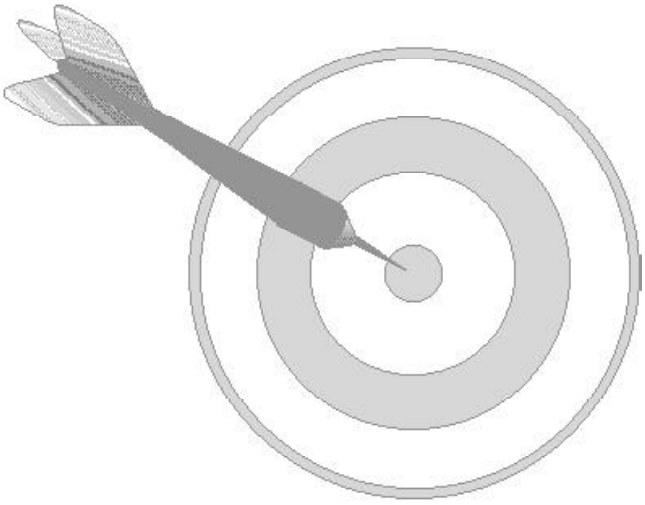
DART*Scanner*™

Process Data Collector
Operating Instructions



Making Molding Simple™

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Table 23: Itemized changes between the standard DART*Scanner*™ and the DART*Scanner*™ with failsafe option

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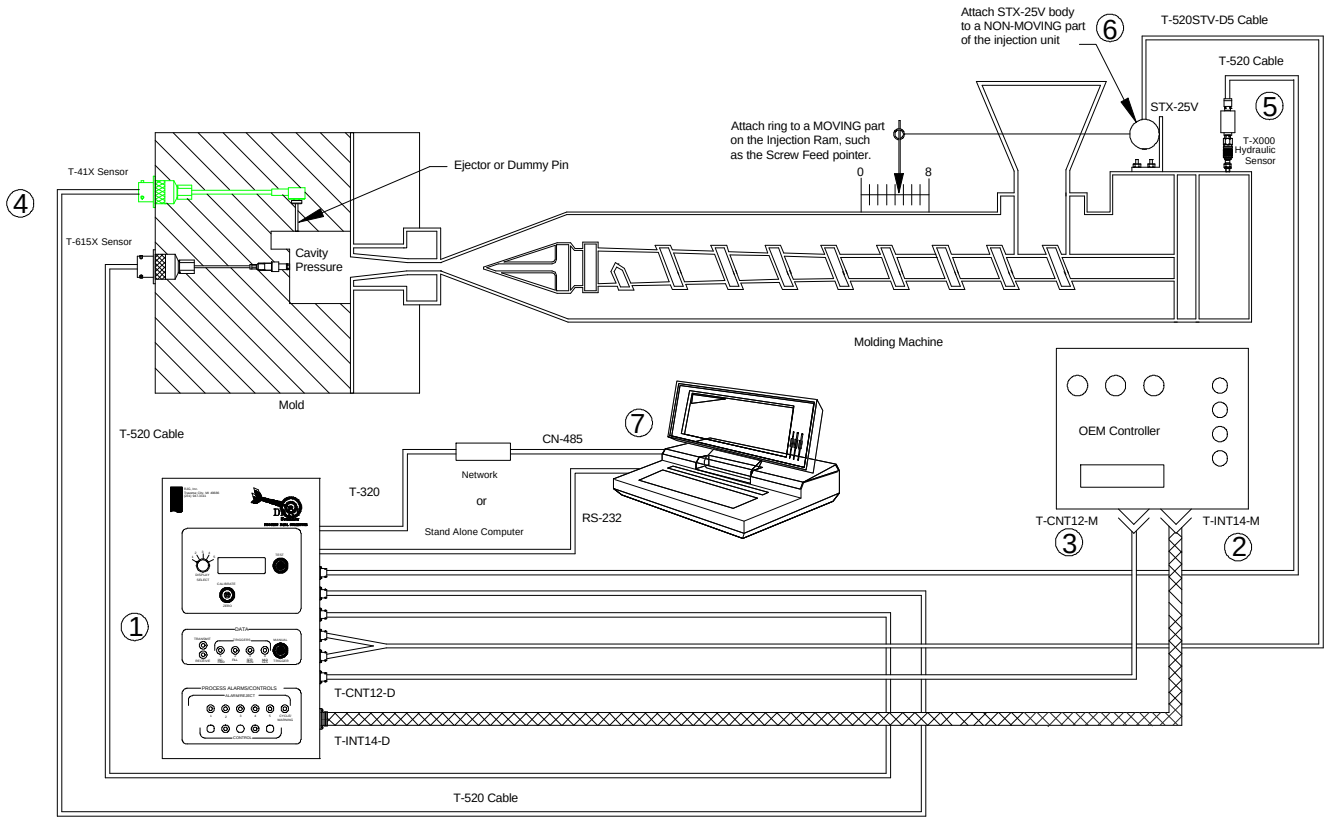


1 **DART*Scanner*™ Location** - The DART*Scanner*™ can be located anywhere that is convenient. However, there are certain considerations that should be taken into account. Refer to Section 4.1 for more information.

2 **Machine Interface** - In order to do important computations relevant to the injection molding process, the DART*Scanner*™ needs certain triggers from the machine controller. These triggers help synchronize signals from the hydraulic and mold pressure transducers to the actions of the machine for display in the DART*Vision*™ software. These signals are brought to the DART*Scanner*™ through the T-INT14-M panel mount connector and T-INT14-D machine interface cable. The DART*Scanner*™ also supplies two contact closure alarm outputs through the T-INT14-M that can be utilized to turn on warning bells and lights or to signal a robot to automatically reject a part. For more information on installation refer to Section 4.2.1.

3 **Control Interface** - To allow the use of a pressure or stroke set-point for machine transfer, a DART*Scanner*™ supplies three types of signals for Cavity Pressure Control: Contact Closure, Conditioned 0-10V and Conditioned 0-20mV. The user should select just one type of control that best suits their needs. A DART*Scanner*™ is provided with a T-CNT12-M panel mount connector with pigtail wires and a T-CNT12-D to connect the DART*Scanner*™ to the machine's controller. For more information on installation refer to Section 4.3.1.

4 Mold Pressure Transducer Interface - To see the molding process from the *plastic's point of view*, mold pressure transducers are interfaced to the DART*Scanner*™ through the Bendix connectors on the side of the DART*Scanner*™. These 6 pin female connectors are labeled HYD, MP1, MP2, MP3 and MP4, relating to channels 1 through 5. Typically those channels labeled MP1, MP2, MP3 and MP4 are used for mold pressure transducers. However all channels have the flexibility to be configured as needed. Refer to Section 4.4 for more information for setting up a transducer channel. For more information on mold pressure transducer installation refer to the *Installation and Use Instructions* for the RJG sensor you are implementing.

