Assembly Solutions
Application Services

Fanuc Robots with Device Net

JDS402 – DELTA Robot Programming

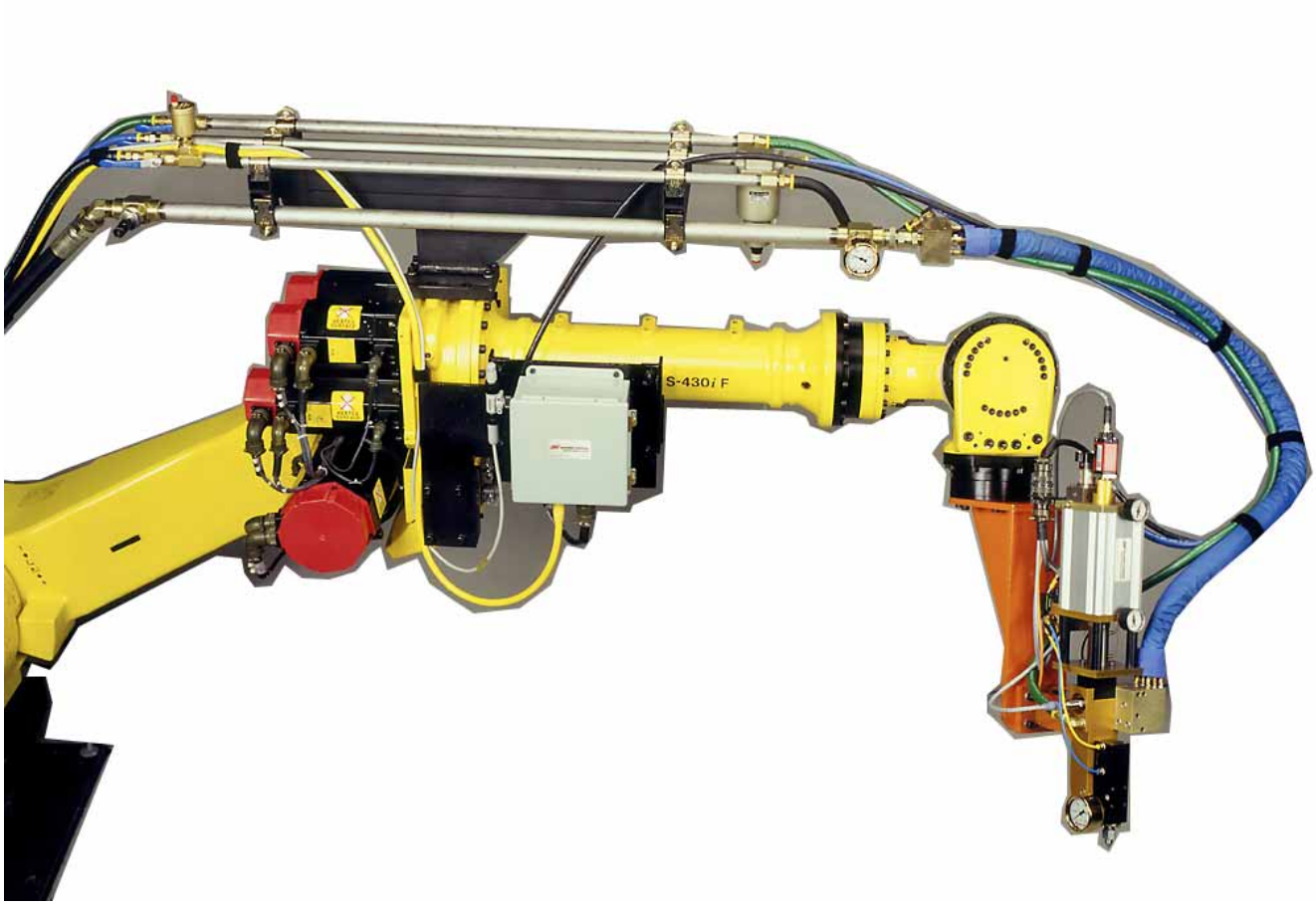
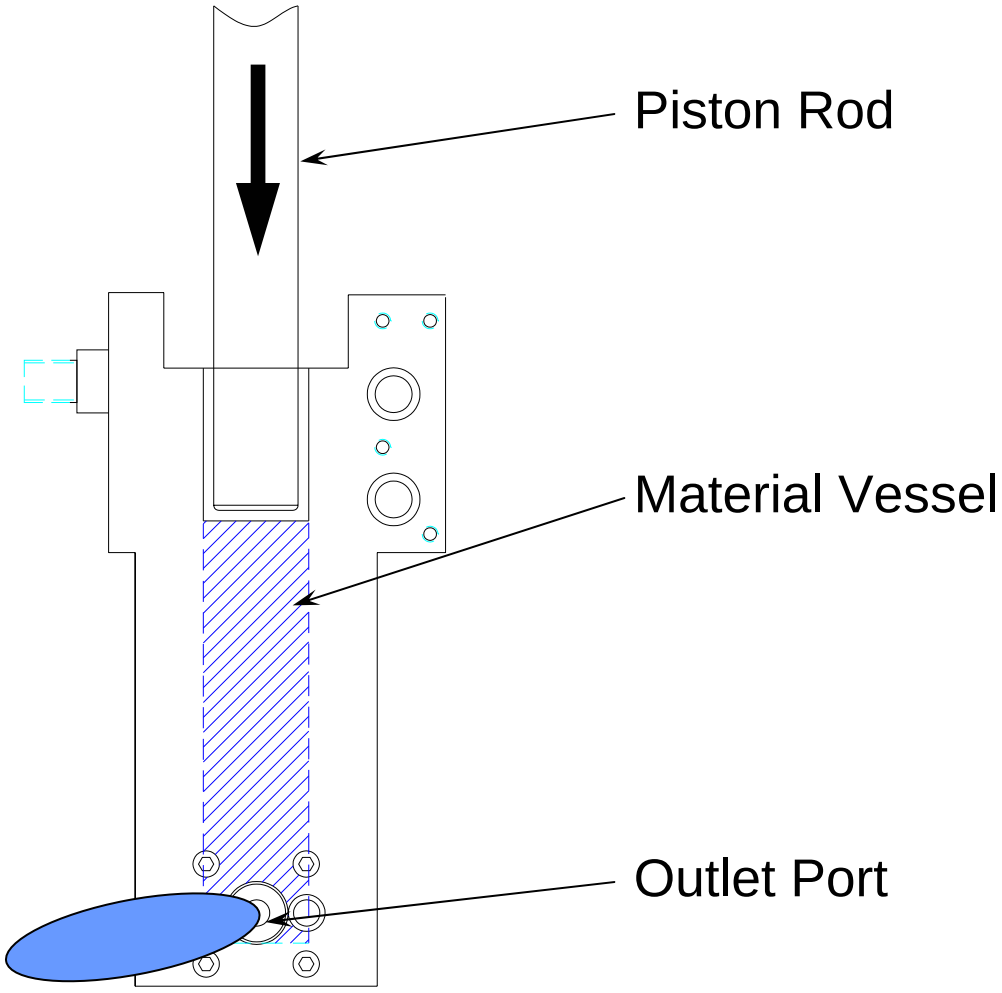


Table of Contents

Reference: Pages 36-37 are in Reference to the General Motors GM RS_4_C Manual February 2003 Specifications.

The 1K systems use a shot meter as a metering device. The shot meter works by using displacement as a method of dispensing material.

The faster and harder the piston rod is moved into the material vessel, the more that the material pressure will increase causing the material to flow faster out of the material outlet port.



Main Components:

Linear Transducer MLDT

Electrical Connector

Air Servo Valve

Air Cylinder

Solenoid Valves

Piston Rod

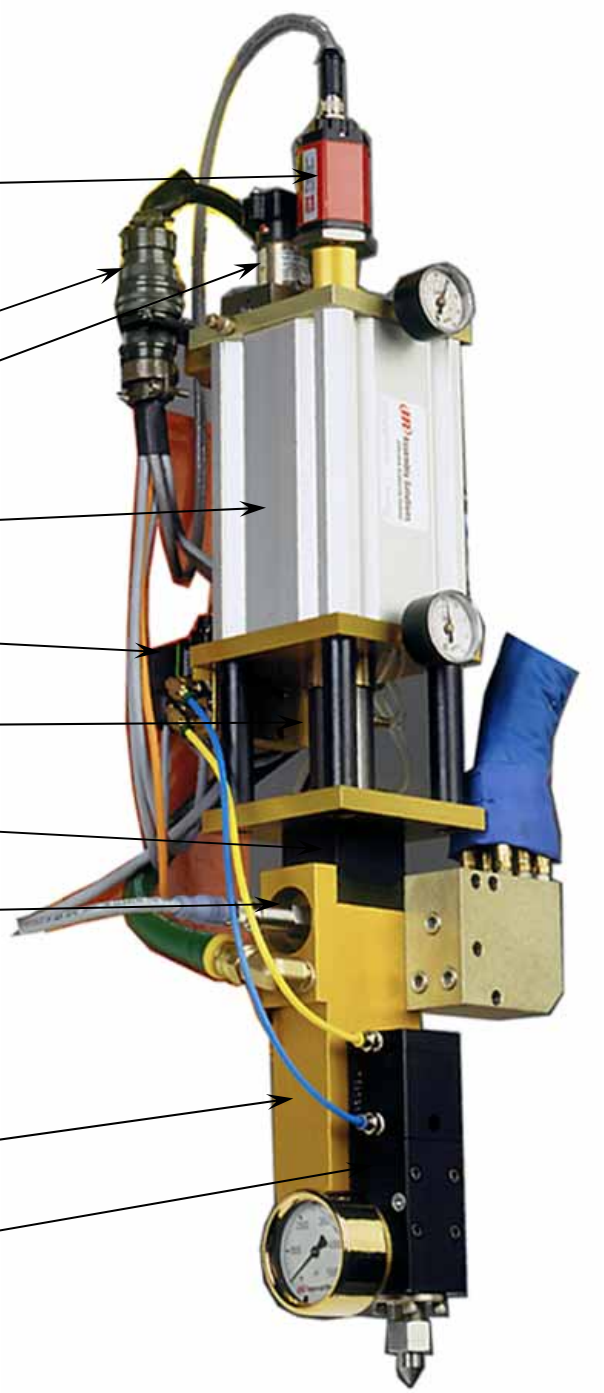
Seal Cartridge

PSI Transducer

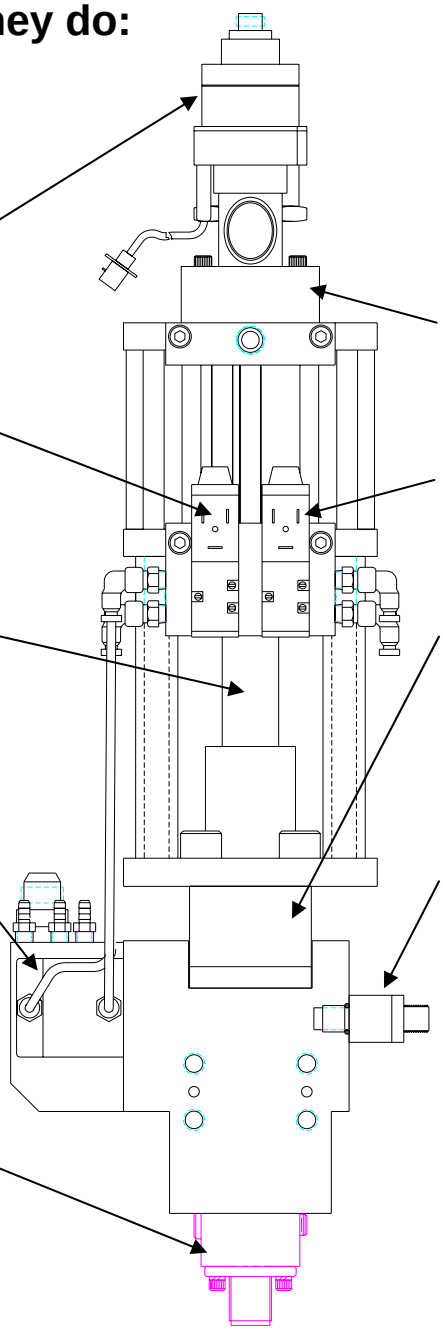
Refill Valve (behind material hose block)

Material Vessel

Dispense Valve



Devices and what they do:



Linear Transducer: Tells the system how much material has been dispensed.

Refill Solenoid Valve: When energized opens the refill valve.

Piston Rod: Used to displace the material in the dispense chamber.

Refill Valve: Uses air to operate. When open connects the pump pressure to the material used in refilling the material chamber.

Dispense Valve: Uses air to operate. When open allows the material to flow out of the Dispense chamber.

Air Servo Valve: Controls the up and down direction of the air cylinder.

Dispense Solenoid Valve: When energized opens the dispense valve.

Seal Cartridge: Has three seals and a scraper to prevent material from leaking out from the material chamber.

Pressure Transducer: Used to tell the PC how much pressure is in the dispense chamber.

MLDT

Magnetostrictive Linear
Displacement Transducer

Part No. 75cc 364-650

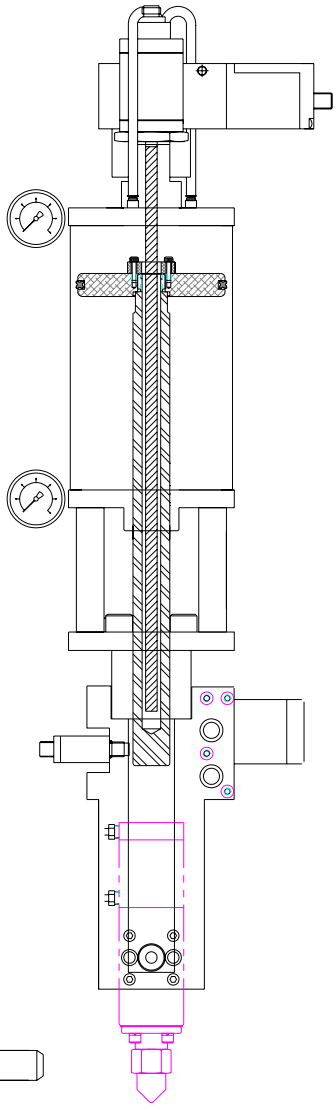
Voltage Input 24vdc
Voltage Output 0-10vdc

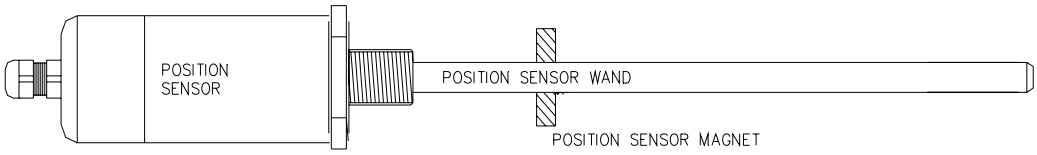
Operation

At the start of the dispense cycle the PC takes a voltage reading (style strobe input). As the system dispenses the piston rod/magnet assembly moves down – the voltage increases and when the Dispense complete signal is sent another voltage reading is taken. The first voltage is subtracted from the second voltage. Then it is multiplied by a kfactor to equal the volume dispensed in CC.

Voltage @home below 1 volt

Voltage @Empty above 9 volts





Apply the 363-141 magnet ring to the end of the rod, and slowly slide it downward to the base of the wand, while observing the voltage output from the meter. Voltage should descend evenly and gradually to zero at the base, without abrupt voltage jumps, interruptions, or ascensions. Replace the sensor if:

* The sensor outputs a constant voltage regardless of magnet position.
* The voltage ever ascends with the magnet traveling toward the base.
* The voltage without the magnet applied exceeds 12.7vdc, or is less than 12.3vdc

Trim adjustment screw

Pressure Transducer:

Part No. 363-314

The pressure transducer tells the 1K system how much pressure is in the dispense chamber. It is designed so that it is flush mount. This prevents material from packing around it and giving inaccurate readings. The range of the transducer is 0-5000 PSI with a 1-10VDC output. 0psi = 1VDC.
To check the pressure transducer use the following formula.
(Pressure x .0018) +1 = Voltage
Example: 700psi x .0018 +1 = 2.26v

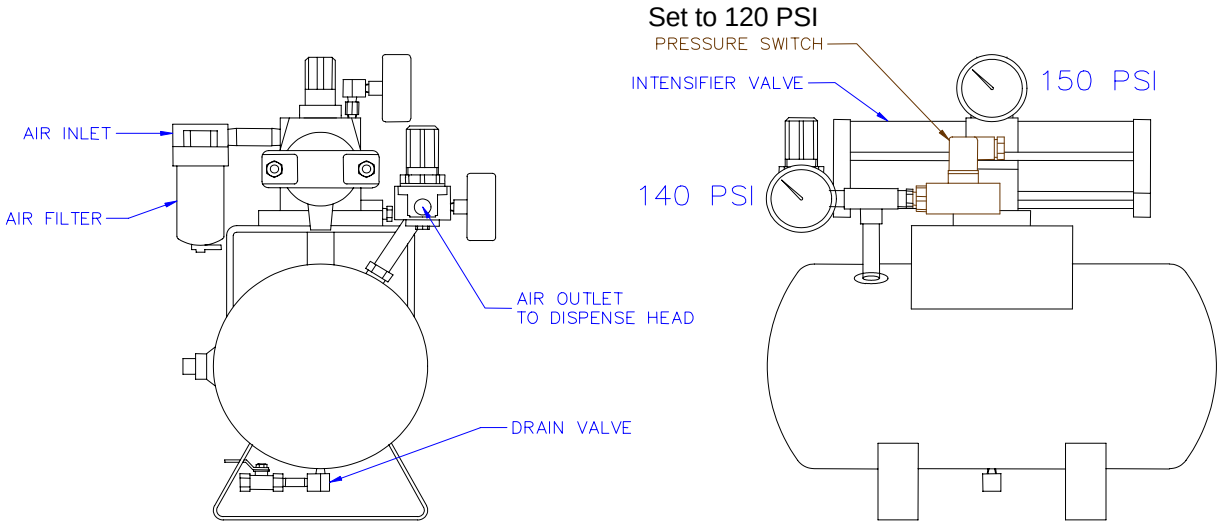
The Transducer has a new feature of an trim pot. To adjust, remove the screw cover on the zero trim adjustment and turn the trim screw until the voltage equals 1vdc with zero PSI on the pressure transducer. Replace the trim screw cover.

Maximum installation torque is 50 in/lbs (5.65 Newt/M)

Air Intensifier

Part No. 364-661

An air intensifier is used to increase the dispense pressure of a 1K dispensing head.
This allows the size of the control valves and air cylinder to be smaller and have a quicker reaction time.
The Air Intensifier assures that the Dispenser is getting 140PSI constantly even though the plant air supply is only 80 PSI. The Intensifier has an pneumatic cylinder pump that boosts the air pressure.



Adjust the Intensifier Valve
Change Filter Element and open Drain Valve if necessary.
Make sure the air to the Intensifier is above 65 psi.
Adjust the tank pressure using the regulator knob on the Intensifier Valve, until the Pressure is about 150 psi.
Adjust the Dispense Head Pressure to 140psi using the Regulator on the outlet
Air to the Intensifier should be run through a 5 micron filter (coalescing-type filter preferred)
Monthly open Drain to expel water or contaminants.

Repair Kit for Intensifier #363-385RK

Air Servo Valve:

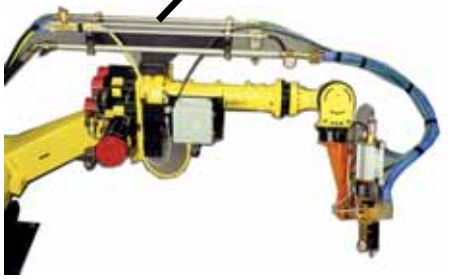
Part No. 354-515

When the system is not in a dispense mode (Gun Off) the Servo signal will be at 5V. At 5v the same pressure should appear on both sides of the Air Cylinder (within 15 PSI of each other) preventing the piston from moving.

Above 5v, the material pressure increases by having more down pressure and exhausting the pressure below the piston. This will send the piston down pressurizing the material.

Below 5v, The air pressure under the piston increases and decreases air pressure above the piston. This will send the piston up (home position). Material force on the piston rod also helps to send the rod up.

NOTE: The Servo signal on the production screen does NOT reflect the incoming robot flow command.

