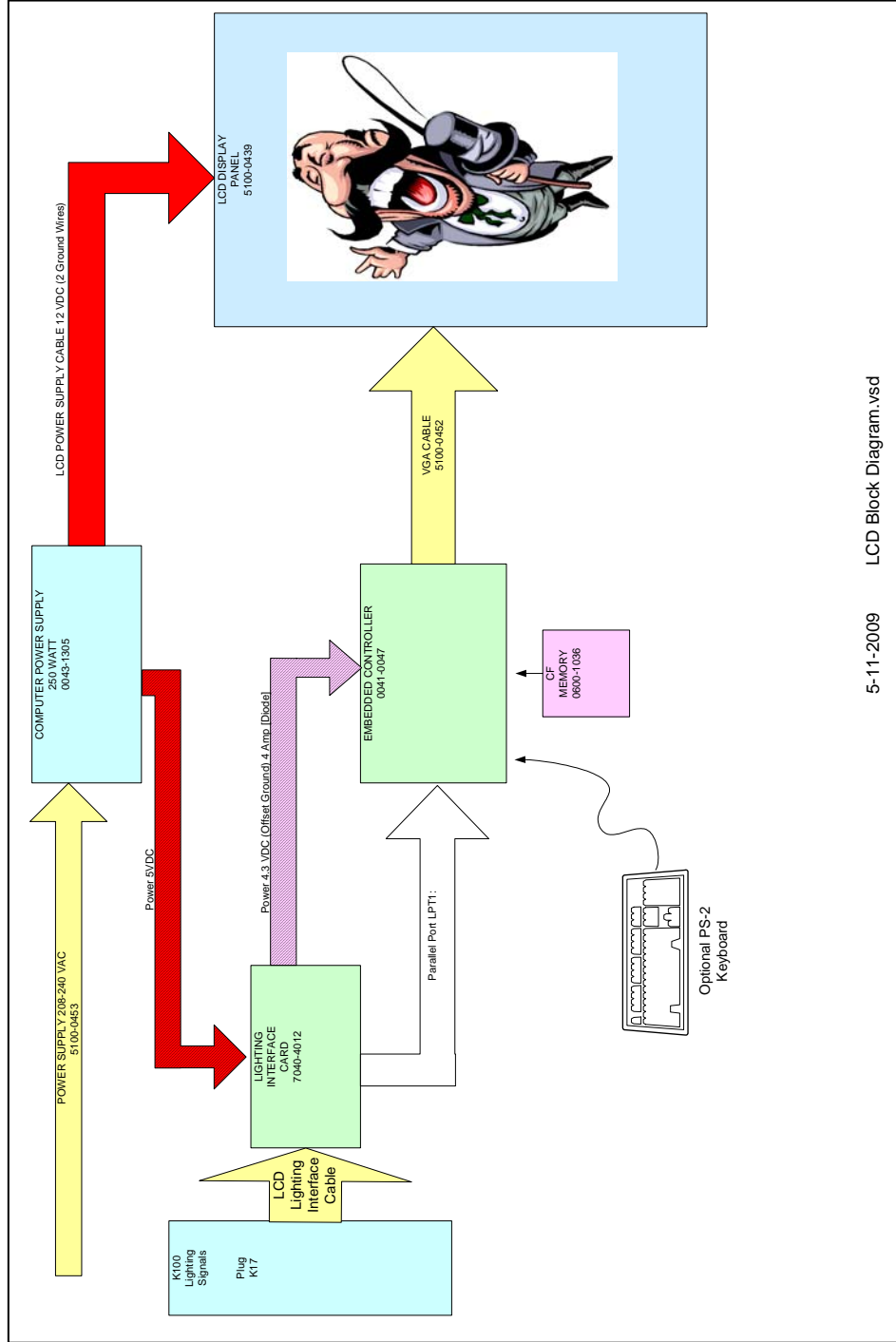
	FILENAMES	DESCRIPTION
1	BugBuster.gif	BugBuster Animated .gif
2	Dryer.gif	Dryer Animated .gif
3	FoamPre.gif	Foam Prewash Animated .gif
4	HPressW.gif	High Pressure Wash Animated .gif
5	HubScrub.gif	HubScrub Animated .gif
6	M7Logo.gif	Mark VII Logo Static .gif
7	RainX.gif	Rain-X Protectant Animated .gif
8	rocker.gif	Rocker Panel Animated .gif
9	softwash.gif	SoftWash Animated .gif
10	totltur.gif	Total Turtle Animated .gif
11	triple.gif	Triple Foam Animated .gif
12	under.gif	Undercarriage Animated .gif
13	Wax1.gif	Clear Coat Animated .gif
14	wheel.gif	Wheel Wash Animated .gif
15	M7-UC.gif	Undercarriage GT Style Animated .gif
16	M7-FB.gif	Foam Bath GT Style Animated .gif
17	M7-ROCK.gif	Rocker Panel GT Style Animated .gif
18	M7-WAX1.gif	ClearCoat GT Style Animated .gif
19	M7-Wheel.jpg	Wheel Wash GT Style Static .jpg
20	M7-Hub.jpg	HubScrub GT Style Static .jpg
21	M7-Bug.jpg	Bug Buster GT Style Static .jpg
22	M7-HPWash.jpg	High Pressure GT Style Static .jpg
23	M7-TFoam.jpg	TriFoam GT Style Static .jpg



Note: file names will change as new graphics are added, this list is for reference only.

Logic and Connection Layout

Figure 3.02.9-02, LCD Option Logic Diagram



Accessing the CF (Compact Flash) Memory



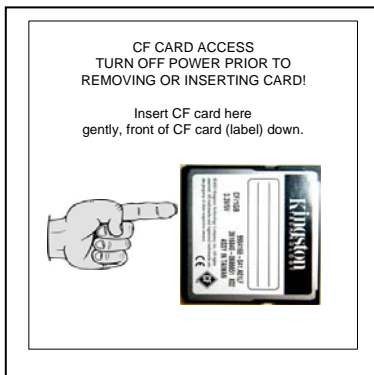
WARNING: Turn Off All Power to the display prior to working on the LCD display, failure to do so will result in damage to the LCD display, Embedded Controller or the CF Memory card.



NOTE Access to the memory card varies on the model of system you have, SoftWashXT gantries have access from the electrical panel door, AquaJetXT and free standing units are accessed by removing the LCD sign from the gantry or stand and removing the water tight back panel.



The CF memory card is accessible from the back of the LCD display. Locate the decal next to the embedded controller card with the CF card marking and Datalight logo sticker facing down.



Electrostatic Discharge (ESD) Precautions

The following practices minimize possible damage to CF Card resulting from electrostatic discharge or improper insertion.

- Discharge personal static before handling devices.
- Remove and insert CF Card with care.
- Use anti-static containers for handling and transport.
- Insert CF Card with the proper orientation, and watch for bent pins on ICs.

Accessing the CF (Compact Flash) Memory



WARNING: Turn Off All Power to the display prior to working on the LCD display, failure to do so will result in damage to the LCD display, Embedded Controller or the CF Memory card.

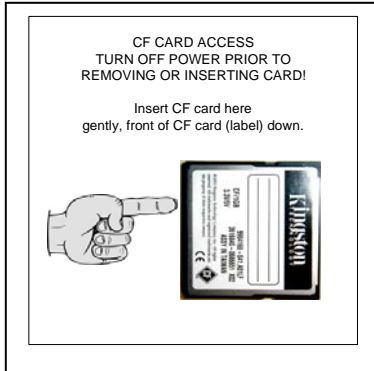


NOTE Access to the memory card varies on the model of system you have,

SoftWashXT gantries have access from the electrical panel door, AquaJetXT and free standing units are accessed by removing the LCD sign from the gantry or stand and removing the water tight back panel.



The CF memory card is accessible from the back of the LCD display. Locate the decal next to the embedded controller card with the CF card marking and Datalight logo sticker facing down.

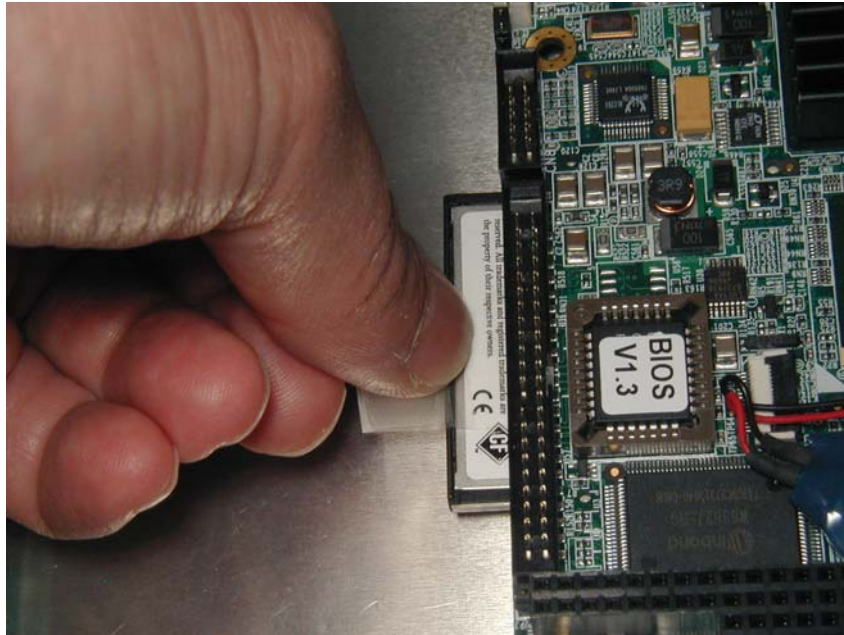


Electrostatic Discharge (ESD) Precautions

The following practices minimize possible damage to CF Card resulting from electrostatic discharge or improper insertion.

- Discharge personal static before handling devices.
- Remove and insert CF Card with care.
- Use anti-static containers for handling and transport.
- Insert CF Card with the proper orientation, and watch for bent pins on ICs.

Figure 3.02.9-03, Accessing the Compact Flash



Trouble Shooting

No LCD Display sign power

Display screen

“DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER”

- CF memory card not installed
- CF memory card blank

Only shows wake up screen

Only show advertising screen (Idle.gif)

Display shows letters of the alphabet

Keyboard Interface

Use optional keyboard to troubleshoot and monitor the LCD system,

- ONLY install the PS2 keyboard when the power is OFF.
- ONLY remove the PS2 keyboard when the power is OFF.

Pushing the 'Enter' key a couple of times quickly, exits you to the ROMDOS system.

LCDtext.exe monitors the 8 outputs of the K100.

LCDview.exe runs the LCD system.



ROMDOS by Datalight does not use the EDIT.COM for text file edit as in MSDOS, instead it uses NED.EXE, with many of the same features of EDIT.COM. For detailed operation of ROMDOS see the Datalight website (<http://www.datalight.com/products/romdos>).

3.02.10. Skins, Cladding Elements, Signage, Display

Front ABS Doors

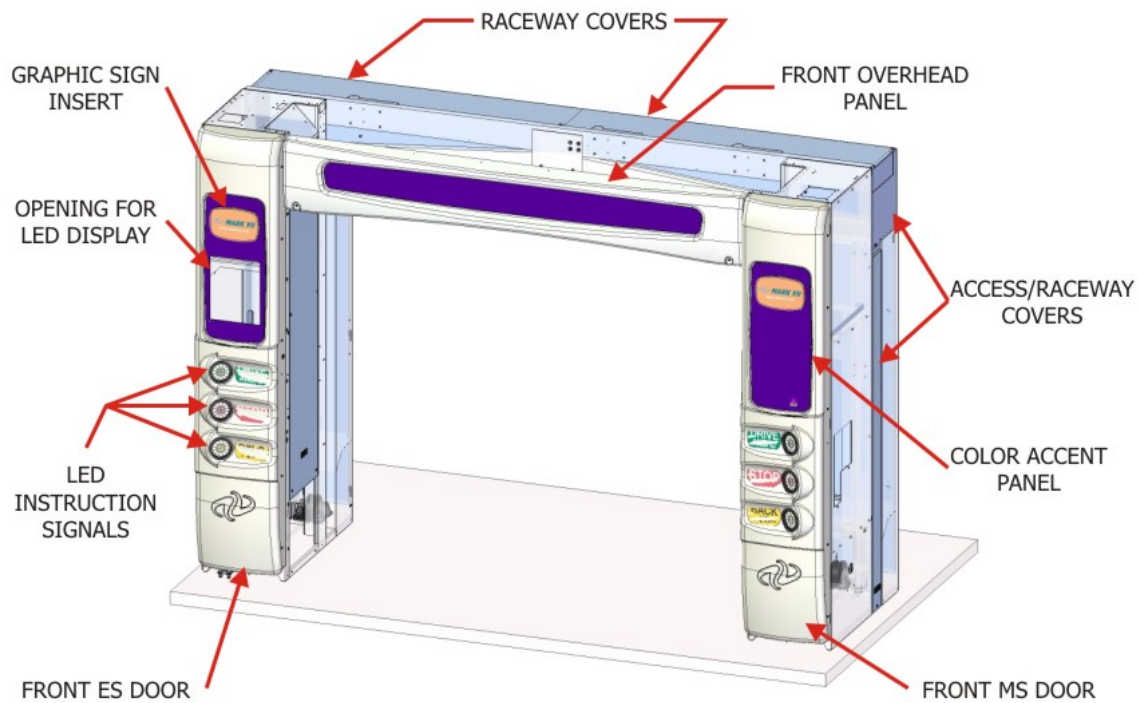
ABS doors are used on both sides of the gantry. There are three LED signal lights mounted in each door, Stop, Drive Ahead, and Back Up.

Custom logo signs can be placed on the front doors along with corresponding accent panels.

When the machine is ordered with an LCD Display, an accent panel with an opening for the LCD Display will be used on the corresponding door.

The front overhead ABS panel is mounted across the two columns.

Figure 3.02.10-01, Front ABS Doors



AQUAJET XT ABS CLADDING

Front Stainless Steel Doors

Stainless steel doors and overhead panel are also available.

Back Cabinet Doors

The Electrical side column is used as the electrical enclosure. The Mechanical side column contains pneumatic and other mechanical components. These cabinets are accessible from the back via stainless steel doors.

Accent Color Panels

Colored plastic panels cover the signage/display area on the front doors, and overhead panel (ABS option only). Different color options are available. The color panels are fastened to the door with ratchet fasteners with matching color.

Signs

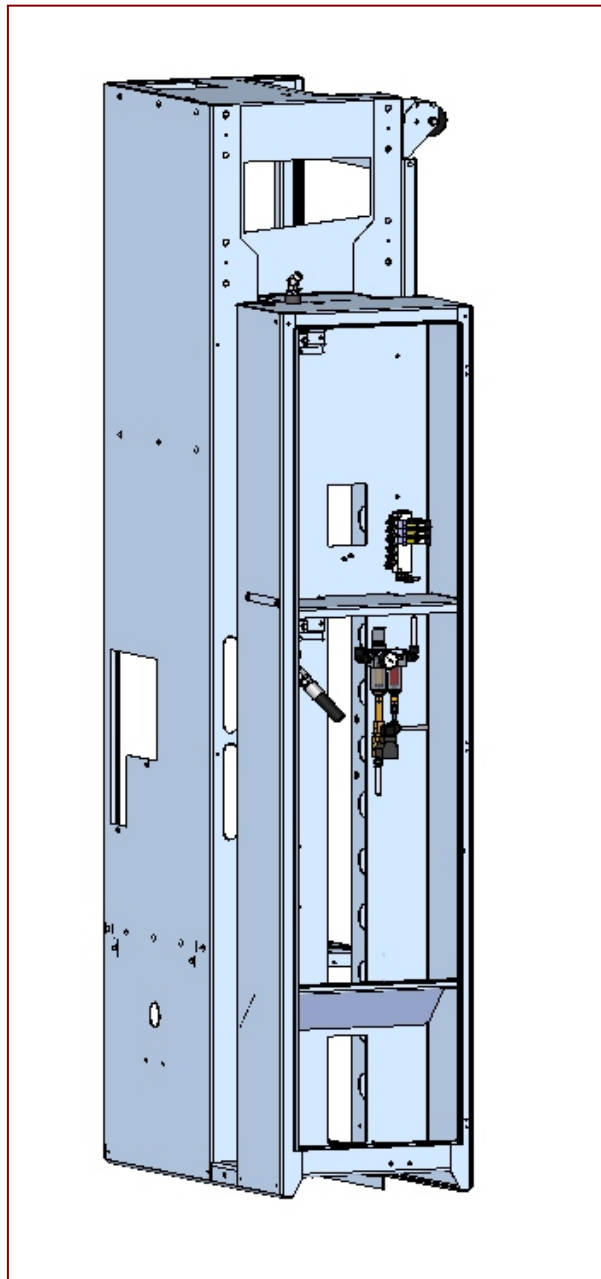
Up to three vacuum formed signs, with color graphics, can be placed on each front door. They can also be placed in combination with the LCD display.

3.03. Pneumatic System

3.03.1. Description

AquaJet XT machines require compressed air for its pneumatic system. Compressed air is used for the Top Boom rotary actuators, HubScrub extend and retract cylinder, Water Heater Tank bubbler, 3-way Ball Valves for directing high pressure water, and E-series Dryer Nozzles. The pneumatic controls are mounted in the mechanical side column of the machine.

Figure 3.03.1-01, Pneumatic System



NOTE

Due to the components used in this pneumatic system, the maximum allowable inlet pressure is 120psi. Mark VII recommends the use of a regulator to be installed between the gantry and supply compressor. The inlet pressure should not exceed 100psi.

3.03.2. Pneumatic Components

Air Regulation and Filtration System

6-Station Pneumatic Valve Manifold

HubScrub Pressure Regulator with Check Valve

3-Way Ball Valve(s)

Air Purge Valve

Air Regulation and Filtration System

This machine requires consistent air pressure for proper operation, and therefore, is equipped with an air pressure regulator. This regulator should be set at 80-90psi. The air filtration system helps extend valve life by removing small particulates and water. The first air filter removes particles down to 20 microns. After the air passes through the first filter, it then passes through the coalescing filter to remove water particles down to .01 microns. For replacement filters, see spare parts list.

6 Station Pneumatic Valve Manifold

Execution of Pneumatic functions is carried out through a 6 station pneumatic valve manifold. Here, filtered air is plumbed in the "A" port of the manifold block for use once the valve is activated. A tube fitting in the "B" port allows particles and water to drain out of the manifold. Every machine ships with a minimum of three 4-way valves. As options are added, more valves are added as needed.

4-Way Pneumatic Valves

There are a minimum of three 4-Way pneumatic valves on every 6 Station Manifold for each Aquajet XT machine. The valves operate on 24 Volts Alternating Current with a rectifier to ensure the valves function properly. They have a maximum operating pressure of 120psi and will work in temperatures from 0 to 120 degrees F.

Two valves are used for controlling the Top Boom rotational movement. There is a valve for the 45 degree Rotary Actuator and one for the 90 degree Rotary Actuator. The third valve is used for controlling the Hot Water Heater Bubbler and Dryer Nozzle Tilt (if so equipped). The air to the bubbler is fed through an orifice fitting, restricting the flow which results in more evenly heated water.

HubScrub Pressure Regulator with Check Valve

For machines ordered with HubScrub, an additional valve is added to the Pneumatic Valve Manifold along with a separate pressure regulator with built in check valve. The pressure regulator allows for the adjustment of the “extend” motion of the HubScrub brush. This ensures that the HubScrub brush doesn’t push too hard and cause damage or not hard enough to clean the wheels. The HubScrub extend pressure should be set at 30psi. The check valve ensures no excess air gets trapped keeping the cylinder extended.

3-Way Ball Valve(s)

Based on the machine configuration, zero, one or two pneumatically actuated Ball Valves may be used for directing high pressure water.

On the AXT300, there are up to two Ball Valve located in the MS cabinet. The bottom Ball Valve directs water to either the HP Top Boom/HP Side Manifolds or to the Undercarriage Manifold. The Ball Valve on top delivers water to the HP Top Boom or the HP Side Manifolds.

AXT 700 has only one Ball Valve located in the MS cabinet. This Ball Valve is used to direct water to the HP top Boom / HP Side Manifolds or to the Undercarriage Manifold. On the AXT700, the HP Top Boom and HP Side Manifolds spray simultaneously, eliminating the need for the top Ball Valve. The HP Side Manifolds are independently controlled by an electric (24VAC) solenoid valve located at the top of each manifold.

Air Purge Valve

The filtration system also contains a purge valve to blow out any debris and water from the filters. The Air Purge Valve operates every time a vehicle moves onto the treadle at the beginning of the wash cycle.

3.04. Fluid System

Incoming water is connected to the main water tank and onboard heater tank.

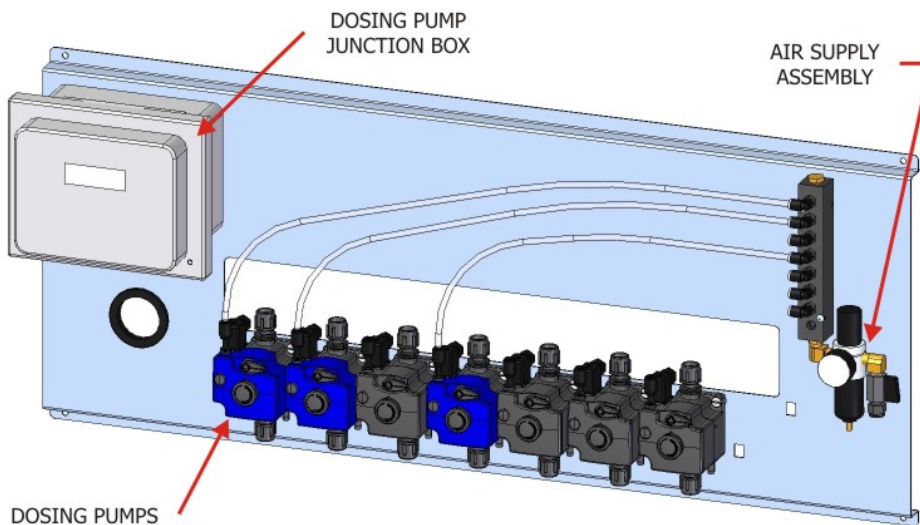
3.04.1. Low Pressure Water/Chemical Distribution

Dosing pumps and cleaning agent containers

The dosing pumps deliver individual chemicals to their corresponding valve on the valve manifold where they feed into the water stream as each valve is opened and each dosing pump is turned on.

Each chemical option ordered comes with a Dosing Pump Assembly, which is mounted in a designated position on the Dosing Pump Panel. The Dosing Pump Assembly consists of a standard 12L/H dosing pump, and inlet, outlet, and air fittings. An optional 3 L/H pump assembly is also available for more concentrated or lower volume chemicals. The Dosing Pump Panel consists of a wall-mounted mounting plate, an air distribution manifold and regulator assembly, and an electrical enclosure assembly.

Figure 3.04.1-02, Dosing Pump Panel



The dosing pumps are pneumatically operated. Each pump has its own internal air valve which is controlled by an electrically activated solenoid. The machine's main control is used to pulse the signal to each pump – the signal must be pulsed to make the pump reciprocate. Air is fed to the dosing pumps from the air distribution manifold assembly, which is fed by the main air supply on site.

Chemical dosing is controlled by adjusting a knob on the front of each dosing pump, which controls the stroke length of the pump's piston. The number of

strokes (pulses) per minute may also be controlled through the machine's main control. For titration-critical chemicals like Presoaks, it is generally recommended to use a faster stroke speed to minimize chemical pulsation.

Maximum working air pressure for the pumps is 87 psi (6 bar).

Standard inlet plumbing included consists of 3/8" OD clear soft vinyl tubing, a plastic compression sleeve, compression fittings, a foot valve/strainer, and a ceramic weight.

Standard outlet tubing is 1/4" OD polyflow tubing, a roll of which is included with each machine. Air tubing and fittings are installed at Mark VII, and the inlet and outlet tubing are installed on site. The dosing pump cables are connected into the electrical enclosure on the Dosing Pump Panel.

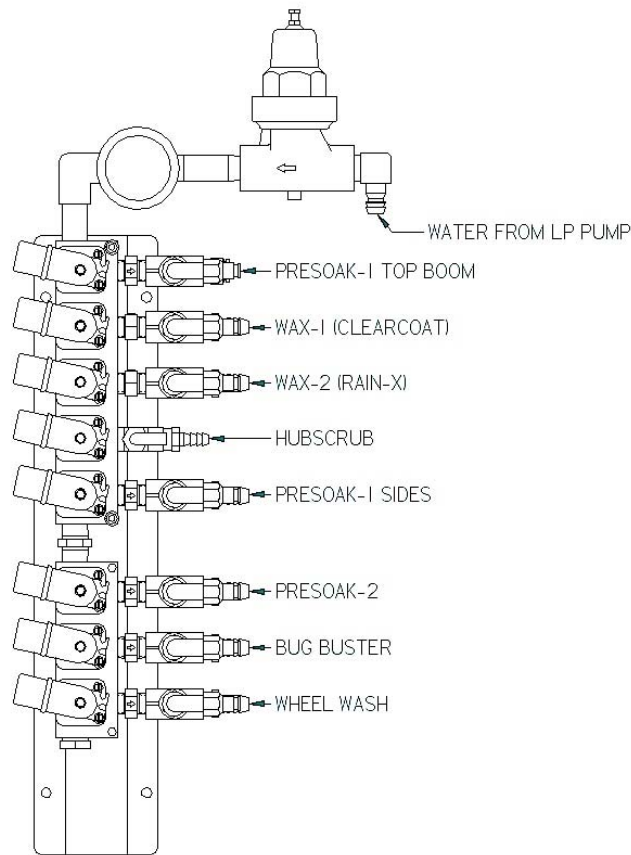
Chemical containers should be placed below the dosing pump panel and as close as possible to the pumps.

Chemical Applicators

Water Valve Manifold

The chemical valve manifold is located on the machine gantry on the Electrical side of the machine. The valve manifold assembly consists of a standard 5-valve stainless steel manifold with a pressure regulator and a pressure gauge installed on the inlet. The manifold is fed with water from the low pressure pump. Each individual chemical option is fed to the valve manifold from a dosing pump located off-board in a pump and chemical room or in some locations may be mounted in the wash bay. The chemicals are injected on the outlet side of the valve manifold at the ports designated for each particular chemical.

Figure 3.04.1-03, Solenoid Manifold



If Presoak-2, Wheel Wash, and/or Bug Buster chemicals are installed as options, an additional 3-station valve manifold is added to the bottom of the 5-station manifold, for a total of 8 available stations.

Designated valve ports not being used are plugged.

Water pressure should be regulated to between 50 and 70 psi at the manifold inlet. There may be slight variations between the various chemical system pressures due to different nozzle sizes and the number of nozzles being fed for each chemical system. It is recommended to set the regulator with only the Presoak-1 system activated.

The exit plumbing for the valve ports consists of a check valve, a stainless steel tee, and hose barb for connecting the hose assembly. The chemical injection fittings are assembled into the arm of the stainless steel tee, and consist of a CPVC injector stem, a ¼" Kynar check valve, a ¼" nylon street elbow, and a push-in fitting to accept ¼" polyflow tubing.

The one exception is the HubScrub option, which has no check valves and feeds water only to the HubScrub brushes. The HubScrub fittings consist of a

3/8" street tee, a 3/8" straight hose barb, and a 3/8" hose barb elbow. There is no chemical used with the Hub Scrub.

Hoses and Nozzles

On the AXT machine, the standard hoses used to deliver diluted chemical to the spray nozzles are nylon braided PVC hose for unheated chemicals, and Pushlok hose for heated chemicals.

Each chemical system has spray nozzles selected for the performance required for each system.

Presoaks, Bug Buster, and Wax-2 use self-aspirating foaming nozzles.

Wax-1 and Wheel Wash use stainless steel nozzle tips.

Spotfree Rinse also uses stainless steel tips.

See parts lists for the specific nozzles used.

Pumping Plant

Water for the Low Pressure systems is supplied from a dedicated pump on the gantry. This supplies water for the chemical systems except for Trifoam. Trifoam water is taken from the city water supply if the line pressure is sufficient (40 psi minimum is recommended for Trifoam). Heated chemicals are supplied with hot water gravity fed to the pump from the heater tank. Unheated chemicals are supplied with water from a city water feed branched from the main water tank fill. Both heated and unheated water is fed through the same pump.

Spotfree Rinse water may be supplied by an R.O. system pump (recommended minimum working pressure should be 50 psi or greater), or if the R.O. system pump does not supply sufficient pressure a booster pump may be added.

Chemical systems

Presoak 1/Presoak 2

Presoak-1: This is usually a strongly alkaline high pH cleaning agent. It is applied with self-aspirating foaming nozzles. It is sensitive to proper titration of chemical to water to provide cleaning. Presoak-1 is applied with hot water.