5 Hydraulic Pressure Transducer Interface - To gather information useful in creating rheology curves, hydraulic pressure transducers are interfaced to the DART*Scanner*™ through the Bendix connectors on the side of the DART*Scanner*™. These 6 pin female connectors are labeled HYD, MP1, MP2, MP3 and MP4, relating to channels 1 through 5. Typically the channel labeled HYD is used for hydraulic pressure transducers, however, all channels have the flexibility to be configured as needed. Refer to Section 4.4 for more information for setting up a transducer channel. For more information on hydraulic pressure transducer installation refer to the *Installation and Use Instructions* for the RJG sensor you are implementing.

6 Linear Stroke, Rotary Stroke and Rotary Stroke/Velocity Transducer Interface - To help determine shot size, stroke-velocity transducers are interfaced to the DART*Scanner*™ through the Bendix connectors on the side of the DART*Scanner*™. Even though these 6 pin female connectors are labeled HYD, MP1, MP2, MP3 and MP4, relating to channels 1 through 5, all channels have the flexibility to be configured for stroke-velocity. Refer to Section 4.4.4 for more information on setting up a stroke-velocity transducer channel. For more information on stroke-velocity transducer installation refers to the *Installation and Use Instructions* for the RJG sensor that you are implementing.

7 Network or Stand Alone Computer Interface - To access all the information the DART*Scanner*™ gathers, a computer can communicate with a DART*Scanner*™ either as a stand-alone unit via the RS-232 connector directly to the computer or on a network with other DART*Scanners*™ through the DARTNET RS-485 connector. For more information on RS-232 installation refer to Section 4.5.1. For more information on the RS-485 installation refer to Section 4.5.2.

3 User Section

The DART*Scanner*™ process monitoring system is permanently mounted to your molding machine. Using an RS-485 multi-drop network, you can connect several machines to one central computer to collect data.

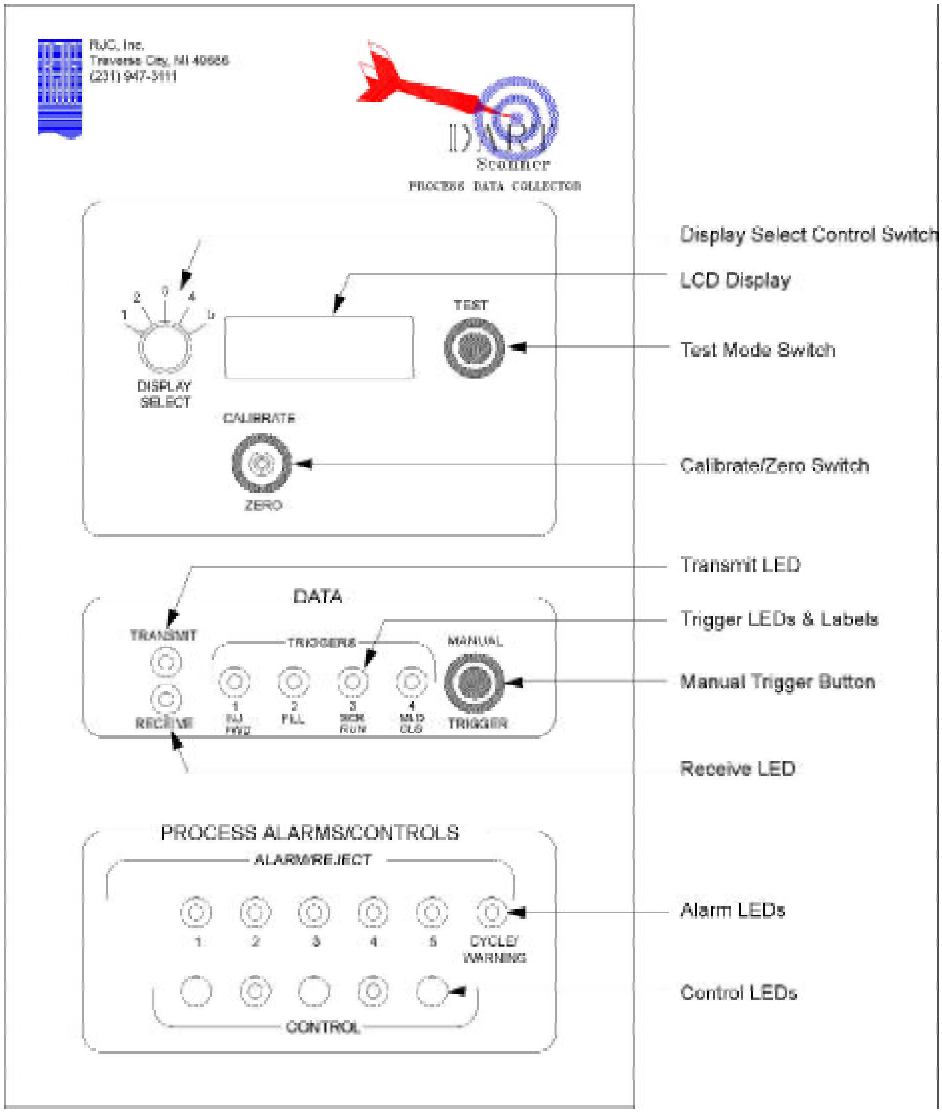


Figure A: DART*Scanner*™ front panel

3.1 Display Select Control Switch

This selects which channel's data will be displayed in the LCD to the right. This can be set from 1-5. For example, if you had this set to 1 and that was hydraulic, then the hydraulic pressure for that cycle would be displayed.

3.2 LCD Display

Shows the current signal for the channel that you have selected with the Display Select Switch.

3.3 Test Mode Switch

During normal operation, the pressure being read in will track up and down as the pressure rises or falls. If the "Test" switch is pressed, then the raw voltage signal being read in from the transducer will be displayed.

3.4 Calibrate/Zero Switch

At job startup, this is used to first zero and then calibrate the channel that is selected by the Display Select Switch. To "Zero" the channel, hold the switch down in the zero position. Then to "Calibrate," hold the switch up in the calibrate position. You should see a calibration number appear. This number should be within 1% of the calibration number that you see on the Dart Scaling window in the DART*Vision*™ Software (see Figure B).