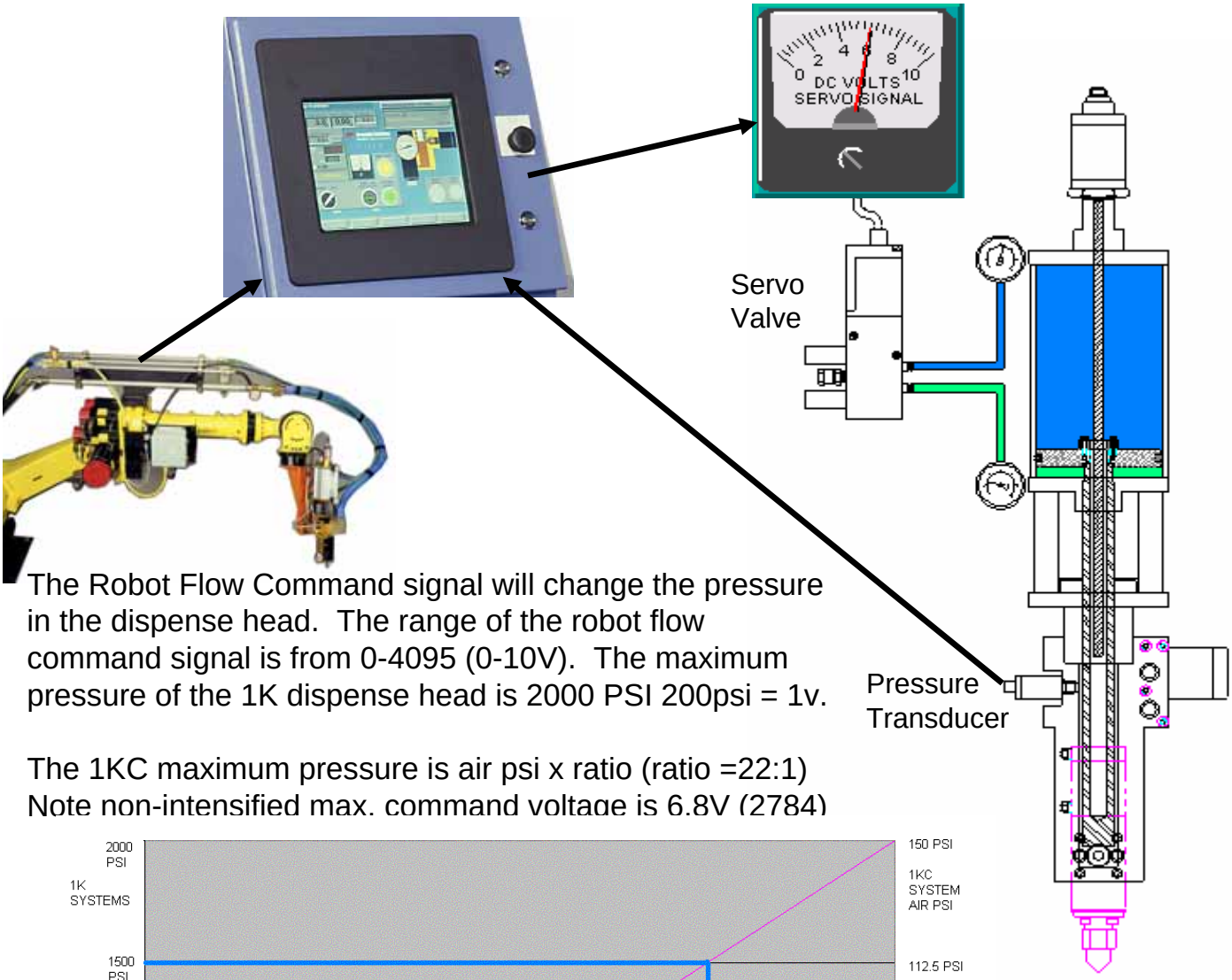


Pressure Loop:
If the robot velocity increases, the output is above 5V when the pressure transducer feedback is subtracted from it. A signal higher than 5V causes the Servo Valve to send maximum pressure to the top of the air cylinder and exhaust the bottom of the air cylinder. The material pressure will increase.

When the material pressure increases to where it is the same as the robot velocity input, the output to the Servo Valve is 5V at idle.

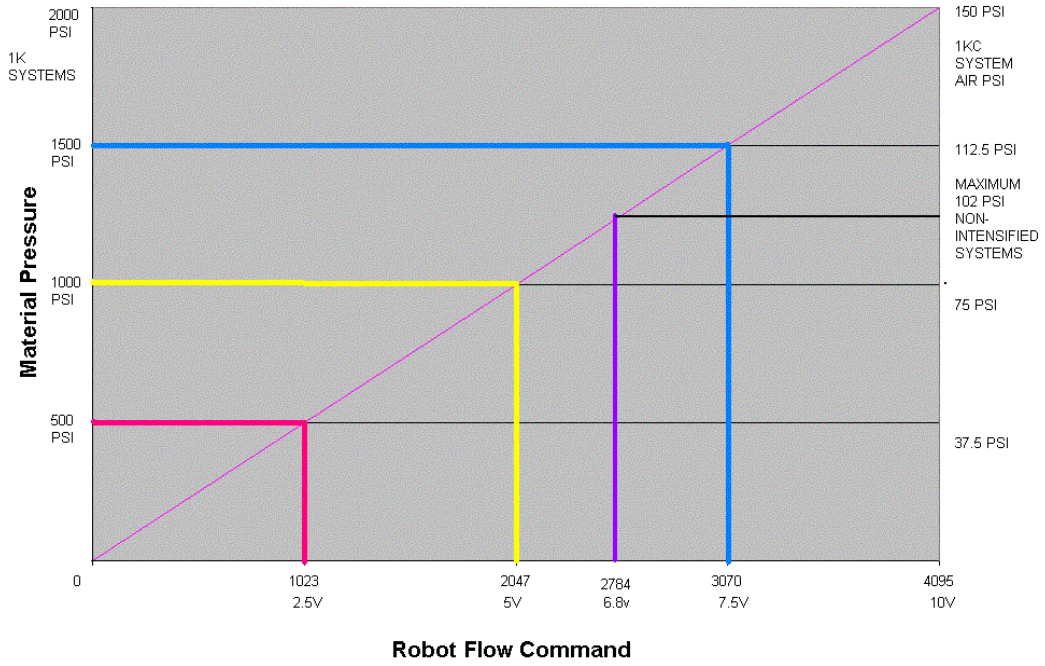
If the robot velocity decreases, the output is below 5V when the pressure feedback is subtracted from it. A signal lower than 5V causes the Servo Valve send maximum pressure to the bottom of the air cylinder and exhaust the top of the air cylinder, and material pressure decreases.

When the material pressure decreases to where it is the same as the robot velocity, the output to the Servo Valve is 5V at idle.



The Robot Flow Command signal will change the pressure in the dispense head. The range of the robot flow command signal is from 0-4095 (0-10V). The maximum pressure of the 1K dispense head is 2000 PSI 200psi = 1v.

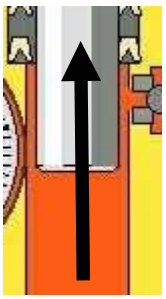
The 1KC maximum pressure is air psi x ratio (ratio =22:1)
Note non-intensified max. command voltage is 6.8V (2784)



1K Dispense Head Sequence of Operation
Manual Mode:

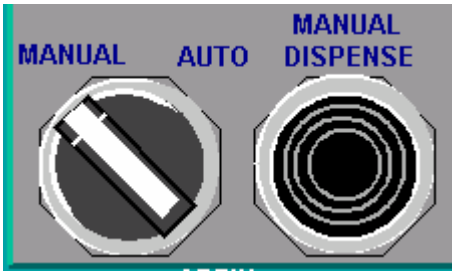
1. The Refill button is depressed and the PC goes into a refill mode.

2. The Refill Solenoid valve is energized and the Refill Valve opens. Pump pressure forces material into the material chamber. The dispense rod starts going in the up direction. The air servo is controlling the pressure in the material chamber to 200 PSI.



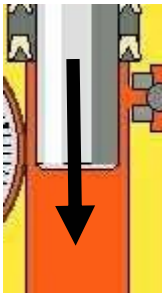
When the MLDT voltage is less that 1 volt the Refill Solenoid de-energized and the Refill Valve closes. The air servo continues to raise the piston rod to a predetermined position, relieving the pressure in the material chamber.

2. The higher the pump pressure is the faster the dispense head will refill.



3. The Manual Dispense button is depressed and the PC goes into a dispense mode.
4. A voltage reading is taken of the MLDT position.
5. A command voltage is sent to the servo valve driving it in the down direction and the dispense solenoid valve is energized and the dispense valve is opened.

6. The command voltage uses feedback from the pressure transducer to determine how much voltage/ force needs to be generated so that the voltage vs. pressure match. The piston rod travels down.

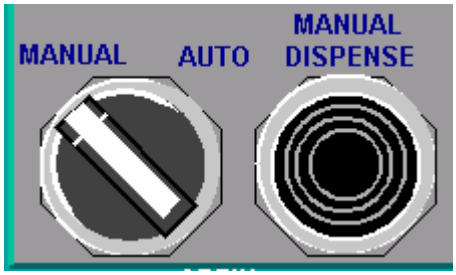


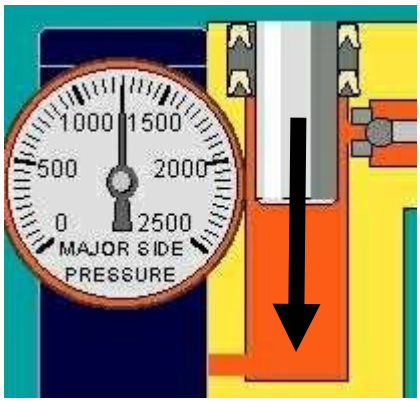
7. After dispensing the Refill button is depressed and the voltage reading is taken of the MLDT and the cc per dispense is calculated. Then step 2 is repeated.

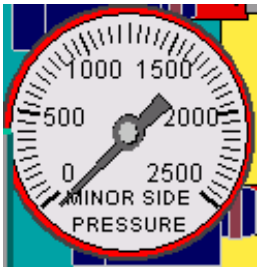
1K Dispense Head checking procedure:

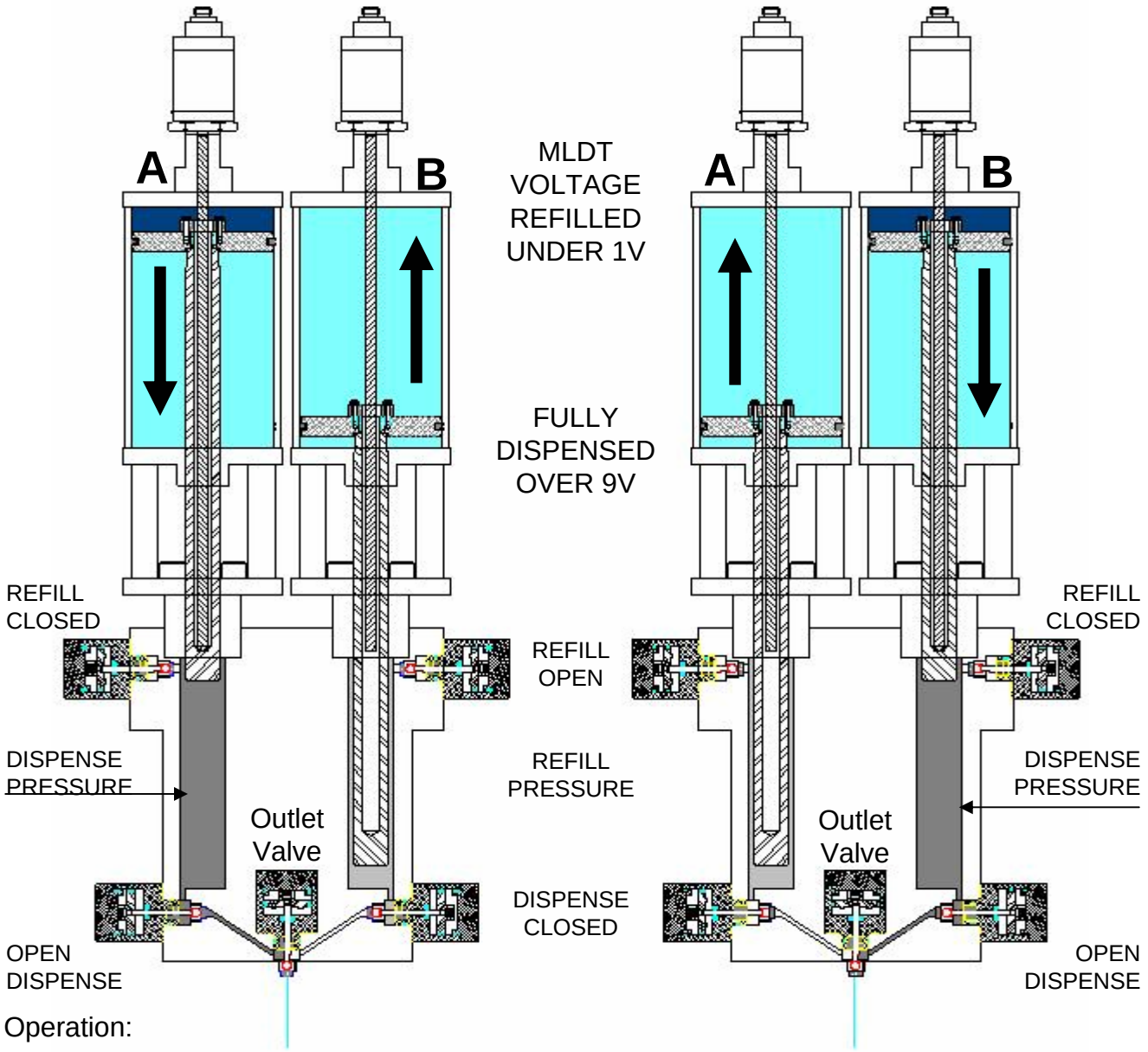
This Procedure test the Dispense valve, Refill valve, MLDT, Servo Valve and Pressure Transducer.

1. On the Production screen put the system into the manual mode. By pressing to Manual Auto button until the Manual dispense button appears. Press the Refill button and verify that NO material is coming out of the dispense valve – if it is replace the valve.
2. Depress the Manual Dispense button until the dispense head has fully depleted all of the material.
3. Continue holding the Dispense button in for 15 seconds. If the pressure on the gauge is within + or - 150 psi of zero the pressure transducer is calibrated. If not replace or calibrate the transducer
4. Let go of the button and wait for another 15 seconds. If the gauge starts to increase the refill valve could be leaking. Replace the refill valve if the pressure starts to increase.
5. Depress the Refill/Reset button. The head should refill without a fault. If it faults increase the pump pressure or refill time.
6. After refilling the servo output voltage will be 5 volts. Both of the air cylinder pressure gauges should be within 15 psi if not replace the servo valve.
7. If there was not a volume displayed and the piston rod did not move check the MLDT.









Operation:

The A cylinder is pressurized, the A refill valve is closed, the A dispense valve is open allowing material to flow through the opened Outlet Valve. At the same time the B cylinder is exhausted, the B refill valve is open and the B dispense Valve is closed. The material (Pump) pressure will force the B piston rod assembly up. When the MLDT voltage is under 1v, the B refill valve will close and the B air cylinder will pressurize awaiting for the A side to empty.

When the A MLDT voltage is over 9v the B dispense valve will open allowing both cylinder to pressurize the outlet valve. After a .5sec. Time dely the A dispense valve will close, The A cylinder will exhaust and the A refill valve will open. The material (pump) pressure will force the piston rod up. When the MLDT voltage is under 1v, the A refill valve will close and the A cylinder will pressurize awaiting for the B side to empty. When dispensing is done the outlet valve will be closed.

MLDT Linear Transducer: Tells the system how much material has been dispensed.

Air Cylinder 22:1 Used to create the material pressure or force on the piston rod.

Piston Rod oil reservoir: used DIDP oil to keep the seals wet and results in longer seal live.

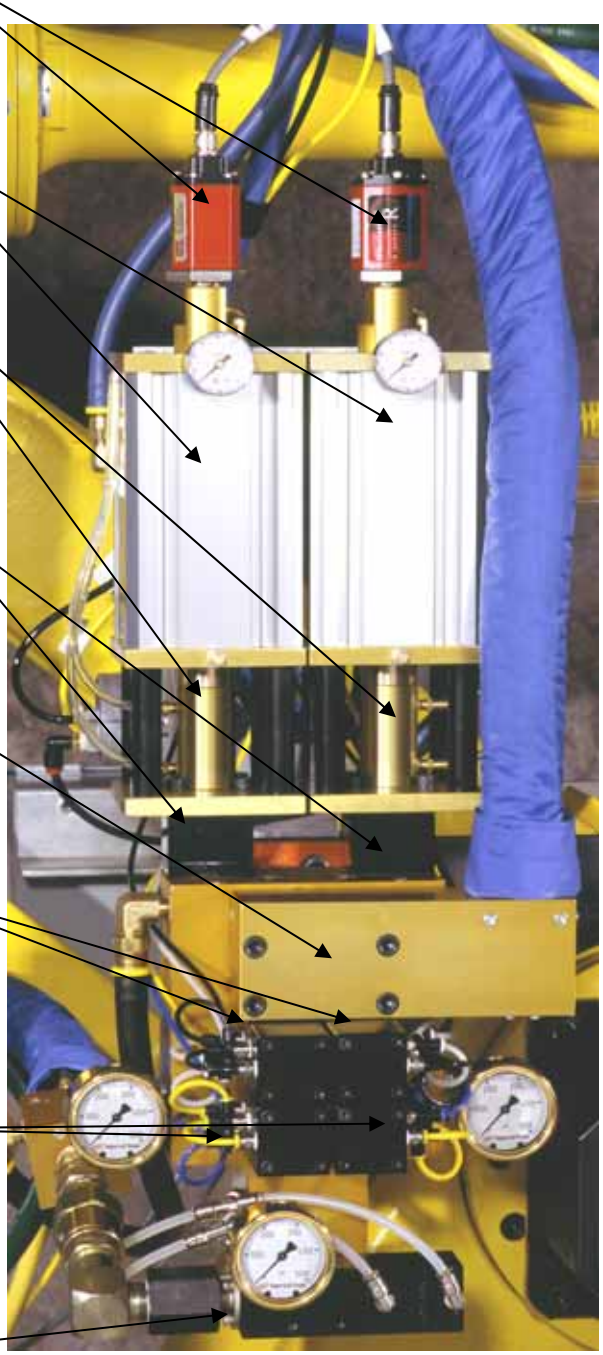
Seal Cartridge: Has three seals and a scraper to prevent material from leaking out from the material chamber.

Temperature Supply Hose: Used to condition the material and supply material to the dispense head.

Refill Valve A & B: Uses air to operate. When open allows the material to flow into the Dispense Chamber

Dispense Valve A & B: Uses air to operate. When open allows the material to flow out of the to the outlet valve.

Outlet Valve: Uses air to operate. When open allows the material to flow out of the Dispense chamber.



Outlet Valve:

Can be used in a remote dispense as shown or a closed coupled dispense head.

MLDT

Magnetostrictive Linear
Displacement Transducer

Part No. 75cc 364-650

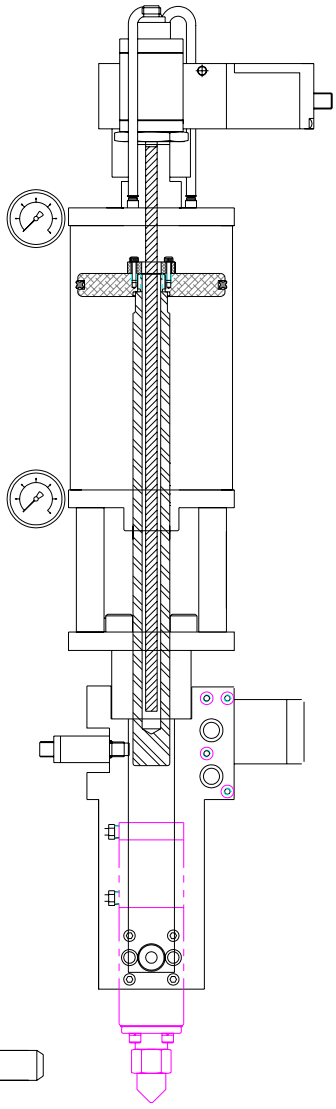
Voltage Input 24vdc
Voltage Output 0-10vdc

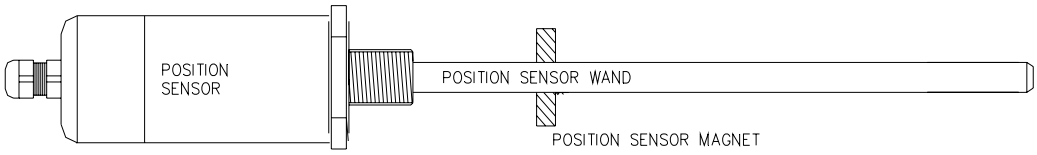
Operation

At the start of the dispense cycle the PC takes a voltage reading (style strobe input). As the system dispenses the piston rod/magnet assembly moves down – the voltage increases and when the Dispense complete signal is sent another voltage reading is taken. The first voltage is subtracted from the second voltage. Then it is multiplied by a kfactor to equal the volume dispensed in CC.