Presoak-2: This may be a high pH alkaline, or a low pH acid chemical. It is applied before Presoak-1. Acids are often used in areas with a lot of road film, to chemically break down the film. Alkalines are used where an additional pass of presoak is desired but the more aggressive acid presoaks are either not needed, or the customer wishes to avoid a more aggressive chemical. This is also applied with hot water.

Wax 1/Wax 2

Wax-1: (aka Clearcoat or Clearcoat Protectant). These are sometimes a true wax, but often are a mineral oil based beading/drying agent that also

produces a shinier finish. These make water bead on the vehicle surface so the vehicle can be dried more efficiently. It is applied with UniJet nozzle tips.

Wax-2: Generally this is either the **Rain-X** product or an equivalent. Wax-2 is applied using self-aspirating foaming nozzles.

Hub Scrub

Hub Scrub is not a chemical application, it uses water only. However it is included here because the water is fed through the water valve manifold and is controlled in the same way as the chemical systems. Hub Scrub water can be hot or cold and is sprayed through the Hub Scrub brushes to lubricate the brushes.

BugBuster

These are proprietary chemicals designed to break down bugs splattered on the front of vehicles. It is applied only to the front of the vehicle. These are often a very strong alkaline as well. Bug Buster is usually applied with hot water.

WheelWash

This is usually a very strong high pH chemical sprayed on the wheels and rocker panels. Chemically it is very similar to a lot of presoaks but is usually stronger or more concentrated. It is usually applied with hot water via UniJet nozzle tips and is not foamed.

TriFoam

Tri-Foam is a colored chemical, usually 3 different colors, typically red, yellow, and blue. It is applied through special "puck" shaped nozzles, which spray the chemical in a rainbow effect. It is used to enhance the shine on the vehicle, and is also a visual enhancement with the rainbow colors, and is usually scented with a fruit or candy scent. The chemical is delivered using either a dosing pump system. The chemicals are diluted off-board at the pump and delivered to a set of foaming chambers (one for each color) where air is added to the chemical to produce foam as it passes through the foaming chamber. The foamed chemicals pass from the foaming chambers to individual nozzles (one on each side of the machine, or two nozzles per color). Tri-Foam is not fed through the chemical valve manifold on the gantry.

SpotFree Rinse/Final Rinse

Spotfree Rinse (aka R.O. rinse) is usually R.O. water fed from an R.O. system using either a pump installed with the R.O. system, or a separate booster pump ordered from Mark VII. Spotfree Rinse is *not* fed to the water valve manifold as with the chemical options. Instead it feeds from the pump directly to its own nozzle array. The pump is located off-board, generally very close to the R.O water tank. At a minimum, the Spotfree Rinse water pressure at the pump should be at least 50 psi for best performance. The customer has the option to use an existing pump which may have been included with the R.O. system they purchased. However, it is up to the customer's discretion whether the pressure provided will be adequate for

rinsing. If there is any doubt, it is recommended that the customer install a Mark VII booster pump. For those customers who do not have an R.O. system and are using soft water for the rinse instead of R.O. water, the system may be fed from city water if the line pressure is high enough. Otherwise a booster pump is recommended to provide adequate rinse water pressure, whether the pump is fed from a storage tank or from a city water line. For these customers, soft water is strongly recommended to minimize spotting on vehicles.

Low Pressure Systems Troubleshooting

Water pressure:

Issues with the chemical system can often be related to water pressure. Water pressure needs to be high enough to provide a good spray pattern, but not so high that the spray atomizes too much and blows away in the breeze. Too high a water pressure will also increase the demand on titrated chemicals – mainly the presoaks – in order to maintain the correct titration. This can increase operating costs by using more chemical and water than necessary.

Verify that the regulated water pressure is at least 50 psi, and preferably between 55 and 65 psi at the gauge as set when running the presoak-1 system only.

If water pump is operating but pressure is unusually low, confirm the pump motor is rotating in the correct direction. Check the regulator setting to ensure that it is set in the correct pressure range. Inspect the check valve on the inlet to the pump.

Dosing pumps:

Check fittings and tubing for cracks or leaks.

Confirm the solenoid on the pump is operating correctly.

If the pump has been sitting idle for a long time, the inlet and outlet check valves may need to be soaked in hot water to loosen or re-dissolve chemical residues that may have dried or become sticky.

Check chemical tubing and fittings out to the injection fittings on the gantry – check for leaks or kinks in the tubing.

NOTE: Do not use soft tubing or hose for the chemical lines except on the dosing pump inlets. All discharge tubing between the dosing pumps and the injection fittings on the gantry should be ¼" OD LLDPE (polyflow) tubing, or nylon tubing may be used as an alternative.

Nozzles:

Check nozzles and also the check valve/strainers contained in the threaded nozzle body under the nozzle tip. Check for debris in the strainers or in the nozzle orifices and clean as needed. Check the orientation of the nozzle tip slots to ensure they are aligned properly for best coverage.

Nozzle tips are either all stainless (Unijet tips), or black polypropylene with a stainless steel tip insert (foaming tips). While these materials are very resistant to most car wash chemicals, certain chemicals may cause damage to the nozzles (such as some acid presoaks).

Chemical compatibility:

Many car wash chemicals are quite harsh. Generally the most aggressive chemicals will be found in presoaks, bug cleaner, and wheel wash chemicals. These are typically high pH alkaline chemicals such as sodium hydroxide or potassium hydroxide. Some presoak chemicals contain low pH acids, which can be very corrosive, and some are extremely toxic, such as hydrofluoric acid.

There are too many different chemicals used in car washes to reference here, but generally speaking the types of car wash chemicals most likely to cause damage or accelerated wear to various car wash components are some of the low pH acid presoaks (those containing sulfuric acid, for example, can cause degradation to stainless steel). Most that are used in car wash systems will not be a serious problem, but for those operators who do use more aggressive chemicals, we recommend monitoring any degradation to the nozzles and other components and adjust the preventive maintenance schedule to include replacing nozzle tips and/or strainer/check valves or other components at more frequent intervals as needed.

Certain other chemicals such as amines can attack Viton seals and O-rings commonly used on car wash components such as valves and tubing fittings.

Always refer to the MSDS for the chemicals you intend to use to see if there may be any potential compatibility issues with the machine components. Consult with your chemical manufacturers and/or Mark VII Equipment if you have any questions regarding chemical compatibility.

Important: See also Warranty Information for listings of specific chemicals that will void warranty if used.

3.04.2. High Pressure System

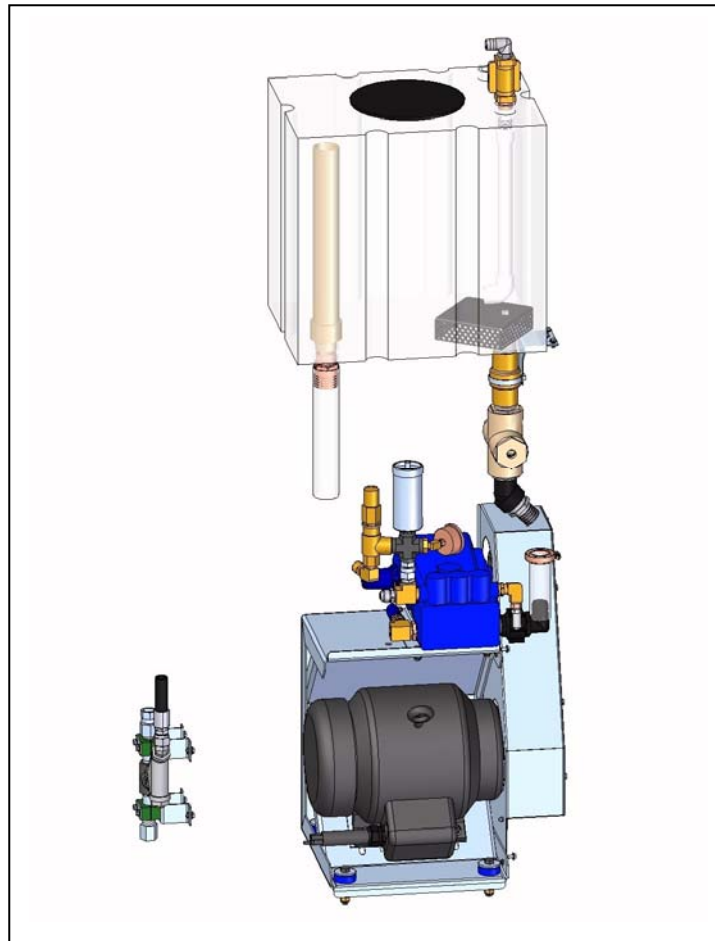
On-board Pumping Station

Onboard Pumping Station is standard for the AquaJet XT. A single on-board pumping station is located in the front of the mechanical side column. The main cold water tank is located directly above the pump. Two types of pumping stations are available, 15 HP (AXT300) and 20 HP (AXT700).

Pumping Station Specifications:

	AXT300	AXT700
Pump	Cat 1540	Cat 2530
Motor	15 hp	20 hp
Gpm	17.5 (top boom), 18 (side manifolds)	28 (all nozzles), 10 (top boom), 18 (side manifolds)

Figure 3.04.2-01, On-board Pumping Station



Off-board Pumping Station

The Off-board High Pressure Pumping Station is an option for the AquaJet XT.

An all-stainless steel frame houses a water tank on top of the frame, pumping unit located right below the tank, distribution manifolds are located nearby the pumping unit. The pump-motor assemblies used in the off-board pumping station are the same as the ones used in on-board pumping station.

Figure 3.04.2-02, Off-board Pumping Station

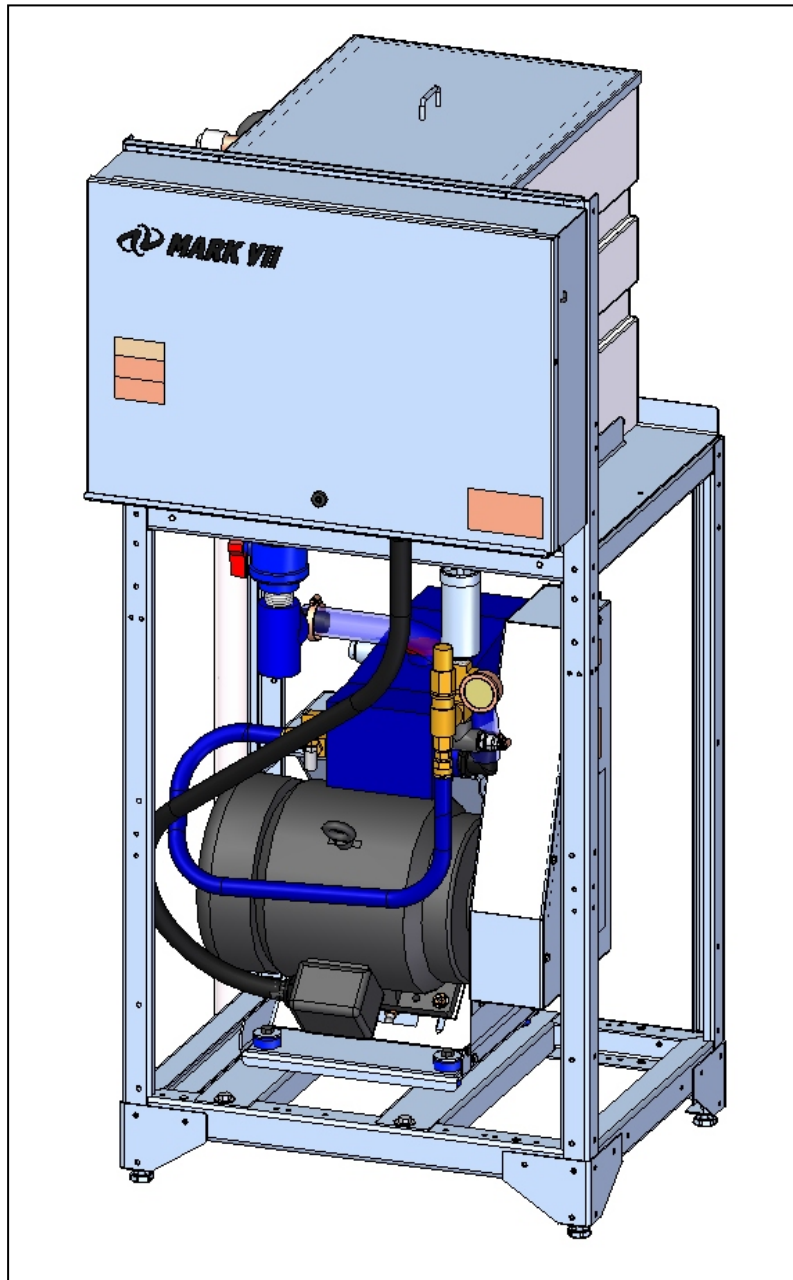
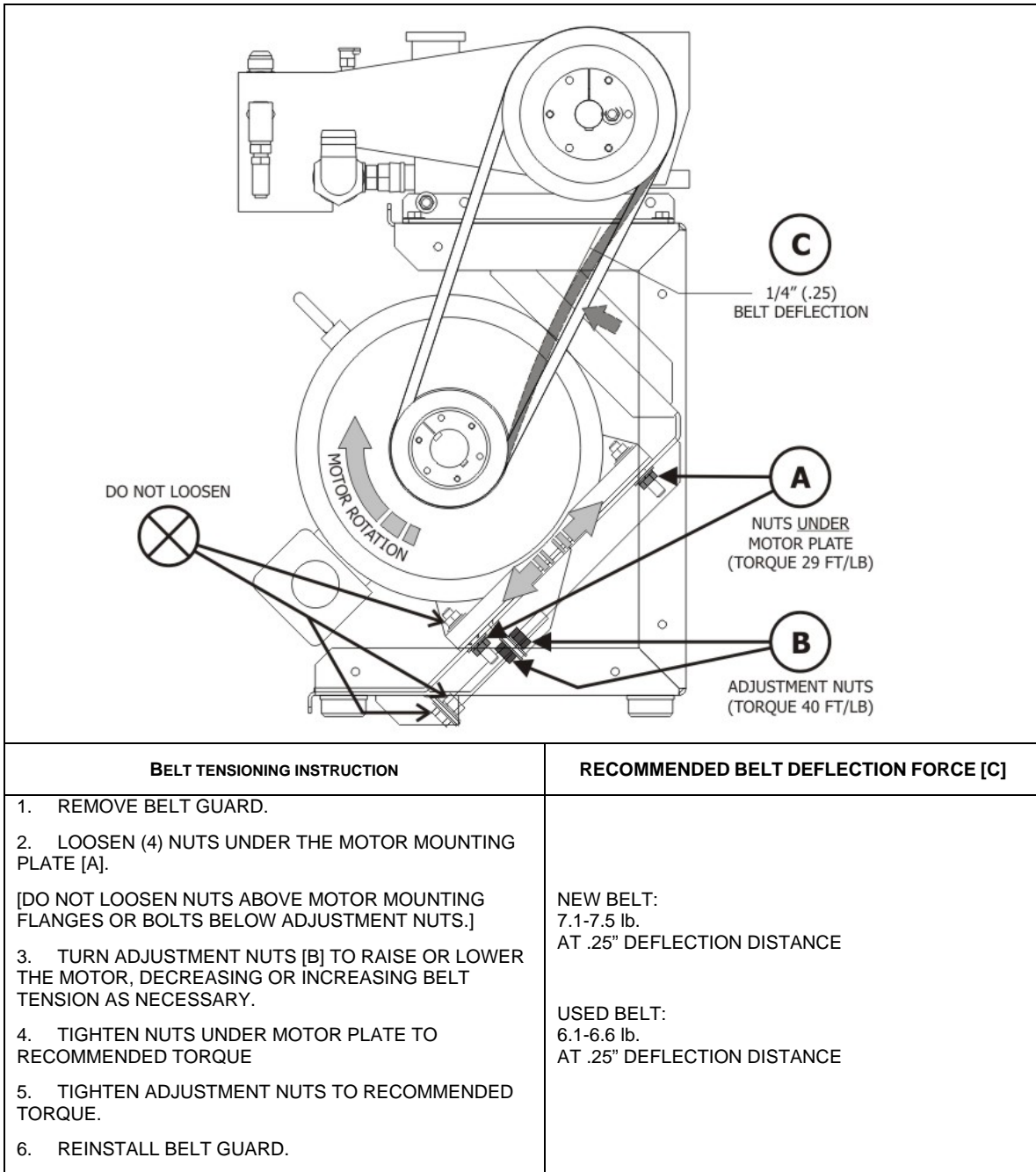


Figure 3.04-03, Belt Tensioning Diagram



Washing Manifolds and Nozzles

Side Wands and Top Boom

For ATX300: Top boom and side manifolds nozzles are independently controlled using a pneumatically controlled high pressure Apollo valve. All high pressure nozzles are never on at the same time.

For AXT700: All top boom and side manifold nozzles are on at the same time. Side manifolds are independently controlled using solenoid valves to conserve water during certain wash passes.

High Pressure Manifolds and Nozzles:

	AXT300	AXT700
Side Wands	(18) 2.0 turbo nozzles	(18) 2.0 turbo nozzles
Top Boom	(10) 3.5 turbo nozzles non-contouring	(10) 2.0 turbo nozzles contouring

Undercarriage

For an on-board Pumping Station, undercarriage distribution valve is located in the mechanical side column. For the off-board Pumping Station, the undercarriage distribution valve is located on the off-board pumping station. Undercarriage is controlled by a pneumatic high pressure Apollo valve. Water pressure is adjusted at the outlet of the assembly and bypass water is directed back to the pump inlet.

Water Heater

Presoak Heater

Presoak heater is located in the electrical side column of the gantry.

The presoak heater is an electrically heated tank that holds approximately 5 gallons of water. Water level in the presoak tank is controlled by two electric float switches attached to the side of the tank. The upper switches monitor the high water level, and the lower switch monitors low water level.

As the water level drops, the upper float lowers and activates the switch. This causes a normally closed (NC) solenoid valve to open, allowing water to enter the tank.

The lower float switch prevents the heater element and low pressure pump from energizing if the tank is low.

Tank Bubbler

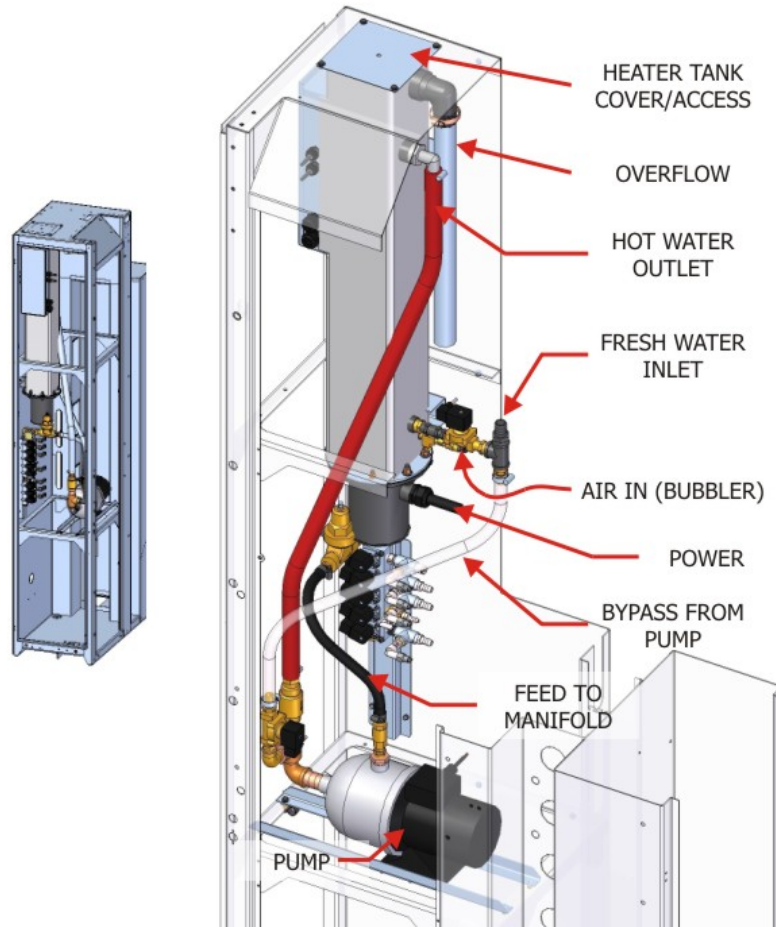
The presoak heater tank bubbler injects air into the tank to circulate the water ensuring constant water temperature throughout the tank. The volume of air injected into the tank is controlled by an orifice. The airflow is taken from the normally open port of an air valve on the pneumatic panel. During the presoak cycle this valve is energized, stopping the air flow, to prevent air bubbles from entering the pump and to ensure use of the warmest water possible.



When the high limit thermostat is tripped, other heater circuits should be checked for possible failure causing overheating.

Figure 3.04.1-01, Presoak Heater

AJXT PRESOAK HEATER ON-BOARD



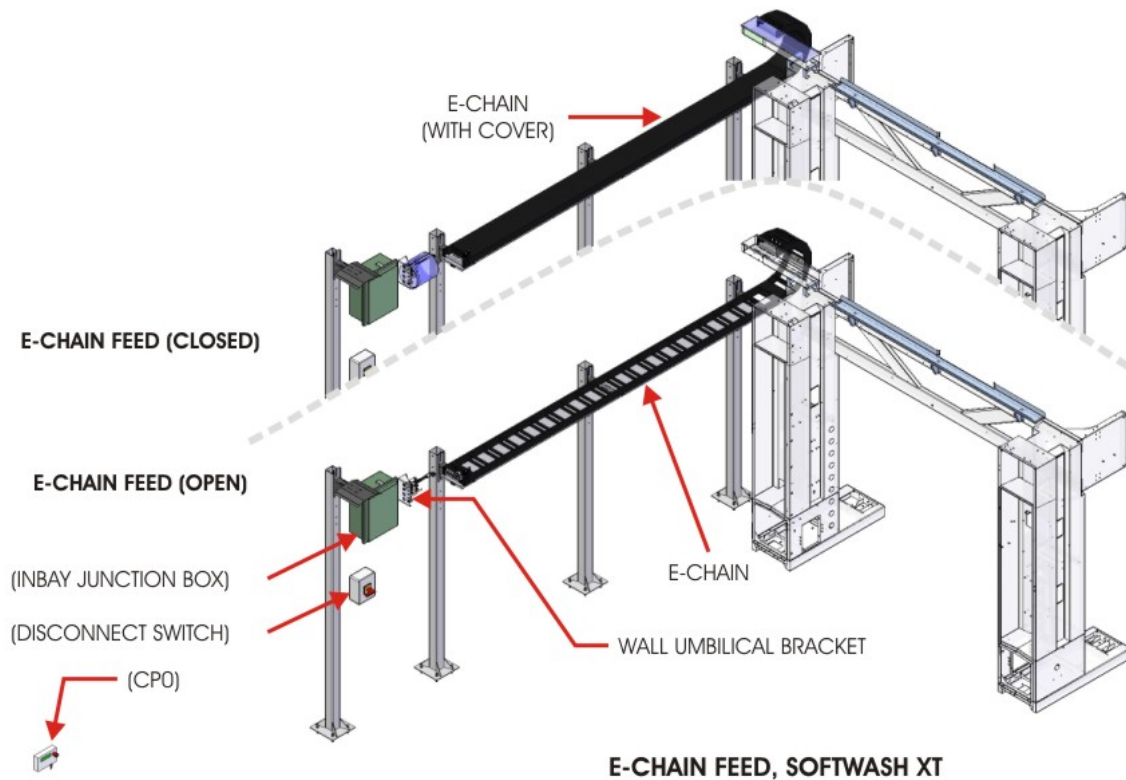
You may occasionally see water come out the overflow port hose. This may be from water sloshing around in the tank and into the overflow port.

Feed System

The Feed system connects the gantry to the mechanical room. If the AquaJet XT® has an on-board pumping plant and water tank, it will require chemical supply lines, power and control cables from the mechanical room. If the AquaJet XT® has a remote pumping plant, it will also require high pressure supply line from the off-board pumping station. Hoses and cables carrying water, chemicals and electricity are routed through the E-Chain.

Standard feed system for AquaJet XT is through an Energy Chain system. Side umbilical feed can be ordered as a special option.

Figure 3.04.3-01, E-Chain Feed System



E-Chain Feed System

The E-Chain option is offered as the standard feed option to the automatic carwash system. The E-Chain assembly is installed onto the bay wall or onto posts for wider bays and connects to the top of the gantry frame. The E-Chain is a hollow carrier, which guides and protects the moving power cables and fluid lines from the bay restraint plate to the machine. Extra care should be taken when routing hoses and cables through the E-Chain. Dividers are supplied with the E-Chain and should be utilized to ensure proper operation.

E-Chain feed system consists of 2 stainless troughs, mounting brackets, chain support, cable restraints and 17 ½' of Energy Chain. The E-Chain system is installed onto the bay wall with adjustable brackets and connects to the gantry.

See installation guide for more detail.

Side Feed Umbilical System

The Side Feed System consists of a restraint plate mounted on the gantry and a wall mounted restraint plate. Hoses and cables are connected to each of the restraint plates and hang between the gantry and the wall. This system can be installed on either side of the gantry.

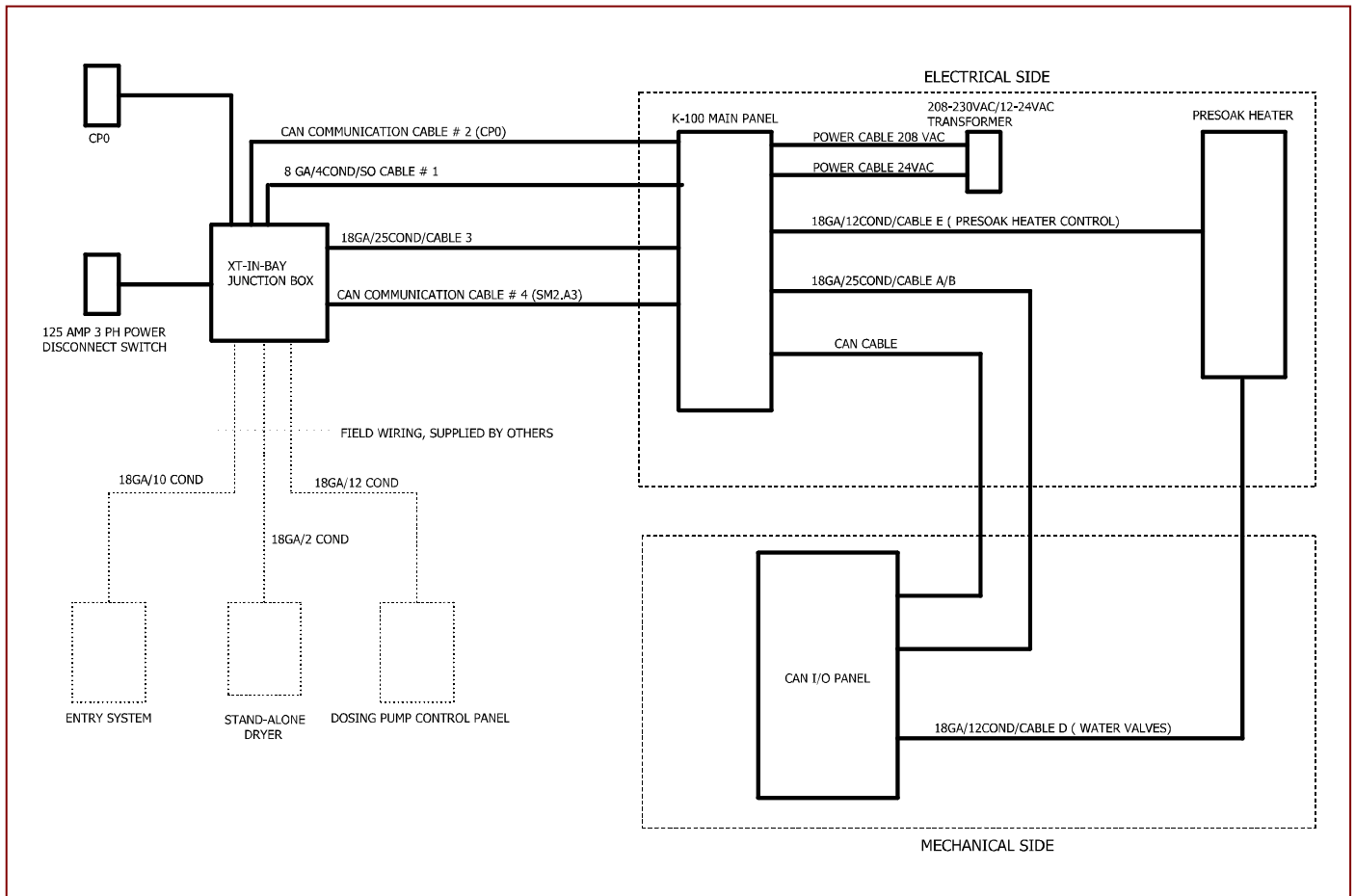


Hoses and Cables

Improper routing of hoses and cables can cause excessive wear and/or premature failure. Proper routing and clamping for the cables and hoses are shown in the installation manual.