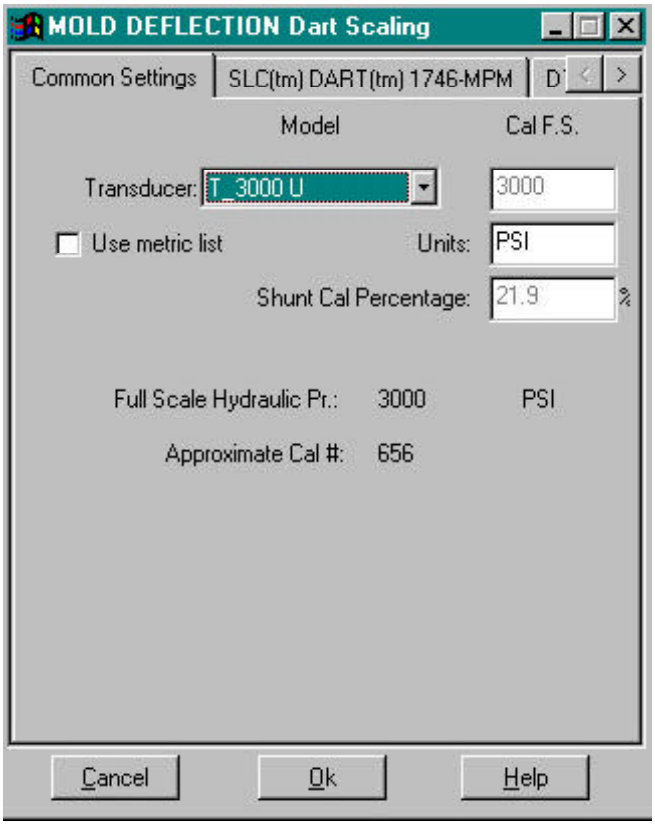


Figure B: DART*Vision*™ transducer scaling screen

NOTE: The molding machine can be "On," but should not be cycling during the Zero and Calibration.

You will need to calibrate each channel, which only needs to be done on a job start or if you change a transducer during a run. Remember that each time you start a new job, you need to calibrate the channels that you will be using.

3.5 Transmit LED

This light will come on when the DART*Scanner*™ responds to a request for data from DART*Vision*™.

3.6 Receive LED

This light will come on when the DART*Scanner*™ receives a request for data from DART*Vision*™.

3.7 Trigger LEDs

These are visual representations as to when the actual machine trigger signals are coming on. This will let you know if you have the T-INT14-M machine interface cable wired into the machine properly. Listed below is how the sequence of triggers should look if you have them all hooked up and in the proper locations.

1. Mold will "Close" and Trigger 4 (Mold Closed) will come "On."

2. Injection Forward (Hydraulics begin pushing plastic)
   Trigger 1 (Injection Forward), Trigger 2 (Fill Only), and Trigger 4 (Mold Closed) should all be "On."

3. Filling of the part is done and you are now packing.
   Trigger 2 (Fill Only) will go "Off", but Trigger 1 (Injection Forward) and Trigger 4 (Mold Closed) will remain "On."

4. Fill, Pack and Hold are done, and screw will begin to recover
   Trigger 1 (Injection Forward) will go "Off", but Trigger 4 (Mold Closed) will remain "On."
   After a brief second Trigger 3 (Screw Run) will come "On."

5. Screw is done recovering
   Trigger 3 (Screw Run) and Trigger 4 (Mold Closed) will both go "Off."

6. Mold Opens, ejects the part, Closes, and the cycle starts over.

3.8 Manual Trigger Button

This is used when you **do not** have any other triggers hooked up to the box. When the Mold closes, you can "Press & Hold" this button and the Trigger 1 light will come "On." Continue to hold it through Fill, Pack & Hold, and release it when you first hear the screw start to recover. By doing this, you are giving the DART*Scanner*™ a manual Trigger 1. You can also use the Manual Trigger Button to get data from the DART*Scanner*™ if you have triggers hooked up but are not cycling the machine.

Note: Pushing the Manual Trigger Button <u>does not</u> cycle the machine, it only tells the DART*Scanner*™ that one cycle has ended and another has started.

3.9 Alarm LEDs

The 1-5 under each one of the lights represents the input channels 1-5 for the transducers. If you have alarm parameters set in the software and have the alarms enabled, when an alarm is generated the light(s) for the channel(s) on which the alarm is generated will light up. You can then go to the Alarms display in the DART*Vision*™ software to see exactly what the alarm was. The one labeled as Cycle Time will alarm when you have exceeded the cycle time by the percentage that you have set in DART*Vision*™ setup.

NOTE: For simplified operations, see the Appendix.

3.10 Control LEDs

The green LED will show you on which channel the control feature is activated. This LED will light when the transducer signal passes up through the set-point and turn off when the signal drops below the set-point.

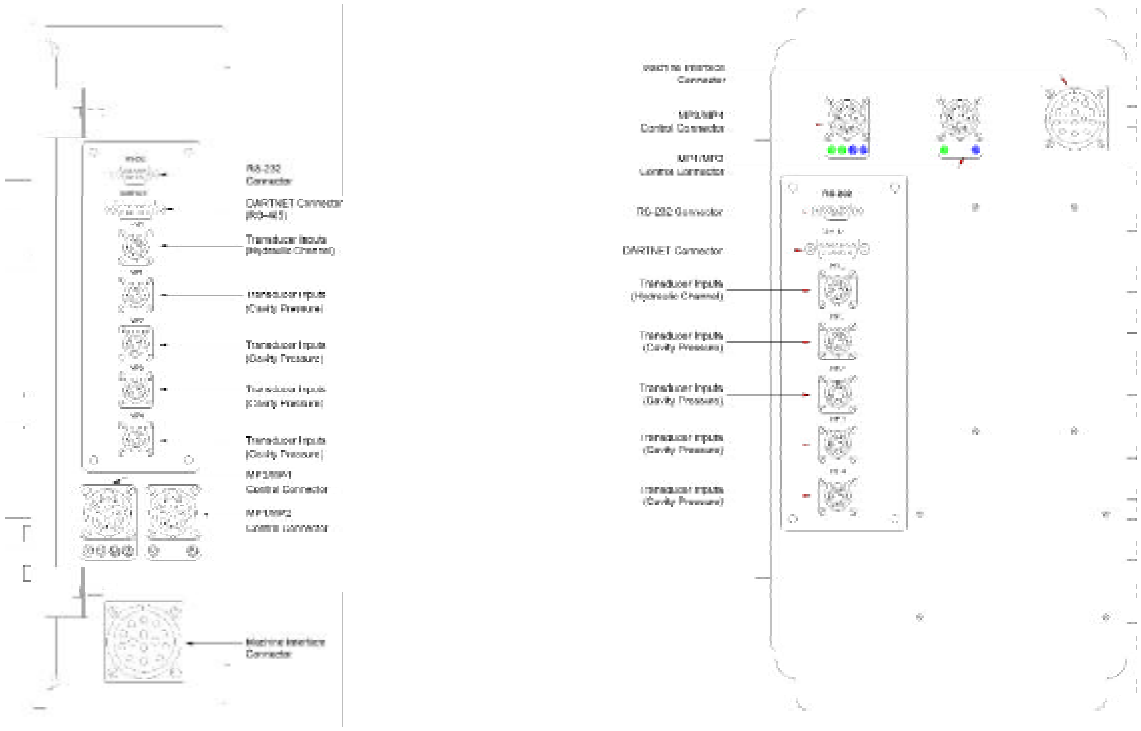


Figure C: Side mount connectors Back mount connectors

3.11 RS-232 Connector

This is an RS-232 communications port used by the DART*Vision*™ software to communicate with the DART*Scanner*™. Connect one end of a 9 to 9 pin serial cable to the DART*Scanner*™ and plug the other end directly to the serial port on your computer.