Voltage @home below 1 volt

Voltage @Empty above 9 volts





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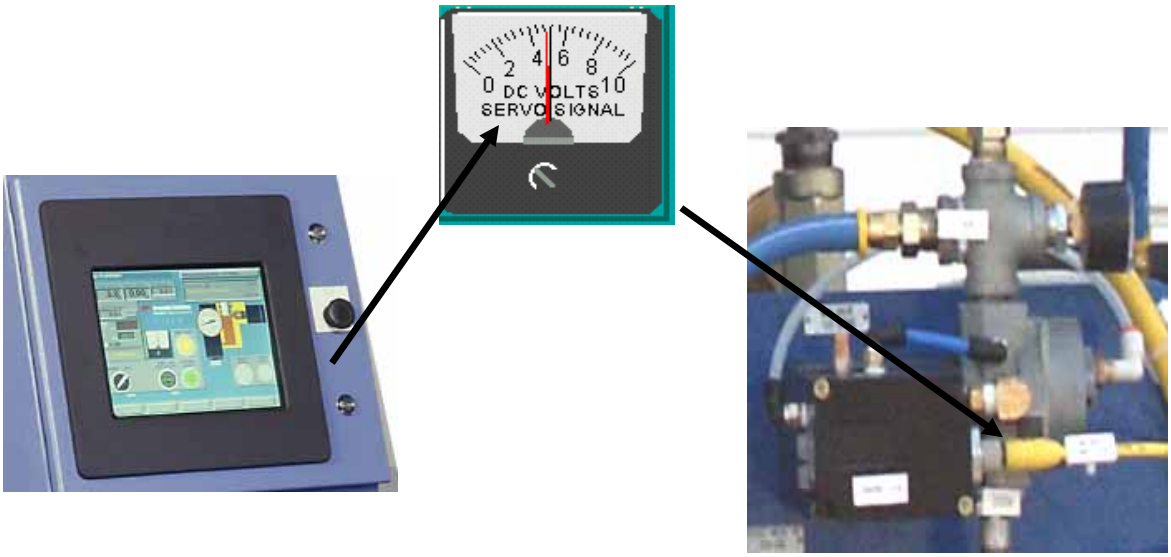
* The sensor outputs a constant voltage regardless of magnet position.
* The voltage ever ascends with the magnet traveling toward the base.
* The voltage without the magnet applied exceeds 12.7vdc, or is less than 12.3vdc



Air Servo Valve:

Part No. 354-515

The servo controls the air pressure going to the top (down pressure) on the air cylinders. The Proportional Valve uses a 0-10vdc signal to control the air pressure to the dispense heads. The output of the Proportional Valve is 0-150 psi. There are two types of pressure outputs that can be achieved – Intensified air and non-intensified air. The Proportional valve will work with both outputs. An example of the pressure outputs:

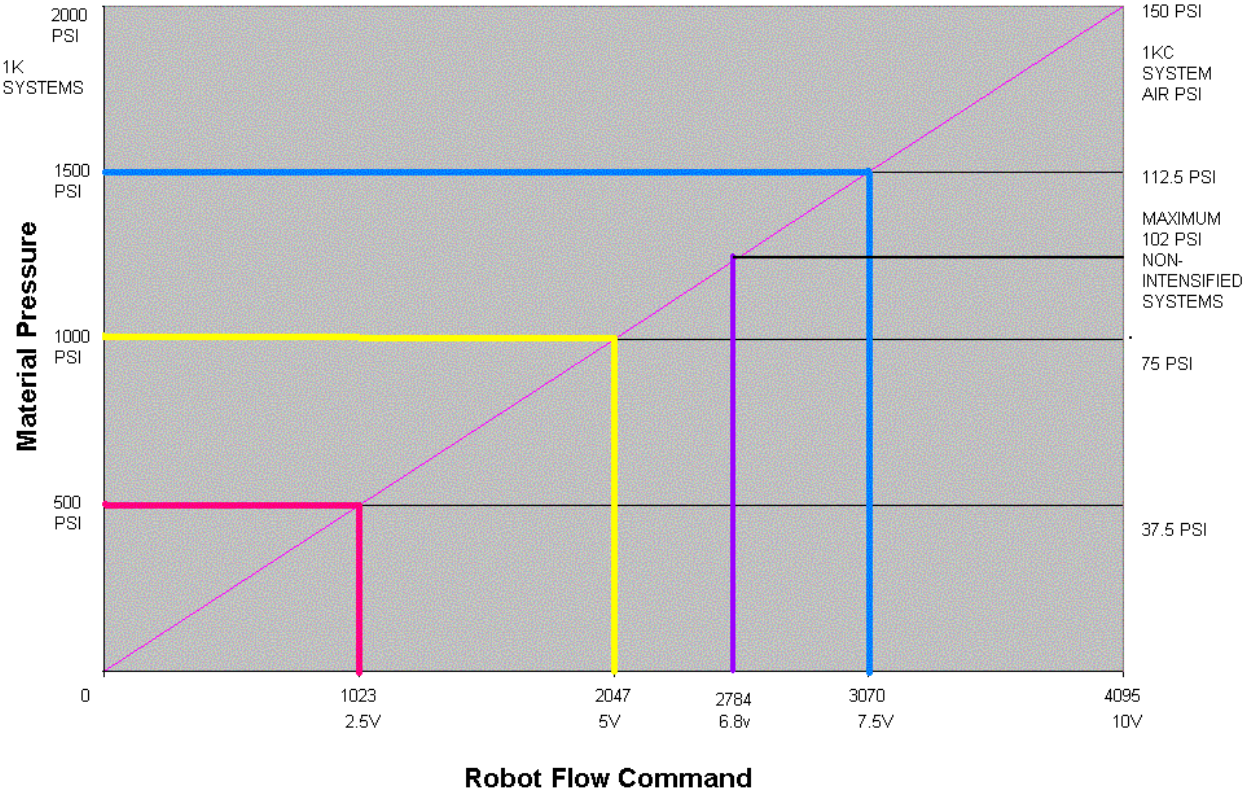
Intensified Air	0v=0psi	5v=75psi	10v=150psi
Non-Intensified Air	0v=0psi	5v=75psi	6.7v=100psi

The non-intensified air systems use the same Proportional Valve as the intensified air systems. However the command signal will max out at 6.7v and no more pressure will be achieved.

The 1KC Pressure Control:

The Robot Flow Command signal will change the pressure in the dispense head. The range of the robot flow command signal is from 0-4095 (0-10V). There are two types of outputs that can be achieved Intensified and non-intensified air pressure.
The 1KC maximum pressure is air psi x ratio (ratio =22:1)
A intensified system can create 3300 PSI of material pressure.
A non-intensified system can create 2200 PSI of material pressure.
Pressure Examples: 0v=0psi 2.5v=825psi 5v=1650psi
Non-intensified max 6.8v=2200psi Intensified air 7.5v=2475psi
10v=3300psi
The proportional valve output is the same using intensified air or non-intensified air up to 6.8vdc.

Note non-intensified max. command voltage is 6.8V (2784)

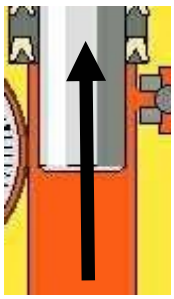


1KC Dispense Head Sequence of Operation Manual Mode:

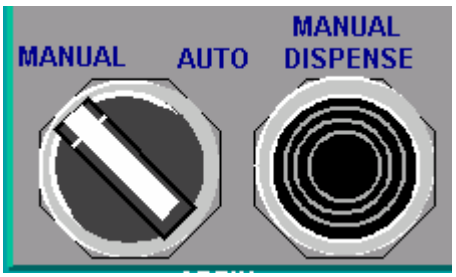
1. The Refill button is depressed and the PC goes into a refill mode.

2. Both Refill Solenoid valve is energized and the Refill Valve opens. The air is exhausted on the top side of the air cylinder. The Pump pressure forces material into the material chamber. The dispense rod starts going in the up direction.

   When the MLDT voltage is less that 1 volt the Refill Solenoid de-energized and the Refill Valve closes.

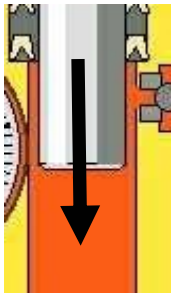


3. The higher the pump pressure is the faster the dispense head will refill.
4. The Manual Dispense button is depressed and the PC goes into a dispense mode.



5. A voltage reading is taken of the MLDT position.
6. A command voltage is sent to the servo valve driving the A cylinder in the down direction and the A dispense solenoid valve is energized and the A dispense valve is opened. The Outlet Valve is opened.

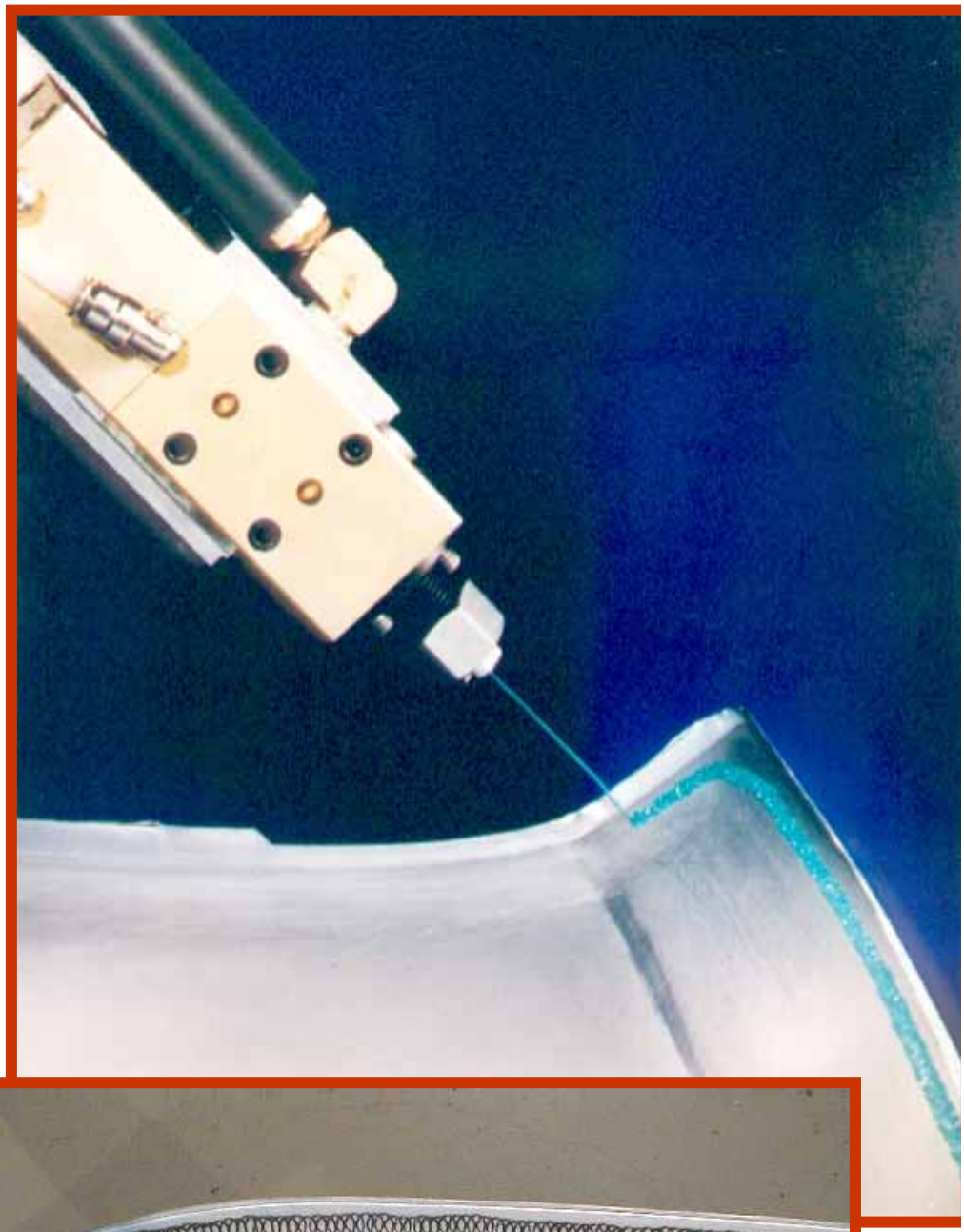
7. When the Piston gets near the end of the travel its travel the B air cylinder is pressurized and B dispense valve is opened.
8. After a .5sec time dely the A dispense valve is closed and the A air cylinder is exhausted.



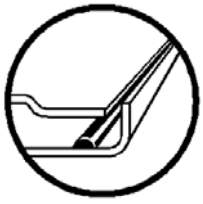
9, The A refill valve is open allowing material to force the piston up to a MLDT voltage Under 1v . Then the A refill valve is closed and the A air cylinder is pressurized awaiting for the B cylinder to empty.

Ingersoll-Rand specializes in delivering effective solutions for high viscosity industrial Adhesive, Sealing, and Lubrication Applications.

Through the years, Ingersoll-Rand has developed solutions for a wide variety of applications and has refined them into a flexible and innovative collection of processes.



Applications:
Ingersoll-Rand Systems expertise crosses industrial and international boundaries to provide the highest levels of technology and reliability to customers who have a desire to improve value throughout the life of their product.



Hem Adhesive Bead
Adheres joints where the workpiece is crimped (hemmed) over the adjoining piece

Hem Adhesive Ribbon
Provides a low, wide profile when the workpiece is dimensionally inconsistent

Lap Joint Adhesive Bead
Adheres joints where the metal is welded or simply held in place by the adhesive

Lap Joint Adhesive Ribbon
Provides a low, wide profile when the workpiece is dimensionally inconsistent

After Hem Sealer
Seals a joint that has been crimped (hemmed) over

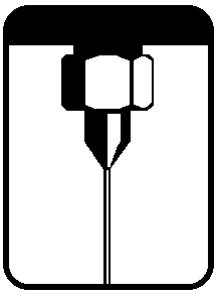
Joint Sealer
Penetrates and seals a joint

Shaped Bead
Beads are shaped for gasketing, workpiece inconsistency, or vibration dampening as well as for special applications

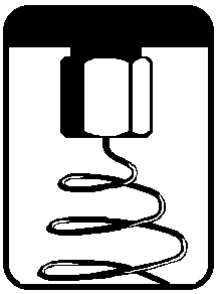
Patches and Coatings
Sprayed patches can replace hand applied patches in Body Panel Reinforcement, Sound Deadening, and Weatherproofing

Processes

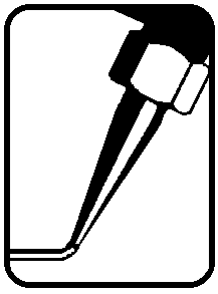
Ingersoll-Rand Systems utilizes award winning technology and state-of-the-art controls to provide the most effective and reliable processes available.



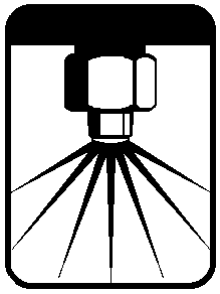
Streaming
Material is applied to the workpiece by a thin jet so that the process is not affected by inconsistencies in the workpiece



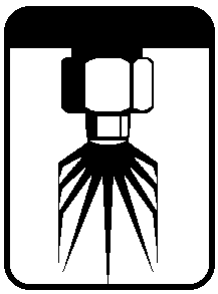
String Dispersion
Provides a wide application pattern without atomizing the material



Extrusion
Material is deposited onto the workpiece directly where bead shape is critical to its performance



Spraying
Airless application of materials in a wide pattern of consistent thickness



Clip Fan (Precision) Spraying
Application of materials in a pattern of tightly controlled width

Nozzles

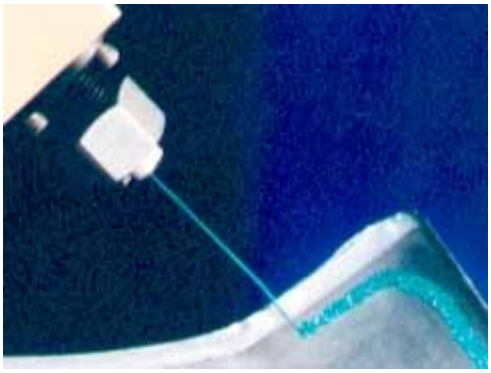
Ingersoll-Rand uses a wide variety of nozzles to dispense a array of different materials in different applications. Specialty nozzles can be made.

Shown are String dispersion, tip orientation, specialty, extrusion

Horse hair brushes and robotic teach tips

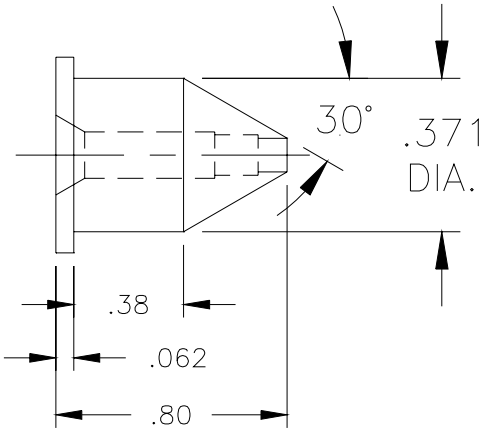
Cone tip streaming, HV style streaming, spraying tips.

Streaming vs Extruding



Streaming involves faster robot speeds (500-1500mm/s) and higher pressures the extruding. The dispense system creates a pressure behind a small orifice. The material is forced out of the nozzle in the form of a small stream. The larger the nozzle the less force the stream has and the closer the nozzle needs to be programmed to the part. Streaming can works if the work piece is horizontal, vertical or overhead. Streaming is the preferred method of dispensing.

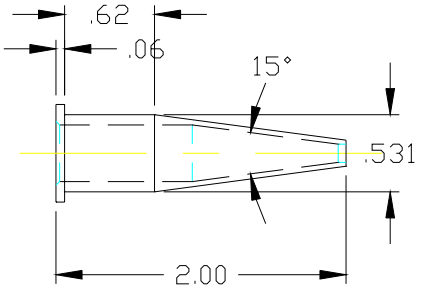
PART No.	DESCRIPTION	ORIFICE
362-853	STREAM TIP W/ INSERT	.030
362-853A	STREAM TIP W/ INSERT	.035
362-853B	STREAM TIP W/ INSERT	.040
362-853C	STREAM TIP W/ INSERT	.045
362-853D	STREAM TIP W/ INSERT	.050
362-853E	STREAM TIP W/ INSERT	.060
362-853F	STREAM TIP W/ INSERT	.018
362-853G	STREAM TIP W/ INSERT	.021
362-853H	STREAM TIP W/ INSERT	.026
362-853L	STREAM TIP W/ INSERT	.075
364-224	STREAM TIP W/ INSERT	.187



Extruding Nozzle Selection

When using a extruding nozzle the bead size in normally larger (10mm) then streaming. To create a 10-20mm bead with a streaming tip it would take slow robot speeds and very high pressures. With the extruding nozzle the robot speeds can increase, but the bead can only be dispensed in a horizontal (down) direction. There are many ways to misuse an extrude nozzle so we will use the following statement as our guide. The diameter of the opening of the nozzle is equal to the diameter of the bead that you want to apply.

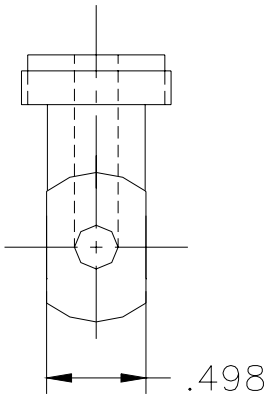
PART No.	DESCRIPTION	ORIFICE
400-723	EXTRUDING TIP	.093
400-724	EXTRUDING TIP	.125
400-725	EXTRUDING TIP	.187
400-726	EXTRUDING TIP	.250

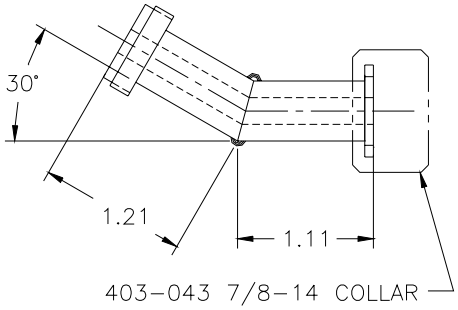


Adaptors

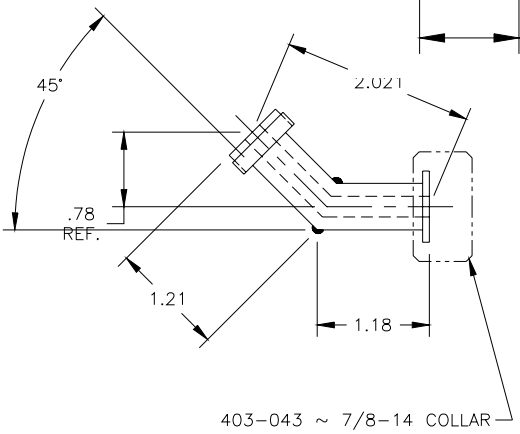
Sometimes it is necessary to install an angle offset adaptor to help make the programming easier. All of the angle adaptors have tip orientations so that they can be installed on the dispense valve in 90 deg. Rotations.

Adaptors can only be install on special dispense valves Such as a 105B038D dispense valve or a 105B038xD 4 or 6 inch extended dispense valve.





403-114-30



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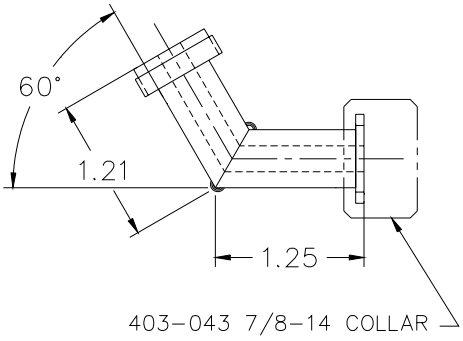
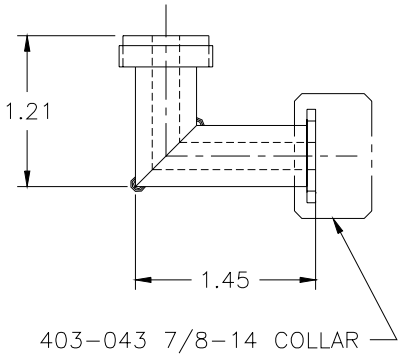
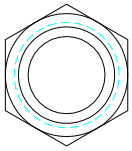


403-114A

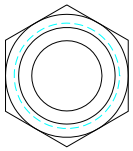


403-114-90B

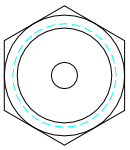
COLLARS



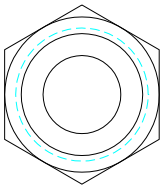
400-667
3/4 in. x 16 thd. .550 opening
Used with Extrusion Nozzles



400-667A
3/4 in. x 16 thd. .494 opening
Used with Standard Spray Tips



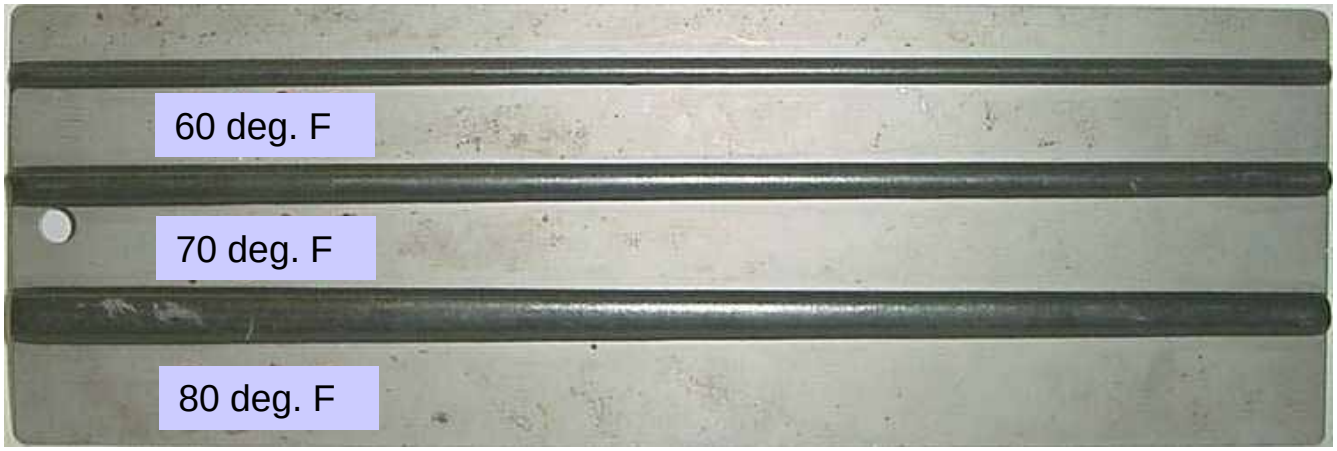
403-132
3/4 in. x 16 thd. .191 opening
Used with HV Type Spray Tips



403-043
7/8 in. x 14 thd. .500 opening
Used with Orientated Spray Tips.