3.05. Electrical

Figure 3.05-01, Electrical Control Diagram



3.05.1. Main Electrical Enclosure

(For wiring refer to drawing 0000-0108 for the main control panel, and 0000-0115 for remote pumping plant)

Main Electrical Enclosure is located in the ES side column of the gantry. The K100 CPU resides in this enclosure along with inverters (for Drive motors and for Lift motor), motor starters and motor protectors.

Figure 3.05-02, Main Electrical Enclosure



High Voltage Power

Incoming power is connected to the main electrical panel located in the main electrical enclosure (Electrical side enclosure).

Low voltage Power

The high voltage power is transformed to low voltage power via transformer located behind the main electrical enclosure, electrical side.

Interface

Output signals are designated with an A---- and Inputs signals are designated with an E----. Refer to input/output list in appendix.

In addition, for overall conformity, all interface terminals are labeled the same as GT series machine, for example, 13 is 24VDC GND, 0 is 24VDC+, 16 is 24 VAC HOT and 33 is 24VAC COM.

For REMOTE PUMPING PLANT 16L for local 24VAC HOT and 33L for local 24VAC COM

All water and pneumatic valves are controlled by 24VAC, all remote chemical dosing pumps are controlled by 24 VDC.

All LED STOP, GO and REVERSE signs are 12VDC.

3.05.2. Mechanical Side Junction Box

MS Junction Box locates in the MS side column of the Gantry, above the pneumatic panel.

The CAN I/O Card (A2) resides in this enclosure along with relays and terminals

This CAN I/O card is controlled by the K100 thru a shielded cable CAN communication.

Figure 3.05-03, Mechanical Side Junction Box



3.05.3. Operating unit (CP0)

CP0 is a device for setting-up and programming. It also carries an E-Stop Switch. This device is controlled by the K100 thru a shielded cable CAN communication. The 24VDC power is also supplied through the CAN cable.

Figure 3.05-04, CP0 with CAN Communication cable, and E-Stop cable



3.05.4. Equipment in Wash bay and Equipment room

In-bay Junction Box

In-Bay Junction Box is wall-mounted inside the wash bay, where all the umbilical cables from the machine connect to.

The second CAN I/O Card (A3) resides in this enclosure along with relays and terminals

This CAN I/O card is controlled by the K100 thru a shielded cable CAN communication.

Figure 3.05-05, In-bay Junction Box



Main Power Disconnect Switch

A Main Power Quick Disconnect Switch for the main supply, 208-230VAC 3 Phase 125AMP, is mounted in the wash bay where easily accessible. This switch controls the power to the rollover machine.

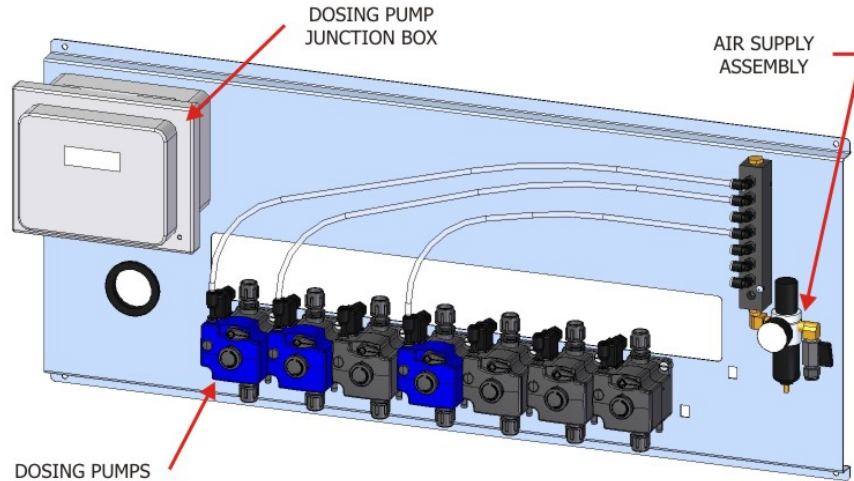
Figure 3.05-06, Main Power Disconnect Switch



Dosing Pump Junction Box

Located in the Dosing Pump Junction Box, there are interface terminals for control cable from the In-bay Junction Box to control 24VDC chemical dosing pumps.

Figure 3.05-07, Dosing Pump Panel



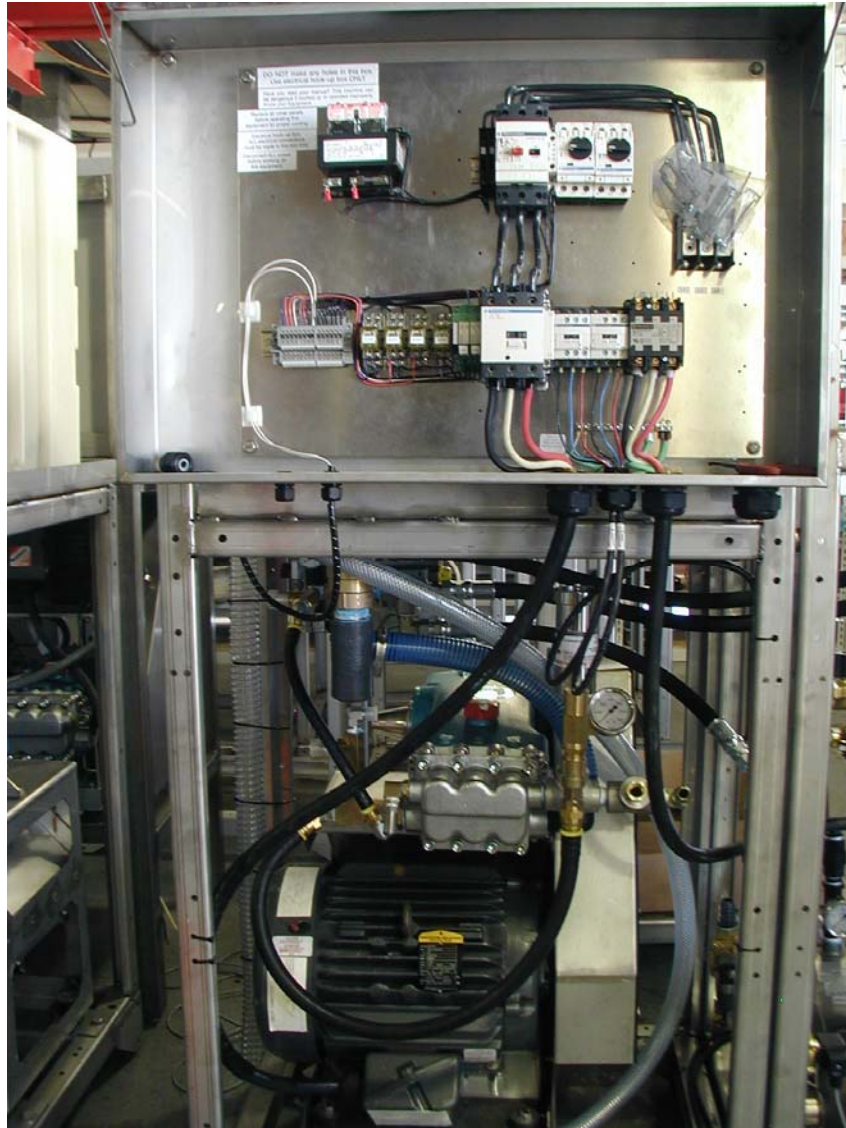
High Pressure Pump Controls

AXT machines - HP pumping control motor starters reside in the main electrical cabinet on the Electrical side of the machine

AXTO machines - HP pumping control enclosure is located on the remote pumping station. Motor starters and motor protectors reside in this enclosure.

Refer to drawing 0000-0115 for 15 to 20 HP remote pumping plant.





Figure 3.05-08, AXTO 700 Remote Pumping Plant




4. EQUIPMENT SET-UP AND COMMISSION

4.01. Commissioning

This chapter describes all the stages which must be worked through in order to put the roll-over wash system into operation correctly. For installation instruction, refer the installation manual.

-  Clean the floor of the building. Take particular care over the area around the floor rails.
-  Clean the transmitters and receivers of all the photo eyes.
-  Remove all obstacles, such as cleaning equipment, buckets, hoses, etc. from the building.
-  Only in cold weather: remove any frozen areas from the entrance and exit areas of the building.





Check brushes:

-  Check all brushes for foreign parts (dirt, small stones, etc.) and remove them if necessary.





Caution: Foreign parts in the brushes may damage the vehicle. Make sure that no foreign parts stuck in the brushes. Clean the brushes periodically (see chapter 7.2.4). Mark VII can accept no responsibility for damage to vehicles which are caused by dirty brushes.

Switching on:

-  Open the air and water connections.
-  Switch the system on at the main switch.
-  The roll-over wash system carries out a self-test which last about 10 seconds.
-  Note the message displayed on the operating unit.

Cleaning agents:

-  Check the levels in the chemical storage containers.

 If necessary, fill or replace chemical storage containers. If a chemical storage container has been emptied completely, all air must be bled out of the supply lead (see Chapter 6 "Settings and Adjustments").



Caution: The wrong selection of cleaning agents may cause poor cleaning results and damage to the vehicle and the system. The selection of the best suited cleaning agents depends among other things on the water quality and water hardness. Discuss with your cleaning agent supplier which cleaning agents are best suited for your system.




Danger: Highly inflammable and toxic cleaning agents may cause damage to machinery and injury to persons. Such cleaning agents may not be used because of the risk for fire hazard and health.



Danger: Caution should be exercised in handling all chemical compounds. Some car wash chemicals are somewhat caustic and should not be permitted to come in direct contact with bare skins or eyes.

- Always refer to product MSDS Sheets for proper precautions.
- Whenever handling such chemicals wear proper protective rubber gloves, boots and a face shield.

 After refilling containers, check the filters in the suction hoses to ensure they function correctly, and clean them if necessary.

Safety devices:



Danger: A fault in the safety devices (emergency-off function, safety shut-down and safety switches) can cause serious accidents and/or damage to vehicles.

For this reason, all safety devices must be checked every day to ensure that they function correctly. If any safety device is faulty, please inform Mark VII Service immediately. On no account may the roll-over wash system be put into operation.

We recommend to each operating company that the performed tests with the test result as well as name, date and signature of the testing person should be documented in written form.





Proceed with the following steps to check the safety devices:

Moving the wash gantry:

The test result of a function test is always displayed on the operating unit. Therefore it is recommended to move the wash gantry close to the operating

unit to easily read off the test result. Use the manual control buttons as described in chapter 8.

Check emergency-off function:

-  Press the emergency-off button.
-  The display in the operating unit shows “Emergency Off“
-  Release the emergency-off button.
-  Acknowledge the message.

In the event of malfunctions, see chapter 6 “Settings and Adjustments”

After all checked and properly functioning, the roll-over wash system is now ready for operation.

4.02. Dismantling



Danger: We can accept no liability for damage caused by dismantling, transportation or reconstruction or by conversion work carried out on the roll-over wash system. This applies also for disposal of the roll-over wash system.

Dismantling, transport and reconstruction or conversion of the roll-over wash system calls for detailed specialist knowledge

We recommend you have this work carried out by Mark VII Service.

4.03. Disposal

Disposal of the roll-over wash system

We recommend that you have the roll-over wash system dismantled for subsequent disposal/scrap by Mark VII Service or by another company with suitable experience in your area.

You must comply with the applicable local waste disposal regulations and legislation when disposing of the system.

Disposing of brushes, coverings and waste water

You must observe the applicable local waste disposal regulations and legislation when disposing brushes, coverings and waste water.

5. WASH OPERATION

This chapter contains important safety instructions for washing operation and describes all the stages which must be worked through when washing vehicles.

This information is intended for the wash system operator and for car wash customers. The car wash customer must be fully informed on instruction notices.

Instructions which are intended only for the wash system operator are marked separately.

5.01. Safety instructions



If the roll-over wash system is used for vehicles with certain features, this may result in damage to the vehicle.

- Vehicles which are not suitable for the dimensions of the roll-over wash system (see Chapter 10 "Technical Data") may not be washed.
- New or re-sprayed vehicles on which the paintwork is not yet fully hardened must not be washed.
- Vehicles with special attachments or mounted elements (outside spare wheels, roof railing, taxi signs or similar) may only be washed after inspection and with the approval of the operator.
- Damaged vehicles may only be washed after inspection and with the approval of the operator.
- For convertibles or semi-covered vehicles, the instructions/requirements for the use of car washes provided in the vehicle manual must be observed.
- Vehicles which vary heavily from the standard version such as vehicles with a low or high ground clearance may only be washed after inspection and with the approval of the operator.

Information only for the operator

Mark VII can accept no responsibility for damage to vehicles where one or more of the points listed above are applicable.

If these vehicles are washed irrespective of the above points, this must be done on the good judgment of the operator and will be his responsibility. The following points must be observed here in particular:

For wash systems which are operated in self-service mode, e.g. the operator or his personnel are not present during the wash cycle, it is highly

recommended to install a video surveillance for inspecting every vehicle before the vehicle is cleaned.

Special attachments or mounted elements which cannot be removed must be overridden manually with the relevant control buttons on the operating unit (see Chapter 8 "Operating units").

For vehicles with a low ground clearance, there is a risk that the vehicle will get stuck if a non-recessed under-body wash or car shifting device is installed.

The operating units offer various possibilities for starting the wash program and controlling it manually (see Chapter 8 "Operating units").

5.02. Preparation

In order to prevent damage to vehicles, the following preparations must be made before washing.

These preparations can be made either by the wash plant operator or the customer. The car wash customer must be provided with information about these preparatory steps on instruction notices.

- Remove aerials or push them in.
- Switch off radios if the vehicle is equipped with an automatic aerial.
- Fold in the mirrors if possible.
- Remove any extra mirrors.
- Check that additional lights or headlights are securely attached.
- Lock the vehicle before the wash cycle starts (including trunk or tailgate).
- Switch windshield wipers to their home position.
- Remove all loose parts, such as extra parts attached to windshield wipers or similar objects.
- Close the sliding roof or the roof (convertibles).

5.03. Procedures for Emergency Stops and Malfunctions

Information only for the operator!

Depending on the cause of the emergency stop or the malfunction you may continue or terminate the wash after the cause of the malfunction has been fixed.

Vehicle and/or wash system may be damaged if the wash is continued without fixing the cause of the emergency stop or the malfunction.

Continue the wash only when the cause of the emergency stop or the malfunction has been definitely fixed.

6. SETTINGS AND ADJUSTMENTS

6.01. Adjusting Compressed Air

Main incoming air pressure

The main air pressure connecting to the gantry for all pneumatic functions on the gantry should be set to approximately 80-90 psi (6 bar).

Machine Air Pressure:

Due to the components used in this pneumatic system, the maximum allowable pressure is 120psi before damage will occur. Mark VII recommends the use of a regulator to be installed between the gantry and supply compressor. The air inlet pressure to the machine should not exceed 100psi. To adjust air pressure at the machine, turn adjustment knob on regulator located in the ES column. First pull up on the knob to release it from the “locked” position. Turn the knob counterclockwise to decrease the machine air pressure, clockwise to increase the air pressure. Machine air pressure should be between 80-90psi. Once the desired air pressure is achieved, push down on the knob to “lock” it in place.

Hub Scrub Air Pressure:

For machines with hub scrub, a separate pressure regulator with built in check valve is added. The pressure regulator allows for the adjustment of the outlet air pressure, or in this case, the “extend” motion of the hub scrub brush. This ensures that the hub scrub brush doesn’t extend too forceful causing damage or not hard enough to clean the wheels. The hub scrub extend pressure should be set at 30psi. This is done by turning the knob on top of the regulator. First pull up on the knob, releasing it for its locked position. Turn knob counterclockwise to decrease the outlet pressure, clockwise to increase the pressure. Once the desired pressure has been achieved, push down on the knob to “lock” it in place.

Low pressure chemical systems:

Dosing pump panel:

87 psi (6 bar) max. operating pressure.

TriFoam system:

Approximately 30 psi air set at air regulator on TriFoam

6.02. Bleeding the Suction Line at the Dosing Pumps

- 1 Turn priming lever at top front of dosing pump to vertical position.
- 2 If desired, attach a length of tubing to the priming port stem on the right side of the bottom of the dosing pump to direct primed liquid back to the chemical drum or other container.
- 3 Verify air pressure of 87 psi or lower at the regulator gauge.
- 4 Make sure pump suction line is attached correctly to the pump inlet port.
- 5 Make sure foot valve is submerged in chemical in the chemical container.
- 6 Prime the pump manually by pressing the round black priming button on the left front of the dosing pump repeatedly. Each press of the button generates one stroke of the pump. Continue until liquid begins to be ejected through the priming port. Verify that liquid is rising in the suction line as the pump is being primed, and that there are no air bubbles in the line once liquid is fully primed into the pump.
- 7 Once liquid is primed into the pump and is being ejected through the priming port, stop pressing the priming button and turn the priming lever all the way to the right (clockwise) to horizontal position. The pump is now primed.

NOTE

If priming the suction line is very difficult, as with a very thick, viscous chemical, it may be necessary to prime the pump using a hand operated vacuum pump. The discharge check valve on the top of the dosing pump can be removed and the nozzle tip of the vacuum pump should be inserted into the discharge port hole. Pump with the vacuum pump to draw chemical all the way into the pump. Once primed using the vacuum pump, remove the vacuum pump and replace the discharge check valve in the discharge port, taking care to put the O-ring in place. The pump is now primed.

6.03. Adjusting Dosing Pump

Standard dosing pumps are 12 l/h pumps (about 6.76 oz/min or 200 ml/min.).

Adjustments should be made based on the chemicals being used and their recommended application rates. Adjusting the pumps is accomplished in two ways: by stroke length using the round knob in the middle front of the dosing pump; and by adjusting the stroke frequency, which is done through the CP0 (see below).

- The XT machines support up to 8 dosing pumps, with additional pumps possible. Each of these pumps can be adjusted to cycle at variable rates. This adjustment is thru the CP0, Module 042 (DOP): Parameters 4 thru 11. By default, these pumps will cycle at 100 pulses per minute. A value of 0 will cause the output to remain on without pulsing. 120 pulses per minute is the maximum cycle rate listed by the dosing pump manufacturer, although the CP0 is capable of a higher pulse rate. Do not exceed the maximum cycle rate for the dosing pumps. For further description of Dosing Pump operation, refer to Technical Information manual P20.

6.04. Reading and Setting the Water Flow Pressure for the Low Pressure Chemical Manifold

The AXT machine normally feeds water for the low pressure (chemical) systems using a multi-stage pump. Water for the low pressure systems is fed directly from the pump to the valve manifold inlet. The water pressure is regulated at the inlet to a downstream pressure of between 50 and 70 psi. The pressure can be read at the pressure gauge on the manifold inlet. Pressure is set using the adjusting screw on the water regulator, also mounted on the manifold inlet.

Gantry

On the AXT machine the water pressure should be set with the Presoak-1 top boom running (only). The pressure should be set to a minimum of 50 psi and up to a maximum of 70 psi.

NOTE

Water pressure will vary slightly as each individual low-pressure system is activated due to different nozzle arrays. This is normal and should not affect performance as long as water pressure is within the operating range.

Wash Water Pressure Adjustment:

The outlet pressure of the water at the nozzles from the high pressure pumping plant should not exceed 1000psi. Pressures above 1000 psi do not improve the washing results and serious damage or injury could result if it is greater than 1000psi. To adjust the water pressure, turn the adjustment handle on the regulator (located next to the pump). The jam nut may need to be backed off to turn the adjustment handle. This will need to be done while the high pressure pump is running to be able to read the pump outlet pressure on the gage. Once the gage reads 1000psi with the pump running, tighten jam nut up against handle to prevent any unwanted changes.

Under Carriage Water Pressure Adjustment:

The outlet pressure of the water at the undercarriage manifold should not exceed 500psi. Serious damage or injury could result if the pressure is

greater than 500psi. To adjust the undercarriage water pressure, locate the brass needle valve in the lower left hand corner of the MS cabinet. To adjust, turn the handle to increase or decrease the pressure. This will need to be done while the undercarriage is spraying. You will need to watch the gage as you're turning the handle to determine the outlet pressure. Once you have got the gage reading 500psi, tighten the set-screw in the handle to prevent any unwanted changes.

TriFoam water pressure:

The TriFoam dosing/mixing panel is normally fed by (soft) city water. The pressure is controlled with a water pressure regulator on the dosing/mixing panel. TriFoam water pressure settings will vary depending on the chemical being used. Normal settings range between approximately 30 and 40 psi as read on the pressure gauge on the panel. This will need to be adjusted for the customer's specific chemical and desired foam performance.

NOTE

If city water pressure is inadequate, or if it is highly susceptible to wide pressure variations it may be necessary to install a booster pump to maintain sufficient water pressure to the TriFoam system. Water pressure swings will affect the performance of the TriFoam system. Minor, infrequent variations are usually not an issue, but larger or more frequent variations can cause significant performance issues. The customer should evaluate the performance and consult with Mark VII Equipment to decide accordingly whether a booster system may be necessary, or perhaps a change in TriFoam chemical.

Spotfree Rinse water pressure:

Spotfree Rinse may or may not have a pressure adjustment. Typically there is no adjustment, but there may be a regulator on some systems. True "Spotfree" rinse uses R.O. water from a separate R.O. filtering system. If the pump included with the customer's R.O. system provides adequate pressure (generally a minimum of 50 psi is recommended), it may be used without a booster pump to feed Spotfree Rinse water. If pressure is too low for an adequate rinse (and this should be determined by the customer), an optional booster pump kit may be purchased to increase the Spotfree Rinse pressure. The booster pump kit is recommended for optimum performance of the Spotfree Rinse system.

On some systems, the customer may opt not to install an R.O. system, and use city water for the final rinse. This will generally result in some water spotting on the vehicles. To minimize this, it is recommended to only use soft water if not using R.O. water. The same pressure requirements should be followed – a minimum of 50 psi, or as needed for best performance.

6.05. Setting Air Pressure for TriFoam Generation

As with the water pressure for TriFoam, the air pressure should be adjusted for the customer's specific TriFoam chemicals. Generally the air pressure will range between 25 and 40 psi. Detergent-based TriFoam chemicals will tend to need less air pressure, while polish type chemicals will tend to need higher air pressure.

Air pressure is adjusted using the air pressure regulator on the TriFoam dosing/mixing panel, and the pressure is read on the attached pressure gauge.

TriFoam application is a balancing act between water pressure, air pressure (and volume), and chemical volume. The settings listed here are intended as approximate starting points for adjustment. Generally speaking, the water pressure will normally be a few psi higher than the air pressure, so if the water pressure is initially set at 40 psi, for example, the air pressure should be set to about 30-35 psi to start, and then adjust as needed.

A speech bubble icon containing the word 'NOTE' in all caps.

NOTE

If TriFoam is sputtering excessively, the air pressure and/or air volume may be too high, and/or the chemical volume may be too low.

7. MAINTENANCE AND CARE

7.01. Safety Instructions



Maintenance, service and care work carried out on the machine while it is switched on can cause serious accidents.

Always work through the following steps before starting maintenance, service and care work:

- Move the roll-over wash system into an easily accessible position
- Switch off the electricity on the complete system
- Turn off the compressed air. Close the air supply by turning the input pressure regulator to 0 psi.
- Switch off water supply.
- Secure the system to prevent it from being switched on unintentionally.



Objects such as tools, cleaning supplies, etc which remain in or on the system after completion of maintenance or care work may cause damage to the system or vehicles.

- Makes sure that all objects are removed from the system after completion of maintenance or care work.

7.02. Care

Regular care of the roll-over wash system contributes considerably to its smooth running and helps retain its value. The essential care program includes:

- Lime-scale removal
- Cleaning of the system
- Cleaning of the floor
- Cleaning of Plexiglas
- Cleaning of ABS panels
- Special treatment

The care intervals depend on the water quality and the degree of soiling.



Caution should be exercised in handling all chemical compounds. Some cleaning agents are somewhat caustic and should not be permitted to come in direct contact with bare skins or eyes.

- Always refer to product MSDS Sheets for proper precautions.
- Whenever handling such cleaning agents wear proper protective rubber gloves, anti-skid boots and a face shield.



Highly inflammable and toxic cleaning agents may cause damage to machinery and injury to persons. Such cleaning agents may not be used because of the risk for fire hazard and health.



Cleaning with high pressure can cause damage to the roll-over wash system. Do not use high pressure appliances for cleaning.

7.02.1. *Lime-scale removal*

Sooner or later, depending on the water quality, lime-scale deposits will build up on the system. These must be removed carefully.

- Only use products for lime-scale removal that are based on citric acid, amidosulphuric acid or phosphoric acid.
- Mix these with water in the proportions specified by the manufacturer.
- Use these products to remove the lime-scale deposits carefully from the system.
- Rinse the system down with plenty clear water.



Use of other products, such as cleaners that contain hydrochloric acid, sulphuric acid, formic acid, hydrofluoric acid or oxalic acid or incorrect mixing proportions, can cause corrosion damage and damage to tiles and the surface of the system.

For damages caused by using one of the cleaners stated above no warranty claims will be accepted.

When removing lime-scale, avoid bringing the products into contact with plastic components, belts, sensors and cables. The acidic mixture can cause damage to these elements.

Only for systems with a water recycling system

- After removing lime-scale, check the pH-value in the water recycling system. The pH-value must be between 7.0 and 8.0.
- Wash at least 30 vehicles with fresh water if the pH-value is below 7.

7.02.2. *Cleaning of the system*

- Clean the entire frame of the roll-over wash system.
- Clean the flat belts of the lifting system of roof brush and drier system. Only use pH-neutral cleaning and treatment products for this purpose (see below) or the cleaning agent that is also used for cleaning vehicles in the prescribed concentration.
- Rinse the system down with plenty of clean water.



The permissible pH-value for the cleaning and treatment products used for cleaning the frame must be between 5 and 8 and must not contain any solvent.

Any products with higher or lower values than these may fade color and deteriorate material, and will reduce the lifetime of the roll-over wash system.

7.02.3. *Cleaning of the floor*



A slippery floor may cause severe accidents.
Clean the floor as necessary. Remove all remaining detergent carefully to reduce the slip hazard.

7.02.4. Cleaning of Plexiglas

In general the following chemicals may be safely used with parts made from Plexiglas impact-modified acrylic resins under moderate stress at ambient temperature conditions:

Calgon® Bath Oil	Freon TF Cleaner	Mr. Clean® Cleaner	Soft Scrub® Cleanser
Clorox® Bleach	Glass Plus® Cleaner	Propylene Glycol	Spic & Span® Powder
Fantastic® Cleaner	Liquid Comet® Cleaner	Sodium Hydroxide	Soap and Water
Formula 409® Cleaner	Mineral Oil	Sodium Hypochlonte	

The information about Plexiglas is provided from Atoglas. See MSDS for Health & Safety Considerations.
The following chemicals may be used with caution in low-stress and/or short-duration exposure at ambient conditions

Ammonia	Ethyl Alcohol (≤40%)	Isopropyl Alcohol (≤50%)	Pinesol® Cleaner
Brake Fluid	Gasoline	Lestoil® Cleaner	VM&P Naphtha
Chlorine (10%)	Dow Disinfectant	Kerosene	Lysol® Basin, Tub
	Bathroom Cleaner & Tile Cleaner		

The information about Plexiglas is provided from Atoglas. See MSDS for Health & Safety Considerations.
The following chemicals may cause crazing, cracking, discoloration, or dissolving of acrylic articles and are generally not recommended.

Acetic Acid	Butyl Alcohol	Sulfuric Acid	Turpentine
Acetone	Chlorinated Solvents	Toluene	White Cap® Cleaner
Aromatic Solvents	Lacquer Thinner	Lysol® Spray	Xylene
Benzene	Disinfectant		

The information about Plexiglas is provided from Atoglas. See MSDS for Health & Safety Considerations.

7.02.5. Cleaning of the ABS Panels

The ABS Plastic is durable and has very good chemical resistance. However, caution should be taken when cleaning such plastic.

Under moderate stress at ambient temperature conditions, the cleaner that contains the following chemicals may be safely used:

Hydrochloric Acid 10%	Nitric Acid 10%	Sulfuric Acid 10%	Hydrofluoric Acid 10%
Chromic Acid 10%	Acetic Acid 10%	Citric Acid 10%	Formic Acid 10%
Tartaric Acid 10%			
Ammonia 10%	Sodium Hydroxide 10%	Potassium Hydroxide 10%	Ammonium Hydroxide 10%
Ethylene glycol	Kerosene	Mineral Oil	
Sodium Bicarbonate	Sodium Chloride 10%	Sodium Hypochlorite	Copper Sulfate 10%

The cleaners which contain the following chemicals may be used with caution in low-stress and/or short-duration exposure at ambient conditions

Nitric Acid 35%	Chromic Acid 50%		
Isopropyl Alcohol (Isopropanol)		Hydrogen Dioxide (Peroxide) 30%	

The cleaners which contain the following chemicals are not recommended for cleaning ABS plastic. They may cause damage to ABS articles.