3.12 DARTNET Connector (RS-485)

This is a 15-pin RS-485 multi-drop communications port that is used when you have the DART*Scanner*™ on a network. You would connect one end of the TPJ-361 cable to this port and the other end of the cable to the SP-321M Splitter.

NOTE: You can only use one of the communications ports (COM1 or DARTNET) at a time.

3.13 Channel 1 - Hydraulic Pressure (HYD)

The Gain is pre-set to 250 or mid. You are supplied a T-3000U hydraulic transducer that needs to be mounted to the injection unit. Once the T-3000U is mounted, take a T-520 cable and connect one end to the hydraulic transducer and the other to channel 1 on the DART*Scanner*™.

3.14 Channels 2, 3, 4 & 5 - Mold Pressure Transducers (MP1 - MP4)

The Gain is pre-set to 250 or mid. Once you have the mold pressure transducer(s) installed in your mold, take a T-520 cable and connect one end to the transducer and the other to either channel 2, 3, 4 or 5.

NOTE: The configurations on channels 1-5 are examples. You can order your DART*Scanner*™ with the configuration that you want (i.e. Hyd, MPT, MPT, Stroke and Velocity, etc.).

3.15 MP1/MP2 Control Connector

This is where you will plug in the T-CNT12-D control cable. This will have one or two channels of control, depending how you order your box. The pigtailed end of the T-CNT12-M will then run into your machine panels and connect to your machine. You will need to reference your machine manual as to the type of control you need to use (Contact Closure, 0-10V or 0-20mv) and the exact connecting point within your machine.

3.16 Machine Interface Connector

Connect the T-INT14-D here. The T-INT14-M end will be pigtailed. This pigtailed end is then fed into the machine panel and hard wired to your molding machine. This wire harness contains the line power, Triggers and Alarm Out wires for the DART*Scanner*™.

NOTE: You are required to supply a Trigger 1 signal to see any data on the DART*Scanner*™.

What are triggers and how do I find them on my machine?

Triggers are usually signals (24VDC or 120-240VAC, see Table 1 for extended range) that you feed into the DART*Scanner*™ unit, using the supplied T-INT14-M cable, from the molding machine. These trigger signals indicate to the DART*Scanner*™ when important events happen during the machine cycle. They help synchronize signals from the hydraulic and mold pressure transducers to the actions of the machine for display in the DART*Vision*™ software. There are four triggers that we would like you to hook up. However, if you can only get Trigger 1, that is all that is necessary to begin collecting data. You may have to refer to your machine manual to help you locate these outputs. Here are the trigger inputs that we look for:

3.17 Trigger 1 - Injection Forward (INJFWD)

This is when the high volume pumps engage to begin pushing plastic. The signal is "On" during **Fill, Pack and Hold** and then drops out. Hook the Trigger 1 wire (blue) to the terminal, which will provide this signal. Every machine is different and you will need to refer to the manual for your machine to find this signal.

3.18 Trigger 2 - Fill (FILL)

This comes on when the high volume pumps engage to begin pushing plastic. The signal is "On" during **Fill Only** and then drops out. Hook the Trigger 2 wire (pink) to the terminal, which will provide this signal. This is **NOT** the same signal as Trigger 1 and you will need to refer to the machine manual to find this trigger. This trigger is optional, but if hooked up, will show you valuable information about your fill times.

3.19 Trigger 3 - Screw Run (SCRRUN)

This comes on when the screw starts to recover. The signal is "On" only during **Screw Recovery** and then drops out. Hook the Trigger 3 wire (orange) to the terminal, which will provide this signal. This trigger is optional, but if hooked up, will show you valuable information about your screw recovery times.

3.20 Trigger 4 - Mold Close (MLDCLS)

This comes on when the mold is fully clamped. The signal is "On" during the entire time the **Mold is Closed** and then drops out when the mold opens. Hook the Trigger 4 wire (brown) to the terminal block slot which will provide this signal. This trigger is optional, but if hooked up, will show you valuable information about your mold closed times.

3.21 Trigger Common

This is the common for your triggers and is the grey wire in the multi-colored harness.

NOTE: This must be hooked up for your triggers to operate correctly.

4 Installation

4.1 A Note on DART*Scanner*™ Placement

The DART*Scanner*™ can be located anywhere that is convenient, however, it is recommended that it not be placed too close to a material hopper or dryer. Material hoppers and dryers create a high level of static electricity and although the DART*Scanner*™ is protected from such discharges, it is a sensitive data collection device capable of being damaged in very extreme circumstances. Important technical specifications for the DART*Scanner*™ are listed in Table 1.

Measurements		Rating	
Power input range		AC: 85 VAC to 264 VAC; 47-440 Hz	
		DC: 120 to 370 VDC	
Operating temperature range		0-60C (-15F - 140F)	
Transducer Input Ranges	Low gain (1)	0 to 5V, 0 to 10V	
	Mid gain (250)	-20mV to +20mV	
	High gain (500)	-10mV to +10mV	
Excitation voltages		0V, 10V (factory standard)	
		0V, 15V (jumper selectable)	
		-15V, 15V (jumper selectable)	
Maximum common mode voltage		±10V	
Shunt calibration resistance		200kΩ	
Shunt calibration percentage of full scale (350 Ω bridge)		21.856%	
Number of acquisition channels		5 independent sampling channels	
Sampling rate per individual channel		100 samples per second	
Sampling resolution		1 Part in 4096 (12 bit A/D)	
Machine trigger voltage ranges		AC: 17VAC - 250VAC	
		DC: 24VDC - 250VDC	
Minimum control voltage output resistance	0 to 10V Output	1kΩ	
	0 to 20mV Output	100kΩ	
Control relay contact ratings		Maximum switching power	50 watts
		Maximuim switching voltage	500 VDC or Peak AC
		Maximum switching and carry currents	1A (limited by current limit fuse)
		Maximum control contact switching time after seeing set-point	13mS
Alarm relay contact ratings		15 A @ 120VAC resistive 10A @ 30 VDC resistive or 277VAC 1/2 HP @ 250VAC 1/3 HP @ 120VAC	
Serial communications types		RS-232 (proprietary protocol)	
		RS-485 (proprietary protocol)	

Table 1: DART*Scanner*™ technical specifications

4.2 Machine Interface Installation

A DART*Scanner*™ interfaces to the molding machine using the Control Interface and Machine Interface cables (see Figure 1).