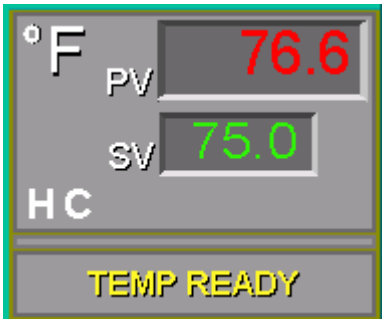
Temperature

Temperature conditioning is used to create a stable environment so that the viscosity of a material remains constant throughout the day. This will improve the job to job quality of a bead. Temperature can be used to make a high viscosity material dispensable without using excessive pump pressure. Some materials can adhere to a oily panel better if the temperature is elevated. Ingersoll-Rand uses water as a medium to condition the material. A closed loop system pumps water through the dispense valve (point of application), dispense head, conditioned hoses and header. The system has an electric heater and a chiller to condition the water. A RTD resistive thermal detector is used to measure the material as close to the nozzle as possible. The RTD feeds back to the PC which in turn controls the temperature of the water.



This example show the difference temperature can make. The dispense pressure and robot speed is the same only the temperature has been changed.

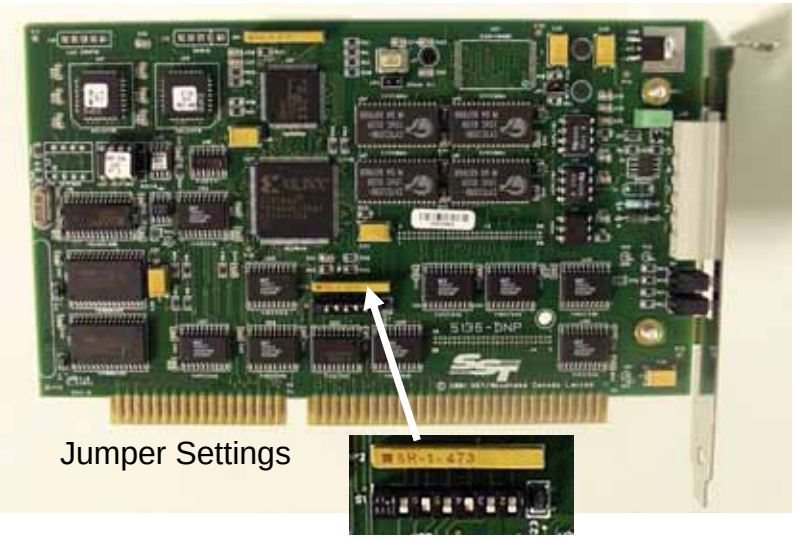
The 100 ohm platinum bulb RTD

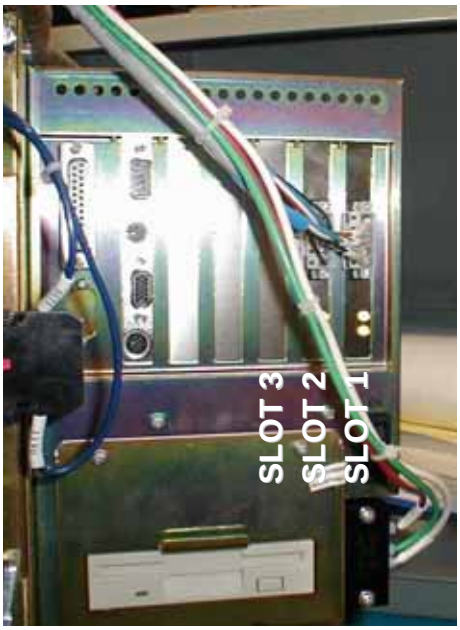


Shown is the PC temperature window which can be displayed in Celsius or Fahrenheit

Device Net

Ingersoll-Rand use device net as a way of communicating from the robot to the PC – The robot is the master and the PC is the slave. Also the communication from the PC to the Robot / Pedestal mount Junction box is device net – PC is the master and the J-box nodes are the slaves. Device net uses a 5 wire connector that contains a 24vdc power, a high – low CAN signal and a shield (similar to a PLC cable). The cables are all shielded twisted pair wiring that resists noise. The PC has communication cards installed – one for each network. The communication between the robot and the PC is configured to have 64 inputs and 64 outputs.





364-207 Device Net Communications Card (DNP)

The dip switches set the address to match correct card to the equipment in the PC software. If a card is removed the DIP SWITCHES must be set.

NOTE: IF the PC is started up without 24vcd power on communications the device net software will not load and the PC screen will show a device net error.

DEVICENET PC CARD DIPSWITCH SETTINGS		DEVICE NET SETTINGS
SLOT	SWITCH SETTINGS 1 = ON 0 = OFF	
1 (AT REAR)	5136–DN / 5136–DNP INTERNAL NETWORK	DISPENSER NETWORK 250 K BAUD
2	ROBOT SYSTEM 1	EQUIPMENT 1 MAC ID 10 500 K BAUD
3	ROBOT SYSTEM 2	EQUIPMENT 2 MAC ID 12 500 K BAUD

PC Nodes

The PC uses several nodes to send inputs and outputs. The main control cabinet, each dispense J-box and pump J-box will have a node. The node consists of a buss coupler, which communicates with the controller card. Attached to the buss coupler an array of I/O cards can be attached to it. Examples are 24vdc Input – 24vdc Output – Analog Input 0-10vdc – Analog Output 0-10vdc.

Node Addressing in the Wago Blocks

DeviceNet recognizes each Wago Block by its Node Address. Every device on a DeviceNet network **must** have a unique (different) Node Address.

DeviceNet's communication speed is determined by its Baud Rate. Every device on a DeviceNet network **must** be set at the same Baud Rate. The Dispenser baud Rate should be set to 250 baud.

Node Addresses and Baud Rates are set by DIP (Digital Input) Switch on the Wago Blocks.

DIPP SWITCH NODE ADDRESSES	
NODE	DESCRIPTION
1	Sys #1 1K Dispenser
2	Single Sys. No/Temp
9	Sys#1 KC Dispenser
11	Sys#2 1K Dispenser
12	Dual Sys. No. Temp
19	Sys#2 KC Dispenser
20	Single System TCU
23	Sys#1 Pumps
25	Sys#2 Pumps
30	Dual System TCU

Analog Output Card

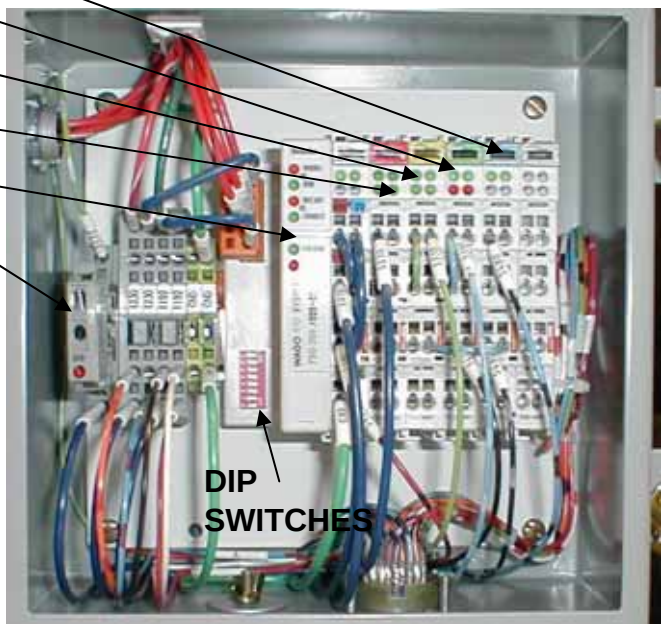
Analog Input Card

Input Card

Output Card

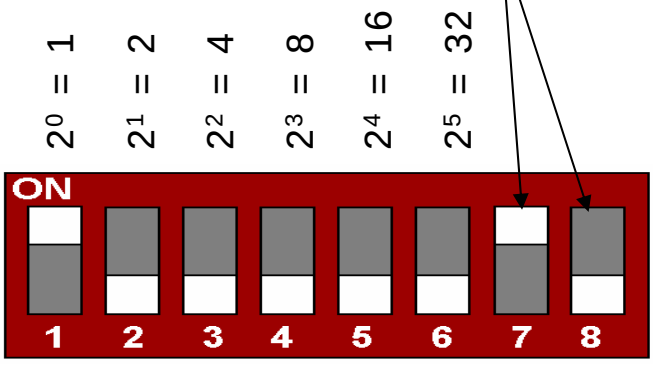
Buss Coupler

Fuses



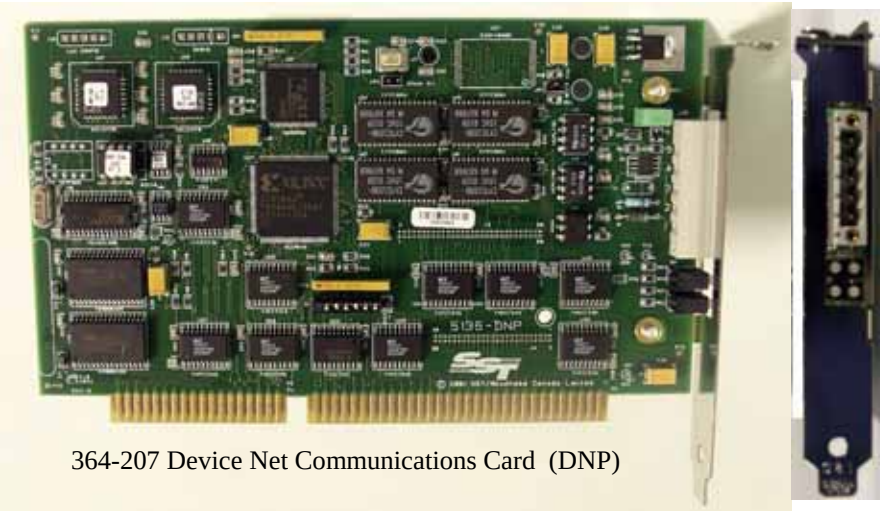
This picture shows a dispense J-box node.

Baud Rate on Autostream Devices is ALWAYS 250k. This setting should not change



The Node Addresses is the sum of the switches that are turned "ON". Address #1 is shown.
Address #3 would have switches 1 & 2 "ON" since 1 + 2 = 3
Address #13 would have switches 1, 3, & 4 "ON" since 1 + 4 + 8 = 13

Device Net Card Identification and Settings



364-207 Device Net Communications Card (DNP)

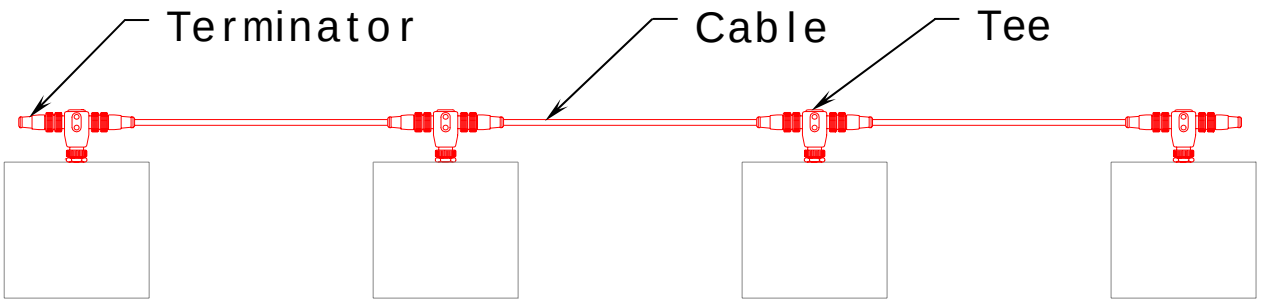
Jumper Settings

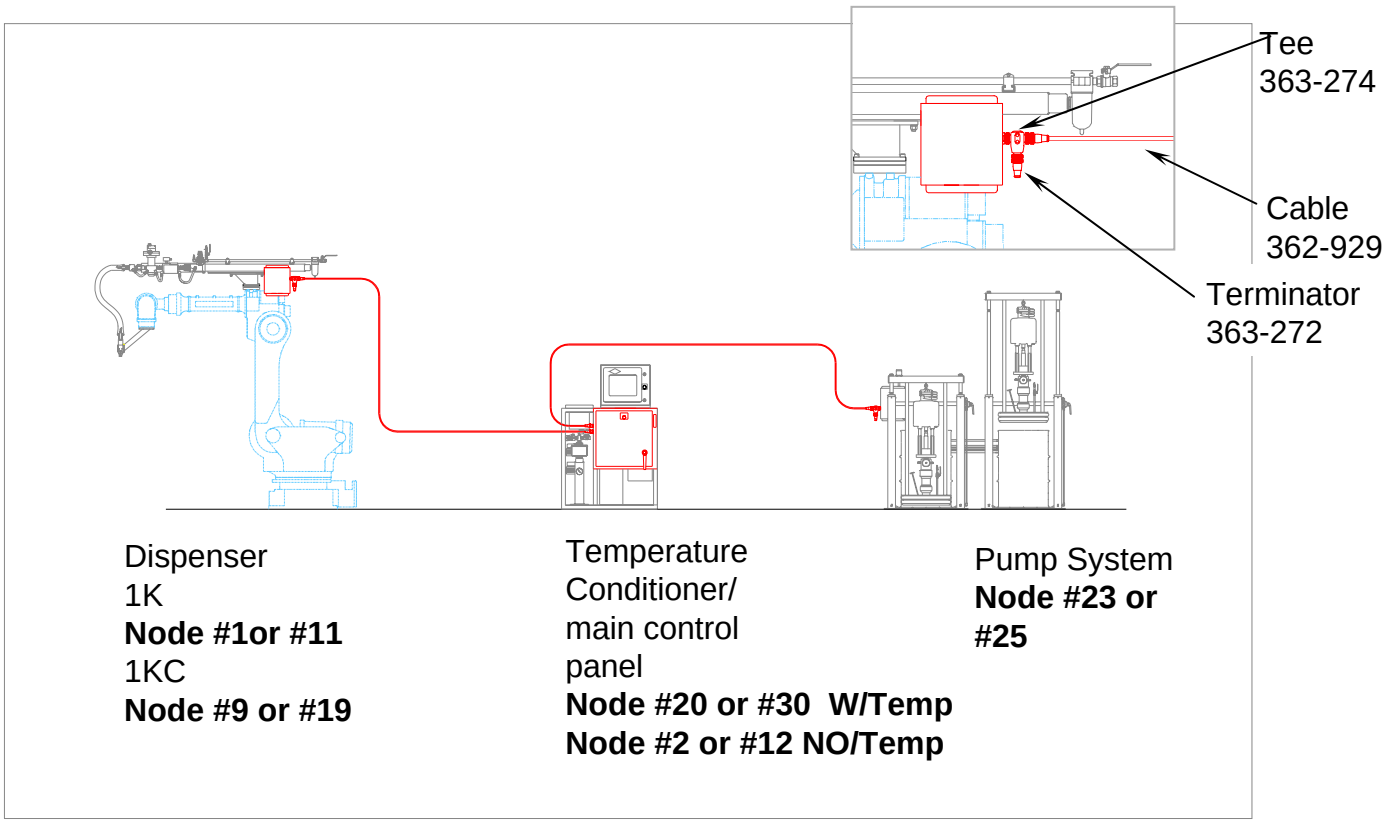
DEVICENET PC CARD DIPSWITCH SETTINGS		
SLOT	SWITCH SETTINGS 1 = ON 0 = OFF	
1 (AT REAR)	5136-DNP 	DISPENSE NETWORK
2		ROBOT SYSTEM 1
3		ROBOT SYSTEM 2

JDS PART	DESCRIPTION	VENDOR PART
364-468	PC computer w/Touchscreen and Ethernet W2000	
364-321	Software Key w2000	
364-114	PC Hard Drive	
363-136	Software Key	
364-207	Device Net communications PC Card	
	DEVICE NET CARDS	
363-213	Device Net Analog Input	750-467
363-215	Device Net RTD Driver	750-461
363-262	Device Net 2 Relay Output	750-514
363-263	Device Net0-230 AC/DC Supply Block	750-612
363-785	Device Net 4-20 MA Output	750-554
362-903	Device Net 24VDC 4 Output	750-504
362-904	Device Net Bus End Terminal	750-600
362-905	Device Net 0-10VDC Output	750-550
362-908	Device Net 24VDC 4 Input	750-402
362-914	Device Net Adaptor (buss coupler)	750-306
363-985	Device Net 24VDC input 8 channel	750-430
363-986	Device Net 24VDC output 8 channel	750-530
	CABLES AND ACCESSORIES	
363-272	Device Net Terminating Plug Male	
363-274	Device Net Junction Tee	
363-591-5	19 Pin Cable (J-Box to dispose head)	
363-392-5	19 Pin Cable (J-Box to dispese head) High Flex	
363-393	Cable for Pressure Switch on air Intensifier	
362-900	Power Supply Din Mount 24VDC 5A	
362-929-10	Device Net Cable M-F 10 Meters	
362-929-15	Device Net Cable M-F 15 Meters	
362-929-3	Device Net Cable M-F 3 Meters	
362-929-7	Device Net Cable M-F 7 Meters	
363-495	Wiring Harness 1K Head	
	1KC COMPONENTS	
363-142	Cable for Linear Transducer MLDT	
363-269	Cable for RTD	
364-168	Cable for Mac Proportional Valve	
364-494	Proportional valve Assembly	
364-493	Cable For Multi Valve Bank	
364-495	Multi Valve Bank	
363-432	Cable for remote Dispense Valve	
363-161B	Remote Solenoid Valve	

Physical DeviceNet Layout

Each DeviceNet network (bus) **must** be set up as a “single-file” string of devices (trunk) connected by special DeviceNet cable.
Each DeviceNet network **must** have terminating resistors (Terminators) at each end.
Devices are dropped off the trunk by Tees and smaller cables (branches).
DeviceNet cable is available in Thick and Thin. Maximum trunk (bus) length for Ingersoll-Rand equipment is 250m for Thick cable and 100m for Thin cable. Ingersoll-Rand uses Thin cable as a standard because it is much more flexible and compact than Thick.
Maximum branch length for Ingersoll-Rand is 6m. Ingersoll-Rand equipment is always attached to the trunk line, so this constraint does not matter.





Robot Inputs (Dispense Controller Outputs)

1. **Dispenser Ready:** A signal indicating that the dispenser is functioning properly with no faults which prevent a normal dispense cycle. This signal requires the dispenser to be in the automatic mode and at the proper temperature, if applicable. During Remote Start, when a Fault occurs, or when depressurized, Dispense Ready shall be dropped by the dispense controller. Dispense 'not ready' status shall be communicated to the cell controller via the 'Process X Tip Maintenance Request' signal.
2. **Dispense In Process:** A signal indicating that the dispense system has received a valid style and is in the dispensing process. Resetting of this signal while the 'Dispense Complete' robot output is asserted directs the robot to read the 'Volume OK', 'No Fault' and 'No Alert' signals from the dispenser.
3. **Volume OK:** A signal indicating that the volume dispensed for the given style was completed within the defined limits in the dispense controller. It shall be reset when the 'Style Strobe' output is turned off by the robot. The OFF state of this signal shall be tested by the robot prior to setting 'Style Strobe' at the beginning of a dispense sequence.
4. **No Fault:** A signal indicating (when low) that an error has occurred within the dispensing equipment.
5. **No Alert:** A signal indicating (when low) that an error has occurred within the dispense equipment. Alerts shall be tracked by the dispenser, and they may result in a major fault after a specified number of occurrences. When an alert is detected, the robot shall set the appropriate 'Process X Alert' output on the cell interface. An alert shall not override processing of the 'Volume OK' signal or cause by itself the 'Task OK' to drop.
6. **Remote Start / Purge In Process:** A signal indicating that a remote start has been initiated by the dispense controller. This signal shall remain asserted until the dispense equipment has achieved 'Dispense Ready' status. The remote start process shall include performing a metered or non-metered purge according to parameters defined within the dispense controller.
7. **Drum Empty:** A signal indicating that one or both material supply drums is empty. This signal shall be interconnected to the appropriate 'Process X Alert 2' robot output on the cell interface.
8. **Flow Measurement Bypassed:** A signal indicating that the dispense controller is operating without flow measurement capability. This signal will be interconnected to the appropriate 'Process X Out of Tolerance' robot output on the cell interface. The robot shall use the state of this input to override the 'Dispense Ready', 'No Fault', and 'Volume OK' dispense interface signals. All other interface signals shall operate as they do in a normal sequence.
9. **Purge Request:** A signal requesting a purge due to dispense inactivity based on a user-definable time within the dispense controller. 'Purge Request' status shall be communicated to the cell controller via the 'Process X Tip Maintenance Request' signal.

Robot Outputs (Dispense Controller Inputs)

1. **Style ID Bits (1,2,4,8,16,32,64,128):** An eight-bit group (binary number) output that is used to relay the style information to the dispenser. The style ID bits shall be set before the 'Style Strobe' and drop low after the 'Dispense In Process' is received. A volume target with tolerance limits shall be associated with each style in the dispenser. A fault shall be sent to the robot if the volume is not within the specified limits.

2. **Style Strobe:** A signal indicating that the style bits are set, per body style, in order for the dispenser to read them. This bit shall remain high until after volume and fault Information are read at the end of the dispense cycle.

3. **Gun X On (1,2,3,4,):** When asserted, these discrete signals to the dispenser turn on guns one through four. Any combination of the guns may be "on" at any given time.