Methyl Alcohol (Methanol)	Ethyl Alcohol (Ethanol) 85%	Cyclohexanol	Isopropyl Alcohol (Isopropanol)
Glycolic Alcohol (Glycerol)	Acetone	Cyclohexanone	Formaldehyde 37%
Methyl Ethyl Ketone	Ethyl Acetate	Ethylene Oxide	Dioxane
Ethylene Oxide	Chloroform	Methylene Chloride	Perchloroethylene
Carbon Tetrachloride (wet)	Trichloroethylene		Benzene
Gasoline (pure)	Cyclohexane	Heptane	Brake Fluids
Toluene	Xylene	Bromine 10%	Chlorine (wet)
Fluorine	Iodine (solution)	Aniline	Phenol (conc.)

7.02.6. Special treatment

Rollover maintenance should be completed with the application of a protective coating.

Treatment can be carried out with commercially available treatment products that are water repellent and form an invisible protective film.

- Apply the treatment product to the frame of the roll-over wash system.
- Rub off any extra treatment product.



Exercise caution when using treatment products.

Always follow the instructions for use and safety instructions provided by the manufacturer.

7.03. Maintenance

7.03.1. *Immediate Maintenance*

Low Pressure System

On startup and running all low pressure systems:

- 1 Inspect all lines and connections for leaks. Repair, replace, seal and/or tighten any loose or damaged parts.
- 2 Inspect all lines for air bubbles (especially chemical feed lines) and purge air from lines if necessary.
- 3 Verify all valves are operating correctly.
- 4 On initial startup of new machines, after running several cycles, inspect nozzle check valve/strainers and clean any debris if necessary.
- 5 Visually check chemical spray patterns and make sure coverage is correct. Adjust nozzle tips if necessary. Make sure nozzle caps are tightened snugly and nozzles are not leaking.
- 6 Check water pressure (and air pressure where appropriate) to confirm settings are correct. Make sure regulator settings are locked.

High pressure system

- 1 Drive belts between electric motor and high pressure pump should be checked for proper tension and abnormal wear. Belts need to be re-tensioned after initial 50 hours of use and then as needed. See “BELT TENSIONING INSTRUCTIONS” located on the pumping plant belt guard cover.
- 2 Check pump oil quality and level frequently through sight glass or dipstick. Add oil if low or replace if oil looks old or milky. Use only CAT pump Crankcase Oil (p/n 6100, ISO 68). Change initial fill after 50 hours of operation. Thereafter, change oil every 3 months or at 500 hour intervals. Check for leaks from manifold and crankcase. High and low pressure seals should be checked every 1000 hours of operation. Change seals as necessary.

7.03.2. *Weekly maintenance*

Flat belt

Check the belts for wear. If there is a high degree of wear, i.e. the belts are frayed or torn, please inform Mark VII Service.

Energy chains

Check all the energy chains including leads and cables (roof brush, dryer system, etc.) for wear and breakage. In the event of heavy wear or breakage, please inform Mark VII Service.

System of hoses

Check the system of hoses for loose connections and leaks. Tighten any loose connections. If you find any leaks, please inform Mark VII Service.

Low-pressure water distribution

Check the low-pressure water distribution for damage and leakages. Please inform Mark VII Service in case of damages or leakages.

Clean the suction grids

Clean the suction grids of the dryer blowers.

Low Pressure System

- 1 Inspect all lines and connections for leaks. Repair, replace, seal and/or tighten any loose or damaged parts.
- 2 Inspect all lines for air bubbles (especially chemical feed lines) and purge air from lines if necessary. If air is found in the lines repeatedly after the lines have been purged, check system for leaks where air can be entering the lines.
- 3 Visually check chemical spray patterns and make sure coverage is correct. Adjust nozzle tips if necessary. Make sure nozzle caps are tightened snugly and nozzles are not leaking.
- 4 Check water pressure (and air pressure where appropriate) to confirm settings are correct. Make sure regulator settings are locked.
- 5 Inspect dosing pumps: Connections, air pressure, functioning correctly, settings correct, inlet lines in good condition, foot valve screens clear, and chemical levels adequate.
- 6 Check water softener system and salt levels. Refill salt as needed per water softener manufacturer's recommendations.
- 7 Check chemical and water usage. Verify dosing pumps are set at proper levels. Titrate soaps and/or do volumetric testing, and adjust chemical application rates if necessary.

7.03.3. Monthly maintenance

Checking the brushes

Check the HubScrub brushes for wear. In the event of heavy wear, please inform Mark VII Service.

Track and guide rollers

Clean all the track and guide rollers.

Check all drive, track and guide rollers for wear. In the event of heavy wear, please inform Mark VII Service.

Low Pressure System

- 1 Inspect nozzles for wear, any unusual variations in spray pattern, and proper alignment. If using low pH chemicals, it may be necessary to replace those nozzle tips on a more frequent schedule than annually or every six months.
- 2 Inspect check valve strainers for debris and clean if necessary.
- 3 Inspect dosing pumps and chemical valve manifold for any leaks or drips, tighten fittings if necessary, and clean any chemical residue
- 4 If the machine is equipped with a water heater inspect the heater tank assembly. Check connections, cable, and water temperature.

High Pressure Top and Side Manifolds

- 1 Top boom lifting belts should be inspected for any damage and/or wear. Any belts that have steel reinforcing wires exposed or fraying on the outside edges should be replaced immediately.
- 2 Rotation of the top boom should be smooth and without effort. If the top boom is stuck or slow to rotate, the rotary actuators may need to be replaced. Also check the plastics blocks that cradle the top boom. If the blocks are worn or damaged, this may also prohibit proper rotation.
- 3 Inspect nozzles on the top boom and side manifolds for wear or any unusual variations in spray pattern. This could indicate the screen and/or nozzle ports are plugged or partially obstructed. The nozzles can be taken apart, inspected, and cleaned as needed. If the nozzle still doesn't perform correctly after the steps listed above, the nozzle will need to be replaced.
- 4 Check all hoses, hose connections, and pneumatic tubing for cracks or splits. Any hoses or tubing with defects should be replaced immediately.

High pressure system

- 1 Drive belts between electric motor and high pressure pump should be checked for proper tension and abnormal wear. Belts need to be re-tensioned after initial 50 hours of use and then as needed. See "BELT TENSIONING INSTRUCTIONS" located on the pumping plant belt guard cover.
- 2 Check pump oil quality and level frequently through sight glass or dipstick. Add oil if low or replace if oil looks old or milky. Use only CAT pump Crankcase Oil (p/n 6100, ISO 68). Change initial fill after 50 hours of operation. Thereafter, change oil every 3 months or at 500 hour intervals. Check for leaks from manifold and crankcase. High and low pressure seals should be checked every 1000 hours of operation. Change seals as necessary.
- 3 The high pressure pump motor should be re-lubricated at severe service intervals (approximately every 4750 hours of operation). Refer to Baldor Maintenance Instructions for procedure, grease type and amount.

- 4 Y-strainer should be checked and cleaned. The strainer can be checked by loosening the cap and removing the strainer. Take extra precaution not to damage the crush washer on the cap.
- 5 Check all hoses, hose connections, and tubing for cracks or splits. Any hoses or tubing with defects should be replaced immediately.

Safety ring switch

Check the safety ring switch for smooth operation.

Spray the guide of the safety ring switch with the Teflon based spray-on grease (e.g. Dupont Teflon White Lithium Grease).

Slide bearings

Spray all slide bearings with the Teflon based spray-on grease (e.g. Dupont Teflon White Lithium Grease).

Drives

Ensure that all the drives are properly sealed. You can recognize leaks by traces of oil on the housing. If you detect any leaks, please inform Mark VII Service.

7.03.4. Annual Maintenance

NOTE

We recommend an inspection and maintenance by Mark VII Service at six-monthly intervals.

Low Pressure System

Thoroughly inspect nozzle tips and check valve strainers, and all chemical lines and components in contact with the chemicals for chemical damage, especially if using low pH chemicals or very concentrated high pH chemicals. Replace any damaged parts, and adjust preventive maintenance scheduling as needed.

It is recommended that the dosing pump check valves (especially for the Presoak, Wheel Wash, and Bug Buster pumps) should be removed and flushed with warm water at intervals if traffic at a particular location is low and there are extended periods of inactivity. Flushing the check valves occasionally will help minimize any buildup and gelling of chemical if it has been sitting for a time between washes.



CAUTION! Take care not to lose small check valve parts during maintenance – especially O-rings, which are tiny and can easily fall off.

For best continuing performance, it is generally recommended that nozzle tips and/or check valve strainers be replaced approximately on an annual basis. For some chemicals, it may also be necessary to replace the chemical feed lines and the dosing pump inlet lines. The need for this will depend

largely on the type of chemistry involved, and on the wash volume at a particular site.



For Spotfree Rinse systems using an R.O. water system, follow the R.O. system manufacturer's recommendations for regular maintenance, including but not limited to, flushing and/or replacing filters.

High Pressure Top and Side Manifolds

Thoroughly inspect all areas of the high pressure top and side manifolds. Check all hoses and connections for splits or cracks. Replace as needed. Look for any unexplained water collecting or pooling. If there is significant water collection, the source must be found and repaired and/or replaced. Inspect all areas of the top boom lifting system (motor, gearbox, lifting belts, pulleys, etc.). Everything should move smooth and freely. Visually check to make sure all fasteners and lock washers are tight. Movement of the top boom carriage should be smooth and steady. Any jumping or binding could be caused by the top boom not being level or worn out guide slides. To level the top boom, loosen the belt clamp screws on the side of the boom that is lower or needs to come up. Once the bolts are loosened, you may be able to pull up on the short or cut end of the belt. Pull up until top boom is level. If the top boom carriage can be moved from side to side more than a ¼", this may indicate the slides are worn out. New slides will need to be installed. Also check to make sure the pulley at top of each rail is spinning freely. Any binding or seizing will disrupt top boom carriage travel.

High Pressure Pumping Plant

Thoroughly inspect all areas of the high pressure pumping plant. Make sure there is no grease or oil on/around vital machine components. Check all hoses and connections for splits or cracks. Replace as needed. Check high pressure pumping plant belts for abnormal wear and proper tension. Check CAT Pump for any leaks around manifold and crankcase. Change seals as necessary. Check crankcase oil level and viscosity. See "Monthly Maintenance" for specifications.

Maintenance – Feeds

These maintenance tasks are recommended to be performed on every preventive maintenance cycle unless noted.

Item	Tasks	Information	Notes
Hoses and Cables	Inspect for wear	Replace as required	
Hoses and Cables in E-Chain	Inspect for corkscrewing	Replace as required, and inspect for proper routing and clamping	
E-Chain	Inspect for wear	Replace as required	
Brackets and troughs	Inspect for dirt and soap build-up	Wash and clean as required	

Maintenance – Door control

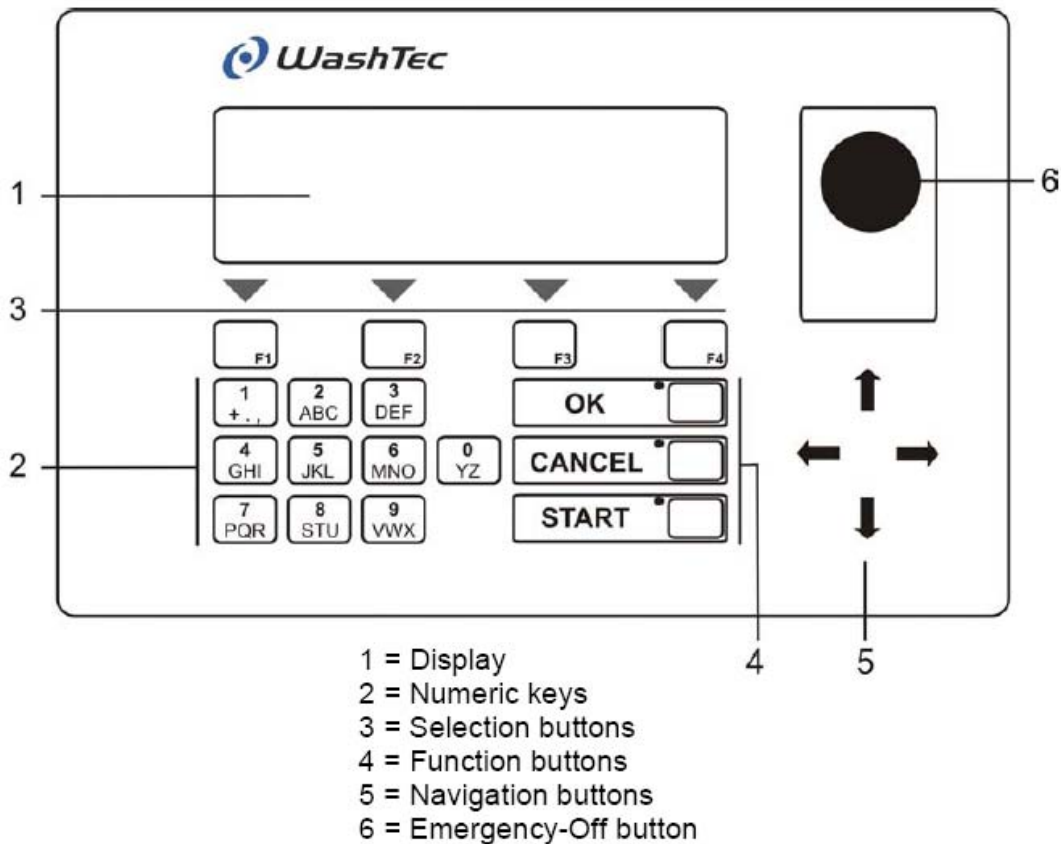
Item	Tasks	Information	Recommended Schedule
Electrical connections	Tighten all connections.		Check monthly.
Operation	Set to automatic and cycle through wash operation.	Test even in warm weather to ensure door control system is working properly.	Check monthly.

8. OPERATING UNIT

The roll-over wash system can be operated, i.e. starting the wash programs and making adjustments, with various different operating units.

The roll-over wash system is always equipped with an operating terminal of type CP0. Wash programs can be started from the operating terminal by pressing a program button or by entering a code.

Figure 8.00-01, Operating terminal CP0




Check which type of operating terminal is used in your system and turn to the relevant chapter or read the individual operating instructions.

8.01. Operating terminal CP0

The operating terminal CP0 is used to control the wash system. It is installed in a plastic housing which can be wall-mounted or integrated in a door cut-out.

The contrast of the display may be adjusted at the operating terminal anytime.

 Press simultaneously the numbers 4 and 6 and additionally one of the buttons <<▲>> or <<▼>>.

 Keep the buttons pressed until the desired contrast is set.

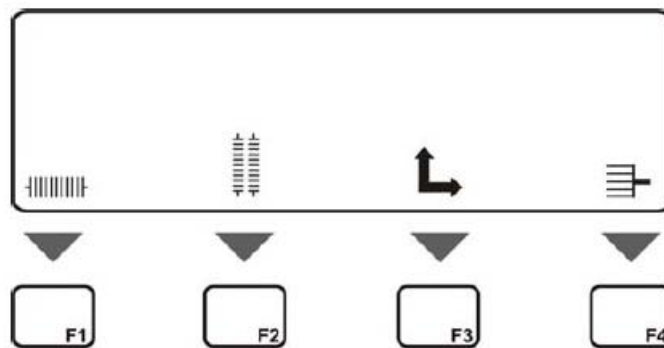
Numeric keys

Numeric keys are used to select programs and to enter data in the service programs.

Selection buttons

The lowest line of the display shows up to four symbols:

Figure 8.01-01, Symbols displayed on CP0



Use the buttons <<◀>> and <<▶>> to display further symbols. All available symbols are shown on the left side.

The symbols for manual operation (control buttons) are used for manual operation of individual machine elements such as roof brush, side brushes or the whole gantry (more information in chapter 9.5).

The symbol P is used to start the service program.

A selected symbol is marked with a black background.

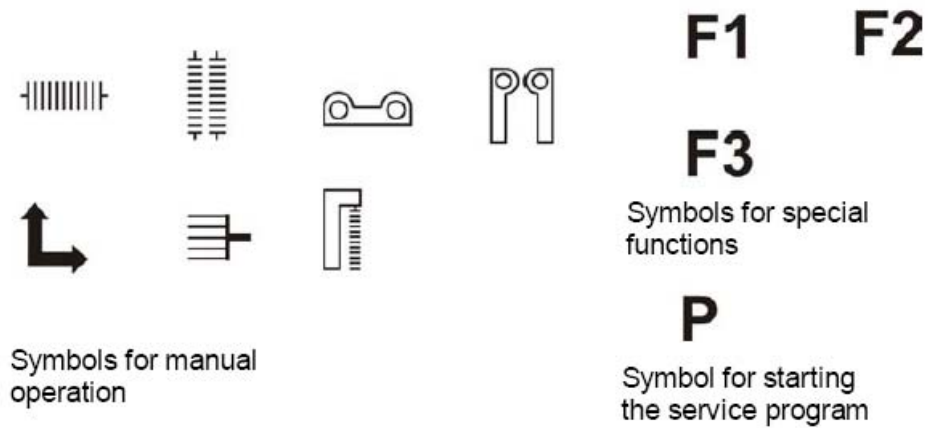
Function buttons

The button <<OK>> is used to acknowledge inputs. The button <<Cancel>> is used to cancel inputs. The button <<Start>> is used to start wash programs.

Navigation buttons

The navigation buttons are used to select the symbols, the direction of motion of the machine elements during manual operation and to navigate within service program menus.

Figure 8.01-02, Symbols for CP0 manual operation



8.02. Startup of the terminal

The operating terminal is started automatically when the roll-over wash system is switched on at the main switch.

Depending on the operation mode, the display may show one of the messages below:

System ready

Or

Select wash:

8.03. Start of wash programs

Wash programs may be started by entering a program number or a program code (code operation mode).

In Code operation mode the customer receives at purchase a ticket with an access code. The wash procedure is started by entering the access code at the operating terminal.

NOTE

Please note that in code operation mode the program selection has to be switched-off (see menu 0361 in chapter 9.6). Otherwise the operating terminal takes the data entry as a program number.


The further steps depend on the operation mode and the position of the vehicle.

Operation


The driver drives in front of the wash building, selects a wash program, drives the vehicle into the building, remains seated and the wash program starts automatically (Automatic start on).

Procedure

 Select the desired wash program on the keypad or enter the code.

 Acknowledge the input with the button <<OK>> or press the button << Cancel >> if you would like to change the input.

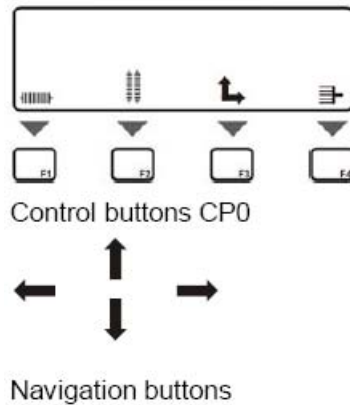
 Drive the vehicle into the building.

 The wash program starts. The display shows:
Program x running

8.04. Manual operation with control buttons

The control buttons can be used for manual operation of individual machine elements, such as the roof brush, side brushes, etc. or of the complete wash gantry.

Figure 8.04-01, Control buttons CP0 and Navigation buttons



At the operating terminal CP0 you probably have to shift the desired machine element symbol into the display by using the navigation buttons. Afterwards you may select the symbol with one of the buttons F1 – F4.

The function which will be initiated by a control button depends on the operating state of the system:

Wash mode = a wash program is executed

Control mode = no wash program active

Wash mode

By pressing a control button the associated machine element will be moved. The movement remains active as long as the button is pressed.



At the operating terminal CP0 only machine elements will be displayed which are currently active.

Control mode


During control mode, i.e. no wash program running, a machine element is only selected with a control button. This machine element can be moved into the desired direction by using the navigation buttons.




Select the desired machine element by using the control buttons.



At CP0: The symbol is marked with a black background

 Select the desired direction of movement by using the navigation buttons.

 The element will be moved as long as the navigation button remains pressed or until the home position is reached.


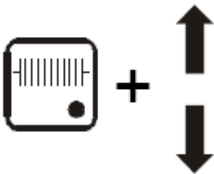
The selected element will be deactivated if no navigation button is pressed within three seconds after selection.





Manual operation can be deactivated to avoid misuse (see chapter 9.6 “Service programs – menu 0360”).

The next two pages show the different functions which may be actuated with the control and navigation buttons.


Control button <<Roof brush>>

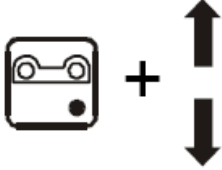
Action	Mode	Description
	Wash mode	Roof brush up. The roof brush moves back downwards after releasing the button.
	Control mode	Roof brush up or down. The roof brush remains in its actual position after releasing the button.

Control button <<Side brushes>>


Action	Mode	Description
	Wash mode	Side brushes apart. The side brushes moves back inwards after releasing the button.
	Control mode	Side brushes apart or together. The side brushes remain in their actual position after releasing the button.

Control button <<Roof nozzle>>


Action	Mode	Description
	Wash mode	Roof nozzle up. The roof nozzle moves back downwards after releasing the button.

	Control mode	Roof nozzle up or down. The roof nozzle remains in its actual position after releasing the button.
---	--------------	--

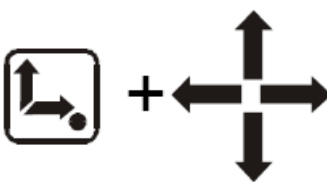
Control button <<Wheel wash brushes>>

Action	Mode	Description
	Wash mode	The wheel wash brushes are switched off and remain switched off until the end of the wash program
	Control mode	Without function.

Control button <<Wash gantry>>

Action	Mode	Description
	Wash mode	Without function
	Control mode	Wash gantry forward or backward. The wash gantry remains in its position after releasing the button.

Control button <<Home position>>

Action	Mode	Description
	Wash mode	Without function.
	Control mode	Roof brush and roof nozzle move upwards, side brushes move apart. The wash gantry moves in its home position.

For safety reasons, one of the four navigation buttons or the button <<OK>> has to be pressed in addition to the button <<Home position>>.

8.05. Service programs

Service programs allow the manager or owner of the wash tunnel to modify designated settings of the system.

Service programs are started by using the special function button <<P>>.

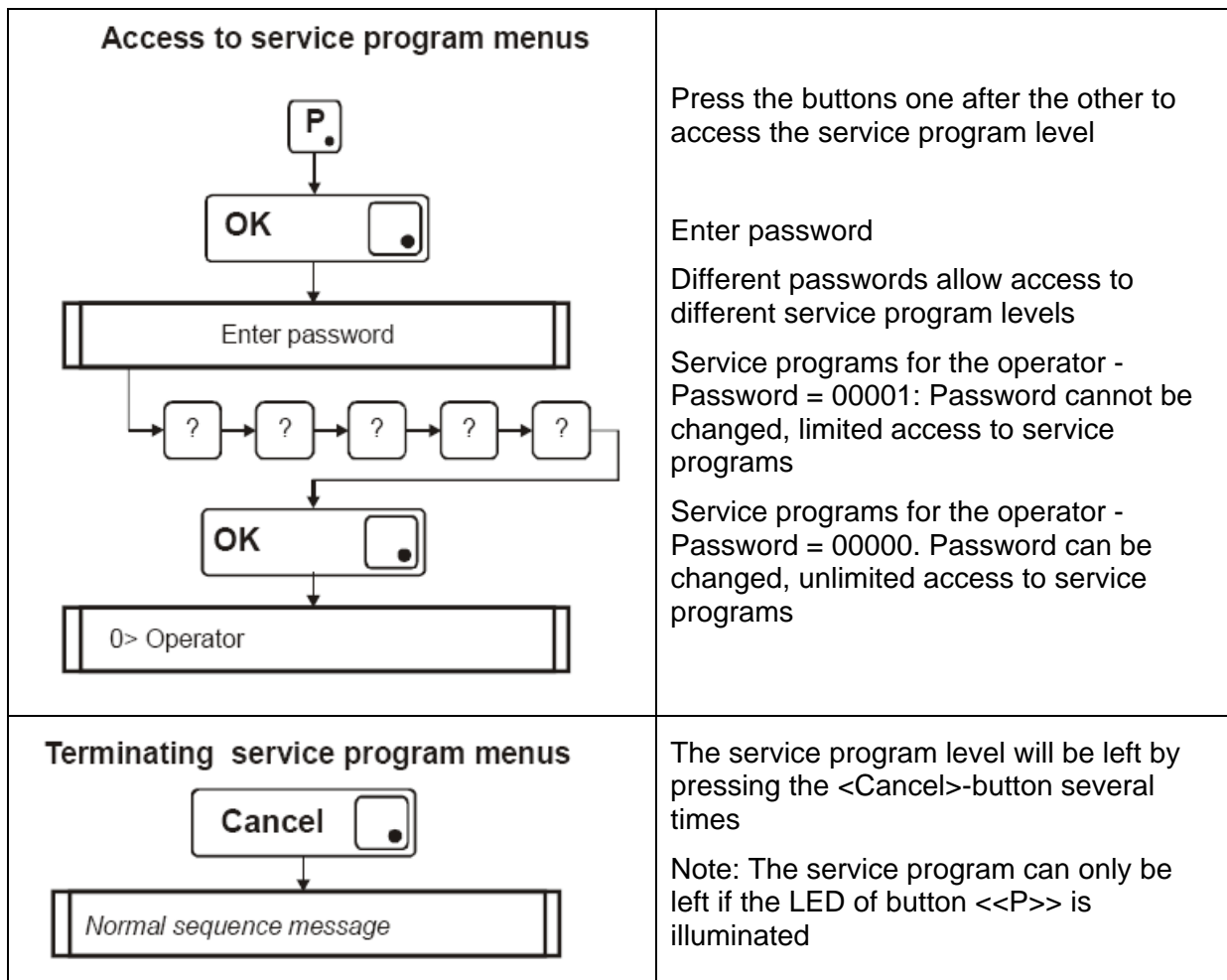
At the operating terminal CP0 you probably have to shift the symbol “P” into the display by using the navigation buttons. Afterwards you may start the service with one of the selection buttons, e.g. F4.

During the further description of the service programs the keypad of the operating terminal is shown occasionally.

Access and Termination

To access and terminate service programs follow the sequence as shown below.

Figure 8.05-01, Access and Termination of Service program menus





Service programs may not be accessed while wash programs are executed.

About using service programs

Service programs are structured in several levels. In programs each level different operations can be performed.



There is a button called <<Cancel>> on the front panel. The meaning of this button is Cancel or Abort.

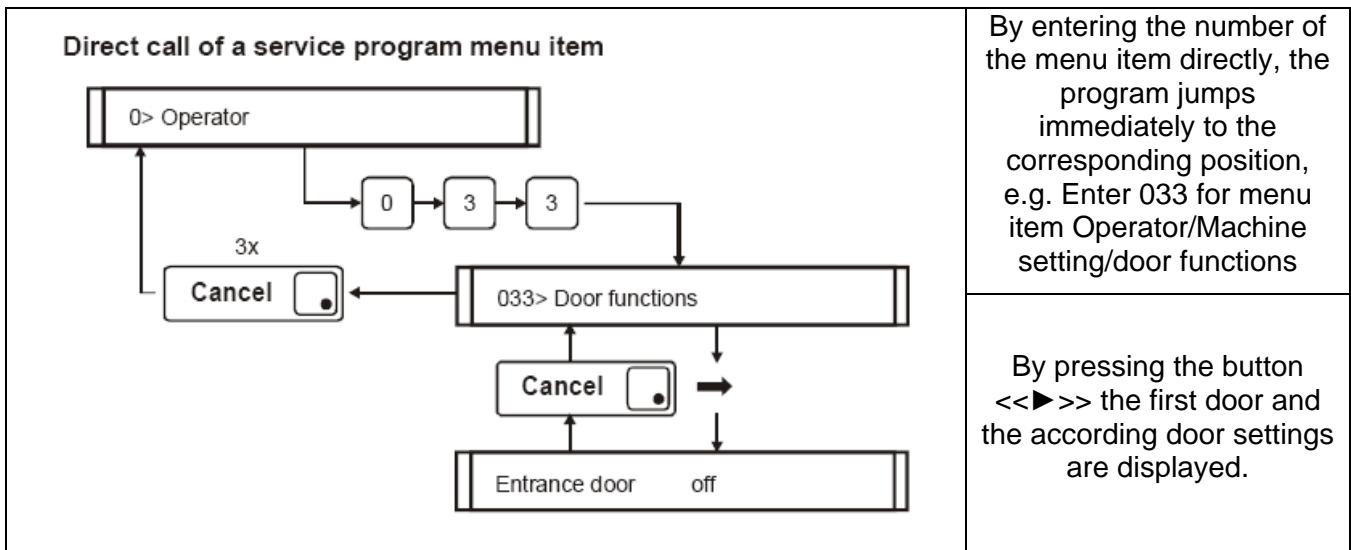
Calling menu items

The menu items within a service program can be called by using the navigation buttons or by entering the menu item number directly.