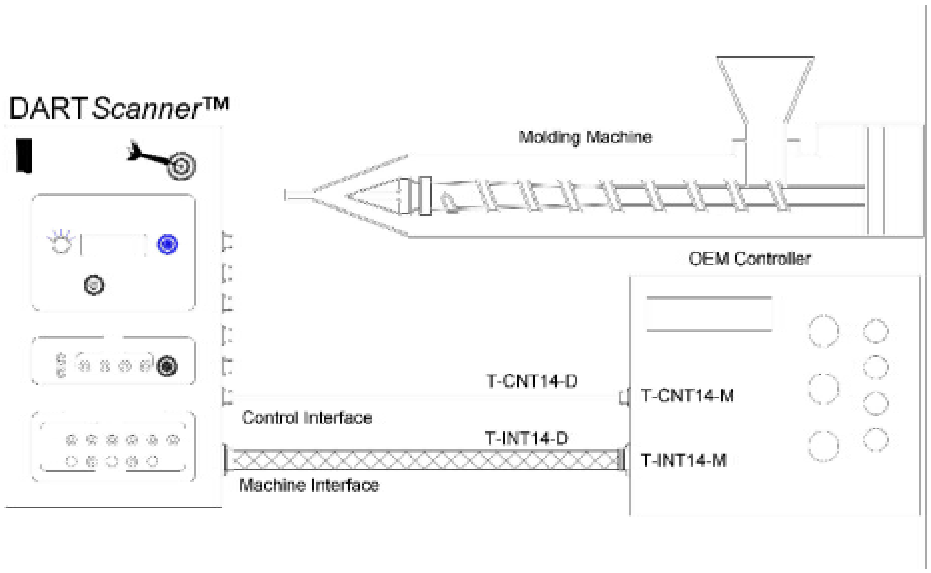


Figure 1: Connection of Control Interface and Machine Interface to molding machine

4.2.1 T-INT14-M Installation

A DART*Scanner*™ is provided with a T-INT14-M panel mount connector with pigtail wires, see Figure 2, that is used to interface the DART*Scanner*™ to a molding machine. Once installed into the molding machine, use the supplied T-INT14-D to connect the DART*Scanner*™ to the T-INT14-M. (See Table 2 for a wiring guide.)

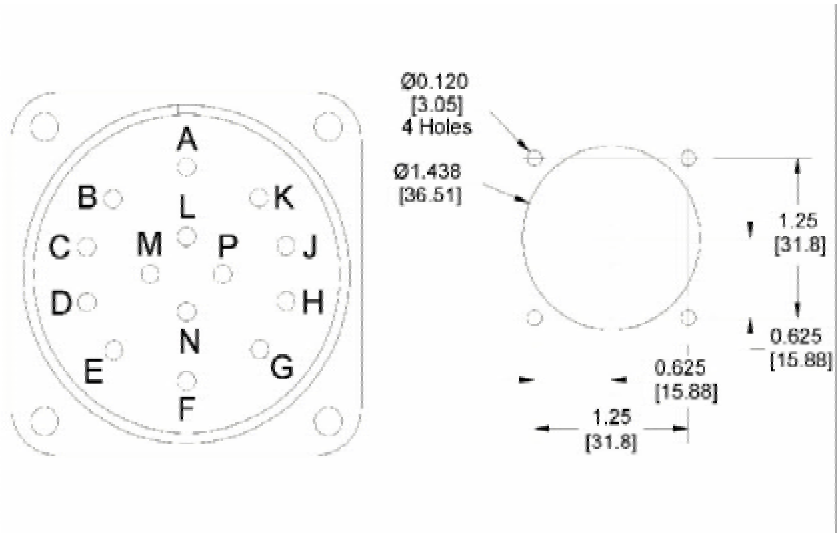


Figure 2: Cut out dimensions for installation of T-INT14-M panel mount control interface connector in inches (mm)

Pin	Signal	Signal flow	Wire Color
A	Fill (Trigger 2)	Machine⇨ DART*Scanner*™	PINK**
B	Injection forward (Trigger 1)	Machine⇨ DART*Scanner*™	BLUE
C	Screw run (Trigger 3)	Machine⇨ DART*Scanner*™	ORANGE**
D	Mold close (Trigger 4)	Machine⇨ DART*Scanner*™	DARK BROWN**
E	AC common	Machine⇨ DART*Scanner*™	WHITE
F	*Line power	Machine⇨ DART*Scanner*™	BLACK
G	Ground	Machine⇨ DART*Scanner*™	GREEN
H	Trigger common	Machine⇨ DART*Scanner*™	GRAY
J	Alarm contact normally open	DART*Scanner*™ ⇨ Machine	RED**
K	Alarm common	DART*Scanner*™ ⇨ Machine	LT BROWN**
L	Cycle time alarm contact normally open	DART*Scanner*™ ⇨ Machine	VIOLET
M	Cycle time alarm common	DART*Scanner*™ ⇨ Machine	YELLOW**
N	Reserved	-	**
P	Reserved	-	**

Table 2: Machine interface connector pin and pigtail cable guide

* Reference Table 3 for range

** These pigtailed wires have been individually shrink wrapped and the ends are tinned. The wires are optional for installation and if left exposed could cause unwanted problems. If needed for installation the shrink-wrap can be removed.

4.2.2 Power Inputs

It is recommended that if the machine supplies line power this is the power source that should be used to supply the DART*Scanner*™ with power (see Table 3 for range). It is also recommended that the machine ground be double-checked to insure a solid connection.

Power input range	
AC Range	85VAC to 264 VAC; 47-440 Hz
DC Range	120 to 370 VDC
Frequency	47-440 Hz
Max Current	1 Amp @ 115 VAC (fused @ 2.5 A)

Table 3: Power input range of DART*Scanner*™

4.2.3 Trigger Inputs

In order to do important computations relevant to the injection molding process, the DART*Scanner*™ needs certain signals from the machine controller. These signals indicate to the DART*Scanner*™ when important events happen during the machine cycle. They help synchronize signals from the hydraulic and mold pressure transducers to the actions of the machine for display in the DART*Vision*™ software. DART*Scanners*™ use the following four signals (triggers) from the machine controller:

- Fill: signal is on only during the fill phase of injection
- Injection Forward: signal is on during entire time of injection forward (fill, pack, and hold)
- Screw Run: signal is on during screw run time (recovery)
- Mold Closed: signal is on while mold clamp pressure is high

These signals can be taken directly from the valve solenoids or from the machine controller (see Figure 3).