4. **Dispense Complete:** A signal that is asserted when the dispense cycle is complete. This signal shall initiate the dispenser to perform the volume calculations for the current job. Based on the volume dispensed, the 'Volume OK' signal with or without an alert may be asserted. A fault could be reported based upon the volume dispensed. The 'Dispense Complete' signal shall be reset after a 'Volume OK' signal, or a fault signal is detected.

5. **Dispense Material Flow Command (1,2,4,8,16,32,64,128,256,512,1024,2048) - Analog:** 12 bit group output representing an analog 0 to 10 V signal that controls the dispense flow rate. This is a binary representation of an analog signal that is proportional to the TCP speed of the robot.

6. **Bead Shaping Command (1,2,4,8,16,32,64,128,256,512,1024,2048) - Analog:** 12 bit group output representing an analog 0 to 10 V signal that controls the bead shaping of he dispensed material.

7. **Remote Start / Purge:** A signal that restarts the dispense system from any "not-ready" state. If the system is already 'Ready,' this signal shall initiate a purge according to parameters in the dispense controller.

8. **Fault Reset:** The fault reset shall be invoked during fault recovery to attempt to reset a fault condition. If the cause of the fault has not been removed, then the fault shall be re-reported after the release of the 'Fault Reset' signal. The dispense controller shall also use this signal to cancel an abandoned style sequence and reinitialize itself for the next cycle. The dispense controller shall check that this signal is low prior to setting 'Dispense in Process' at the beginning of a dispense sequence. If the incorrect state, the dispenser shall report the appropriate fault.

Robot Automatic Sequence of Operations:

1. PC Sends Signal IN PROCESS off
   This signal verifies that the dispense head has been reset from the last job (refilled) and is not in a purge mode. During refill the Beacon light will be on as long as the K device is refilling.

2. PC to Robot - No Dispense Fault (Major)- Dispense Ready High – Do not look at Volume OK condition at the beginning of a job, this bit will be low at the beginning of the job.

3. Robot Sends Body (volume) Style 1-255 It is sent as a 8 bit Group Output..
   a. The style bit is inserted in the DETAILS of a JOB as the PART ID, only the job is configured for the disperser to be true. A separate job is required for each body style.

4. Robot Sends a Style Strobe and the Body style appears in PC Watch Window.
   a. The style bit is latched and can be turned off.
   b. The InProcess bit goes high and the Volume OK bit stays Low. The system is in a Dispensing Mode and the system will precharge if enabled.

5. Robot Sends a 12 bit Group Flow Command signal (0-4095 Max) and the Gun On signal to start dispensing. The Gun On can go on and off.

6. When the robot is done dispensing for 250ms after the last (gun=off) it will check for the Volume OK signal to be LOW. If it is high the device network could be lock up (not responding) and the robot should fault out.

7. Robot pulses Dispense complete signal..
   a. The volume fault table will be looked at and Dispense Volume and recorded (SPC data)
   b. If the volume is out of range a Major fault will occur and the dispense ready signal will go low.
   c. Start the refill sequence on a K device.
   d. The InProcess will stay high until the refill is complete.

8. If there were no faults the Volume OK signal will go High and the dispense ready signal will stay high.

9. The dispense complete will go low and within 0.10 of a second the Style Strobe will go off. If this time is not correct the robot will show an out of sequence major fault.
10. Ready for the Next Job.

Note: The only way for a dispense cycle to work is to run a Job from the Robot.

I/O TIMING CHARTS

Figure 1: Normal Dispense Sequence

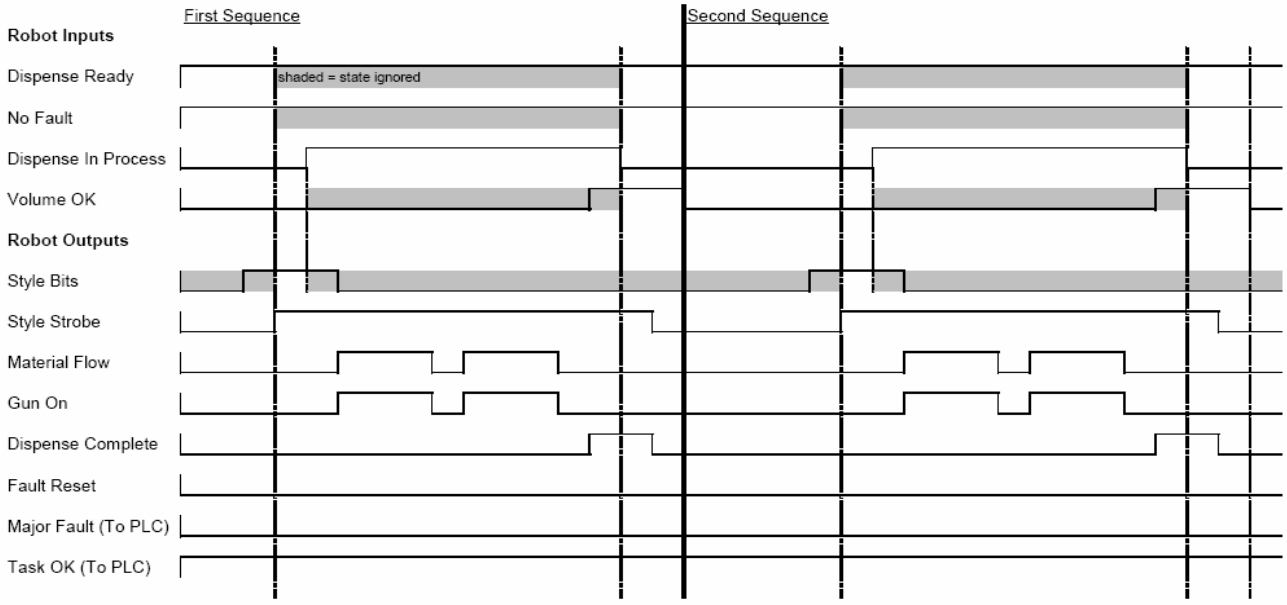
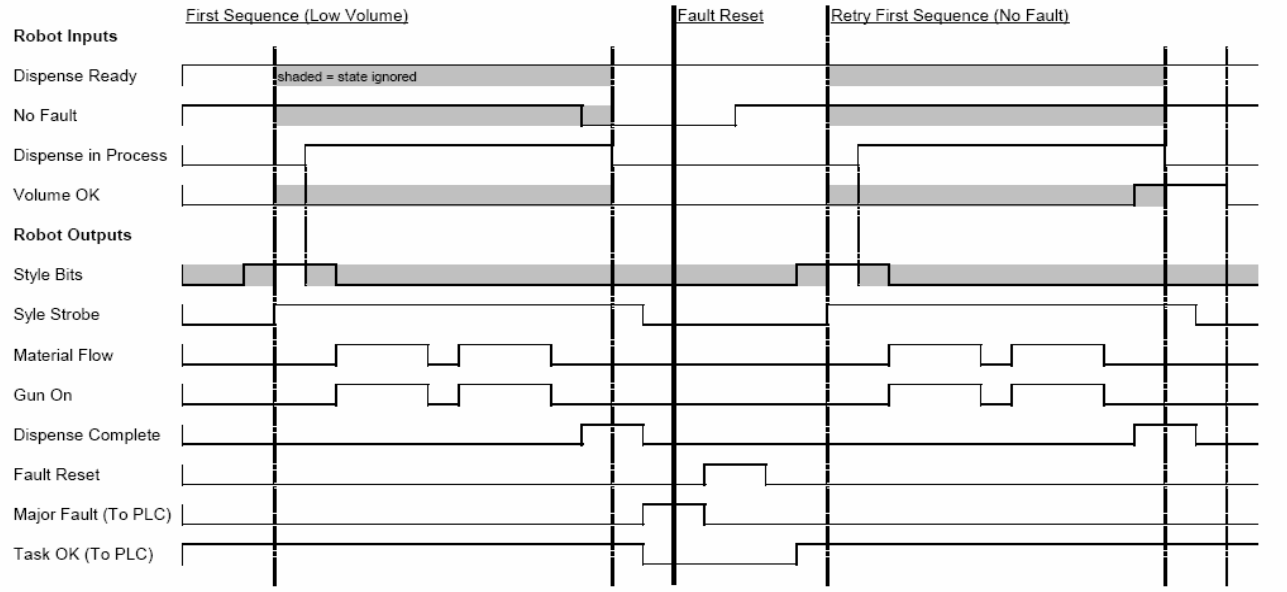
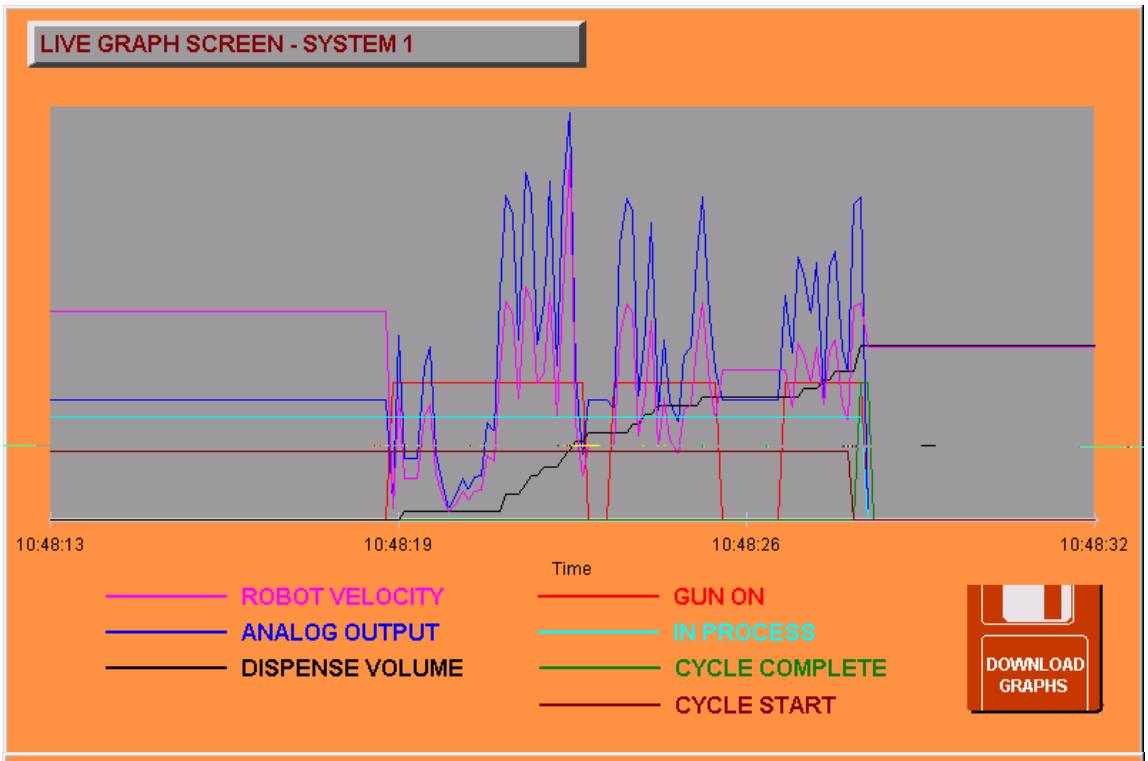


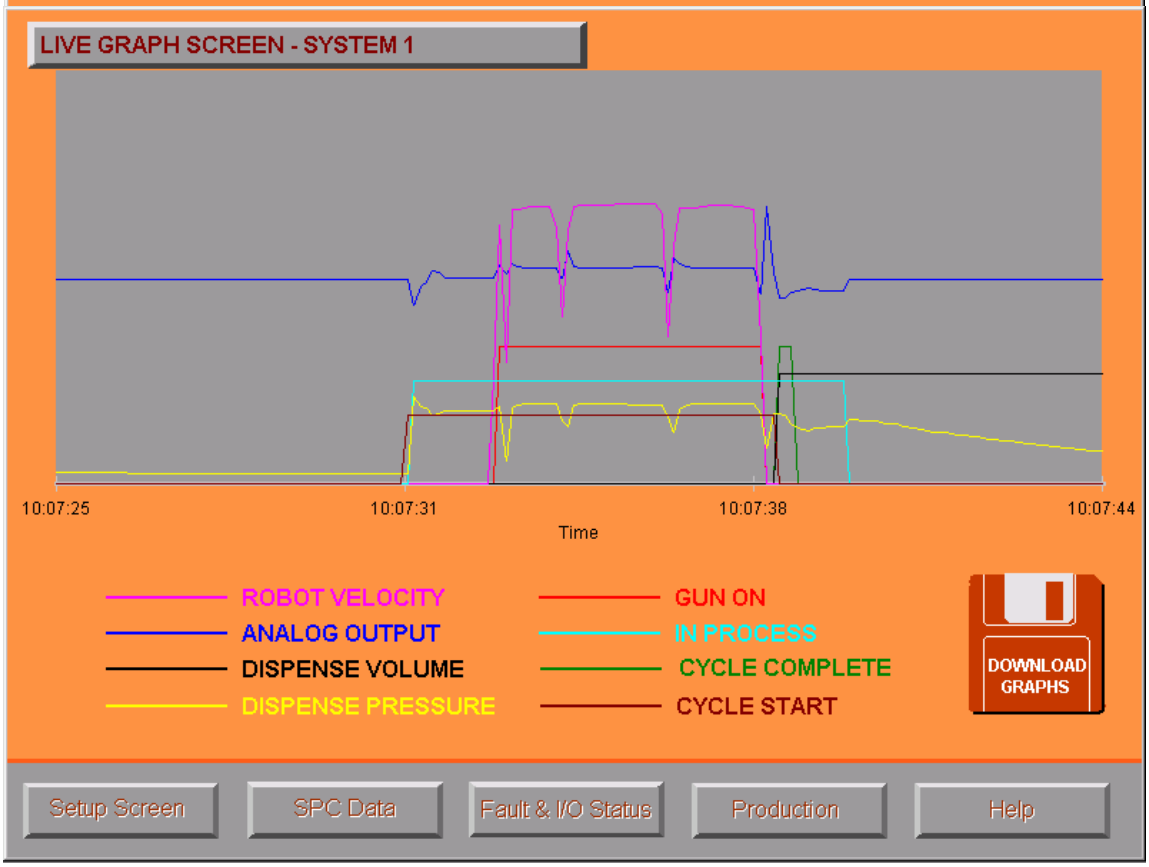
Figure 2: Faulted Dispense Sequence



This Graph shows bad TCPP Programming



This Graph shows a normal TCPP Programming. Can you find the glitch?



GM RS4 I/O: Dispense controller digital inputs (Channel 82 node 10 / 12)

Robot Input (Disp 1 / Disp 2)	Description	Signal name	Node Address (Disp 1 / Disp 2)
In65 / In129	Disp X Ready	diSLXReady	N10:I01 / N12:I01
In66 / In130	Disp X No Fault	diSLXNoFault	N10:I02 / N12:I02
In67 / In131	Disp X No Alert	diSLXNoAlert	N10:I03 / N12:I03
In68 / In132	Disp X In Process	diSLXInProcess	N10:I04 / N12:I04
In69 / In133	Disp X Volume OK	diSLXVolumeOK	N10:I05 / N12:I05
In70 / In134	*(Spare)*	*(Spare)*	N10:I06 / N12:I06
In71 / In135	Disp X Purge Request	diSLXPurgeReq	N10:I07 / N12:I07
In72 / In136	Disp X Remote Start / Purge In Process	diSLXRmtStartInp	N10:I08 / N12:I08
In73 / In137	*(Spare)*	*(Spare)*	N10:I09 / N12:I09
In74 / In138	Disp X Drum Empty	diSLXDrumEmpty	N10:I10 / N12:I10
In75 / In139	Disp X Flow Measurement Bypassed	diSLXFLMBypassed	N10:I11 / N12:I11
In76 / In140	*(Spare)*	*(Spare)*	N10:I12 / N12:I12
In77 / In141	*(Spare)*	*(Spare)*	N10:I13 / N12:I13
In78 / In142	*(Spare)*	*(Spare)*	N10:I14 / N12:I14
In79 / In143	Disp X Ejection Valve(s) Ready	diSLXEjVlvsRdy	N10:I15 / N12:I15
In80 / In144	Disp X Ejection Complete	diSLXEjectCmpl	N10:I16 / N12:I16
In81 / In145	Disp X Felt Advanced	diSLXFeltAdvancd	N10:I17 / N12:I17
In82 / In146	Disp X Primer Check Passed	diSLXPrimeChkPas	N10:I18 / N12:I18
In83 / In147	Disp X Primer Check Failed	diSLXPrimeChkFld	N10:I19 / N12:I19
In84 / In148	Disp X Change Primer Brush	diSLXChangePBrsh	N10:I20 / N12:I20
In85 / In149	*(Spare)*	*(Spare)*	N10:I21 / N12:I21
In86 / In150	*(Spare)*	*(Spare)*	N10:I22 / N12:I22
In87 / In151	*(Spare)*	*(Spare)*	N10:I23 / N12:I23
…	*(In88/152 – In96/160 Spare)*	*(I24 – I32 Spare)*	…
In97 / In161	Volume X Dispensed Data Bit 1	diSLXVolDatBit1	N10:I33 / N12:I33
In98 / In162	Volume X Dispensed Data Bit 2	diSLXVolDatBit2	N10:I34 / N12:I34
In99 / In163	Volume X Dispensed Data Bit 3	diSLXVolDatBit3	N10:I35 / N12:I35
In100 / In164	Volume X Dispensed Data Bit 4	diSLXVolDatBit4	N10:I36 / N12:I36
In101 / In165	Volume X Dispensed Data Bit 5	diSLXVolDatBit5	N10:I37 / N12:I37
In102 / In166	Volume X Dispensed Data Bit 6	diSLXVolDatBit6	N10:I38 / N12:I38
In103 / In167	Volume X Dispensed Data Bit 7	diSLXVolDatBit7	N10:I39 / N12:I39
In104 / In168	Volume X Dispensed Data Bit 8	diSLXVolDatBit8	N10:I40 / N12:I40
In105 / In169	Volume X Dispensed Data Bit 9	diSLXVolDatBit9	N10:I41 / N12:I41
In106 / In170	Volume X Dispensed Data Bit 10	diSLXVolDatBit10	N10:I42 / N12:I42
In107 / In171	Volume X Dispensed Data Bit 11	diSLXVolDatBit11	N10:I43 / N12:I43
In108 / In172	Volume X Dispensed Data Bit 12	diSLXVolDatBit12	N10:I44 / N12:I44
In109 / In173	*(Spare)*	*(Spare)*	N10:I45 / N12:I45
In110 / In174	*(Spare)*	*(Spare)*	N10:I46 / N12:I46
In111 / In175	*(Spare)*	*(Spare)*	N10:I47 / N12:I47
In112 / In176	*(Spare)*	*(Spare)*	N10:I48 / N12:I48
In113 / In177	Disp X Fault Data Bit 1	diSLXFaultBit1	N10:I49 / N12:I49
In114 / In178	Disp X Fault Data Bit 2	diSLXFaultBit2	N10:I50 / N12:I50
In115 / In179	Disp X Fault Data Bit 3	diSLXFaultBit3	N10:I51 / N12:I51
In116 / In180	Disp X Fault Data Bit 4	diSLXFaultBit4	N10:I52 / N12:I52
In117 / In181	Disp X Fault Data Bit 5	diSLXFaultBit5	N10:I53 / N12:I53
In118 / In182	Disp X Fault Data Bit 6	diSLXFaultBit6	N10:I54 / N12:I54
In119 / In183	Disp X Fault Data Bit 7	diSLXFaultBit7	N10:I55 / N12:I55
In120 / In184	Disp X Fault Data Bit 8	diSLXFaultBit8	N10:I56 / N12:I56
…	*(In121/185 – In128/192 Spare)*	*(I57 – I64 Spare)*	…

GM RS4 I/O: Dispense controller digital outputs (Channel 82 node 10 / 12)