The menu items can be found from [page 9-12](#).

The illustration below shows the direct call of a menu item. On the next page you will learn how the menu item is called with the navigation buttons.

Figure 8.05-02, Direct call of a service program menu item



Modification of values/parameters

Values/parameters can be modified within a menu parameters item.

The modification follows the sequence as shown below:

Figure 8.05-03, Menu Navigation with navigation buttons

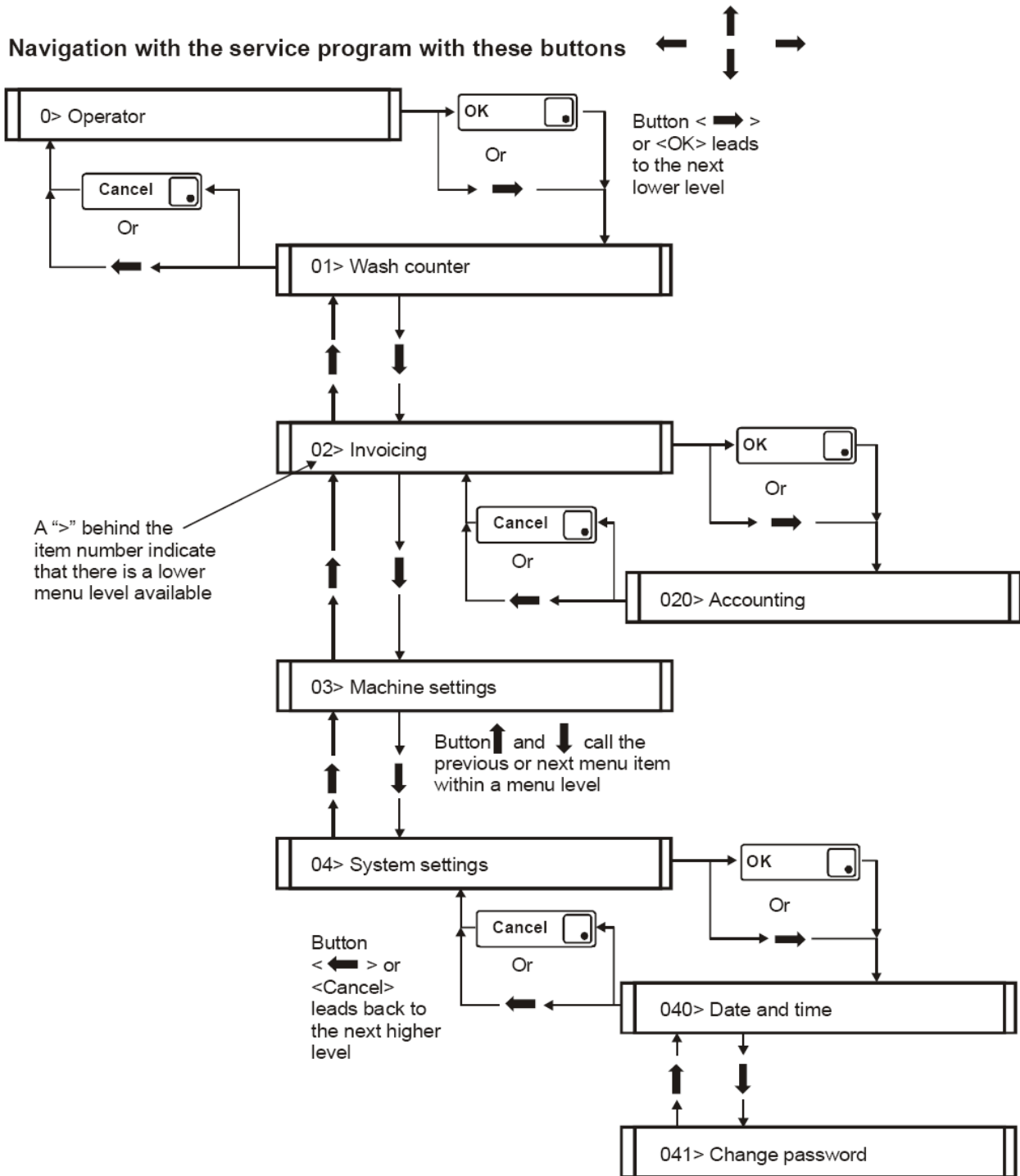
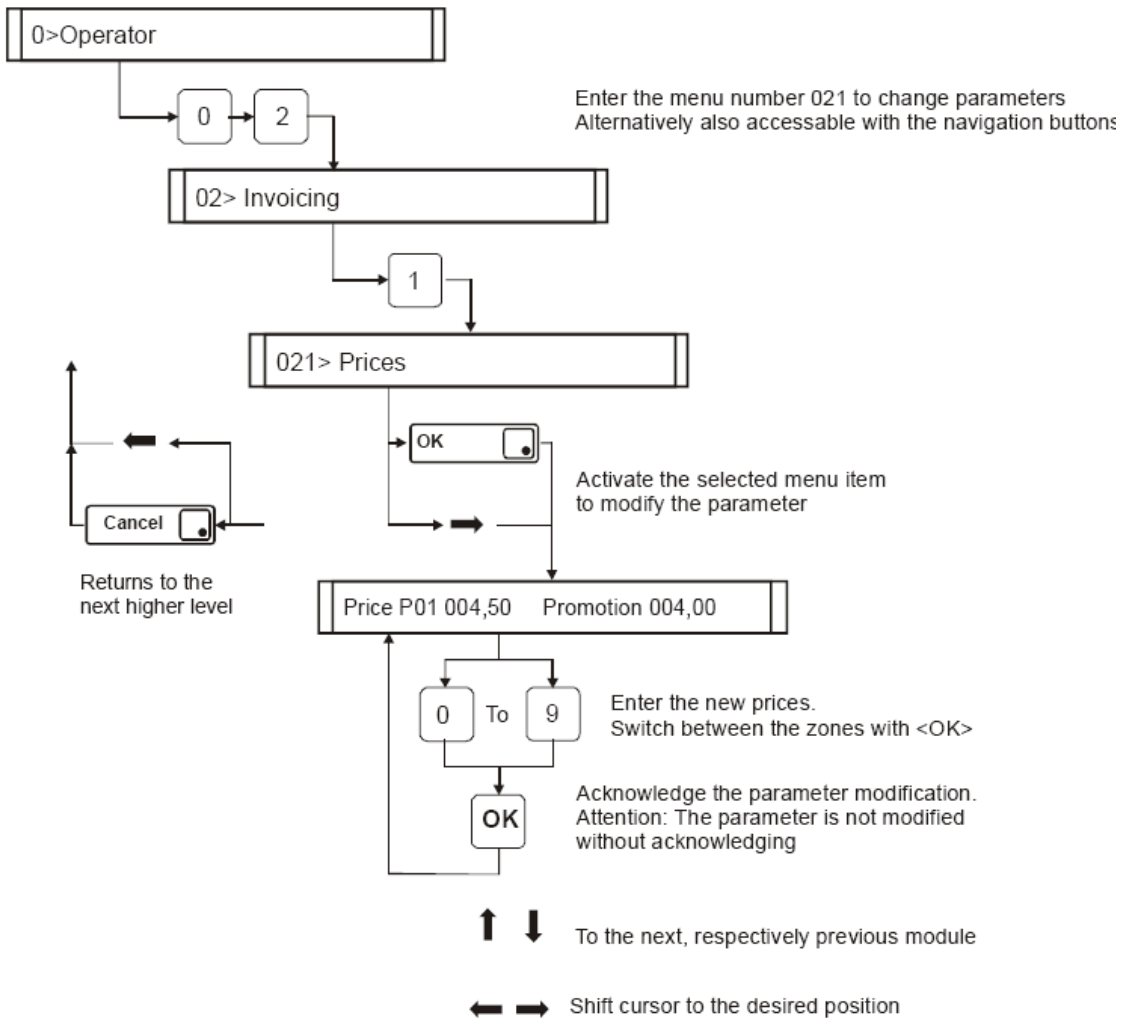


Figure 8.05-04, Modification of a parameter

Modification of a parameter



Service program menus

The menu items of a service program are released by a password when accessing the service program. The following listing shows all menu items which may be called from the operator or the owner of the roll-over wash system.


A menu item can be called directly by using the number code.

Menu 00> Wash counter


The menu “Wash counter” displays different counters. The table below shows at a glance all menus and sub-menus available in this menu item.

01> Wash counter

010 Total counter Total: XXXXXX Shift: YYYYYY Failed: ZZZZZZ
000> Lifetime 0000 Cash (Manual entry) Program 1 XXXXXX Promotion YYYYYY
0124 Clear day counter

 Press the button <<▶>> to enter the next menu level.


⇒ The display shows the first sub-menu
010 Total counter

 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.

Menu 010 Total counter


 Press the button <<▶>> to display the total counter.

⇒ The display shows
Total: XXXXXX Shift: YYYYYY Failed: ZZZZZZ
Total = All wash cycles since commissioning
Shift = All wash cycles since the daily counter has been cleared
Failed = All wash cycles which have been aborted since commissioning


 Press the button <<Cancel>>.

⇒ The display shows:
010 Total counter

Menu 011 Lifetime


 Press the button <<▶>> to enter the next menu level.

⇒ The display shows the first sub-menu
0110 Cash (Manual entry)
The menu "Lifetime" provides three sub-menus

 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.

- 0110 Cash (Manual entry)
- 0111 Non-cash
- 0112 Service

The menu “Cash” shows the total amount of wash cycles which have been started at the operating terminal by entering a wash program. The menu “Noncash” shows the total amount of wash cycles which have been started otherwise, e.g. with a wash card at a card reader. The menu “Service” shows the total amount of wash cycles which have been started from Mark VII Service in service mode.

 Press the button <<▶>> to display the counter of the selected menu.


⇒ The display shows:

Program Z XXXXXX Promotion YYYYYY

Z = Program number (Start with program1)


XXX = All wash cycles of program Z during regular periods

YYY = All wash cycles of program Z during promotion periods

 Select the counters of other programs by pressing the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

⇒ The display shows for example:


0110 Cash (Manual entry)

 Select another sub-menu by pressing the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

⇒ The display shows:

011 Lifetime


Menu 012 Day

 Press the button <<▶>> to enter the next menu level.

⇒ The display shows the first sub-menu

0110 Cash (Manual entry)


The menu “Day” provides four sub-menus

 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.

- 0120 Cash (Manual entry)
- 0121 Non-cash
- 0122 Service
- 0124 Clear day counter

The menu “Cash” shows the total amount of wash cycles which have been started at the operating terminal by entering a wash program during this day. The menu “Non-cash” shows the total amount of wash cycles which have been started otherwise during this day, e.g. with a wash card at a card reader. The menu „Service” shows the total amount of wash cycles which have been started from Mark VII Service in service mode during this day.

For the first three menus:


 Press the button <<▶>> to display the counter menus: of the selected menu.

⇒ The display shows:
Program Z XXXXXX Promotion YYYYYY


Z = Program number (Start with program1)

XXX = All wash cycles of program Z at regular periods

YYY = All wash cycles of program Z at promotion periods

 Select the counters of other programs by pressing the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

⇒ The display shows for example:
0120 Cash (Manual entry)


 Select another sub-menu by pressing the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

⇒ The display shows:
012 Day


For the menu “Clear day counter“:

⇒ The display shows:
0124 Clear day counter

 Press the button <<OK>> to clear the daily counter.

 The display shows:
Day counters cleared

 Press twice the button <<Cancel>> to return to the start menu.

 The display shows:
012 Day


Menu 03 Machine Settings


The menu “Machine settings” is used to switch devices of the wash system on or off or to control them manually.


The table below shows on a glance all menus and sub-menus available in this menu item.

03> Machine settings
030> Modules Enable/Disable Mod 000: RB1 = enable
031> Lift control Onboard Dryer Lift control Onboard Dryer: on
032> Contact pressure Roof brush : 100 %
036> CP0 Settings 0360 Manual override at CP0 0361 WashSelect at CP0
037> Temperatures 0370 Freeze protection aon at xx°C

038> Chemical Purge
Shampoo off
Foam off
Wax off
Wax2 off
Drying aid off
Foam wax off
Spotfree off
High Pressure chem. off
039> HubScrub Purge
HubScrub Purge on

 Press the button <<▶>> to enter the next menu level.

 The display shows the first sub-menu:
030> Module On-Off

 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.

 **NOTE** The menu cannot be activated during operation of the wash system.

Menu 030 Module On-Off

Press the button <<▶>> to display the modules.

The first module is shown:

Mod 001: X = active

X = Abbreviation of the module, e.g. RB1 for roof brush 1


You can now change the condition of a module, i.e. activate or deactivate a module. A module which is deactivated will not be actuated during a wash cycle.


 **NOTE** Use this function to switch off a defect module. You can then operate the wash system with reduced functionality.

Modules which are not in their home position may cause damages to vehicles or to the wash system.


Make sure that all modules are in their home position before you deactivate a module.

The wash system cannot be started if a module is not in its home position.

 Select a module by using the buttons <<▼>> and <<▲>>.


 Press the button <<OK>> to change the condition of the module, e.g. from active to inactive.

⇒ The display shows for example:
Mod 001: DB1 = inactive

 Select further modules by using the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

⇒ The display shows:
030 Modules On-Off

Menu 031 Lift control Onboard Dryer


 Press the button <<▶>> to display the condition of the onboard dryer.

⇒ The display shows:
Lift control onboard dryer: on

You can now change the condition of the onboard dryer, i.e. switch onboard dryer on or off.



Use this menu to switch off the lift control after a malfunction of the onboard dryer. You can then operate the wash system with reduced functionality. The onboard dryer remains in the upper home position. The blower of the onboard dryer remains active.

 Press the button <<OK>> to change the condition of the module, e.g. from active to inactive.

⇒ The display shows:
Lift control onboard dryer: off

 Press the button <<Cancel>> to accept the change.


⇒ The display shows:
031 Lift control onboard dryer




An onboard dryer which is not in the upper home position may cause damages to vehicles or to the wash system. Make sure that the onboard dryer is always in the upper home position before you deactivate the lift drive.

The wash system cannot be started if the onboard dryer is not in its home position.

Menu 032 Contact pressure


 Press the button <<▶>> to display the contact pressure.


 The display shows:
Roof brush: 100%


In case of wear the contact pressure of the roof brush and the side brushes can be adjusted.





**Incorrect adjustment of the brush pressure may cause insufficient washing results or may damage the vehicle.
The brush pressure is optimally adjusted by Mark VII Service on commissioning.**


 Select the brush by using the buttons <<▼>> and <<▲>>.

 Change the contact pressure by using the buttons <<▼>> (+ 10%) and <<▲>> (-10%).

 Press the button <<OK>> to accept the data entry.

 The display shows the new contact pressure:
Roof brush: 110%

 Select further brushes by using the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

 The display shows:
032 Contact pressure

Menu 036 Manual control


In the menu “Manual control” you can deactivate the manual control buttons (only control mode) and you can set the program selection, i.e. starting a wash program by entering a program number at the operating terminal or by entering a code or using the card reader.


The table below shows at a glance all menus available in this menu item.

036> Manual control

0360 Manual control buttons Manual control buttons: off
0361 Program selection at operating terminal Program selection at operating terminal: off


 Press the button <<•>> to enter the next menu level.

 The display shows the first sub-menu:
0360 Manual control buttons

 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.

Menu 0360 Manual control buttons


 Press the button <<▶>>.


 The display shows:
Manual control buttons: on


You can switch the manual control buttons on or off. If the manual control buttons are switched off you cannot move any devices in control mode, i.e. no wash program is running. The control buttons remain active during washing operation.




Use this menu to avoid misuse at systems which are operated in self service mode (e.g. wash systems with card reader).

 Press the button <<OK>> to change the condition, e.g. from on to off.

 The display shows for example:
Manual control buttons: off

 Press the button <<Cancel>> to return to the start menu. The changes will be accepted.


 The display shows:
0360 Manual control buttons

Menu 0361 Program selection at operating terminal


 Press the button <<▶>>.

⇒ The display shows:
Program selection at operating terminal: on

This function is only useful if the operating unit is equipped with a card reader or a code system. With “Program selection at operating terminal: on” wash programs can only be started from the card reader or by entering a code at the operating terminal.

 Press the button <<OK>> to change the condition, e.g. from on to off.

⇒ The display shows for example:
Program selection at operating terminal: off

 Press the button <<Cancel>> to return to the start menu. The changes will be accepted.


⇒ The display shows:
0361 Program selection at operating terminal

Menu 037 Temperature setting


In the menu “Temperature setting” you can set the temperatures for activating the freeze protection and for switching on the heater in the resource cabinet.

The table below shows on a glance all menus available in this menu item.









037> Temperature setting
0370 Freeze protection Freeze protection on at xx°C
0371 Heater Heater on at xx°C

 Press the button <<▶>> to enter the next menu level.

⇒ The display shows the first sub-menu:
0370 Freeze protection









 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.

Menu 0370 Freeze protection

-  Press the button <<▶>>.
-  The display shows:
Freeze protection on at xx°C
-  The cursor is placed below the first digit of the temperature.
-  Enter the new value.
-  Press the button <<OK>>.
-  The data entry is accepted.
-  Select with the <<▼>> and <<▲>> another program or press the button <<Cancel>> to return to the start menu.
-  The display shows:

037> Temperature setting

Menu 0371 Heater

-  Press the button <<▶>>.
-  The display shows:
Heater on at xx°C
-  The cursor is placed below the first digit of the temperature.
-  Enter the new value.
-  Press the button <<OK>>.
-  The data entry is accepted.
-  Select with the <<▼>> and <<▲>> another program or press the button <<Cancel>> to return to the start menu.
-  The display shows:


037> Temperature setting

Menu 038 Spray arch

 Press the button <<▶>>.

⇒ The display shows:
Shampoo off

In this menu you can switch on individual spray arches. The complete spray arch inclusive pumps and dosing pumps will be switched on. Switching the spray arches on or off has no impact on the settings or the wash program.


 Select the spray arch which should be switched on by using the buttons <<▼>> and <<▲>>.

 Press the button <<OK>> to switch on the spray arch.

⇒ The display shows for example:
Shampoo on

⇒ The selected spray arch will now be switched on.

 Press the button <<OK>> to switch off the spray arch.

 Select further spray arches by using the buttons <<▼>> and <<▲>> or press the button <<Cancel>> to return to the start menu.

⇒ The display shows:
038 Spray arch

Menu 04 System settings

This menu is used for system settings and to assign program names to wash programs.


NOTE


The menu “system settings” cannot be accessed with the password 00001.


The table below shows at a glance all menus and sub-menus available in this menu item.

04> System settings

040> Date and time Day: 0 Date: 01.01.2002 Time: 14:05:00
044> Version info K100 AJXT S/W = X.XX11/X.XXOpened: 00:00 – 24:00 Mo
047> Release Please enter PIN:


 Press the button <<▶>> to enter the next menu level.

 The display shows the first sub-menu:
040> Date and time

 Select the desired sub-menu by pressing the buttons <<▼>> and <<▲>>.


Menu 040 Date and time

 Press the button <<▶>>.


 The display shows the current setting for date and time. The cursor is placed below the day code:


You can now display and change date and time. The day code will be generated from the date. Mo = 0, Tue = 1, etc. to Su = 6

Display only

 Press the button <<Cancel>> to return to the start menu without any changes.


Change

 Press the button <<OK>> and the cursor is placed below the 1. digit of the date.
<OK>

 Enter the new date.

NOTE

The date can only be reset with a clearance from Mark VII.

 Press the button <<▶>> until the cursor is placed below the first digit of the time or press the button <<OK>> to accept the new date and than the button <<Cancel>> to return to the start menu.
<OK>

<Cancel> <Cancel>



Enter the new time.



Press the button <<OK>> to accept the data entry.



The new time is accepted.



The cursor is placed below the daily code.



Press the button <<Cancel>> to return to the start menu.



The display shows:

040 Date and time

9. AUXILIARY EQUIPMENT

9.01. Coin boxes

The coin box is the device used by the customer to select the wash level and options, and is their first interface with the in-bay automatic car wash. Mark VII offers several different coin box models. Optional features include bill, coin, and/or credit card acceptance.

The coin box is connected to the command PLC options board and to the point of sale (POS) unit, if there is one.

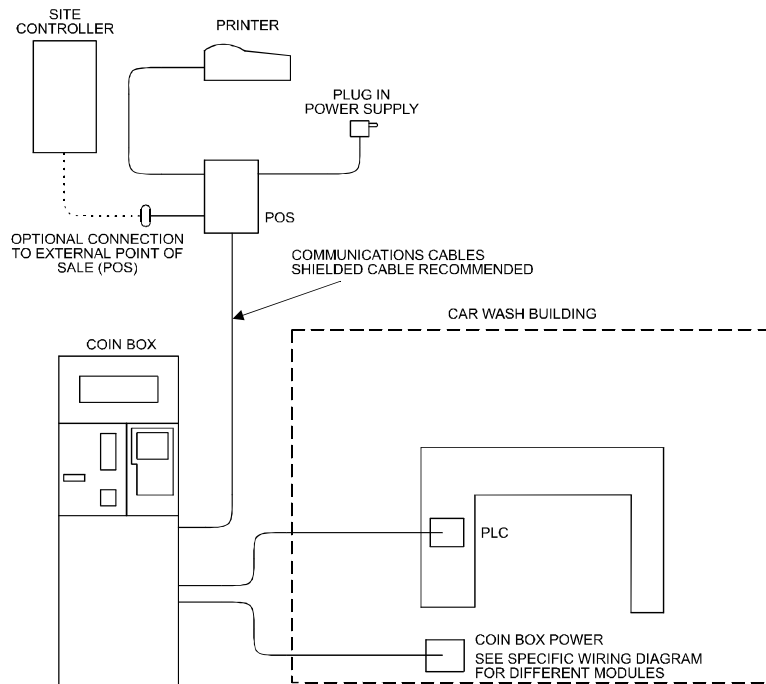
Operation

The following steps occur when a coin box is used.

- 7 The car wash customer selects and pays for a wash, either at the coin box or the POS.
- 8 The car wash customer activates the car wash by entering the pre-paid code into the coin box. If there is a POS, the coin box checks and confirms the code and authorizes the appropriate wash level and options.
- 9 A switch closure occurs in the coin box, sending a signal to the PLC.
- 10 (Unitec mode only)
While the car wash is in operation, the programmable logic controller (PLC) sends a continuous *car wash in use* signal to the coin box. During this time, the coin box will accept another customer's payment or code, and hold them in queue.
- 11 (Unitec mode only)
After a wash (when the vehicle leaves the treadle), the PLC turns off the car wash in use signal, which notifies the coin box and the POS (if applicable) that it is ready for the next wash.
- 12 If a wash was held in queue, the wash is activated and the system waits for the next customer to enter the bay.

The relationship between the coin box, the POS, and the PLC is shown in Figure 4.150-1.

Figure 9.01-01, Overview of Coinbox Signals



For additional information, see the maintenance manual provided with the coin box.

9.02. Door control

The door control system is a signaling device only to a door operator. It has its own PLC that serves as the interface between the car wash and the door opening and closing mechanisms.

The door control system is an optional feature that may be used for security purposes or to protect the bay during freezing temperatures. For temperature control, a thermostat with an outside temperature probe is linked to the Door Control PLC. When the temperature falls below a set temperature (usually 36° F), the doors open and close for each vehicle wash cycle.



The doors can be manually opened and closed at any time. However, doing this bypasses the PLC, so it cannot tell whether the doors are open or closed. As a result, when doors are manually opened, they must also be manually closed.

This system makes some provisions for safety and security of the doors to the car wash; however, it is the responsibility of the door operating mechanism to insure safe operation.

Component	Reference
Door control PLC	Not shown
Electric eyes or magnetic loops	Not shown

Thermostat	Not shown
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Operation

The following steps occur when the door control system is used.

Note: The door control system receives only two signals from the carwash controller; these are the door open pulse and the stop lamp signal. These signals tell the door control when to open the entrance door, when to close it and when to open the exit door. The exit eyes or loops are only used to close the exit door.

- 1 A customer activates the car wash at the coinbox/POE by depositing payment and entering a selection, or by entering a code. This sends a wash signal to the car wash PLC to initiate any of its four washes. (The car wash controls when the wash signal is sent to the door control PLC. If the wash is not currently in use, the signal is forwarded immediately, and the entrance door opens.)
- 2 The vehicle enters the bay and activates the stop sign by stopping on the treadle switch. The stop sign signal is echoed to the door control. When the stop sign has been on constantly for 10 seconds, the door control PLC signals the closing mechanism that it is time to close the entrance door. The door control does check to see if the entrance eyes are blocked before sending this signal, if so the doors are not closed and retried as soon as the eyes are no longer blocked.
- 3 When the wash is completed, the stop sign turns off, signaling that the wash is done, and the exit door is opened.



In case of any error, such as out of water, the red light flashes, signaling the exit door to open so that the customer is not trapped in the bay due to a non-recoverable error. Also if the power were to fail to the carwash the exit door will open.

- 4 As the vehicle exits, it crosses 2 sets of electric eyes, magnetic loops, or a combination of these. Ten seconds after the outside loop or eye is passed and both are cleared the exit door closes. The arrangements of the eyes or loops are as follows the first set is just inside the exit door, the second is outside the door.



Any time the inside set of eyes and/or loops are activated, the door control signals to open the exit door.

Safety Features



There must always be a clearly marked method of emergency exit for the car wash customer or others in the bay, in case of power failure or other emergencies.

While there are entrance safety eyes provided with the door control, the door operator mechanism should also provide safety devices that insure the door cannot close on an object, person or car.

All units have an auto/manual switch. To discontinue automatic door operation, the operator must put this switch in the manual position. This way when the switch is returned to the automatic position, the door controls will be in synchronization with the car wash and automatically put the doors in the proper position. For example, if a wash is not in progress and there are no signals from a thermostat, the system will check the detection devices and, if they are clear, close the doors. This relieves the operator from having to run a wash cycle in order to close the doors, for example, when the temperature drops.

If the door cannot close, for example, if there is an obstruction in the doorway, the door control system will abandon the attempt for approximately 10 minutes. It will retry in 10-minute intervals, sounding a warning horn before each new attempt. This process continues until the door is successfully closed.

The horn will sound during any unscheduled door closure, including a closure due to a drop in temperature.

Service Notes

It is recommended that the door control system be left on automatic all the time. This prevents accidental freeze-ups due to unexpected temperature changes, especially in the spring and fall.

The eyes and/or loops on the door control system are not intended for reversing purposes; that is, they will not cause the door to reverse direction once it is in motion. The door control mechanism should provide for not closing on anything in the door's path.



Be sure that nothing is blocking the magnetic loops when turning the power to the door control system back on, such as after servicing. If the loops are blocked when the power comes on, they may not function accurately.

For more detailed information on the door control system, refer to the Door Control Unit Owner's Manual.