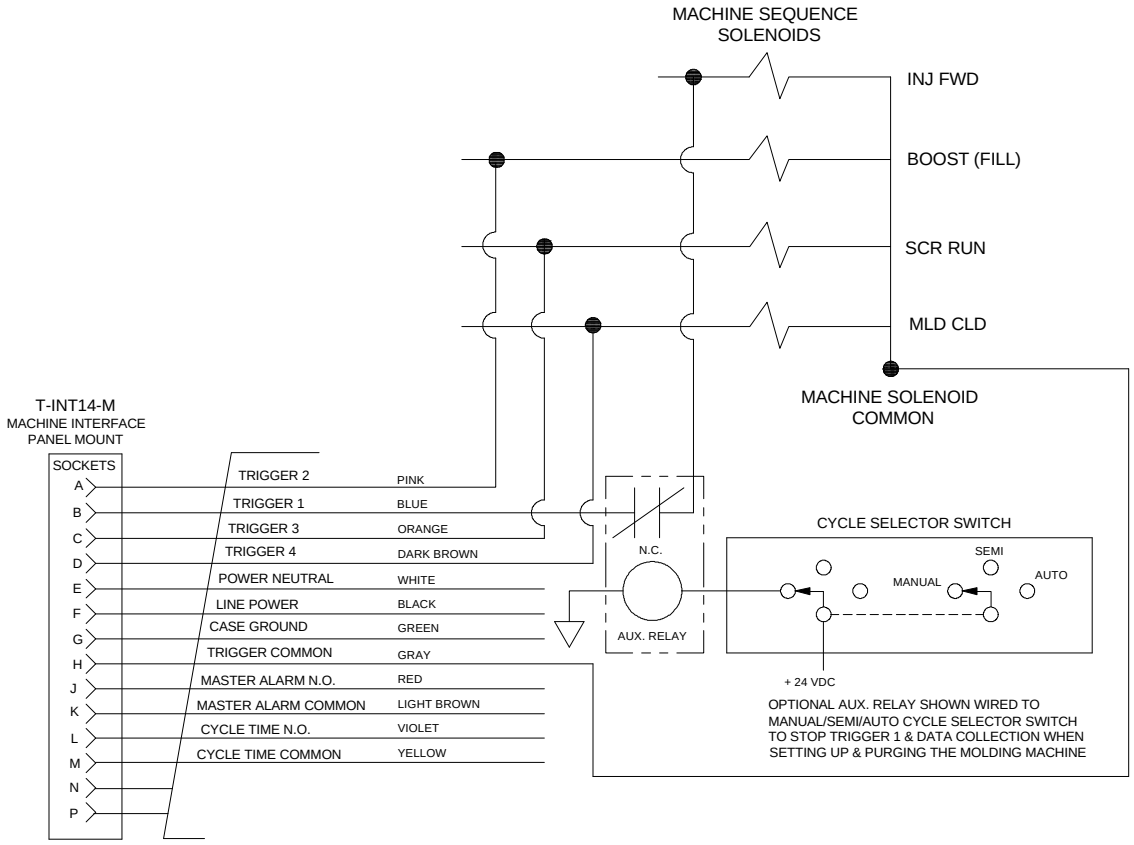


Figure 3: Trigger wiring guide

NOTE: The machine sequence signal input for Trigger 1 (the Master Trigger for the DART*Scanner*™) can be wired through the Manual/Semi-Automatic Cycle Selector switch on the press to disable the triggers when not running in Automatic cycle. This prevents the counting of parts and data collection during purging and set-up. Trigger 1 can be wired through an available set of normally closed terminals of the switch, which are opened when the switch is set to the Manual mode.

The DART*Scanner*™ inputs these trigger voltage signals using opto-isolated circuits to insure full isolation from the machine controller. Since the DART*Scanner*™ gets its power from the machine panel, machines that use contact closure triggers will have to supply the trigger voltage to the contacts. Powering the DART*Scanner*™ equipment from the machine panel eliminates problems associated with isolating two power sources. However, for added protection all DART*Scanner*™ trigger inputs are opto-isolated and all alarm outputs are contact closure.

Table 4 shows the differential voltage ranges the DART*Scanner*™ can use for trigger inputs. The DC "On" voltage can be positive or negative as long as when the trigger is "Off," the differential voltage is zero.

Trigger signal type	Voltage range
AC trigger	AC: 17VAC - 250VAC
DC trigger	DC: 24VDC - 250VDC

Table 4: Trigger voltage ranges

4.2.4 Alarm Connections

A DART*Scanner*™ supplies two contact closure alarm outputs that can be utilized to turn on warning bells and lights or to signal a robot to automatically reject a part. The contacts will stay open until the DART*Scanner*™ detects a variant cycle. The DART*Scanner*™ is shipped so that the cycle time alarm does not affect the master alarm (See Table 5 for contact ratings.) However, the ability to tie the Cycle Time Alarm output to the Master Alarm output is user selectable by moving a jumper inside the DART*Scanner*™. **Please contact RJG Customer Support at 231-947-3111 for assistance**.

Alarm relay contact ratings
15 A @ 120 VAC resistive 10 A @ 30 VDC resistive or 277 VAC 1/2 HP @ 250 VAC 1/3 HP @ 120 VAC

Table 5: Alarm relay contact ratings

4.3 Machine Transfer Control Installation

4.3.1 T-CNT12-M Installation

A DART*Scanner*™ is provided with a T-CNT12-M panel mount connector with pigtail wires (see Figure 4) that is used to transfer the machine using the DART*Scanner*™. Once installed, use the supplied T-CNT12-D to connect the DART*Scanner*™ to the T-CNT12-M (see Table 6 for a wiring guide.)

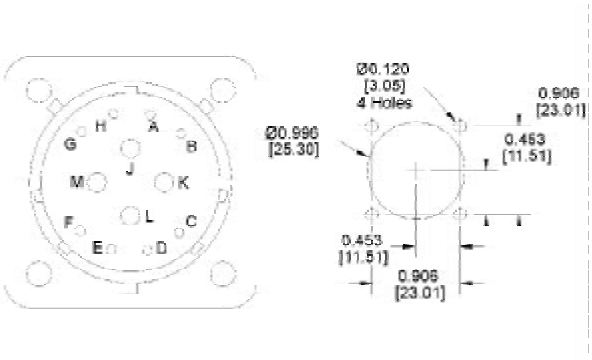


Figure 4: Cut out dimensions for installation of T-CNT12-M panel mount machine interface connector in inches (mm)

Pin	Signal	Signal Flow	Wire Color	
G	MPT 1: +Analog signal (0-10V)	DART*Scanner*™ ⇨ Machine	Pair	RED
H	MPT 1: Analog signal commmon (0-10V)	DART*Scanner*™ ⇨ Machine		BLACK
A	MPT 1: +Analog signal (0-20mV)	DART*Scanner*™ ⇨ Machine	Pair	WHITE
B	MPT 1: Analog signal common (0-20mV)	DART*Scanner*™ ⇨ Machine		BLACK
J	MPT 1: Transfer contact normally open	DART*Scanner*™ ⇨ Machine	Pair	GREEN
M	MPT 1: Transfer common	DART*Scanner*™ ⇨ Machine		BLACK
C	MPT 2: +Analog signal (0-10V)	DART*Scanner*™ ⇨ Machine	Pair	BLUE
D	MPT 2: Analog signal common (0-10V)	DART*Scanner*™ ⇨ Machine		BLACK
E	MPT 2: +Analog signal (0-20mV)	DART*Scanner*™ ⇨ Machine	Pair	YELLOW
F	MPT 2: Analog signal common (0-20mV)	DART*Scanner*™ ⇨ Machine		BLACK
L	MPT 2: Transfer contact normally open	DART*Scanner*™ ⇨ Machine	Pair	BROWN
K	MPT 2: Transfer common	DART*Scanner*™ ⇨ Machine		BLACK

Table 6: Machine control connector pin and pigtail cable guide

4.3.2 Overview of Control Types

A DART*Scanner*™ supplies three types of signals for Cavity Pressure Control: Contact Closure, Conditioned 0-10V Analog and Conditioned 0-20mV Analog. The user should select just one type of control that best suits their needs. Table 7 is provided as a guide to the three different control options.