Robot Output (Disp 1 / Disp 2)	Description	Signal Name	Node Address (Disp 1 / Disp 2)
Out65 / Out129	Disp X Style ID Bit 1	doSLXStyleID1	N10:O01 / N12:O01
Out66 / Out130	Disp X Style ID Bit 2	doSLXStyleID2	N10:O02 / N12:O02
Out67 / Out131	Disp X Style ID Bit 4	doSLXStyleID4	N10:O03 / N12:O03
Out68 / Out132	Disp X Style ID Bit 8	doSLXStyleID8	N10:O04 / N12:O04
Out69 / Out133	Disp X Style ID Bit 16	doSLXStyleID16	N10:O05 / N12:O05
Out70 / Out134	Disp X Style ID Bit 32	doSLXStyleID32	N10:O06 / N12:O06
Out71 / Out135	Disp X Style ID Bit 64	doSLXStyleID64	N10:O07 / N12:O07
Out72 / Out136	Disp X Style ID Bit 128	doSLXStyleID128	N10:O08 / N12:O08
Out73 / Out137	Disp X Style Strobe	doSLXStyleStrobe	N10:O09 / N12:O09
Out74 / Out138	Disp X Dispense Complete	doSLXDispenseCmp	N10:O10 / N12:O10
Out75 / Out139	Disp X Gun 1 On	doSLXGun1On	N10:O11 / N12:O11
Out76 / Out140	Disp X Gun 2 On	doSLXGun2On	N10:O12 / N12:O12
Out77 / Out141	Disp X Gun 3 On	doSLXGun3On	N10:O13 / N12:O13
Out78 / Out142	Disp X Gun 4 On	doSLXGun4On	N10:O14 / N12:O14
Out79 / Out143	(Spare)	(Spare)	N10:O15 / N12:O15
Out80 / Out144	(Spare)	(Spare)	N10:O16 / N12:O16
Out81 / Out145	Disp X Material Flow Command Bit 1	aoSLXMatFlow	N10:O17 / N12:O17
Out82 / Out146	Disp X Material Flow Command Bit 2	aoSLXMatFlow	N10:O18 / N12:O18
Out83 / Out147	Disp X Material Flow Command Bit 4	aoSLXMatFlow	N10:O19 / N12:O19
Out84 / Out148	Disp X Material Flow Command Bit 8	aoSLXMatFlow	N10:O20 / N12:O20
Out85 / Out149	Disp X Material Flow Command Bit 16	aoSLXMatFlow	N10:O21 / N12:O21
Out86 / Out150	Disp X Material Flow Command Bit 32	aoSLXMatFlow	N10:O22 / N12:O22
Out87 / Out151	Disp X Material Flow Command Bit 64	aoSLXMatFlow	N10:O23 / N12:O23
Out88 / Out152	Disp X Material Flow Command Bit 128	aoSLXMatFlow	N10:O24 / N12:O24
Out89 / Out153	Disp X Material Flow Command Bit 256	aoSLXMatFlow	N10:O25 / N12:O25
Out90 / Out154	Disp X Material Flow Command Bit 512	aoSLXMatFlow	N10:O26 / N12:O26
Out91 / Out155	Disp X Material Flow Command Bit 1024	aoSLXMatFlow	N10:O27 / N12:O27
Out92 / Out156	Disp X Material Flow Command Bit 2048	aoSLXMatFlow	N10:O28 / N12:O28
Out93 / Out157	(Spare)	(Spare)	N10:O29 / N12:O29
Out94 / Out158	(Spare)	(Spare)	N10:O30 / N12:O30
Out95 / Out159	Disp X Fault Reset	doSLXFaultReset	N10:O31 / N12:O31
Out96 / Out160	Disp X Remote Start / Purge	doSLXRemoteStart	N10:O32 / N12:O32
Out97 / Out161	Disp X Clear Primer Complete	doSLXClrPrmrCmp	N10:O33 / N12:O33
Out98 / Out162	Disp X Black Primer Complete	doSLXBlkPrmrCmp	N10:O34 / N12:O34
Out99 / Out163	Disp X Urethane Complete	doSLXUrethaneCmp	N10:O35 / N12:O35
Out100 / Out164	Disp X Advance Felt	doSLXAdvanceFelt	N10:O36 / N12:O36
Out101 / Out165	Disp X Waiting for Primer Data	doSLXWaitPrimer	N10:O37 / N12:O37
Out102 / Out166	Disp X Primer Brush Change Compete	doSLXPrmrBrChCmp	N10:O38 / N12:O38
…	(Out103/167 – Out112/176 Spare)	(O39 – O48 Spare)	…
Out113 / Out177	Disp X Bead Shaping Command Bit 1	aoSLXBeadShp	N10:O49 / N12:O49
Out114 / Out178	Disp X Bead Shaping Command Bit 2	aoSLXBeadShp	N10:O50 / N12:O50
Out115 / Out179	Disp X Bead Shaping Command Bit 4	aoSLXBeadShp	N10:O51 / N12:O51
Out116 / Out180	Disp X Bead Shaping Command Bit 8	aoSLXBeadShp	N10:O52 / N12:O52
Out117 / Out181	Disp X Bead Shaping Command Bit 16	aoSLXBeadShp	N10:O53 / N12:O53
Out118 / Out182	Disp X Bead Shaping Command Bit 32	aoSLXBeadShp	N10:O54 / N12:O54
Out119 / Out183	Disp X Bead Shaping Command Bit 64	aoSLXBeadShp	N10:O55 / N12:O55
Out120 / Out184	Disp X Bead Shaping Command Bit 128	aoSLXBeadShp	N10:O56 / N12:O56
Out121 / Out185	Disp X Bead Shaping Command Bit 264	aoSLXBeadShp	N10:O57 / N12:O57
Out122 / Out186	Disp X Bead Shaping Command Bit 512	aoSLXBeadShp	N10:O58 / N12:O58
Out123 / Out187	Disp X Bead Shaping Command Bit 1024	aoSLXBeadShp	N10:O59 / N12:O59
Out124 / Out188	Disp X Bead Shaping Command Bit 2048	aoSLXBeadShp	N10:O60 / N12:O60
…	(Out 125/189 – Out 128/192 Spare)	(O61 – O64 Spare)	…

Device Net Variables to PC

These Values should be entered so that the Robot can talk to the PC.
Communication Setup (Menu/I-O/TYPE{F1}/0{next page}/DEVICE NET
Rack 81 = PLC Controller Rack 82 = Ingersoll-Rand PC

In rack 82 board the detail values are:
Mac ID: GM Equipment #1 = 10 Equipment #2 = 12 At 500 Baud

Baud Rate = 500K or 125K for Daimler Chrysler specs
Board auto restart = ON
Input resume state = LAST
Size of output from master = 0
Size of input from master = 0

Setting the Device net I/O assignment:
1 Device name = Ingersoll-Rand 2 Comment = PC
3 Vendor ID = 8
4 Device Type = 12
5 Product code = 0
6 Polled I/O = default yes
Digital input = 64
Digital output = 64
Analog input = 0
Analog output = 0
Strobed = default no
Rest of the values are no or 0

Under the Rack 82 the Ingersoll-Rand definitions are added.
Device name = Ingersoll-Rand (device created above)
A dual system will have 2 Mac ID's set up.

After the I/O have been set up the robot need to reboot and the device networks need to be put online

Robot I/O Device net Information

3. DeviceNet Board Setup and Configuration

3.1. Configuring and Connecting the DeviceNet Interface Daughterboards

Before you can connect the DeviceNet Interface daughterboards to devices on the DeviceNet network, you must configure them properly. Use Procedure 3.1. to configure the daughterboards.

When you configure DeviceNet Interface daughterboards, you use two screens: the I/O DeviceNet Board List screen and the I/O DeviceNet Board Detail screen. Refer to Table 3.1. and Table 3.2. for a listing and description of each of the items on these screens.

Table 3.1. DeviceNet Board List Screen Items

ITEM	DESCRIPTION
Board	This is the number of the DeviceNet Interface daughterboard, 1-4.
Comment	This is text you enter to describe the daughterboard. A comment is not required.
Rack	This is the I/O rack that will be used to configure the I/O used with the daughterboard on the controller. DeviceNet Interface daughterboards must use racks 81 through 84: Rack 81 - Daughterboard 1 Rack 82 - Daughterboard 2 Rack 83 - Daughterboard 3 Rack 84 - Daughterboard 4 **You cannot change the rack number of a daughterboard.**
Status	This is the current state of the DeviceNet Interface daughterboard. **ONLINE** indicates the board is presently active. Information to and from devices configured on this network is being updated. **OFFLINE** indicates that no data is being transferred to or from devices connected to the board. Scanning of devices connected to this board will not start at power up. **ERROR** indicates that an error has been detected. The board is effectively off-line, but scanning will be attempted after power up.

Table 3.2. DeviceNet Board Detail Screen Items

ITEM	DESCRIPTION
Board	This displays the number of the selected daughterboard.
Status	This displays the status of the selected daughterboard: ONLINE, OFFLINE, ERROR.
Scanner Type	The model of scanner represented by this daughterboard. Currently two kinds are supported: SST 5136-DN and SST 5136-DNP.
Motherboard	The type of motherboard used with the daughterboard. Currently there are two kinds: "full-slot" and "wide-mini."
MAC-Id	This is the Media Access Control ID used by the daughterboard. It must have a value of from 0 to 63. The MAC-Id must be different from the MAC-Ids of all other devices on the network.
Baud Rate	This specifies the data rate used in transfers between the DeviceNet Interface board and the devices on the network. Specify one of the following baud rates: 125 KB 250 KB 500 KB
Board Auto-restart	When this is set to ON, the board will automatically restart communication with the DeviceNet network after a board or network error has occurred and the error situation has been resolved. Setting this value to OFF turns off board auto-restart. The default value is OFF.
Input resume state	The two valid values for this setting are LAST and ZERO, and this setting affects all input I/O ports (digital, analog, group, and so forth) which have an assigned rack value equal to the board's rack number. When the input resume state is set to LAST, these input ports will retain their last known values if the port goes offline. When the input resume state is set to ZERO, the port values are set to zero. The default value is LAST.
Slave Status	Slave status indicates the status of the slave connection of this DeviceNet board. If the slave connection is not enabled (if size of output from master and size of input to master are 0), this field displays OFFLINE. If it is enabled and the remote master has not yet connected, this field indicates IDLE and error DNET-125 is posted. If the remote master is connected, this field displays ONLINE. This field is display only.
Slave Error Severity	This sets the error severity level of the error DNET-125 that indicates the slave connection is idle. Select WARN, STOP or PAUSE as required.
Slave Operation: Size of output from master	For slave operation, in which the R-J3*i*B controller acts as a slave to an external master, this specifies the size of the output **from** the master **to** the daughterboard, in bytes. See Figure 3.1..
Slave Operation: Size of input to master	For slave operation, in which the R-J3*i*B controller acts a slave to an external master, this specifies the size of the input **to** the master **from** the daughterboard, in bytes. See Figure 3.1..

Procedure 3.1. Configuring and Connecting DeviceNet Interface Daughterboards

1.Press MENUS.
2.Select I/O.
3.Press F1, [TYPE].
4.Select DeviceNet. You will see a screen similar to the following.

```
Board List                    1/4
Board    Comment        Rack  Status
1    [           ]    81      OFFLINE
2    [ Ingersoll]    82      OFFLINE
3    [           ]    83      OFFLINE
4    [           ]    84      OFFLINE
```

1.To configure each daughterboard, move the cursor to the daughterboard you want to configure and press F4, DETAIL. You will see a screen similar to the following.

```
Board Detai
lBoard: 1              Status: OFFLINE
Scanner type:
SST 5136-DN-104
Motherboard:  Full-slot
1  MAC-ID:              0
2  Baud-rate:           500 KB
3  Board auto-restart:    ON
4  Input resume state (rack 82): LAST
5  SLAVE Error Severity:      WARN
6  Size of output from master:   0 Bytes
7  Size of input to master:     0 bytes
```

1.Move the cursor to MAC-Id and type the MAC-Id. This must be a value from 0 to 63 and must be different from the MAC-Id of any other device in the network. (choose 0)
2.Move the cursor to Baud-rate, and press the function key that corresponds to the baud rate you want to use:
For 125 KB, press F2.
For 250 KB, press F3.
For 500 KB, press F4.
3.Move the cursor to Board auto-restart to set the board auto-restart state:
To turn it on, press F2.
4.Move the cursor to input resume state to set the input resume state for the board:
If inputs are to retain their last state, press F2.

The Analog Values are set up as a Group BCDB bit.

Menu/ IO/Group

The style bits are set up using a eight (8) group selection

The Analog bits are set up using a 12 group selection

Fanuc new software will have this set up for you.

Create a group from the Digital outputs rack 82 Mack ID 20 or 22 starting point N:33 for 12 Nodes

Reference range 0-4096 where 10V is equal to 4095 Style bits are set up as a group BDCB bit .

The Body Styles are set up as a Group BCDB bit.

Create a group from the Digital Output Rack 82 Mack ID 20 or 22 Starting Point N:1 for 8 Nodes

Range is 0-255 different style bits

TCPP or NOT to TCPP that is a very good Question.

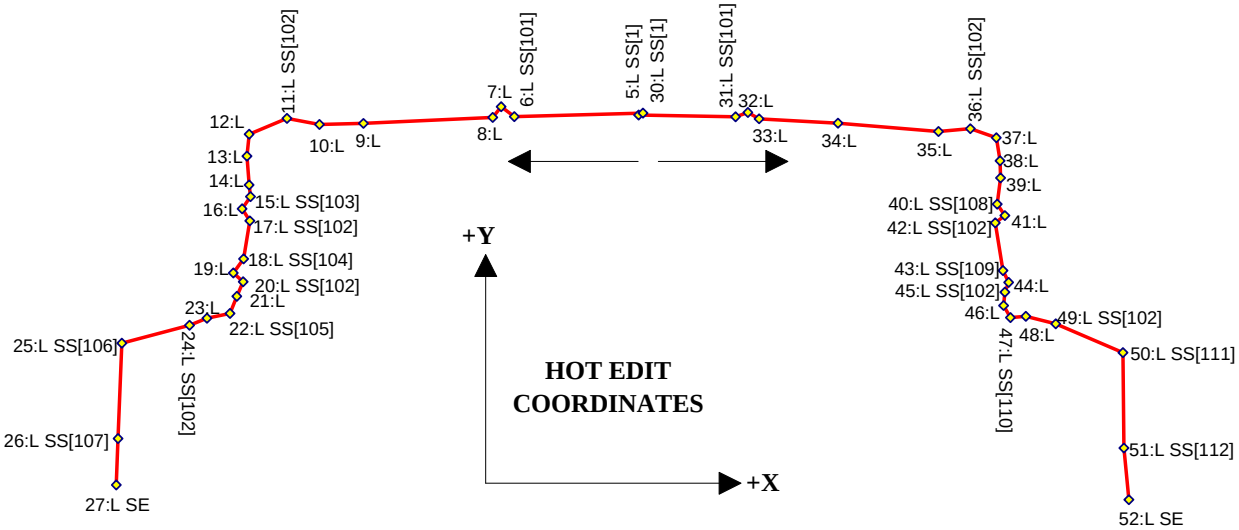
Non - TCP Proportional Approach (Direct Voltage):

This approach is used when the application allows for robot speeds to be constant and so the dispenser flow rates can be constant. Constant speeds can be maintained by the robot if the motion is straight. However, if the robot speeds are kept slow enough it will maintain a relatively constant speed though a complex path. If the robot speeds very greatly or motion is complex the method of programming becomes quite difficult requiring the programmer to adjust the material flow at a point where the robot speed changes.

Seal Start (SS) 300mm/s 3m bead @ 3v=1228 Seal End (SE)

Seal Start (SS) 300mm/s 6m bead @ 6v=2457 Seal End (SE)

If the dispense path is very simple and straight direct voltage is normally used. Any voltage from 0-10v (0-4095) can be used to achieve the bead size. However if the dispense path is more complicated (see diagraph below) TCPP is normally used. Direct Voltage is easier to setup then TCPP



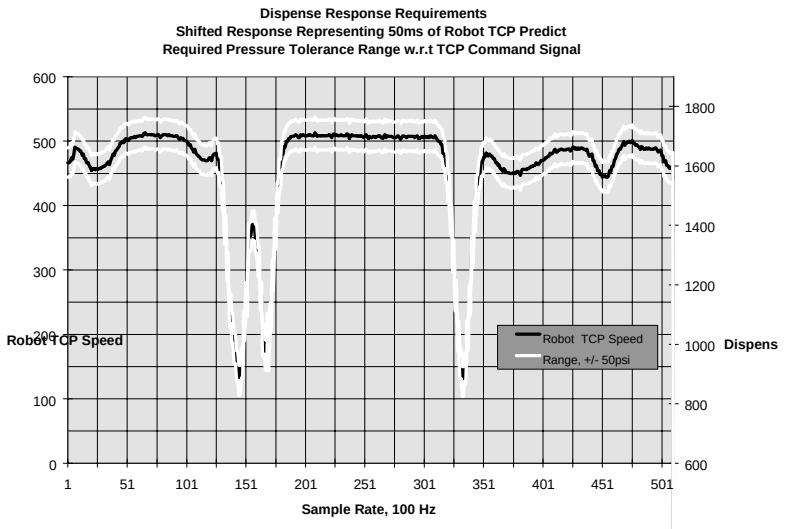
TCPP Tool Center Point Predict

This approach requires the most complex and costly equipment but has paid for itself by making dispense robot programming less of an art. This approach was developed solely for the purpose of reducing programming complexity in conjunction with improvements in bead control. This method is interchangeable for Extruding or streaming, however, extruding adds more complexity for the robot programmer. The basic intent is to have dispensing flow control tied directly to the speed of the robot in such a fashion that the robot programmer can change robot speeds as required to address the specific application without having to adjust flow control commands to the dispensing equipment. Bead quality should not be effected when robot speed varies. This involved three basic concepts to make this a reality;

1. The flow control signal from the robot to the dispenser must be sent before it is actually required (equipment delay).
2. The flow control signal must be scaled so that at various robot speeds the signal received by the dispensing equipment is correct for that robot speed.
3. The dispensing equipment must be responsive enough to match the accel/decel changes of the robot. The Robot/Dispense combination for these three items is as follows;

1. The Robot controller accurately predicts the TCP (tool center point) velocity which is adjustable up to 200ms in advance of any programmed point.
2. The scaling of the signal will be determined during Bead Width Calibration during set up which is a Bead width (volume) vs. voltage relation.
3. The flow control shot meter is directly coupled to the dispensing gun providing response of about 50 ms which is matched to the time when the TCP (Tool Center Point) velocity is provided.

This graph shows the robot Flow command TCPP response. The dispense path is the p panel with two corners one sharper than the other



End of Arm Tool TCP

End-of-arm tool TCP must be set up prior to dispensing material, the tool center point must be moved from the sixth axis faceplate to the tip of the tool. Use the most accurate method provided by the robot manufacturer to teach the robot TCP. Put a 1 ” teach tip in place of the nozzle and teach the TCP at the pedestal stand. However, through the use of simulation or physical studies it may have been deemed necessary to extend the TCP to a length that makes sense for the individual applications. Always verify the TCP is correct by selecting the robots tool coordinate motion and align the teach tip pointer with the registration stand pointer and then rotate about all axes, the teach tip should remain fixed on the registration stand pointer. If the teach tip does not stay fixed verify that the manufacturers procedures have been correctly followed and retry. If you cannot teach an accurate TCP contact the Manufacturer for assistance.

It is recommended that when installing the Tool Center Point the that the six point method is used.

USER FRAME / Work Object Frames

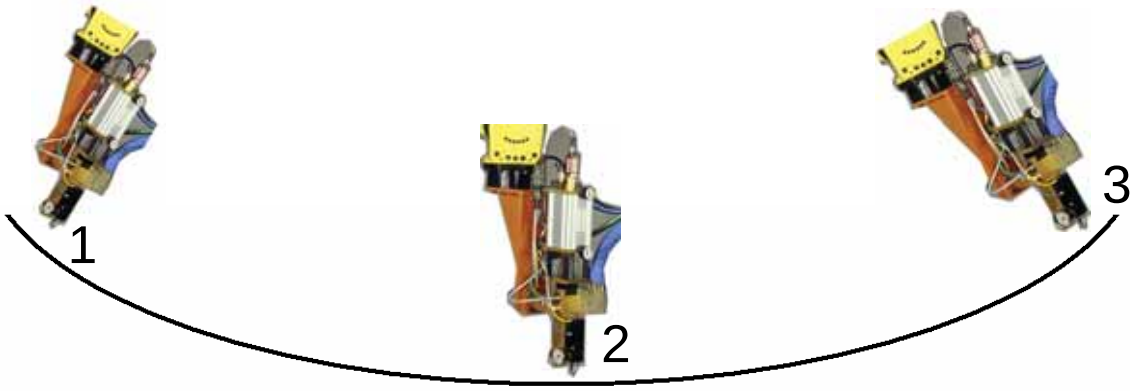
The User Frame or work object frame is set up using the right hand rule so that (+) positive X is the same direction as the flow of the line or part. This is a practical way to set up the work object frame so as to spend little time discovering the Cartesian coordinate directions when manipulating path positional data. The most efficient way to select an origin for a work object frame for a single robot application is to chose a point that it is equidistant form all the points in a path and securely in the robot work envelope. In the cases where multiple robots are working on the same part in the same coordinate system it would make more sense or select the center of gravity of the work object to accommodate global offsets as in the case of vision. The origin can be found by moving the robot to the desired point in space and writing down the X,Y,Z coordinates. These coordinates should be rounded off to the nearest ones place and then manually entered into the X,Y,Z coordinates of the work object frame. At this point W,P,R should all be zero which indicates that the frame is in line with the robot world frame. Next, determine the amount of rotation, in 90º increments, needed to alien the world frame of the robot so that its (+) X direction points in the direction of the flow of the part. For a Fanuc robot enter that number in the R coordinate of the work object frame. For an ABB robot enter the correct number for the quaternians. Record the numbers to the documentation accompanying the robot controller under setup information.

NOTE: A user frame must be used if the program is using RTCP (Remote Tool Center Point)

Motion Planning

It is very important to correctly program the path if TCPP is being used. The motion should be smooth and not jerky. Try to use the 4th, 5th and 6th axes as Little as possible. When these axes are moved they accelerate the flow command signal. The signal in no longer stable and starts to oscillate. Try to do most of the motion with the 1st, 2nd and 3rd axes. The following are some programming rules that help create better dispense beads:

1. Do – program the path in Linear motion not Joint or circular.
2. Do Not – change the coordinate system during dispensing. This include leading in and leading out.
3. Do – A lead in and lead out point is required before a SS or SE. Normally the point is 4 inches before the bead start or end.
4. Do Not run the dispense equipment if the command voltage is over 80% of the signal. The system will not repeat.
5. Try to run the equipment in the 40 to 60% command voltage range.
6. Do Not run an adhesive over 100ºF. It will accelerate the curing of the material.
7. Have batch compensation OFF and the Global Scaling at 100% and the Offset at 0 when programming.
8. Do not use fine points when programming

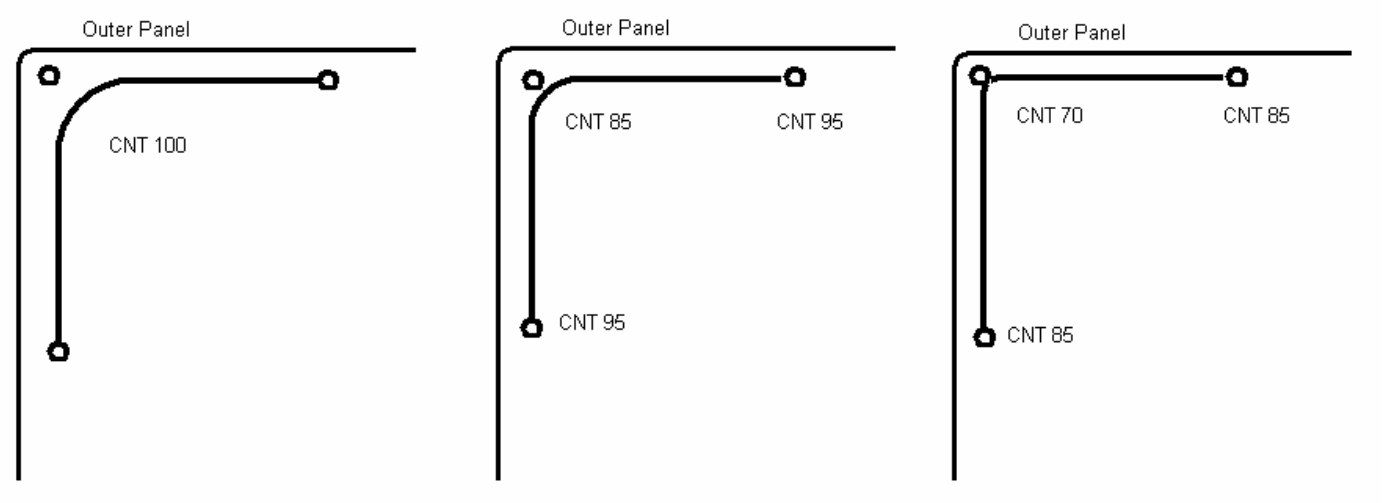


Most panels are not flat and the preferred dispense orientation is perpendicular from the panel (see diagram above). When the dispense head is re-orientated the 4th, 5th and 6th axes must be used. To do this it is best to use the motion of the robot. Start at point #1 and insert a node perpendicular to the panel. Move the robot to point #3 and insert another node. Move the robot from node 3 to node 1 at a slow speed. Stop the robot halfway and only use the first 3 axes to move the robot to point #2. If more points are needed so that the arc is smooth add them in the same manner. When finished the robot will have a smooth motion and a gradual change in the flow command signal.