10. TECHNICAL DATA

10.01. Dimensions

Figure 10.01-01, AquaJet XT[®], Machine Dimensions

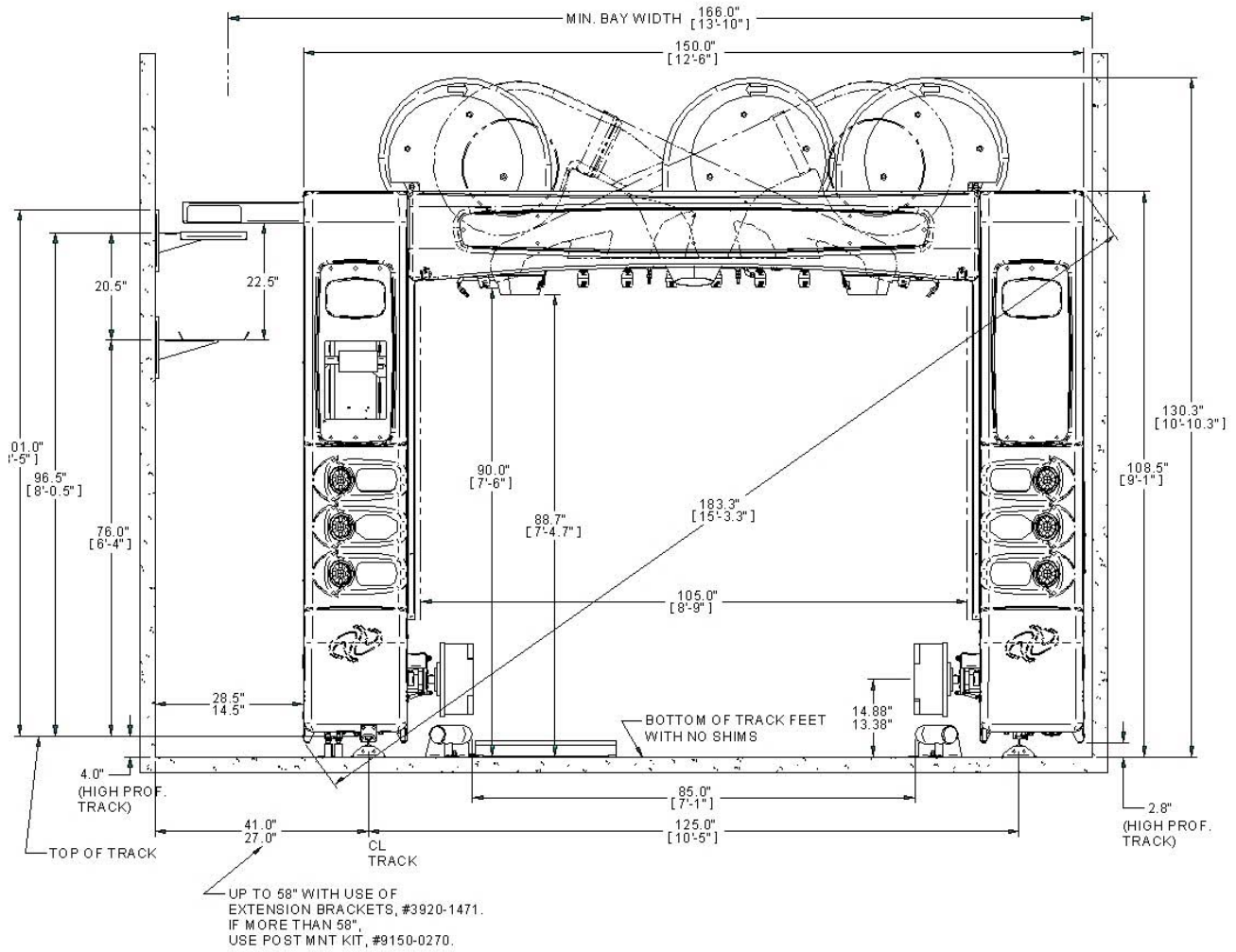


Figure 10.01-02, AquaJet XT[®], Machine Dimensions

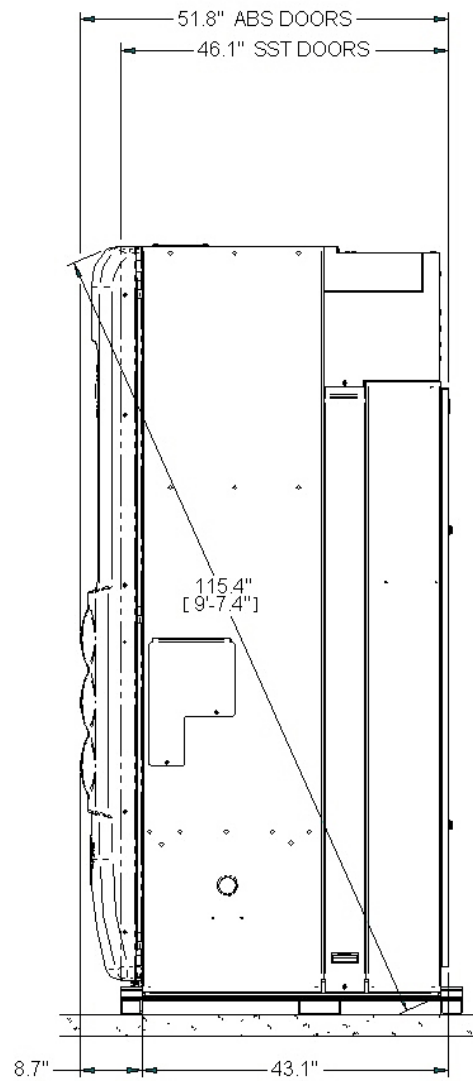
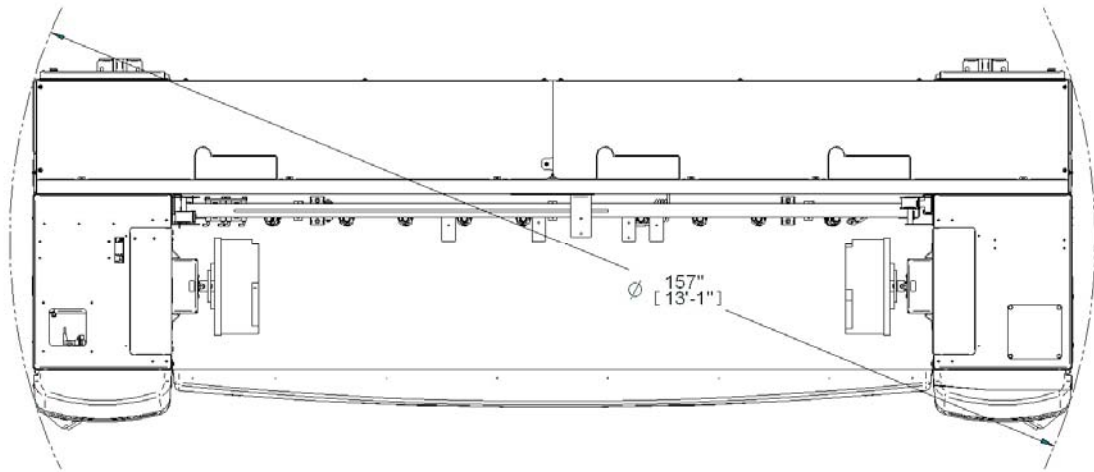


Figure 10.01-03, AquaJet XTO-300, Pumping Station

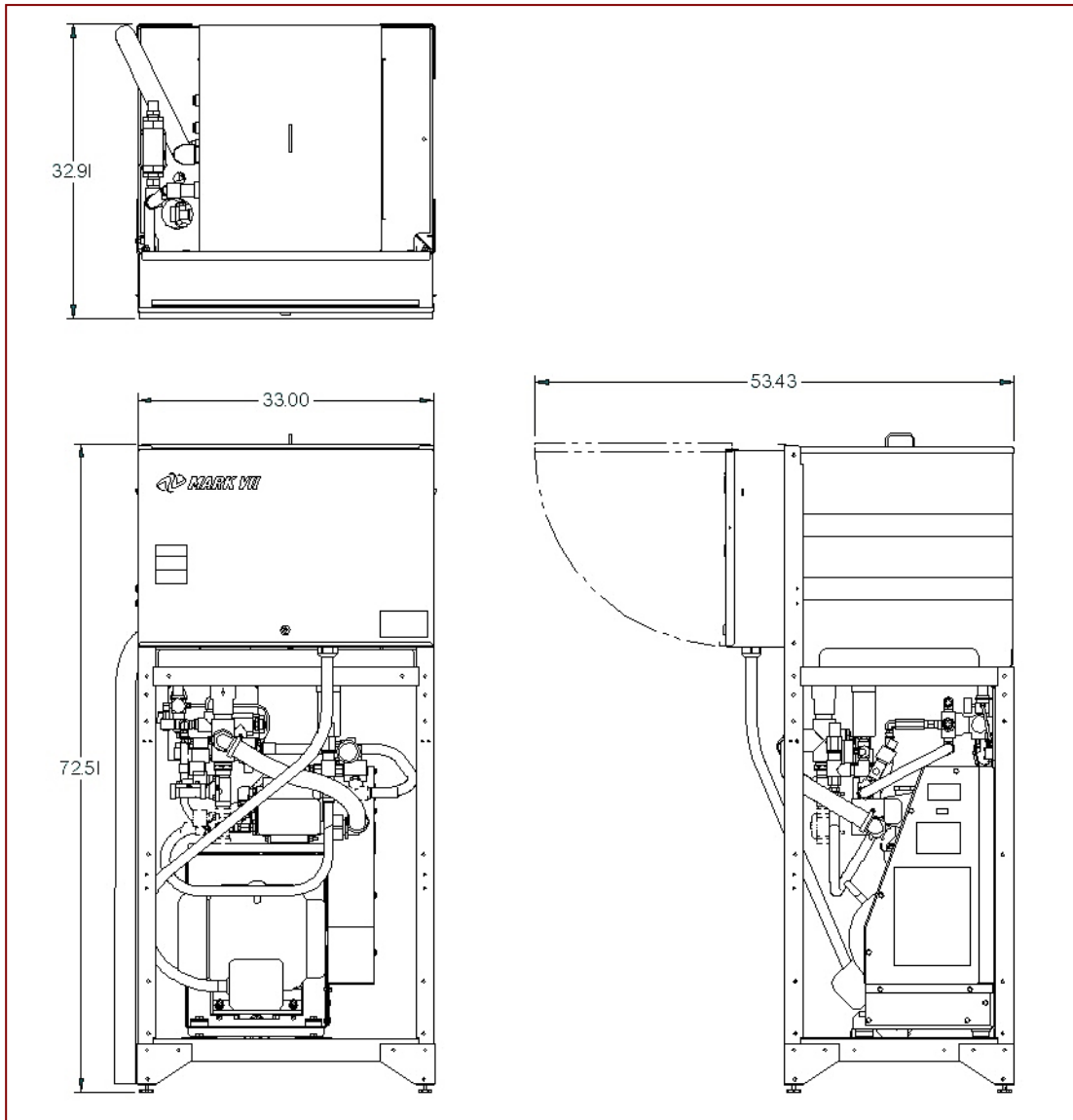
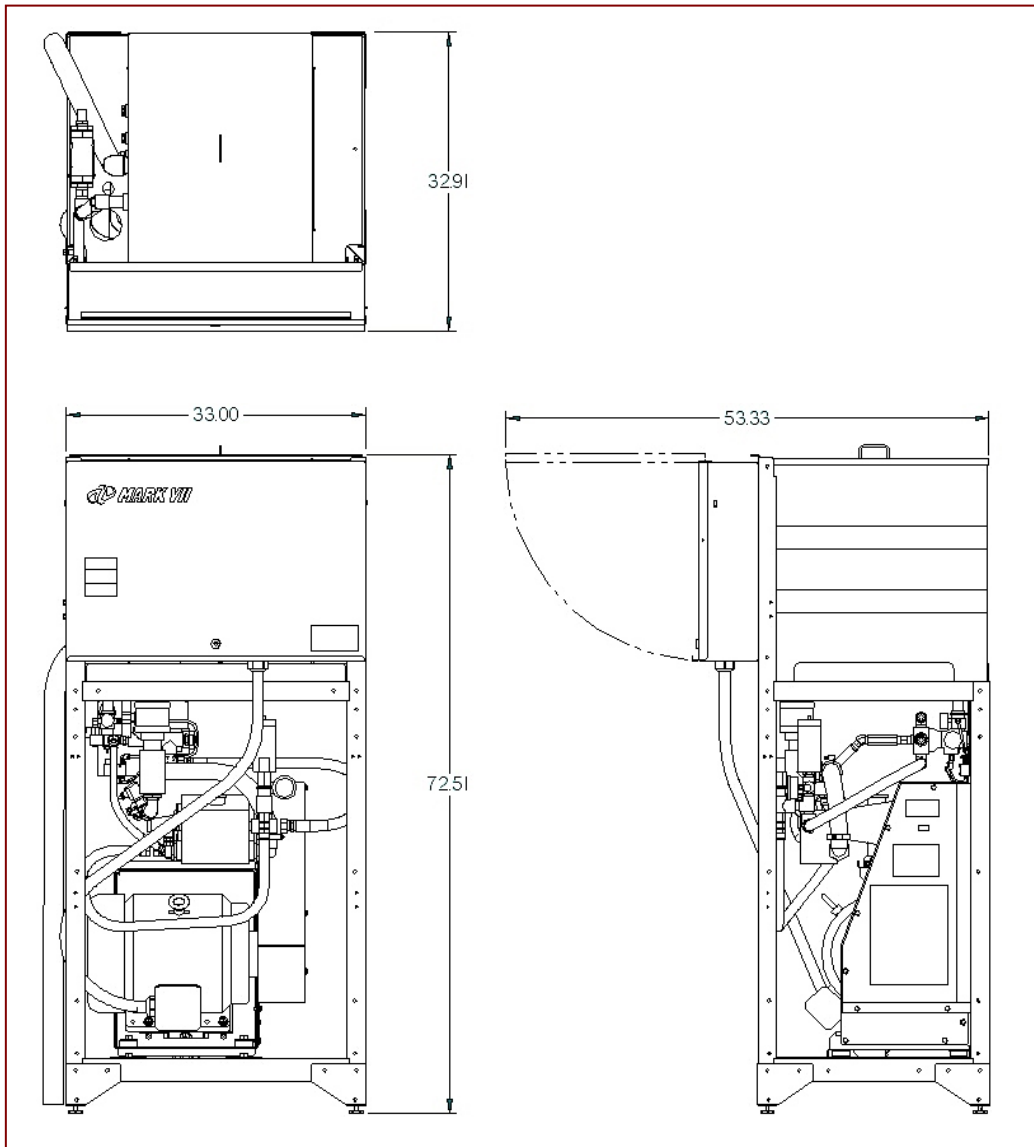


Figure 10.01-04, AquaJet XTO-700, Pumping Station



Machine Dimensions

	AquaJet XT [®]	AquaJet XT [®] with On-board Dryer (AquaDri E-30i)	AquaJet XT [®] with Contouring Dryer (AquaDri E-15)
Height	108.5" / [277 cm]	130.3" / [331 cm]	130.3" / [331 cm]
Width	150" / [381 cm]	150" / [381 cm]	150" / [381 cm]
Length (Depth)	51.8" / [132 cm]	51.8" / [132 cm]	51.8" / [132 cm]

Pumping Plant

Height	80.5" / [205 cm]
Width	40.5" / [103 cm]
Length (Depth)	32" / [81 cm]

Vehicle Clearance

Height	89" / [226 cm] from bay floor to tip of wash nozzle
Width	105" / [266.7 cm]
Width (between guide rails)	85" / [216 cm] – (Standard)



Vehicle clearance heights measure from base of gantry tracks. Actual heights may vary due to the slope of the bay floor.

10.02. Weight

Machine Weights

	AquaJet XT [®]	AquaJet XT [®] with On-board Dryer (AquaDri E-30i)	AquaJet XT [®] with Contouring Dryer (AquaDri E-15)
Weight	2,075 lbs / 941 kg	3,575 lbs / 1,621 kg	3,075 lbs / 1,621 kg
	Pumping Plant		
Weight	1350 lbs / 613 kg		

10.03. Technical Data

Electrical (Domestic Only)

Gantry / Pumping Plant	208-240 VAC 60 Hz 3phase, 75 amp
On-board Dryer	20 HP 208-240 VAC 60 Hz 3phase, 75 amp
	30 HP 208-240 VAC 60 Hz 3phase, 125 amp

NOTE

Dryers require separate, dedicated electrical service.

Air and Water

Minimum Water feed pressure	50 pounds per square inch (psi) [3.5 bar]
Maximum Water feed pressure	80 pounds per square inch (psi) [5.5 bar]
Water demand	35 gallons per minute (gpm) [132.5 liters/minute]
Air supply	½" line with 80 psi minimum [5.5 bar], 120 psi maximum [8.3 bar] (* see note)
Air consumption demand	Constant – 1 ½ cubic feet per minute (cfm) [43 liters/minute] Intermittent - 12 cfm [340 liters/minute]

Water demand refers to water supply at the machine's connection location. Water supply to the building has to be sufficient to provide such demand.

NOTE

An air regulator (p/n 3501-1071) needs to be installed and set to 120 psi if compressor is set to deliver pressures greater than 120 psi. The pneumatic components in this equipment are only rated for 120 psi.

Recommended Bay Size

	AquaJet XT®	AquaJet XT® with On-board Dryer
Height	12' 6" / [381 cm]	14' 6" / [442 cm]
Width	16' / [488 cm]	16' / [488 cm]
Length	36' / [1098 cm]	36' / [1158 cm]

Recommended Track Length

	AquaJet XT™ (standard)	AquaJet XT™ (recommended)
Track length	28' / [854 cm]	32' / [976 cm]