> **CAUTION: When programming your machine to accept a RJG cavity pressure transfer control input you must utilize any time, pressure or stroke overrides in the machine control algorithm. If a set point is set incorrectly or a transducer is removed from the mold, the cavity pressure may not reach a transfer set point so there must be a backup to keep from flashing or damaging a tool.**

Though one channel is typical, a DART*Scanner*™ may be configured with two or more Mold Pressure Control channels. Each Machine Control Connector is capable of carrying up to two channels of Mold Pressure Control. (Refer to Table 6 for Machine Control Connector pin and pigtail cable guide.) Here are some ways to utilize multi-channel mold pressure control:

- One or more channels as redundant backup control for the first channel
- Letting the first channel, of multiple channels, that reaches set-point transfer the machine
- Multiple set-points for rising and falling control edges
- Two or more channels must reach pressure for transfer to happen

While currently it is rare to configure more than one cavity pressure control channel, the addition of one or more cavity pressure measurements for monitoring is common. The T-CNT12-M connector(s) can also be used to interface any additional number of monitoring channels.

Control type	Typical usage	Signal excitation & autozero	Signal calibration requirements	Control set-point requirements
Contact Closure	Press control does not have a mold pressure transfer setup screen (common w/retrofits)	Provided by the DART*Scanner*™	None by the press control - All calibration done by the DART*Scanner*™	Ability to select external boost cut-off & set a safety transfer set-point
Conditioned high-level analog (0-10V)	Press control has mold pressure transfer on its screens	Provided by the DART*Scanner*™	See scaling notes	Mold pressure and safety transfer set-points
Conditioned low-level analog (0-20mV)	Press control has mold pressure transfer, but has a redundant signal conditioner that cannot be bypassed	Provided by the DART*Scanner*™	See scaling notes	Mold pressure and safety transfer set-points

Table 7: Comparison of control type options

4.3.3 Contact Closure Control

If Contact Closure Control is selected the machine controller will need to provide the ability to select external boost cut-off & set a safety transfer set-point. The DART*Scanner*™ provides a normally open set of contacts that will close when the mold pressure passes through the set-point on the rising slope and will open when the pressure falls through the set-point. The DART*Scanner*™ provides all signal excitation, auto zeroing and calibration.

4.3.4 Conditioned 0-10V Analog/Conditioned 0-20mV Analog Control

If Conditioned 0-10V Analog or Conditioned 0-20mV Analog control is selected, the machine controller must provide the ability to choose the following parameters on the set-up screens:

- Choice of Direct (mounted flush to the cavity) or Indirect (placed behind an ejector pin) Sensor
- If Indirect Sensor, the Ejector Pin Size and/or Ejector Pin Area
- Full Scale Rating of Transducer being used by the DART*Scanner*™ (force if indirect, pressure if direct)
- Single or Multi-channel control configuration (optional)

Gain	0 - 10 Volt output range		0 - 20mV output range	
Switch position	Transducer scale range	Voltage range	Transducer scale range	Voltage range
High (500)	0 to 1/2 full scale	0 to 10 volts	0 to 1/2 full scale	0 to 20mV
Standard Mid (250)	0 to full scale	0 to 10 volts	0 to full scale	0 to 20mV
Low (1)	N/A	N/A	N/A	N/A

Table 8: Control output and scale output ranges

The machine controller will set the scaling based on these parameters. Signal excitation and autozeroing is provided by the DART*Scanner*™. Refer to Table 8 for an overview of this scheme. What follows is a detailed explanation of the scaling scheme. Figure 5 shows a typical mold pressure curve whose peak is at exactly full scale of the transducer.

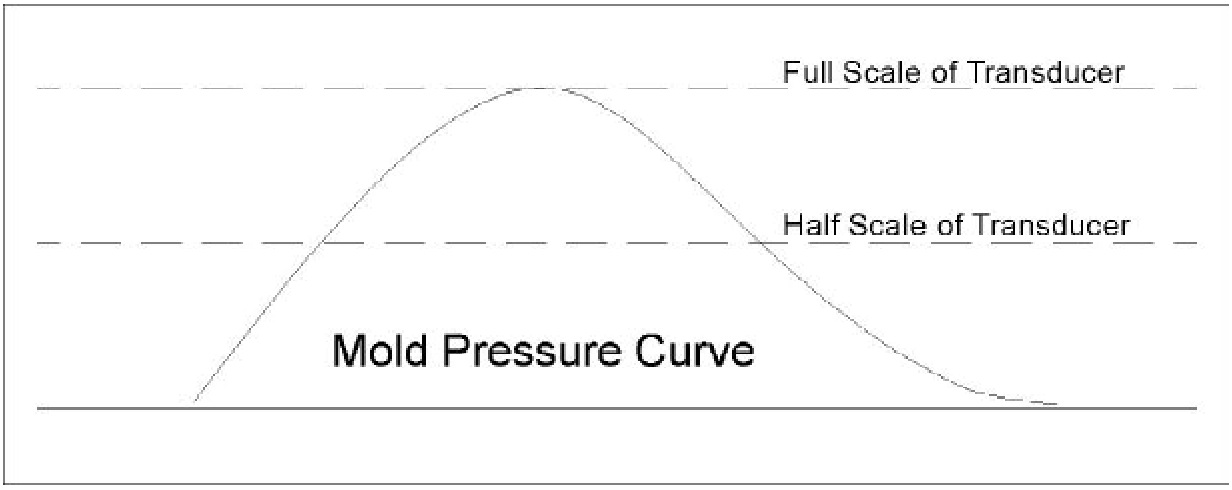


Figure 5: Typical mold pressure curve with a peak at full-scale pressure of the transducer