Motion Planning

The Process of doing a corner is very simple with TCPP. Just put a point in the corner and a lead in and lead out point about 1.5 inches (3.81 centimeter) from the corner point. The normal robot motion will round the corner with 100 CNT. To make the corner sharper lower the CNT values in the corner until the sharpness of the corner is obtained. See Example below. Notice that the lower the CNT value are set the sharper the corner are. The robot will slow down in the corners and the command voltage will drop automatically – otherwise the corners will have extra material in them. If direct voltage is used the voltage needs to be changed at all three points of the corner.

NOTE: DO NOT USE A CNT VALUE BELOW 50.



When teaching the robot path program. It is very important to try to keep the nozzle perpendicular from the panel. It is not always possible to do this – if the nozzle needs to be angled try to have the bead follow instead of leading. This will effect the look of the bead. It is very important to find the robot speed Before TCPP values are adjusted.

Ideally keep the nozzle perpendicular

Have the bead follow the nozzle

Last choice have the bead lead.

Robot Direction

Setting Up Dispenser I/O.

The next step is understanding the associated data fields in the Fanuc controller that are associated with dispensing.

a. The Menu-/1/O-(type) dispenser.
b. The Inputs and outputs that are related to the dispenser must be assigned. If a SS - SE (seal start or seal end) is entered into the path program the device net digital signal must correspond. This links the device net I/O to the SS & SE commands.
c. Without this information when a SS1 is commanded nothing will happen.
d. If the robot has two equipments set up there will be a screen for E1 and E2. press next and select equipment number to see the other equipment.
e. Refer to the robot I/O to set this information.

NOTE The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1. Also your screen will differ depending on options.

I/O Sealing In E1
Dispensing Equipment

NAME	IN	PT	SIM	VALUE
1 Dispenser Ready:	DI	[1]	U	OFF
2 In-Process:	DI	[2]	U	OFF
3 Volume Fault:	DI	[3]	U	OFF
4 Major Fault:	DI	[4]	U	OFF
5 Minor Fault:	DI	[5]	U	OFF
6 Automatic Mode:	DI	[6]	U	OFF
7 Manual Mode	DI	[7]	U	OFF

To change between the input and output screens , press F3, IN/OUT. You will see a screen similar to the following.

I/O Sealing Out E1
Dispensing Equipment

NAME	OUT	PT	SIM	VALUE
1 Open gun:	DO	[1]	U	OFF
2 Flow Command:	GO	[1]	U	0
3 Style Bits:	GO	[2]	U	0
4 Style Strobe:	DO	[2]	U	OFF
5 Dispense Complete:	DO	[1]	U	0
6 Remote Start:	GO	[2]	U	0

Note: This screen is very handy to use – The outputs can be fired and the inputs can be monitored.

Tuning the dispense equipment

1. The first step in this process it to complete the path program. It is essential to know the robot speed. All of the adjustments for TCPP must be done at the normal run speed of the robot. The robot path program is normally taught first so that the cycle time can be established. If the cycle time is not met the path may need to taught faster.

2. Create a path that is a straight line with a SS and SE that is 1 Foot or 30 centimeters long.

3. Using the Setup Page select constant voltage and set it to 5V.

4. Run the path program and note the bead size. The bead size will not normally be the size you need. It will need to be adjusted.

5. To adjust the bead size the following options may be used.
   a. Raise or lower the voltage. If the voltage becomes above 7.5 volts or below 2 volts. Another variable will need to be changed.
   b. Adjust the material temperature – Higher will increase the bead size and lower will decrease the bead size.
   c. Change the nozzle size. - Larger will increase the bead size, however the velocity of the stream will decrease – the robot path may need to be closer to the panel.
   d. A small nozzle will make the velocity of the stream increase (shoot farther) but increase the chance for a tip plug.

6. The Dispense system needs to run in the mid range before TCPP calibrations are attempted. If the equipment is running a 2 or 9 volts flow command the system will not be able to alter the flow command enough to effectively make TCPP work.

SS Robot Speed same as path program SE

Use the voltage in the Constant / Manual Setup screen to setup desired flow rate. (5v = 2045)

Seal Schedules

1. The Seal Schedules can be accessed by depressing the DATA button and then F1 Seal Schedules.

2. This is where the system can be set up for direct voltage or TCPP Bead Width calibration. There are 30 seal schedules for each equipment. More than one seal schedule or type (TCPP or Direct Voltage) can be used in a path program. A signal path program can consist of direct voltage and TCPP Bead Width Variables.
   a. An example of using both variables in one program would be if there was an area of the panel that needed to be filled. If BW was chosen and the robot was not moving the command signal would be 0.

•**1** Press DATA.
•**2** Press F1, [TYPE].
•**3** Select Seal Sched. If the following screen is not displayed, press F2, LISTING. You will see a screen similar to the following.
NOTE The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1.

DATA Seal Sched
E1Variable Orifice System

Schd	Value		Flow Type	Comment
1	10.0	mm	BW TCPP	FOUR DOOR LR
2	0.0	mm	BW TCPP	
3	4	V	Volts	
4	0.0	mm	BW TCPP	
5	0.0	mm	BW TCPP	
6	0.0	mm	BW TCPP	
7	0.0	mm	BW TCPP	
8	0.0	mm	BW TCPP	
9	0.0	mm	BW TCPP	

•**4** Set the values for each schedule as appropriate.
• **5 To display more information about a single schedule,** press F2, DETAIL. You will see a screen similar to the following.

Seal Schedules

1. Under The dispense style depress F2 for the LISTINGS of the body styles. Another screen will show some of the specific adjustable information for each individual body styles.

DATA Seal Sched E1	
Variable Orifice System	
1 Schedule # 1	
2 Flow type:	TCPP Bead Width
3 Flow model:	LINEAR
4 Flow rate:	3.00 mm
5 Guns used:	1--***
6 Equip. ant-time:	0 ms
7 Eq. additn. ant-time:	0 ms
8 Gun on ant-time:	0 ms
9 Gun off ant-time:	0 ms
10 Bead shaping (BS):	0.0 psi
11 BS on ant-time:	0 ms
12 BS off ant-time:	0 ms
13 Pre-pressure time:	0 ms
14 De-pressure time:	0 ms
15 Correction factor:	1.0
16 Correction bias:	0v
17 SS time offset:	0ms
18 SE time offset:	0ms

- **To return to the LISTING screen** , press F2, LISTING.

2. The information that we will normally use is:
   a. (2) Use TCPP Bead Width or Volts (direct voltage).
   b. (3) Linear should be used in all configurations.
   c. (4) Flow rate should be the size bead that is required or if direct voltage is used a voltage number 0-10v can be inserted.
   d. (5) Guns used normally set to 1
   e. (6) Equipment. Ant-Time is the equipment delay. This variable sends the flow command before the robot actually gets to the node. Without this variable set correctly TCPP will not work. This is the reaction time of the mechanical equipment.
   f. (8) Gun on ant-time This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned on. If you want the gun to turn on before the robot reaches the destination position, set ***Gun on ant-time*** to a negative number. If you want the gun to turn on after the robot reaches the destination position, set ***Gun on ant-time*** to a positive number.

Seal Schedules

Continued:

DATA Seal Sched E1	
Variable Orifice System	
1 Schedule # 1	
2 Flow type:	TCPP Bead Width
3 Flow model:	LINEAR
4 Flow rate:	3.00 mm
5 Guns used:	1--***
6 Equip. ant-time:	0 ms
7 Eq. additn. ant-time:	0 ms
8 Gun on ant-time:	0 ms
9 Gun off ant-time:	0 ms
10 Bead shaping (BS):	0.0 psi
11 BS on ant-time:	0 ms
12 BS off ant-time:	0 ms
13 Pre-pressure time:	0 ms
14 De-pressure time:	0 ms
15 Correction factor:	1.0
16 Correction bias:	0v
17 SS time offset:	0ms
18 SE time offset:	0ms

- **To return to the LISTING screen** , press F2, LISTING.

g. (9) Gun off Ant:time. This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned off. If you want the gun to turn off before the robot reaches the destination position, set ***Gun off ant-time*** to a negative number. If you want the gun to turn off after the robot reaches the destination position, set ***Gun off ant-time*** to a positive number.

h. (10) Bead shaping is normally not used. The BPR system uses bead shaping and calls out a GO = xxxx directly from the path program.

I. (15) The Corrector Factor should always be set to 1.0 this value multiplies the flow command by a percentage (1.0 = 100%).

j. (16) Correction bias should always be set to 0v this value adds or subtracts direct voltage to the flow command.

The rest of the values are not mentioned and are normally not used:

NOTE: If multiple seal schedules are used the specific information for each body must be duplicated in each seal schedule. If the values are entered in one schedule they are NOT entered in all schedules.

Dispense Equipment TCPP Setup

This screen is under MENU/SETUP/DISPENSOR
These set of variables Setup the TCPP bead size requirements.
Some of the newer fields will ask for the robot speed. This would be the normal speed of the dispense path.

```
EQ SL Setup                D1
R-J3 Vari. Orifice Dispense System
Flow Rate Calibration
Calibration status:          DEFAULT
Seal sched in MOV_SEAM:      30
 1 Flow rate type:           TCPP Bead Width
 2 Desired flow rate:        3.0 mm
 3 Sample program:           [MOV_SEAM]
 4  Home program:            [MOV_HOME]
 5 TCPP BW scale factor:     1.000
```

Seal Schedule in Mov_seam is the default calibration seal schedule when running the automatic calibration program (Not Recommended to run).

1. Desired flow rate indicates the target flow rate that will be used for this calibration. Set this to the flow rate that will be used most often in your process. Editing this item is the same as editing Flow rate type in the specified sealing schedule, which is sealing schedule 30. If one equipment is dispensing 2 bead sizes such as a 3mm and 5mm. An in-between size should be chosen - 4mm. This is one of the values that the command signal (0-4095) uses to scale itself.
2. TCPP BW scale Factor should be set to 1.000. This is an internal factor not easily changed. Do not run the sample programs as the will alter this scale factor.

Dispense Equipment TCPP Setup

These set of variables tune the TCPP variables into the dispense equipment. These are calibrations variables used to tune the dispense bead into the required bead size.

Setup Scaling	D1	
R-J3 Vari. Orifice Dispense System		
1	Material Factor	1.00
2	Flow Rate Bias	0.00v
3	Minimum Flow Command	0.00v
4	Flow command AOUT type	Volts
5	Use Default ACC:	Disable
6	Default ACC	20
CALIBRATIONS		
8	Meter Max Speed	Complete
9	Flow Rate Control	

- **To return to the LISTING screen** , press F2, LISTING.

1 Before starting verify that the (8) Meter Max Speed calibration has been completed. If not follow these steps.
   a. Move the curser until COMPLETE is highlighted.
   b. Press (F3) Start on the teach pendent
   c. Verify the Maximum voltage is 10.00v
   d. Verify the voltage step is 0.10v
   e. Continue without moving the robot and the calibration will be complete.

2. Material Factor is a multiplying scale factor of the bead. This factor sets the major size of the bead. Mostly controls the large size of the bead in the straight away. This is when the command signals are the greatest.

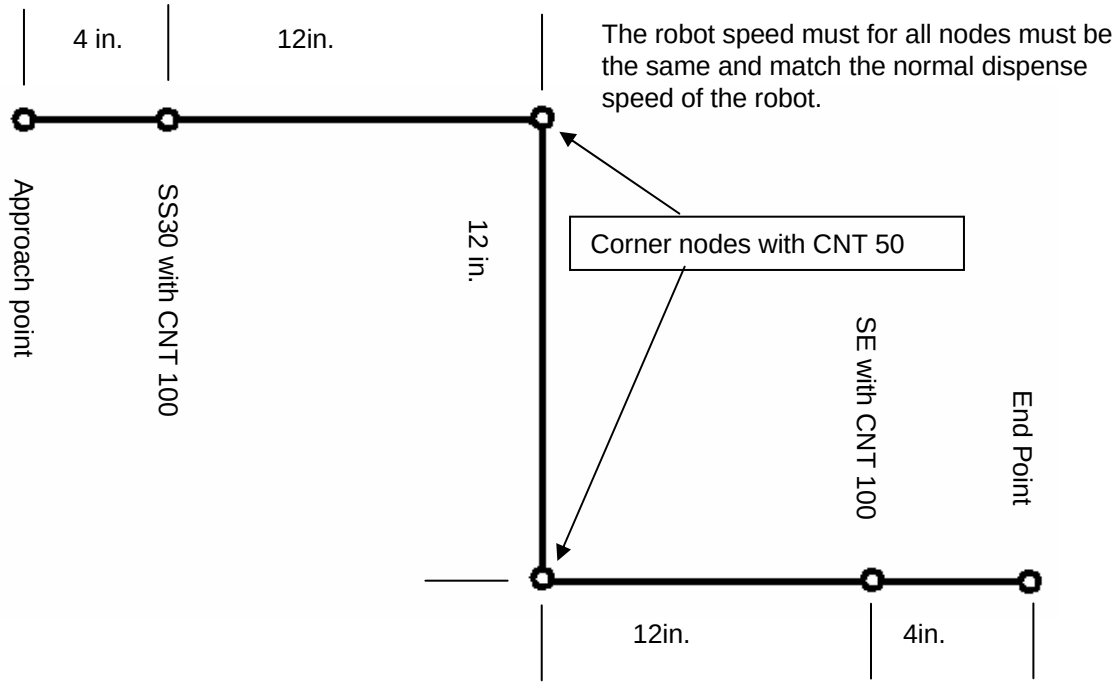
3. Flow Rate Bias adds or subtracts voltage to the command signal. This factor sets the minor size of the bead. When the robot goes through a corner the material factor command signal can go to zero. If this happens the corners will not have any material. To offset this voltage is added to the signal to make the corners the correct size.

Finding the Equipment Delay.

One of the first requirements of dispensing is to find the equipment delay. The only way that this can be achieved it to run a specific program and change the equipment anti-time variable listed in the DATA variables.

ZIGZAG

ZIGZAG is a program that is used to establish the equipment delay. This program MUST be run at the same speed that is in the normal run dispense path program. Follow the example below as a path program.



Create the program on the dispense part or something strong enough that one can scrap off the material. Mark the seal start and the seal end positions. Use seal schedule 30 to set up the bead size.

Finding the Equipment Delay.

Use seal schedule #30 and verify that the correct be size is set up in the DATA/ Seal Schedule and that the flow type is TCPP bead width.

In MENU/SETUP/DISPENSER make the following adjustments to the bead size..

1. Increase the Material factor to 5.0. This will give a very high scaling factor which will make the large part (straight away) part of the bead very big. The bead size is not important at this time – the equipment delay is.

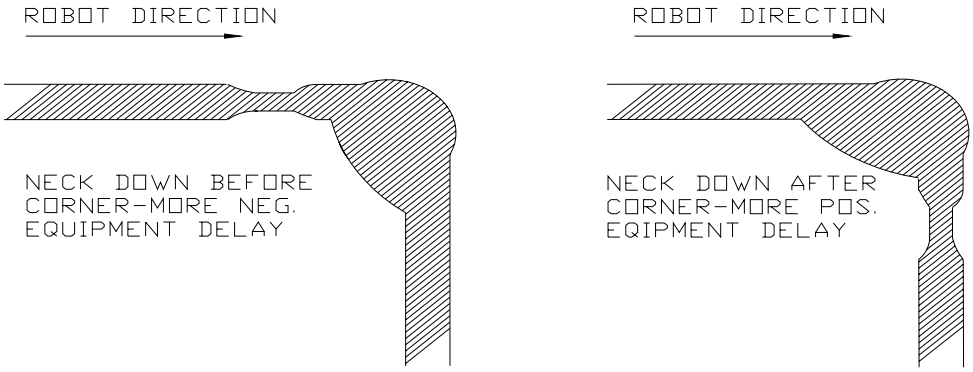
2. Decrease the Offset Bias to -1.5v. This will make the smaller part of the bead (corners) look like they almost have no material.

3. Run the bead path – Make sure that a style bit and strobe is sent otherwise the system will run in manual voltage.
   a. The straight away should look heavy.
   b. The corners should have too much material.
   c. There should be a neck down in the bead after the corners.

4. The neck down in the bead after the corners is the actual equipment delay. The robot is sending the flow command signal at the actual time it approaches the node. It take a few milliseconds for the dispenser to respond.

5. Adjust the equipment delay in the DATA SEAL SCHEDULE menu.
   a. Normally a 1K system running 500mm/s will have a equipment delay of 50ms.
   b. Keep adjusting the equipment delay until the neck down area is directly in the corners.

6. Transfer the equipment delay to all of the seal schedules that the program will use.



NOTE: WHEN RUNNING THE BEAD PATHS THEY MUST BE RUN A 100% SPEED

Adjusting the Gun On-Off Delay

Use seal schedule #30 and verify that the correct be size is set up in the DATA/ Seal Schedule and that the flow type is TCPP bead width.

1. Verify that the equipment delay is in the seal schedule that is being used. The equipment delay will effect the gun on and gun off anti time.

2. Run the path and the bead should start slightly after the node is programmed for the SS (Gun On).
   a. This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned on. If you want the gun to turn on before the robot reaches the destination position, set ***Gun on ant-time*** to a negative number. If you want the gun to turn on after the robot reaches the destination position, set ***Gun on ant-time*** to a positive number.
   b. Adjust the Gun On ant-time until the bead start is directly on the SS node.

3. Run the path and the bead should end slightly after the node is programmed for the SE (Gun Off).
   a. This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned off. If you want the gun to turn off before the robot reaches the destination position, set ***Gun off ant-time*** to a negative number. If you want the gun to turn off after the robot reaches the destination position, set ***Gun off ant-time*** to a positive number.
   b. Adjust the Gun Off ant-time until the bead ends directly on the SE node.

Adjust the bead size.

1. Run the bead path and adjust the Material Factor in the MENU/SETUP/DISPENSOR screen until the correct bead size is achieved.

2. The corners should be undersize. Adjust the Offset Bias in the MENU/SETUP/DISPENSOR screen until the correct bead size is achieved.
   a. When the Offset Bias is increased the bead size on the straight away will increase. Just lower the Material Factor to compensate.

3. Adjusting the Material Factor and Offset Bias are set by trial and error method. Trying to use the formula rarely works and is a waste of time.

NOTE: WHEN RUNNING THE BEAD PATHS THEY MUST BE RUN A 100% SPEED

Running the Dispense path

The TCPP variables have been defined. They just need to be transferred to the seal schedule that is being used for the dispense bead path.

a. Go to the listing for seal schedule 30.
b. Copy the seal schedule and paste the values in the seal schedule that is being use for the dispense path.

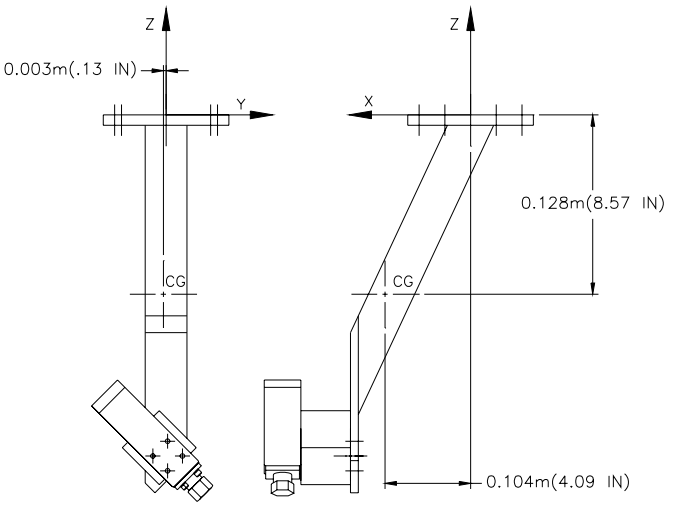
Run the dispense path that was programmed earlier. Some of the corners might need to be adjusted by adjusting the CNT percentage values.
If the bead size is not correct slight adjustments can be made to the MENU/ SETUP/DISPENSER Scaling Factor variable.

NOTE: There is a MENU/SETUP/DISPENSER set up screen for equipment #1 and another screen for equipment #2. If the robot is using 2 equipment. It is very easy to get these mixed up.