11. APPENDIX

11.01. Mechanical Schematics

Figure 11.01-01, Schematic: AXT 700 High Pressure System

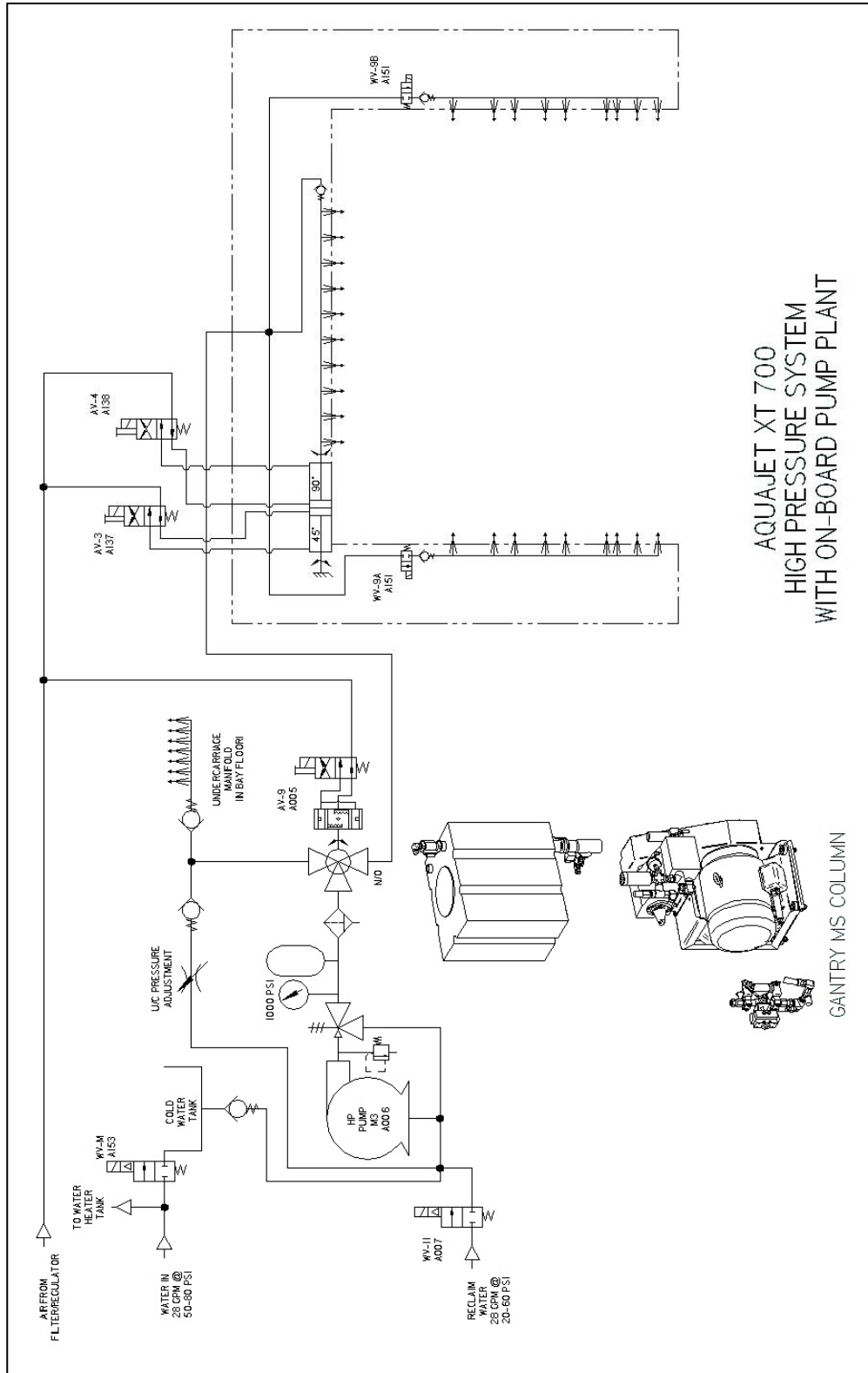


Figure 11.01-02, Schematic: AXTO 700 High Pressure System

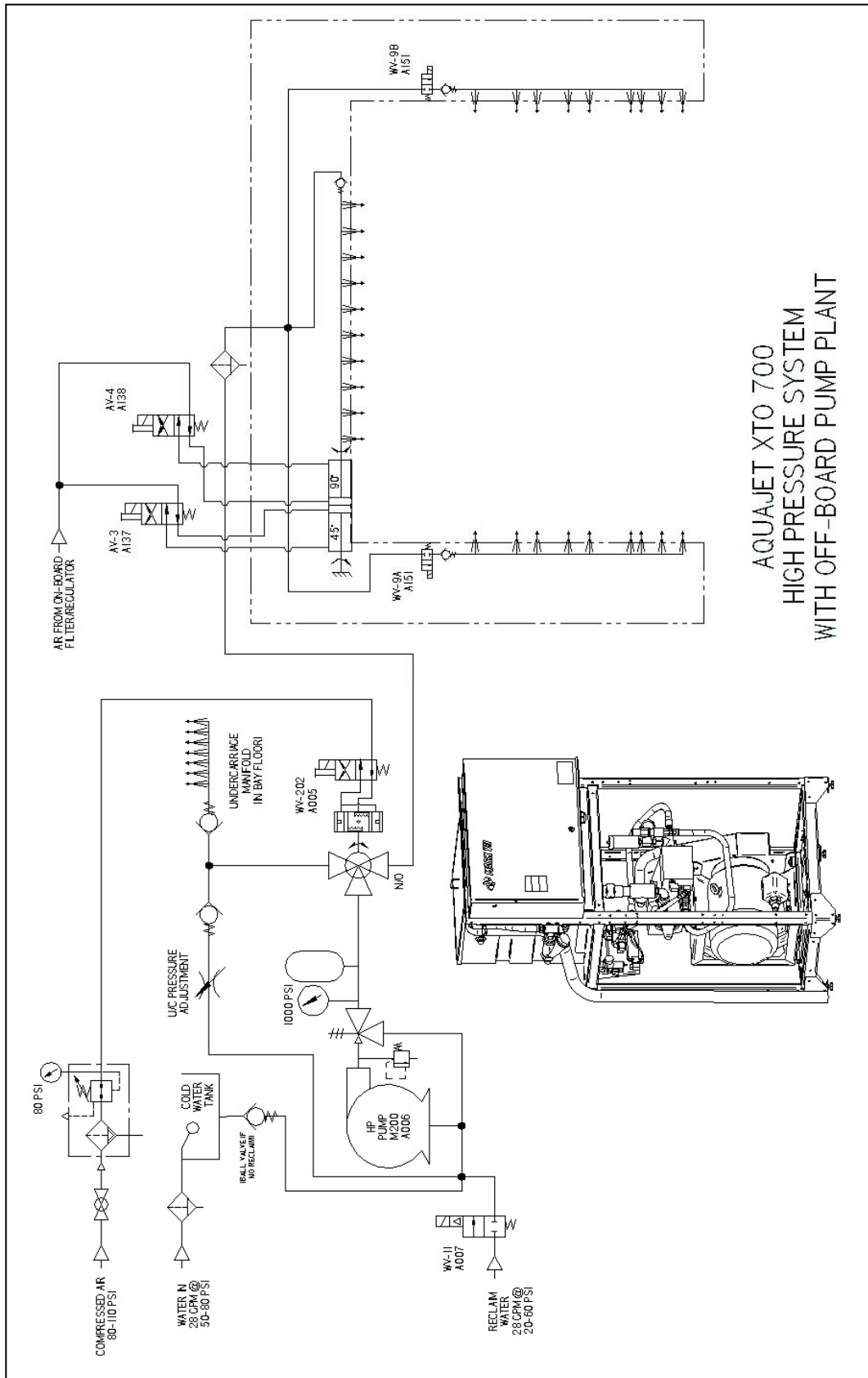


Figure 11.01-03, Schematic: AXT 300 High Pressure System

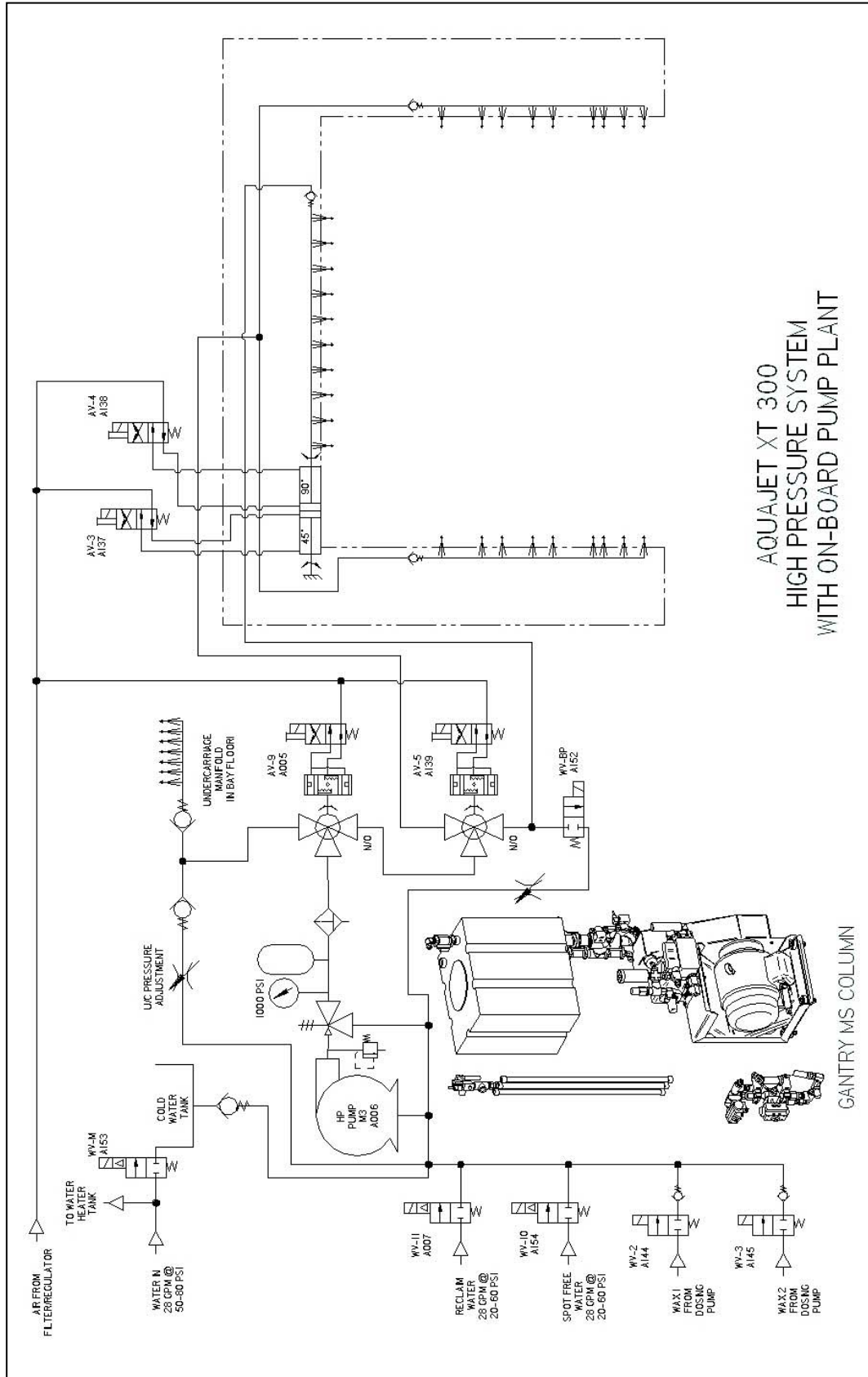


Figure 11.01-04, Schematic: AXTO 300 High Pressure System

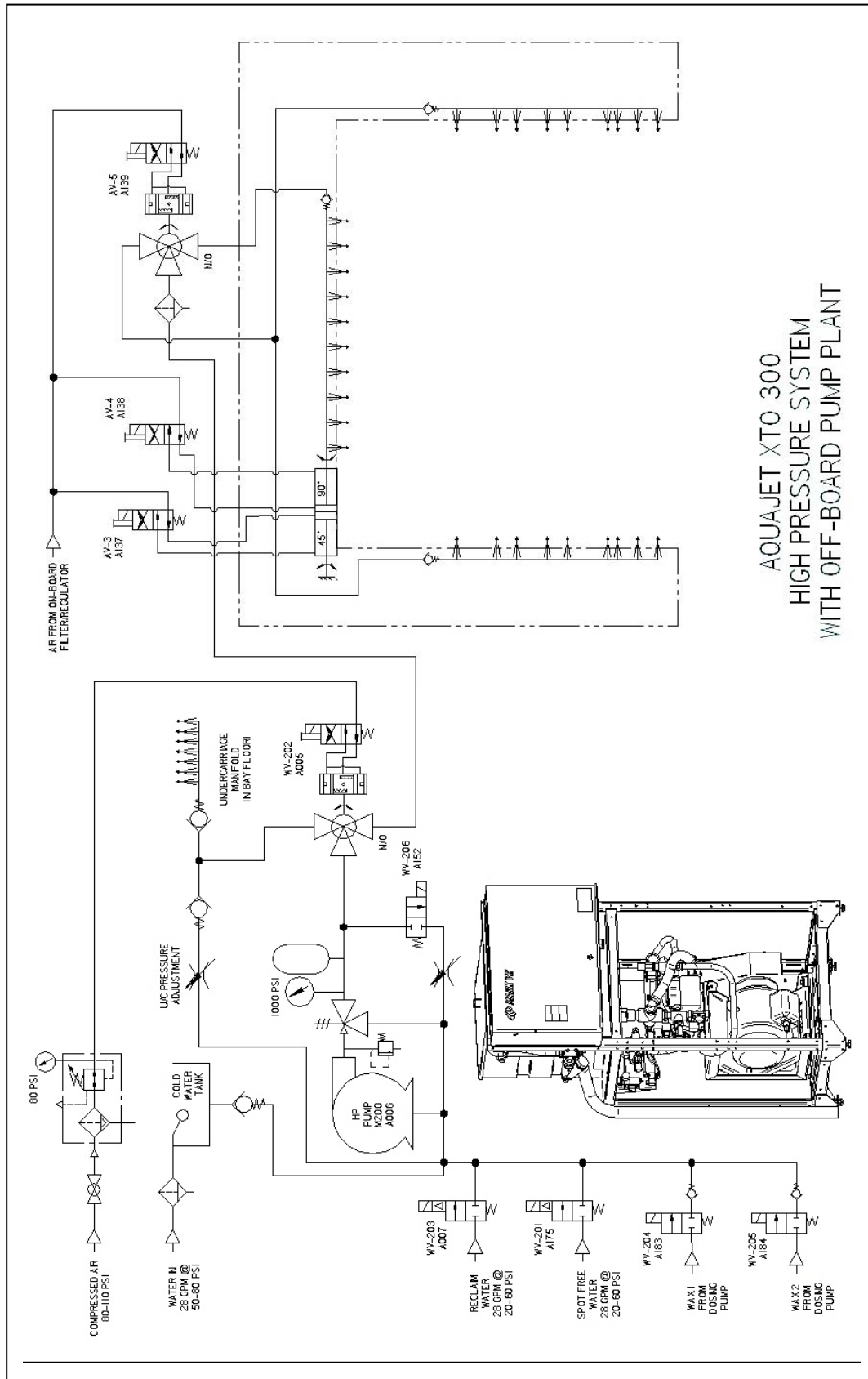


Figure 11.01-05, Schematic: Low Press. Pump System and Dosing Pump Panel

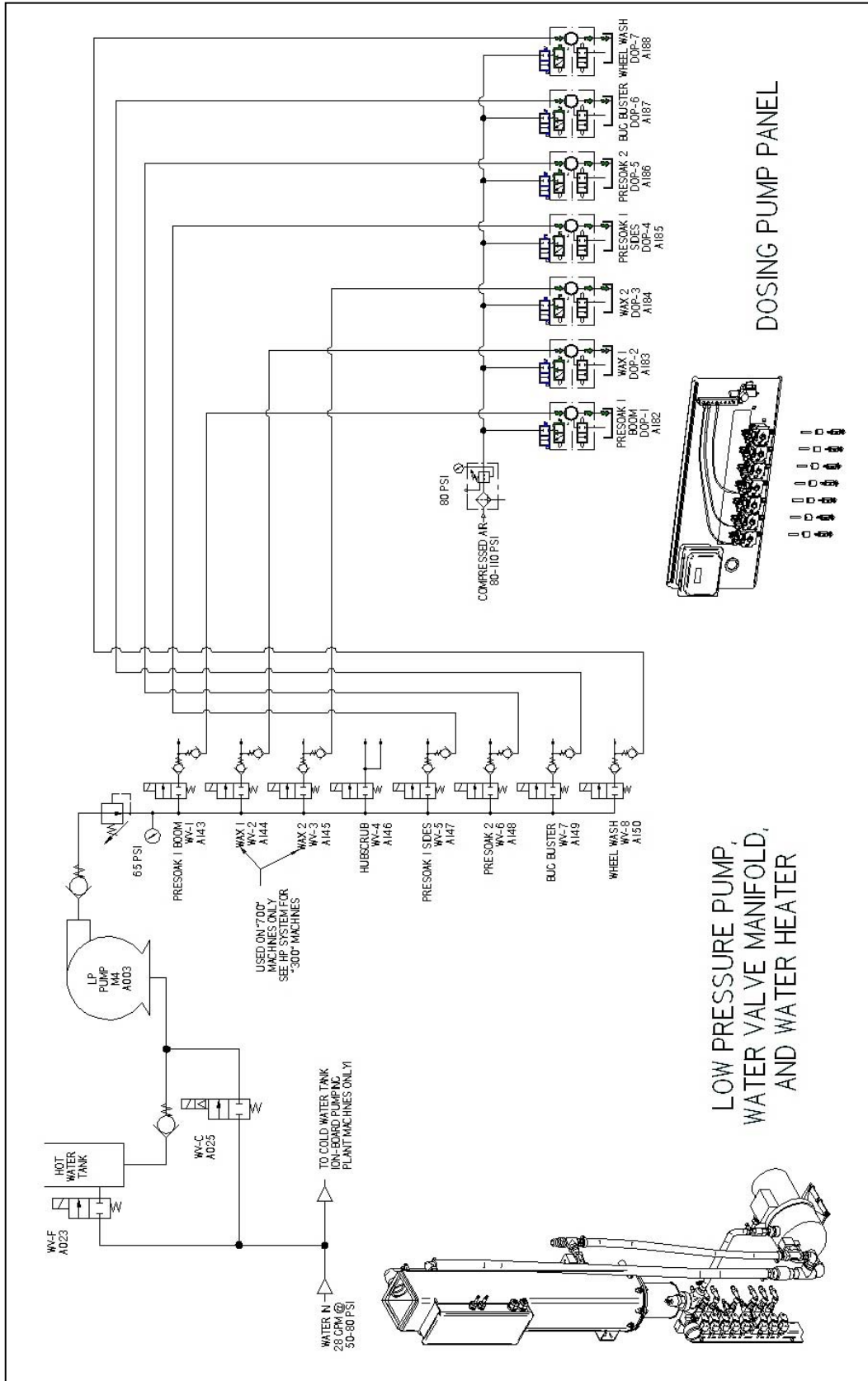


Figure 11.01-06, Schematic: Pneumatic Panel

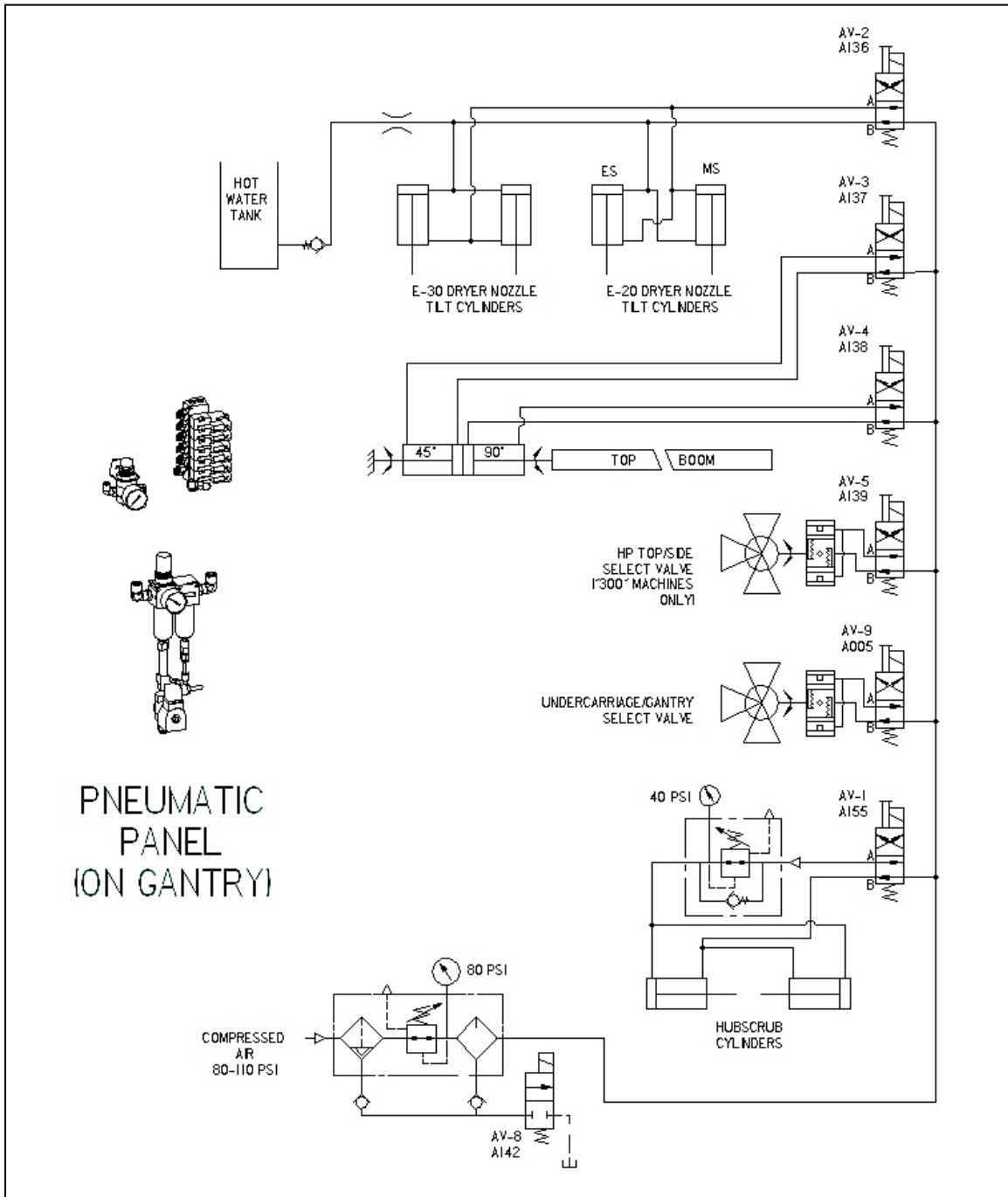


Figure 11.01-07, Schematic: Tri-Foam Pump Panel

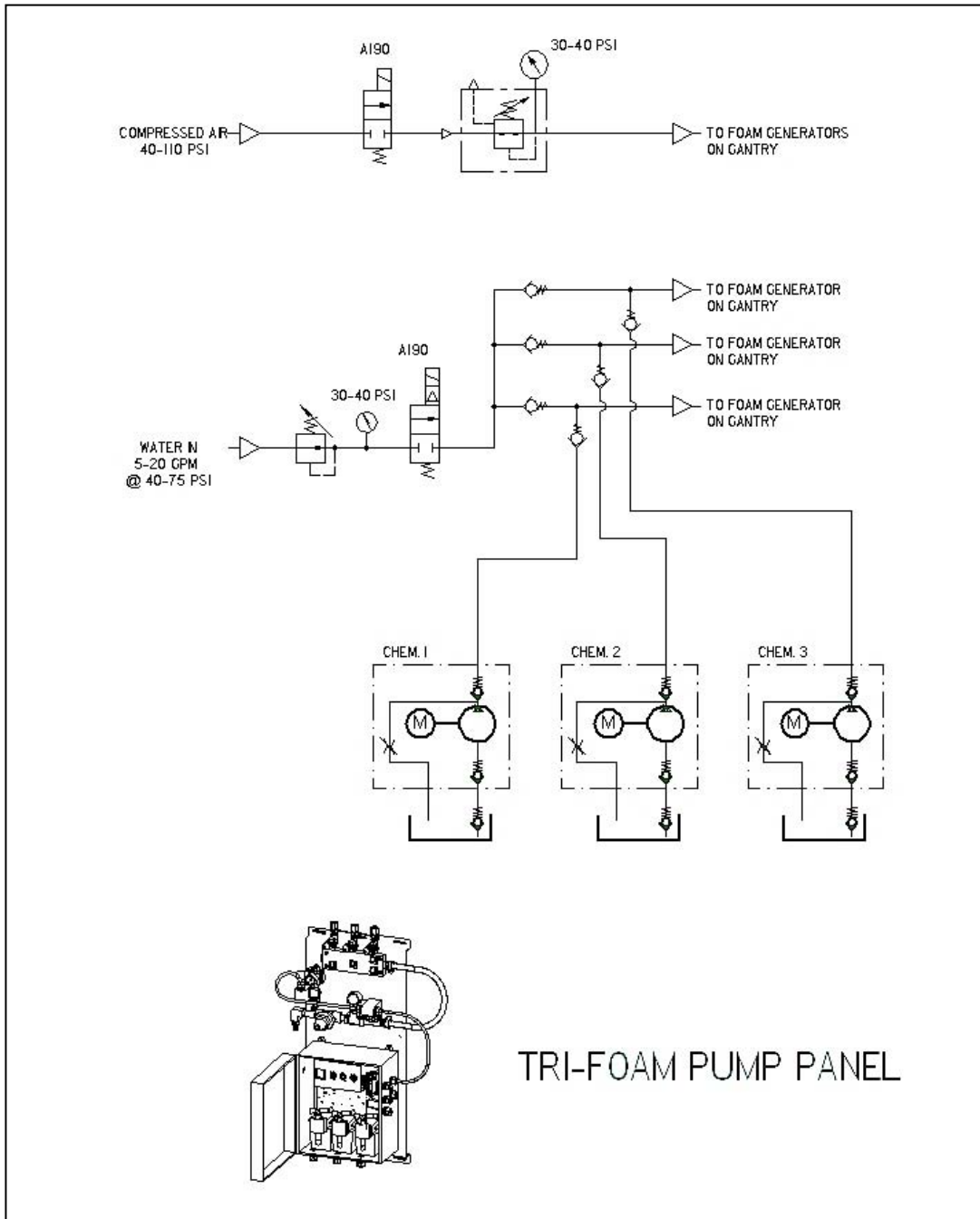


Figure 11.01-08, Schematic: Presoak 1 & 2

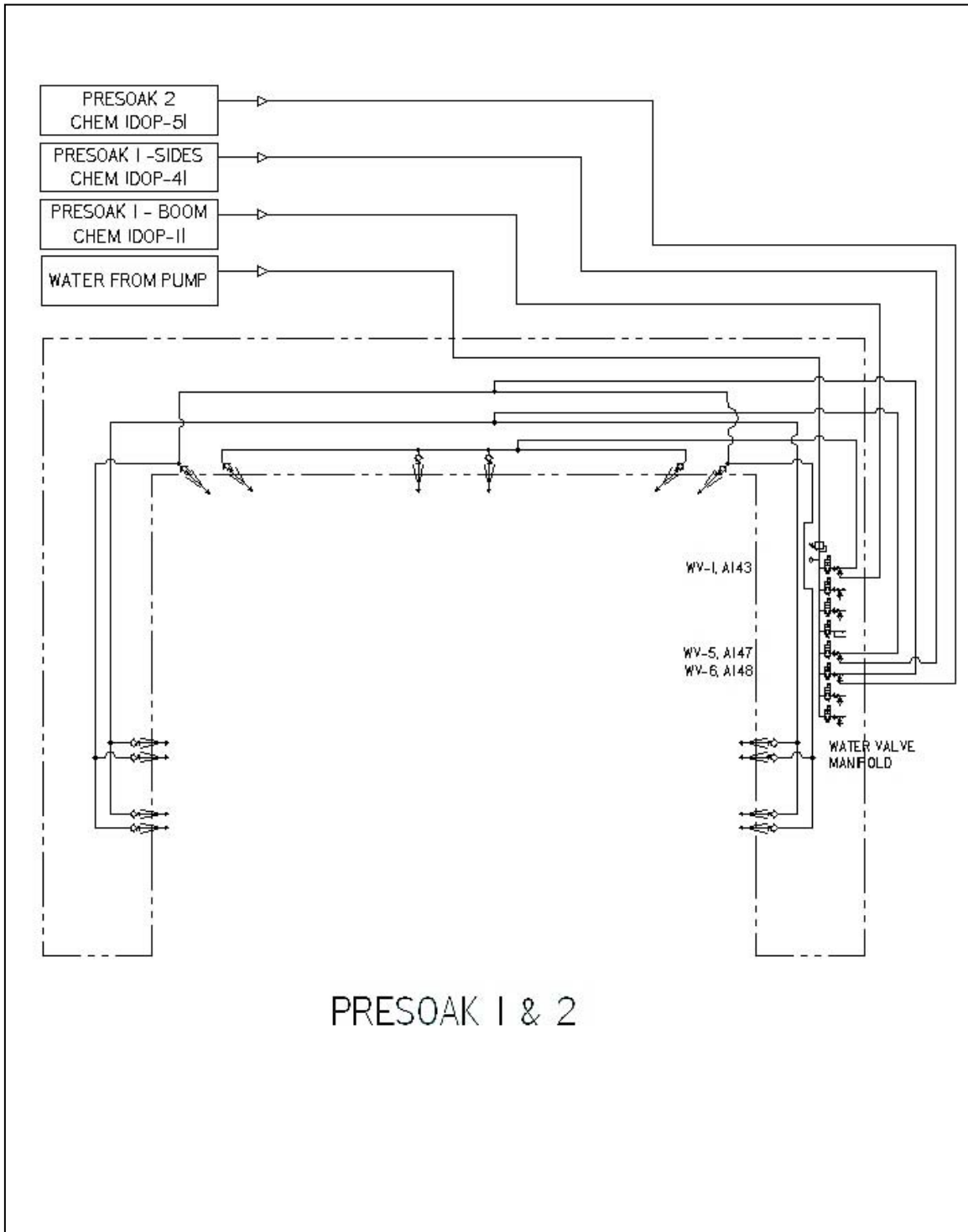


Figure 11.01-09, Schematic: Wax 1 & 2

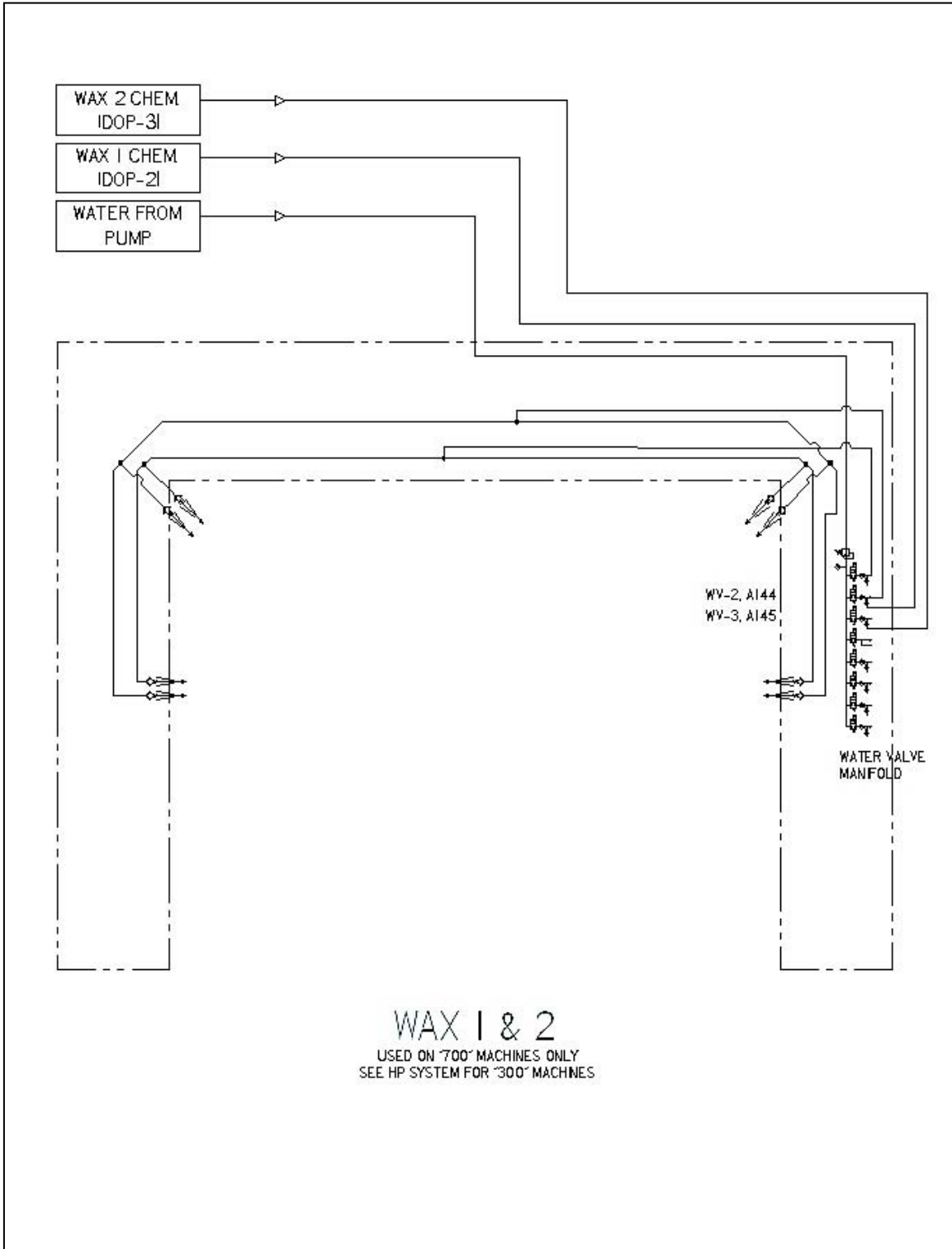


Figure 11.01-10, Schematic: BugBuster

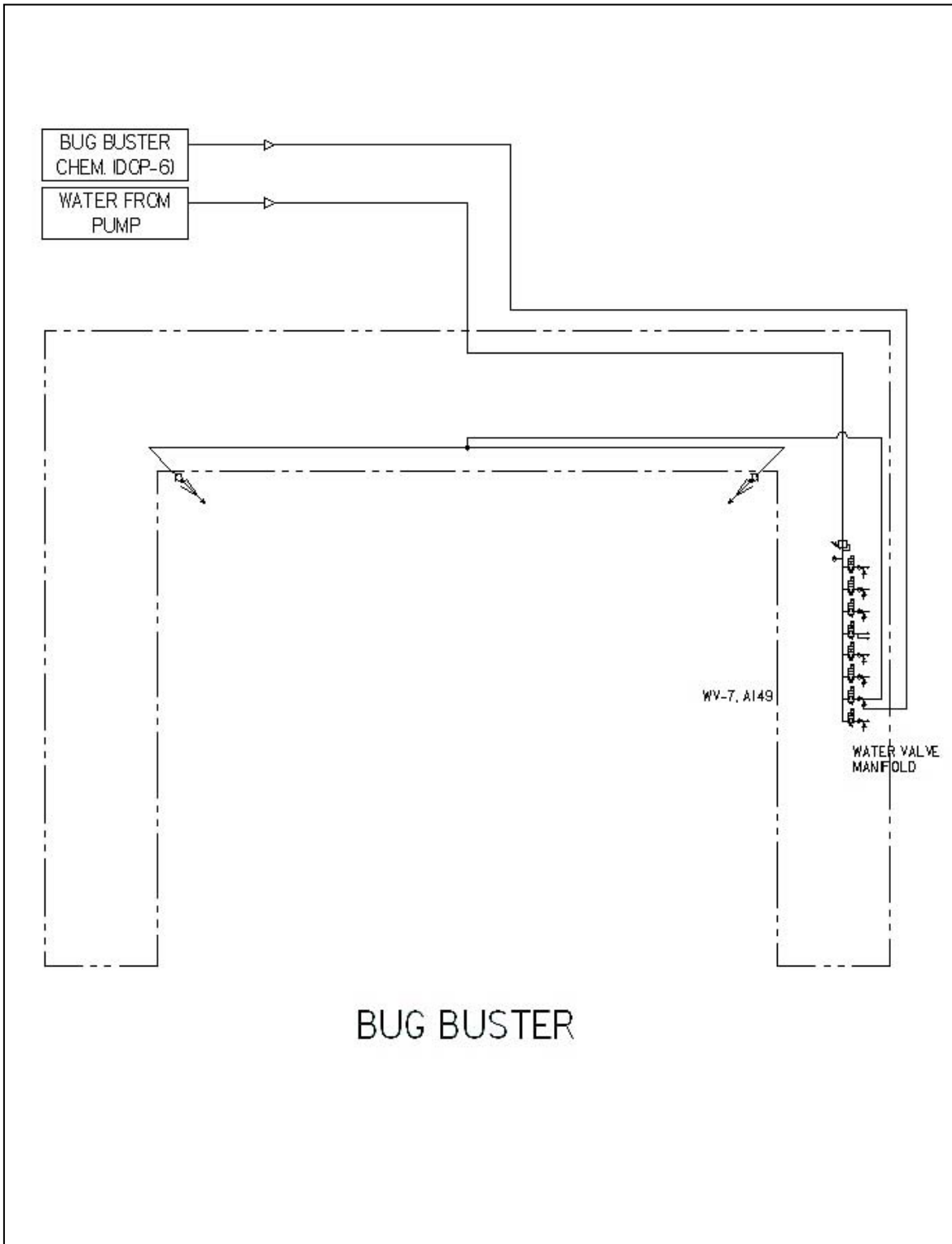


Figure 11.01-11, Schematic: Wheel Wash

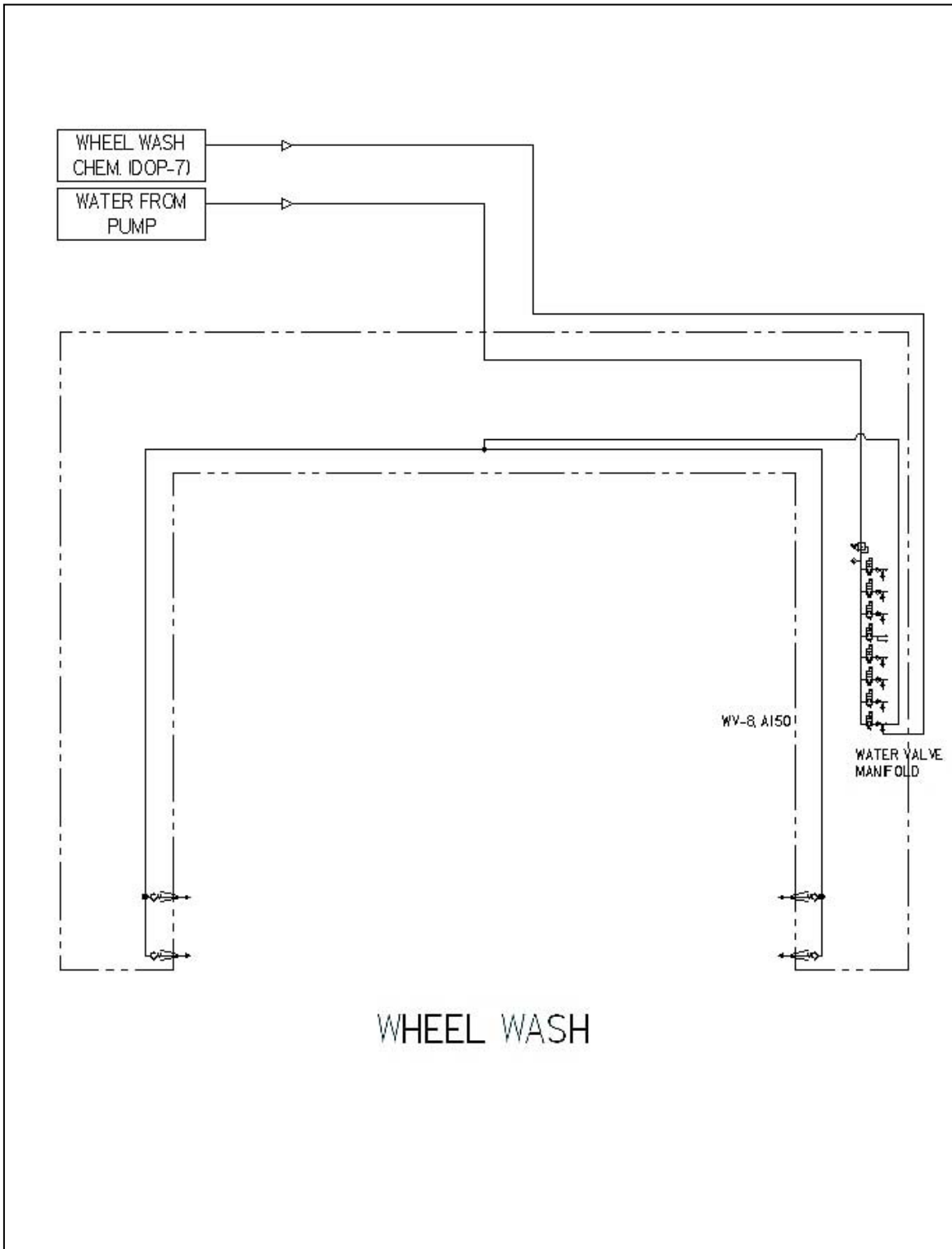


Figure 11.01-12, Schematic: Spotfree Rinse

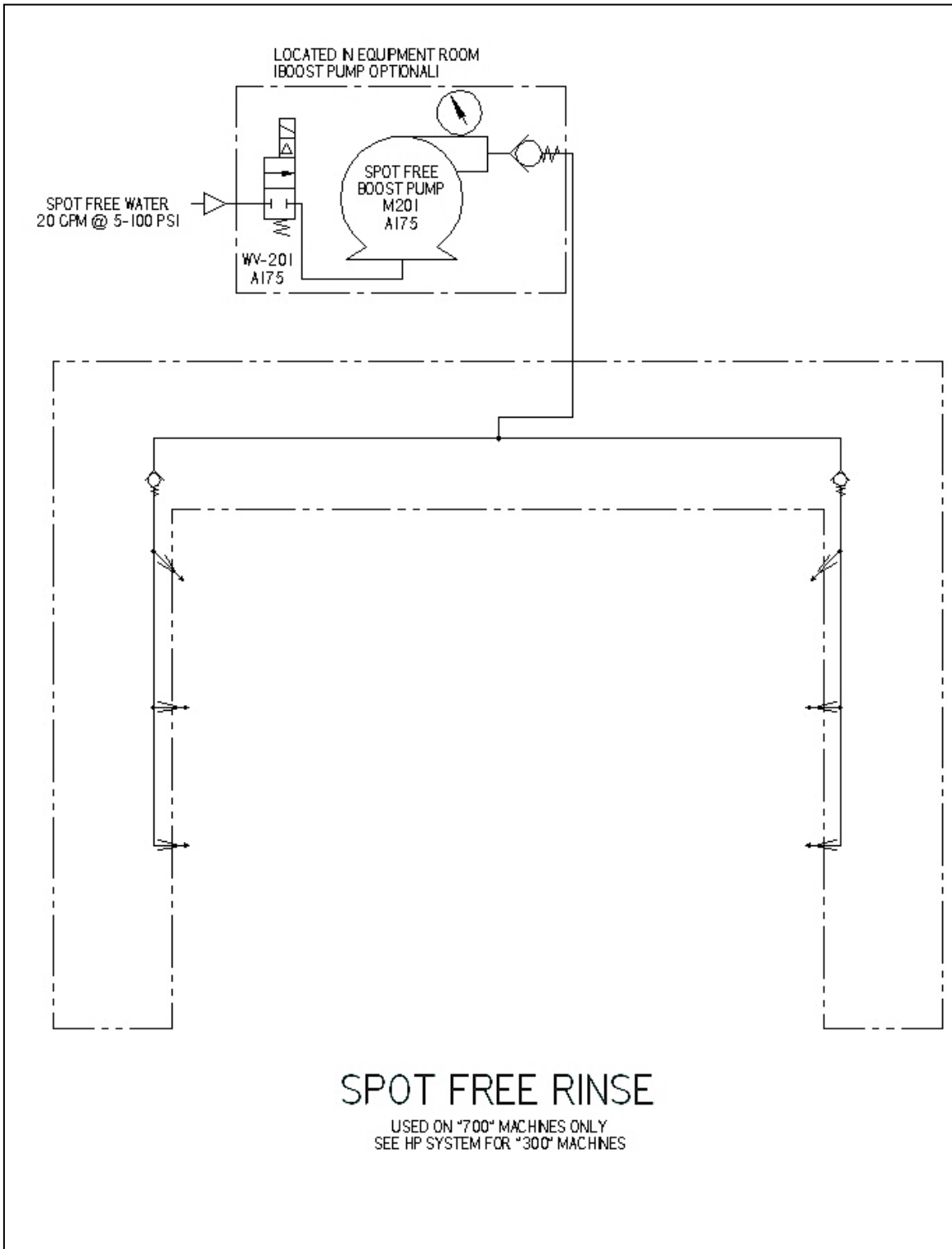


Figure 11.01-13, Schematic: TriFoam Nozzles

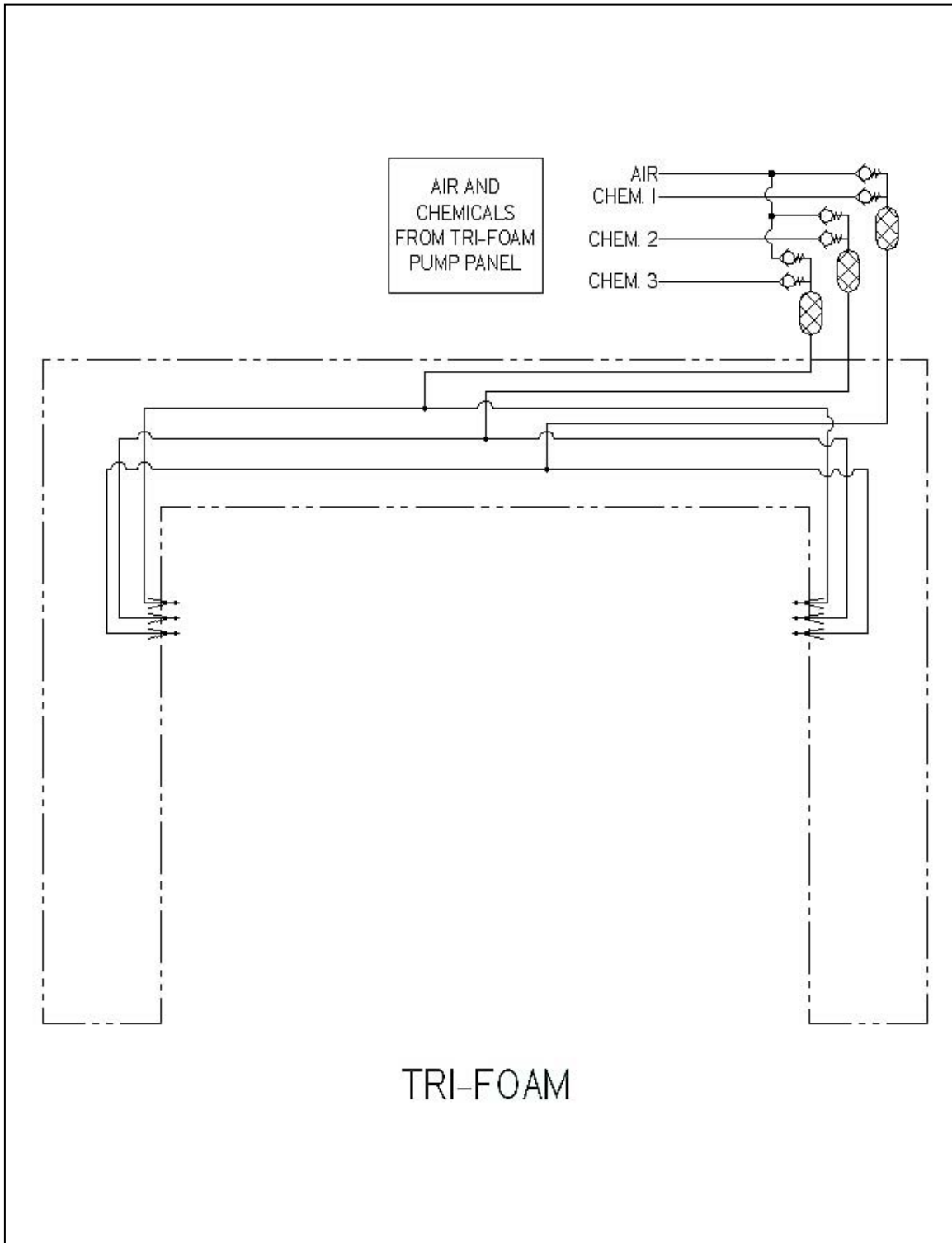


Figure 11.01-14, Schematic: HubScrub

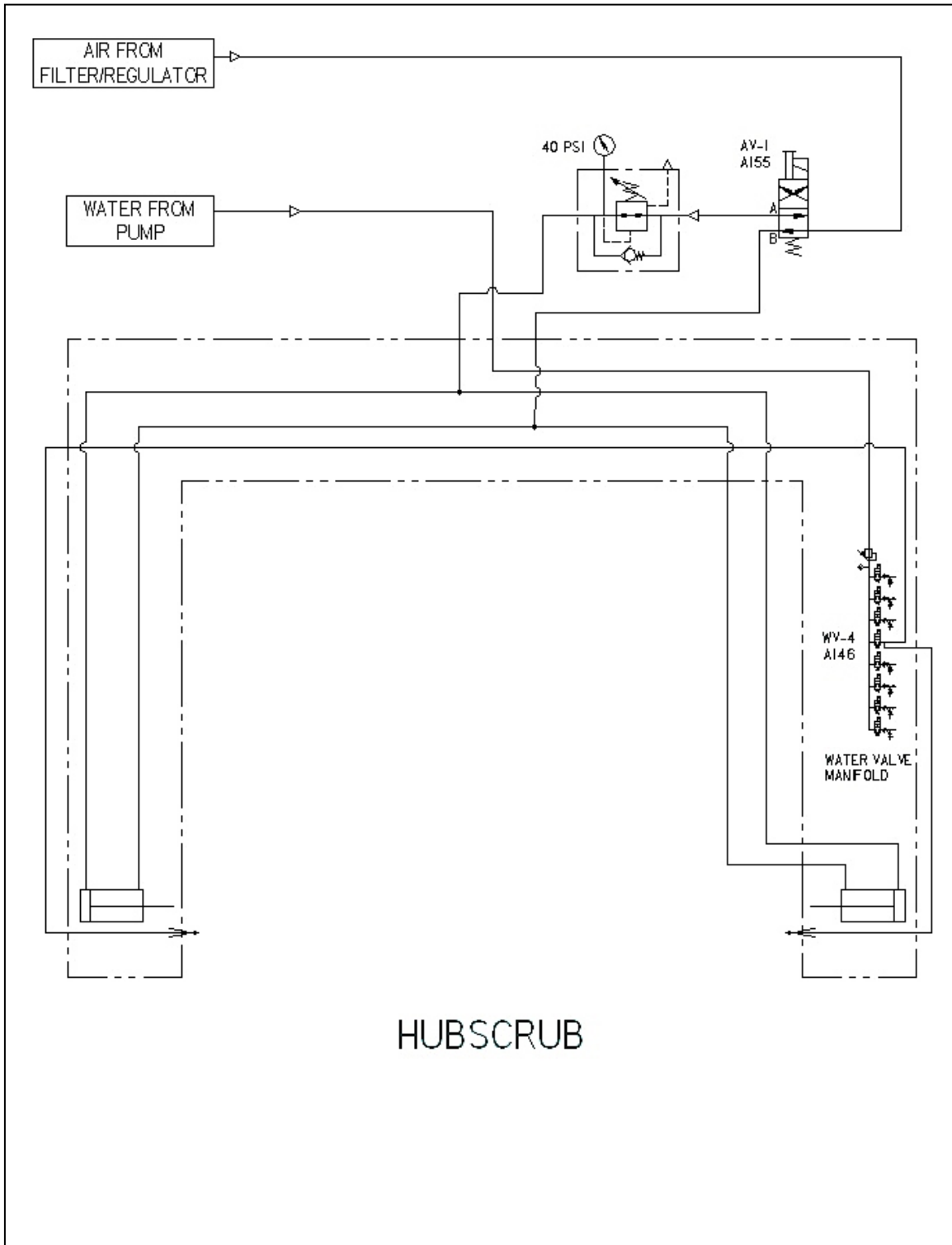
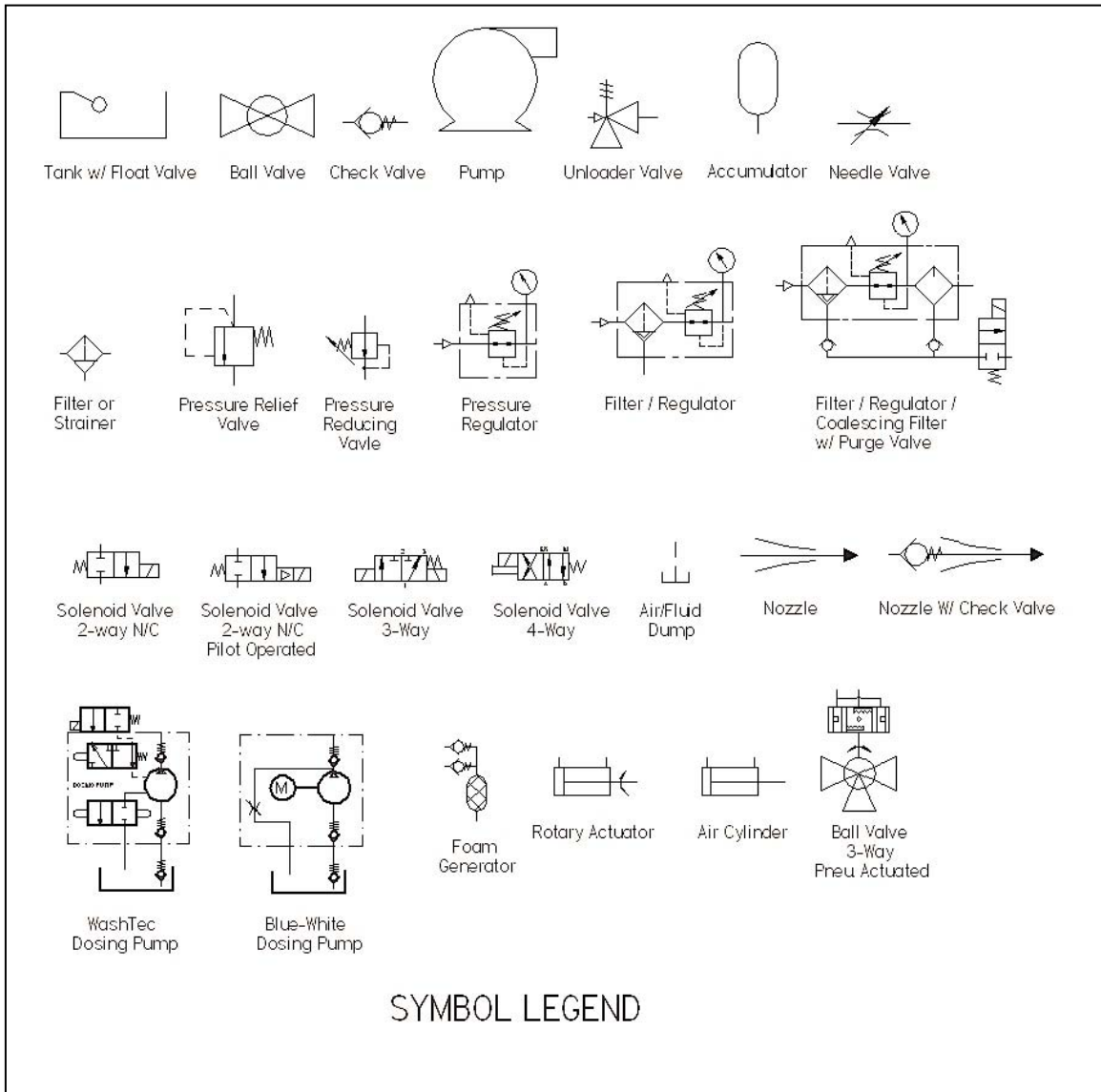


Figure 11.01-15, Schematic: Symbol Legend



11.02. Warranty

GENERAL TERMS OF SALE

This Agreement is made between the Seller ("Seller") and the Buyer ("Buyer") identified on the front page of this Agreement. This Agreement shall not be binding unless and until an order is accepted by Mark VII Equipment, Inc. ("Manufacturer").

1. **Purchase Price.** Buyer agrees to purchase the equipment ("the Equipment") and other goods ("Goods") identified on the Order Form and Supplements hereto for the prices indicated on the Order Form and Supplements hereto.
2. **Terms.** Unless otherwise set forth in writing on the Order Form and Supplements hereto, (a) a deposit is required upon execution of this Agreement and (b) Buyer shall pay the cash balance for the Equipment and/or Goods sold to Buyer under this Agreement upon shipment. The Seller reserves the right (x) not to ship the Equipment and/or Goods until payment in full is received and (y) to ship the Equipment and/or Goods under reservation for payment against documents of title. Prices on the Order Form and Supplements shall remain in effect for ninety (90) days after an order is accepted by Manufacturer. **Thereafter, any price increases for the Equipment and/or Goods by Seller from and after the date of this Agreement and prior to shipment shall be added to the total purchase price unless otherwise agreed.**
3. **Taxes and Other Rights.** Buyer shall be responsible for remitting to Seller, along with the purchase price, all sales tax or use tax (or any tax in lieu of such taxes) arising from this sale or Buyer's purchase, ownership or use of the Equipment or Goods.
4. **Inspection and Risk of Loss.** Buyer agrees to inspect all Equipment and Goods upon arrival. Buyer hereby assumes the risk of loss from any hazards occurring after delivery by Manufacturer or Seller to a carrier for shipment to Buyer and agrees to assert all claims for damages or losses in traffic directly against such carrier. Claims for shortages must be made to Seller at its home office within ten (10) days after start up of Equipment, but in no event later than three (3) months after the date of original shipment by Manufacturer. Buyer agrees to provide Seller a reasonable opportunity for inspection after receipt of any claim.
5. **Title and Security Interests.** Title to the Equipment and Goods herein shall remain with the Seller until all payments are made and all conditions herein contained are fully fulfilled. In the event title is determined to have transferred to Buyer, Buyer hereby grants Seller a security interest in the Equipment and Goods and agrees to execute all instruments in connection therewith. The Equipment shall at all times be deemed personal property, even after attachment or connection to realty. The Buyer shall keep the Equipment in good working condition, and physical appearance, and all Equipment and Goods free of liens. The Equipment shall not be removed from the Buyer's premises without the written consent of the Seller. Until the purchase price is fully paid, the Buyer shall maintain insurance on the Equipment and Goods as shall be requested by the Seller.
6. **Financing.** If the Equipment and Goods sold under this Agreement is to be financed, Buyer agrees to execute a conditional sale agreement, security agreement, promissory note and such other instruments as may be required by the Seller, all in form and substance satisfactory to the Seller.
7. **Assignment.** The Seller may assign this Agreement for financing purposes and the Buyer agrees to supply all information required by such assignee. In the event that Buyer does not qualify for financing, Seller may terminate and cancel this Agreement. The Buyer may not assign its rights or obligations under this Agreement without first obtaining Seller's written consent, which consent shall not be unreasonably withheld. Subject to the foregoing limitations, this Agreement shall be binding upon and inure to the benefit of the legal representatives, successors, and assigns of Buyer and Seller.
8. **Indemnification.** The Buyer agrees to save the Seller and Manufacturer or its/their assigns harmless from any and all liability, claims, and judgments, including costs and all attorneys' fees, for all injury or damage to property or persons caused in any manner by the use of Equipment or Goods.
9. **Nonpayment.** Time is of the essence in this Agreement. The acceptance by Seller or its assignee of any payment hereunder after the same is due shall not constitute a waiver of any provision of this Agreement or of any further default. If any payment is not made at the time and in the manner herein provided, Seller or its assignee shall have the option (a) to declare the entire purchase price or balance thereof immediately due and payable, (b) retain any deposit held by Seller as liquidated damages, and not a penalty, for breach of contract, (c) retake possession of the Equipment and/or Goods, and (d) revoke any discounts, including the reinstatement of any price increase with respect to the Equipment and/or Goods which has not been passed on to Buyer. If Seller or its assignee shall take possession of the Equipment and/or Goods, Seller may sell the Equipment and/or Goods at a public or private sale and apply the proceeds thereof to the Buyer's obligations hereunder. If notice is required prior to the sale of the Equipment and/or Goods, then the parties hereto agree that ten-(10) days' notice shall be deemed adequate notice. Buyer hereby waives any rights of offset, and counterclaim and agrees it shall be obligated for the cost of the recovery, repossession, renovation, sale and relocation of the Equipment and/or Goods and any deficiency remaining after the application of the proceeds of the sale of the Equipment and/or Goods to Buyer's obligations hereunder. It is agreed that in any litigation to recover the Equipment and/or Goods or purchase price hereunder, the prevailing party shall be entitled to recover, in addition to any damages, reasonable attorneys fees and court costs.

10. Acts of God and Force Majeure. All obligations to be performed by Seller hereunder shall be subject to delay or failure resulting from acts of God, war or civil disturbances, fire, labor disputes, regulations or restrictions of government or other conditions or circumstances beyond its control. Buyer shall bear any costs incidental to Buyer's delay or failure in acceptance of the Equipment and/or Goods or any other performance.
11. **DISCLAIMER OF WARRANTY.** NEITHER MANUFACTURER NOR SELLER MAKES ANY WARRANTIES AS TO EQUIPMENT OR GOODS SOLD HEREUNDER EXCEPT AS PROVIDED IN THIS AGREEMENT. NEITHER MANUFACTURER NOR SELLER MAKES ANY WARRANTY THAT EQUIPMENT OR GOODS SOLD UNDER THIS AGREEMENT WILL BE MERCHANTABLE OR THAT SUCH EQUIPMENT OR GOODS WILL BE FIT FOR ANY PARTICULAR PURPOSE. MANUFACTURER AND SELLER EXPRESSLY DISCLAIM ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, EXCEPT AS FOLLOWS:

Manufacturer warrants its equipment systems to be free of defects in material and workmanship for a period of one (1) year from the date of shipment of the pumping plant as set forth below. Manufacturer warrants the frame only and the high-pressure pump to be free of defects in material and workmanship for a period of five (5) years. Manufacturer warrants the equipment system, frame, and the high pressure pump to be free of defects in material and workmanship except when the Equipment is (a) misused, neglected, not installed according to Manufacturer's instructions, (b) not installed in conformance with all local codes and regulations, (c) not maintained according to Seller's or Manufacturer's instructions, (d) not operated with soft water, or (e) not operated within the Manufacturer's limitations, including (without limitation): (i) water hardness to two grains or less after water softener treatment, (ii) maximum operating temperature of the water heater set at 140 degrees F, (iii) use of liquid chemical concentrates only, (iv) maximum static domestic water pressure of 60 P.S.I. and a minimum domestic water pressure of 40 P.S.I. during maximum flow, and (v) a maximum operating pump pressure of 1200 P.S.I.

Manufacturer warrants that vacuum motors, gauges, accumulators, vending machines, and coin box switches shall be free of defects in material and workmanship for a period of thirty (30) days. Manufacturer warrants that main pump contactors shall be free of defects in material and workmanship for a period of ninety (90) days. Defective parts must be returned to Manufacturer, freight prepaid. If covered under the terms of this Agreement, defective part values may be credited to the Customer for all applicable positive warranty dispositions. However, the Manufacturer reserves the right to repair or replace parts or use alternate forms of credit to fulfill warranty obligations for any material covered under the terms of this agreement.

The following normal wear parts carry **NO WARRANTY**: hoses, bulbs, belts, fuses, fixed nozzles, filters, screens, high pressure wands, brush heads, wire, chain, and brush handles. Manufacturer makes **NO WARRANTY FOR FLUIDS OR CHEMICALS.**

Manufacturer will honor warranties extended by another manufacturer for any pass-through purchased item. A pass-through purchased item is a system manufactured solely as an assembly by another manufacturer, such as water softeners and bill changers. They are purchased by manufacturer for sale to customers per customer specification.

Seller warrants that any replacement parts shall be free of defects in material and workmanship for the remaining period of warranty (if any) of the part that is replaced.

Seller will provide labor for repair or replacement within the first ninety (90) days of any warranty period provided in this Agreement (or, for vacuum motors, gauges, accumulators, vending machines, and coin box switches, for the thirty-day warranty period). The warranties in this Agreement otherwise **EXCLUDE** (a) any LABOR or INSTALLATION costs, (b) the REPLACEMENT of ANY FLUIDS, such as oil or chemicals, (c) any cleaning of any parts, or (d) ANY INJURY to surrounding persons or DAMAGE to surrounding property caused by failure of any part.

This warranty specifically **EXCLUDES** failure of parts due to (a) damage caused by neglect, accident, fire, flood, wind storm, acts of God, freeze-up, misuse, misapplication, (b) alterations not approved in writing by the manufacturer, (c) corrosion caused by chemicals or unusual characteristics of the water supply, (d)

failure to perform prescribed maintenance, (e) use of replacement parts which do not conform to Manufacturer's specifications, or (f) damage caused by vandalism.

Any and all warranties shall be void if any of the following chemicals are used in connection with any Manufacturer's equipment or equipment systems: hydrofluoric acid, bromic acid, hydrogen cyanide, hydrochloric acid, chlorinated solvents, ammonium bifluoride, ethanolamine, d-limonene, and any product with a flash point less than 105 degrees Fahrenheit.

Buyer must notify Seller of any breach of warranty within ten (10) days after discovery or prior to the end of the warranty, whichever is earlier, or the claim shall be deemed waived.

This warranty applies only to the original purchaser of the Equipment or Goods and at the original installation address only. This warranty is not transferable.

12. **LIMITATIONS OF REMEDIES.** IN THE EVENT OF BREACH OF ANY WARRANTY, THE LIABILITY OF MANUFACTURER AND SELLER WILL BE LIMITED TO REPAIRING OR REPLACING ANY NONCONFORMING EQUIPMENT OR GOODS. IN NO EVENT WILL MANUFACTURER OR SELLER BE RESPONSIBLE FOR ANY OTHER DAMAGES, EITHER DIRECT, INDIRECT, PUNITIVE, SPECIAL OR CONSEQUENTIAL, INCLUDING (WITHOUT LIMITING THE GENERALITY OF THIS PROVISION), LOSS OF RUNNING TIME, INCONVENIENCE, LOSS OF INCOME, LOSS OF PROFITS, LOSS OF USE, OR PERSONAL INJURY.
13. **Dispute Resolution.** Any controversy or claim (including claims against Manufacturer) arising out of, or relating to, this Agreement (or any modification hereof) or any sales pursuant to this Agreement including, but not limited to, the interpretation, performance or breach of this Agreement and any claim for damages, rescission or indemnification, shall be settled by arbitration in Denver, Colorado, USA, in accordance with the Commercial Arbitration Rules then obtaining of the American Arbitration Association or its successors. The law of the State of Colorado (but not including its law concerning conflict of laws), including the Uniform Commercial Code in effect in Colorado, shall govern construction and interpretation of this Agreement and shall govern all controversies arising out of, or relating to this Agreement or any modification, renewal, or extension hereof, including, but not limited to, performance or breach thereof, and any claim for damages, rescission, indemnification, or equitable relief, provided that arbitration proceedings and the enforcement of any arbitration award shall be governed by United States federal law, to the exclusion of state law. The arbitration award shall be final and binding on the parties and may be entered and enforced in any court or competent jurisdiction. The parties consent to the jurisdiction of the state courts of Colorado and of the United States District Court for the District of Colorado, in connection with (and for all purposes relating to) such arbitration. The parties consent that any process or notice of motion or other application to any of said courts, and any document in connection with such arbitration may be served by certified mail (return receipt requested), by personal service or in such other manner as may be permissible under the rules of the applicable court or arbitration tribunal, provided that the notices are sent by first-class U.S. Mail to the billing address of Buyer or mailing address of Seller and Manufacturer appearing herein, and further provided that reasonable time for appearance is allowed. The parties further agree that arbitration proceeding must be instituted within two years of any alleged breach or other wrongful conduct, notwithstanding any longer periods that may be provided by otherwise applicable law, and that the failure to institute arbitration proceedings within such period shall constitute an absolute bar to the institution of any proceedings and a waiver of all claims.
14. **Entire Agreement.** This Agreement (including the Order Form and Supplements as applicable) expresses the entire understanding of the parties with reference to the subject matter hereof, and there is no other understanding, agreement, representations, or warranty, express or implied, statutory or otherwise, in any way limiting, extending, defining or relating to the provisions hereof. No agreement altering, modifying or extending the terms of this Agreement shall be valid unless in writing signed by Seller or its duly authorized representatives. After acceptance by Manufacturer, this Agreement cannot be canceled, altered or modified without the written consent of Manufacturer.
15. **Remedies, No Waiver.** No failure by Seller or Manufacturer to insist upon strict compliance by Buyer or to exercise its rights shall be construed as a waiver of such rights on any other occasion or in any other circumstance.
16. **Severability and Survivability.** If any provision of this Agreement is found to be unenforceable under any applicable laws or regulations, such provision shall be deemed modified to permit enforcement to the maximum extent permissible by law or, if such modification is not permissible under applicable law notwithstanding this provision, then shall be deemed stricken from this Agreement. Invalidity or un-enforceability of any provision shall not affect the enforceability of any other provision in this Agreement. Obligations created under this Agreement shall survive expiration or termination of this Agreement to the extent provided herein.
17. **Site Preparation and Installation.** Buyer agrees to prepare site for Equipment in accordance with Seller's instructions and to complete such preparation prior to Equipment delivery. Installation is not included in the agreement, and



Buyer agrees that it will purchase installation from Seller or will make its own arrangements for installation prior to Equipment delivery.