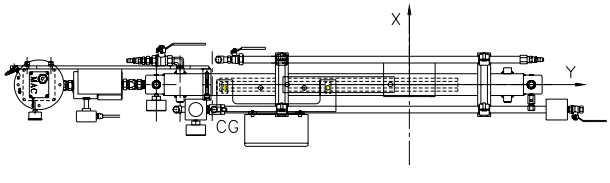
YOU HAVE JUST SET UP YOUR FIRST TCPP BEAD WIDTH CALILBRATION.

Robot Motion

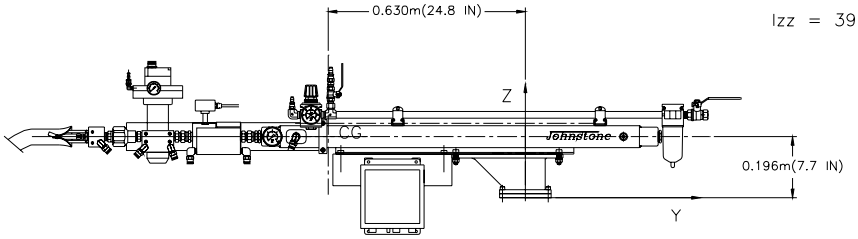
If the robot motion is not smooth some additional settings may be required.
Listed below are some variables that have helped programmers set up the robots and tune in the TCPP values. The variables are located under Menu/System/(type/Variables).
The robot payload from Fanuc is set to the maximum value of 120.000 . If the payload is lighter and the robot program is running faster than 500 mm/s the corner of the program could bounce. To fix this change the variable $GROUP - UPR_T/enter/enter/enter/$PAYLOAD (item 22).
Pounds X 2.2 = Kilo. The variable is in Kilo's.
Below are some standard weight and mass variables for a single system.



SINGLE GUN EOA TOOL
MASS = 6.1 kg
Ixx = 0.404 kgm^2
Iyy = 0.505 kgm^2
Izz = 0.113 kgm^2



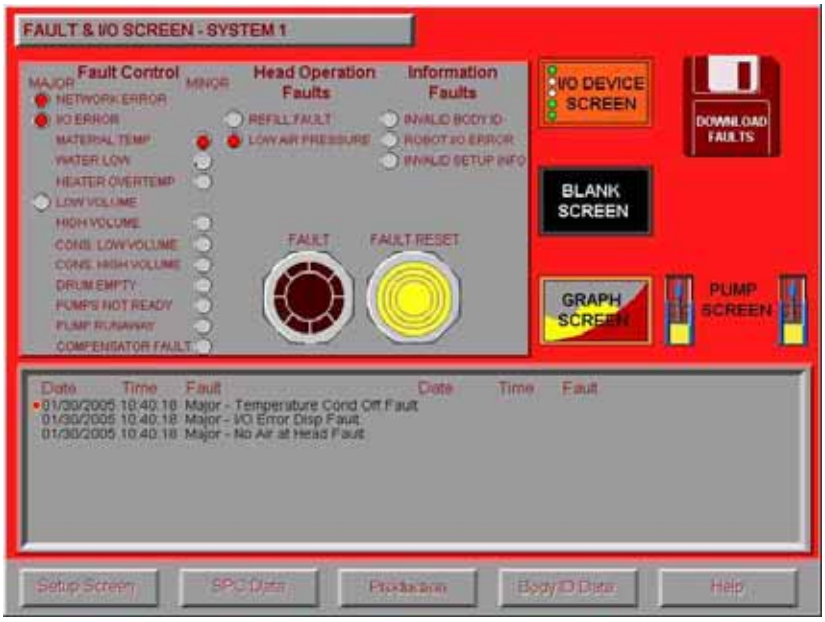
SINGLE HEAT EXCHANGER
MASS = 57.6 kg
Ixx = 16.2 kgm^2
Iyy = 2.5 kgm^2
Izz = 39.0 kgm^2



If a fault is on it will be shown with a red light. The setup screen determines if the fault is a Major or Minor

Note this picture shows 4 faults 3 Major and 1 Minor.

This a record of the faults that has a date/time log. The most recent fault has a red dot next to it.



Fault	Problem	Solution
1K & KC Low Volume Visually Verified not enough material. 1K only	1. Plugged tip 2. Expired Material 3. Low Dispense Pressures. 4. Plugged Material Filter. 5. Pump Pressure to Low 6. Plug in material path 7. Material not at temperature 8. Air Intensifier not working. 9. Scaling or Compensation out of range. 10. Body ID target changed. 11. Defective PSI Transducer 12. Dispense head not working 13, Robot Command signals to Low.	1. Replace tip and Purge. 2, Change Material and Purge 3, Check operation of Dispense head. 4. Change Material Filter Element. 5. Reset Pump PSI to Specifications. 6. Use pressure gauges to locate pressure drop in system. 7. Check Temperature system. 8. Check operation of Intensifier tank PSI= 150 Outlet =140 PSI 9. Reset Scaling or Batch Compensation. 10. Reset Body ID Target. 11. Test or Replace PSI Transducer 12. Check operation of dispense head (Seized Polyseals & check solenoid valves) 13. Check Robot Variables.
1K & KC Low Volume Visually Verified Good Bead	1. 1K - MLDT Linear transducer not functioning correctly 2. 1R- Flow Monitor K factor not set correctly	1. Replace MLDT and check wiring. 2, Reset the Flow Monitor K factor in the set up screen.

Fault	Problem	Solution
1K & KC High Volume Visually Verified too much material	1. Worn or not tip 2. Material too thin 3. Refill valve leaking 4. Material temperature to High. 5. Global Scaling or Batch compensation to high. 6. Robot Command Voltage to High 7. Body ID target value inaccurate.	1. Replace tip and Purge. 2, Change Material and Purge 3, Check valve for leakage-replace 4. Check Temperature system and reset the material temperature. 5. Reset Scaling and Batch compensation to 1. 6. Reset Variables in robot controller. 7. Reset body ID target value.
1K & KC High Volume Visually Verified Good Bead	1. Worn or not tip 2. Material too thin 3. Pump pressure to high 4. Material temperature to High. 5. Global Scaling or Batch compensation to high. 6. Robot Command Voltage to High or speed to slow. 7. Body ID target value inaccurate.	1. Replace tip and Purge. 2, Change Material and Purge 3, Check and reset pump pressure 4. Check Temperature system and reset the material temperature. 5. Reset Scaling and Batch compensation to 1. 6. Reset Variables in robot controller. 7. Reset body ID target value.
Refill Fault	1. Plugged material filters 2, Air pressure not on. 3. Pump Pressure to low. 3. Temperature system not on and up to temp. 5. Refill Solenoid/Valve not working. 6. Pressure transducer not reading. 7. MLDT not working 8. Dispense head seized. 9. Refill time set to short.	1. Change Material Filters 2. Turn on Air pressure to dispense head. 3. Check pump PSI and reset to specifications. 4. Start temp system and wait for pumps to pressurize. 5. Replace Refill or Solenoid Valve. 6. Replace pressure transducer. 7. Replace MLDT. 8. Replace dispense head. 9. Reset the Refill time in the setup screen.
Network Error	1. Communication has stopped between the robot and Autostream system 2. Controller/Robot locked up. 3. Device net card not working	1. Check for 24V at the device net terminals and reset robot controller and Autostream panel. 2. Reboot robot then Autostream Controller. 3. Replace device net card.

Fault	Problem	Solution
I/O Error Autostream Panel Error	1, One of the device net nodes is not working correctly. 2. Cable or wiring disconnected 3. Node not reading correctly. Does not have 3 green lights.	1. Look at the I/O device screen to see if all of the nodes are operating. Press fault reset button to clear. 2. Check for 24VDC and nodes and check the cables, tees and terminators. 3. Reboot system if not working replace buss coupler.
No Material Dispensed NO Fault	1. The robot did not send the Robot Style bit and the Job was Ignored.	1. Autostream software is operating correctly. The robot needs to send the robot Style bit.
PC Panel will not boot up	1. Does not have power 2. Software not loaded in VLC counsel 3. Device net cards not working 4. Hard-drive failed 5. Blue Screen only	1. Turn on the power PC has an on/off switch on it. 2. Load Files in VLC counsel (see replacing a hard drive) 3. Check jumper setting on DNet cards or replace 4. Replace hard drive. 5. Replace Hard drive then Replace PC.

DISPENSE HEAD

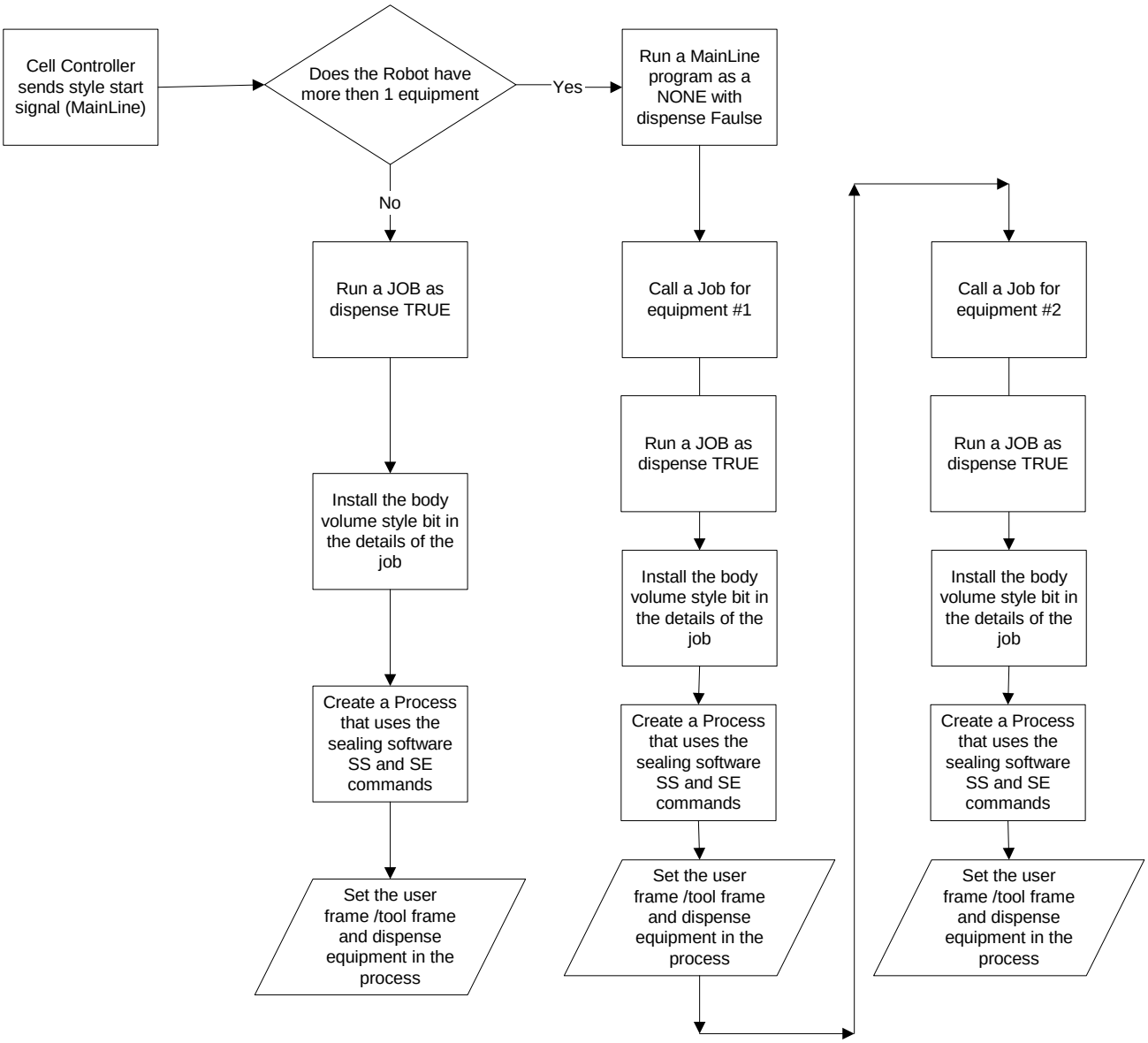
PROBLEM	CAUSE	SOLUTION
Material Leakage Past Rod Seals	Seals are worn	Replace Seals in Seal Cartridge.
	Rod is worn or scored	Clean off or replace rod.
	Cured Material on Rod	Clean off or replace rod.
Material Leakage from Seal Cartridge	Loose Connecting Parts	Tighten four Hex Head Bolts to Body.
	Cut or missing O-Ring	Disassemble using directions in this manual and replace O-Ring.
	Cracked Body	DISCONTINUE USE OF DISPENSER
Material Leakage from Refill Valve Bleeder hole	Valve Seals are worn	Replace Seals in Refill Valve.
	Valve Rod is worn or scored	Clean off or replace rod.
	Cured Material on Valve Rod	Clean off or replace rod.
Material Leakage from Transducer Well	Transducer is loose	Tighten BUT DO NOT OVERTIGHTEN the Transducer
	Cut or missing O-Ring	Replace O-Ring
Dispenser Not Refilling Properly	Low Air Pressure to Intensifier	Make sure air to the Intensifier is above 60psig.
	Low Material Pressure from Pumps	Make sure there is at least 200 psig of material pressure at the Dispenser.
	Refill Valve malfunctioning	Rebuild or replace Refill Valve.
Low Volume Faults	Material has changed viscosity	Change system parameters to account for change.
	Tip is plugging	Clean out or replace Dispense Tip.
	Position Transducer is out of calibration or malfunctioning	Replace Position Transducer.
High Volume Faults	Material has changed viscosity	Change system parameters to account for change.
	Tip is worn	Replace Dispense Tip.
System Lagging on Refill or Dispense	Servo Valve contaminated	Clean out or replace the Servo Valve. Assure that air is properly filtered (coalescing-type).
	Air Leakage past Piston.	Clean out the Air Section and replace Quad Ring if necessary.
Bead is Too Large at the Start of the Dispense	Feed Pump pressure is too high.	Reduce Feed Pump pressure to be at or lower than the Dispense Pressure.

TEMPERATURE CONDITIONING

Problem:	Solutions:
Unit will not start.	•Verify that the main disconnect is in the "on" position.
	•Verify that a water level fault is not present.
	•Verify that the fuses or breakers for the transformer and pump have not blown.
Unit has power but the pump is not running.	•Make sure that there is not a low water level fault.
	•Verify that the fuses or breakers for the pump have not blown. Set breaker to 1.6A
Pump is running but there is no flow.	•Verify that the pump is rotating in the proper direction.
	•Verify that all valves are open.
	•Clean the Y-strainer
	•Make sure that the tubing or water hose lines are pinched.
The unit is running but not heating.	•Verify that the controller is calling for heat. Output indicator light should be lit/pulsing.
	•Verify that the fuses or breakers for the heater have not blown.
	•Verify that the SCR is receiving a heat signal from the controller. The signal light on the SCR should be flashing green.
	•If there is not signal to the SCR, verify that the controller is providing a DC output.
The unit is not cooling with the chiller running.	•Verify that the controller is calling for cool. Output indicator light should be lit.
	•Verify that the fuses or breakers for the 3 Way Modulating Valve have not blown.
	•Verify that the controller is providing a mA output to the 3 Way Modulating Valve.
Low Water Level Fault is present	•Verify that the water level in the reservoir is below the level switch. If it isn't, replace the level switch as it is faulty.
	•"Walk" the water flow path for the entire circulation loop looking for a leak in any tubing, hoses, or manifolds. Repair or replace as needed.
Material Temperature Deviation Fault is present.	•If the process temperature is below the set point temperature, Check for flow restriction.
	•If the process temperature is above the set point temperature, Check for flow restriction and chiller operation.
	•Check to pressure gauge for an abnormally high system pressure
	•.Verify that all manual ball valves are open.
	•Verify that there is water flow through any tubing and hose Correct any pinched lines.
	•Clean the Y-Strainer located near the 3 Way Actuator Valve.
High Water Temperature Fault is present	•Check the pressure gauge for an abnormally high system pressure.
	•Verify that there is water flow through any tubing and hose Correct any pinched lines.
	•Clean the Y-Strainer located near the 3 Way Actuator Valve.

MATERIAL PUMP

PUMP AIR MOTOR	
Problem	**Solution**
Air Leakage out of the Main Exhaust	Check for worn or damaged O-rings on Spool #18 Check for worn or damaged "U" cup Packing #14 Check for worn or damaged Spool #20 Check for worn or damaged O-ring on Piston Assembly #50
Air Leakage around Piston Assembly	Check for worn or damaged "U" cup Packing #12
Air Leakage out of the pilot exhaust hole	Check for worn or damaged "O-ring #3 Check for worn or damaged inside diameter of Cylinder #6 Check for worn or damaged O-ring #1 Check for worn or damaged "U" cup packing #24 Check for worn or damaged "U" cup Packing #12 on Piston #11
MATERIAL LOWER PUMP	
No Material at Outlet (pump continually cycles)	Check material supply, disconnect or shut off the air supply and replenish the material, reconnect.
Material on one stroke only (fast downstroke)	The foot valve body may not be seating in the lower check valve seat. Remove the foot valve body from the check valve seat, clean and inspect the check valve seat area. If the foot valve or seat is damaged, replace.
Material on one stroke only (fast upstroke)	The valve seat may not be seating in the upper valve seat. Remove the valve seat, clean and inspect. If the valve seat is damaged, replace. Check for worn or damaged packings and seals. Replace the packings and seals as necessary.
Material leakage out of the solvent cup or material appears on the pump plunger rod	Relieve the pressure in the pump and tighten the solvent cup until leakage discontinues. If this procedure does not aid in stopping the leakage problem, the upper packing may be worn. Replace the packings as necessary.
Pump running freely in both directions	Air in Foot Valve – Open bleeder valve on Foot Valve and run pump until all of the Air is expelled. Verify the position of the Elevator hand valve – it should be in the down position.
Elevator not going up (leaking air from exhaust)	The elevator cylinder piston O-rings are leaking and should be changed. The elevator air pressure is set to low – raise PSI (40 PSI normal)



CREATING A JOB:

1. Depress **SELECT** on the teach pendent
2. Using the F buttons depress **Create**
3. Give the job a name using the F buttons and press enter to accept the name.
4. Using the F buttons select details.
5. Cursor down to sub type and using the F buttons choose **JOB.**
6. Add a comment by cursing over to the empty comment field and pressing **ENTER**.
7. Using the F button press next.
8. Make the job a **DISPENSE TRUE.** And press next.
9. The Part ID: must be given a number. This number is also identified in the Autostream pc as the body ID number. Give it a number between 1-64.
10. Using the F buttons select end.
11. Go to the Autostream controller and in the body ID screen select the same number, Give it a name and guess at a volume. The volume will be changed later.

I2. In the teach pendent Job that you just created call in PROGPICK and PROGDROP. These are the pick up and drop off programs that have been created for you.

Example of a Job
1: CALL PROGPICK ;
2: CALL PRGDELTA ;
3: CALL PROGDROP ;

CREATING A PROCESS:

1. Depress **SELECT** on the teach pendent
2. Using the F buttons depress **Create**
3. Give the PROGRAM a name using the F buttons and press enter to accept the name.
4. Using the F buttons select details.
5. Cursor down to sub type and using the F buttons choose **PROCESS.**
6. Add a comment by cursing over to the empty comment field and pressing **ENTER**.
7. Using the F button press next.
8. Make the program a **DISPENSE TRUE.** And press next.
9. The User Frame/ Tool Frame /Dispense equipment are defined on this page.
   a. The used frame must be setup (for lab use 1)
   b. The Tool Frame must be setup (for lab use 2)
   c. The equipment number is used to select E1 or E2. (for lab use 1)
10. Using the F buttons select end.
11. The path program can be programmed.
12. If the system is a pedestal RTCP needs to be added to each line.

EXAMPLE of a Path Program
1: UFRAME_NUM=1 ;
2: UTOOL_NUM=2 ;
3: ;
4:L P[1] 400mm/sec CNT100 RTCP ;
5: ;
6:L P[4] 700mm/sec CNT100 RTCP ;
7:L P[3] 400mm/sec CNT100 RTCP ;
8:L P[2] 400mm/sec CNT100 SS[1] RTCP ;
9:L P[5] 400mm/sec CNT100 RTCP ;
10:L P[9] 400mm/sec CNT100 RTCP ;
11:L P[8] 400mm/sec CNT100 RTCP ;
12:L P[7] 400mm/sec CNT100 RTCP ;
13:L P[10] 400mm/sec CNT100 RTCP ;
14:L P[6] 400mm/sec CNT90 RTCP ;
15:L P[11] 400mm/sec CNT100 RTCP ;
16:L P[14] 400mm/sec CNT100 RTCP ;
17:L P[13] 400mm/sec CNT100 RTCP ;
18:L P[12] 400mm/sec CNT90 RTCP ;
19:L P[15] 400mm/sec CNT100 RTCP ;
20:L P[22] 400mm/sec CNT100 RTCP ;
21:L P[21] 400mm/sec CNT100 RTCP ;
22:L P[20] 400mm/sec CNT100 RTCP ;
23:L P[19] 400mm/sec CNT100 RTCP ;
24:L P[16] 400mm/sec CNT100 RTCP SE ;
25:L P[17] 400mm/sec CNT100 RTCP ;
26:L P[18] 400mm/sec CNT100 RTCP ;
27:J P[23] 25% CNT100 ;
28:J P[24] 25% CNT100 ;
29: ;
30: UFRAME_NUM=1 ;
31: UTOOL_NUM=1 ;

To Look a the teach pendent using a remote computer:

1. On the remote computer choose start and run.
2. Type “telnet” and enter
3. A dos window will open and type “open xx.xx.xx.xx
   The xx.xx.xx.xx is the IP address of the robot.
4. the IP address can be found under the MENU/Setup/ Ethernet
   Under the TCIP protocol window.
5. A new window will open and Type “tpdisplay”
6. Type in a password if used. And teach pendent display will appear.

Also the Robot has a web server. To access it>

Open up your web browser and type in the IP address of the robot.

With this program the I/O, Current Position and Programs are available.

To find the IP address go to Menu/Setup/IO the press the F1 button (type) and select “Host Comm” and scroll down to TCIP Properties and press Details.