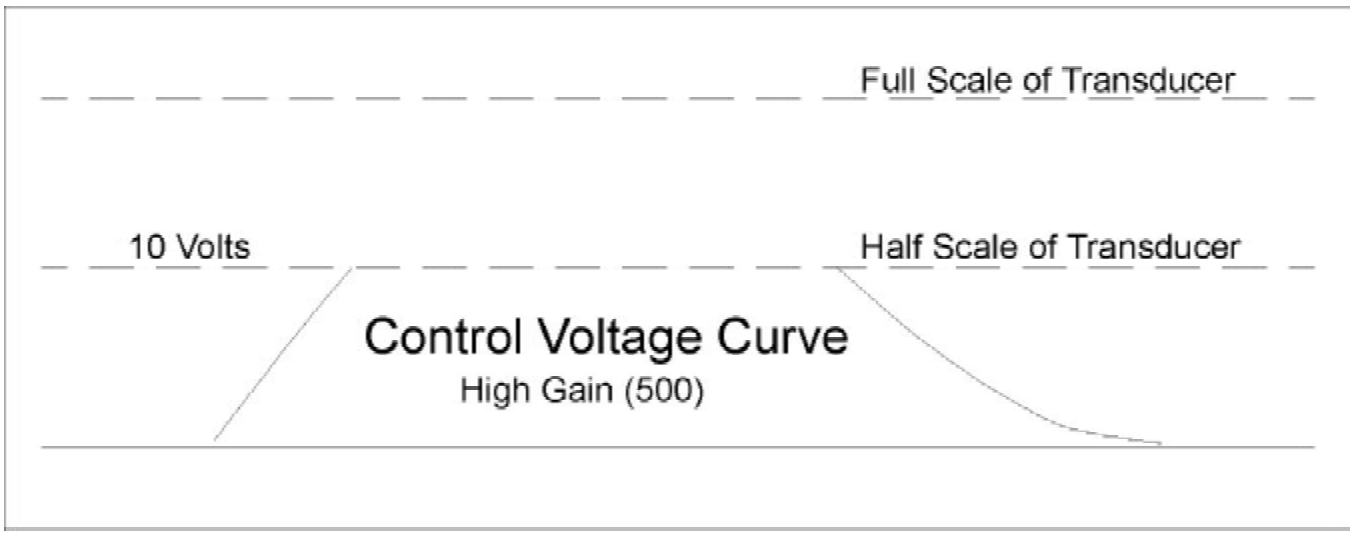


Figure 6: Voltage output relating to the mold pressure curve of Figure 5, Gain=500.

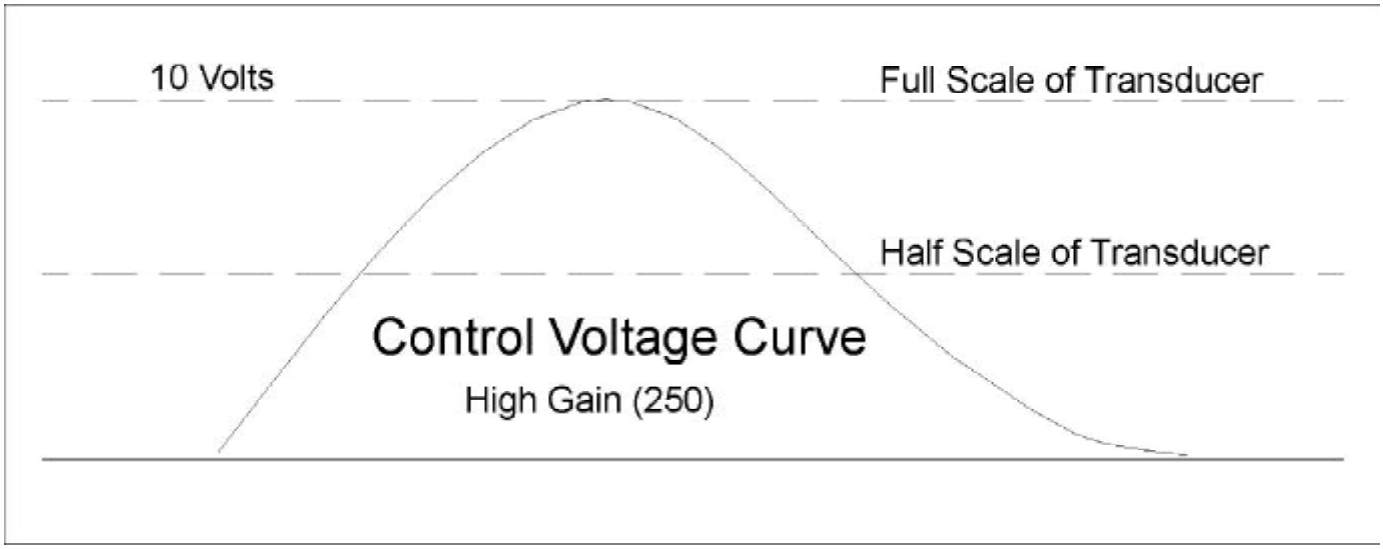


Figure 7: Voltage output relating to the mold pressure curve of Figure 5, Gain=250.

High Gain (500) Direct Sensor Scaling Notes

The DART*Scanner*™ will provide either a 0 to 20mV signal or a 0 to 10V signal relating to 0 to 1/2 of the full scale rating of the transducer. If the pressure on the transducer goes above half scale, the output will stay at 10 Volts (20mV). Refer to Figure 6 for a graphical representation.

Example: A DART*Scanner*™ utilizing a direct sensor with a full scale rating of 20,000psi will provide a Voltage of 5V (Conditioned High-Level Analog) or 10mV (Conditioned Low-Level Analog) when the direct sensor's cavity is pressurized to 5,000psi.

Pressure = (Signal Voltage/Maximum Signal Voltage)*(1/2 of Full scale Pressure)

Pressure = 5,000psi = (5V/10V)*10,000psi *(Conditioned High-Level Analog Signal Voltage)*

Pressure = 5,000psi = (10mV/20mV)*10,000psi *(Conditioned Low-Level Analog Signal Voltage)*

High Gain (500) Indirect Sensor Scaling Notes

The DART*Scanner*™ will provide either a 0 to 20mV signal or a 0 to 10V signal relating to 0 to 1/2 of the full scale rating of the transducer. If the pressure on the transducer goes above half scale, the output will stay at 10 Volts (20mV). Refer to Figure 6 for a graphical representation.

Example: A DART*Scanner*™ utilizing an indirect sensor with a full scale rating of 2,000 lb. sitting under a 1/4" ejector pin will provide a voltage of 5V or 10mV when the indirect sensor's cavity is pressurized to 10,186psi.

Pressure = (Signal Voltage/Maximum Signal Voltage) / (1/2 of Full scale Pressure/Ejector Pin Area)

Pressure = 10,186psi = (5V/10V)*(1000lb./0.04909in²) *(Conditioned High-Level Analog Signal Voltage)*

Pressure = 10,186psi = (10mV/20mV)*(1000lb./0.04909in²) *(Conditioned Low-Level Analog Signal Voltage)*

Standard Mid Gain (250) Direct Sensor Scaling Notes

The DART*Scanner*™ will provide either a 0 to 20mV signal or a 0 to 10V signal relating to 0 to the full scale rating of the transducer. If the pressure on the transducer goes above half scale, the output will follow it all the way to the full scale of the transducer. Refer to Figure 7 for a graphical representation.

Example: a DART*Scanner*™ utilizing a direct sensor with a full scale rating of 20,000psi will provide a Voltage of 2.5V (Conditioned High-Level Analog) or 5mV (Conditioned Low-Level Analog) when the direct sensor's cavity is pressurized to 5,000psi.

Pressure = (Signal Voltage/Maximum Signal Voltage)*(Full scale Pressure)

Pressure = 5,000psi = (2.5V/10V)*20,000psi *(Conditioned High-Level Analog Signal Voltage)*

Pressure = 5,000psi = (5mV/20mV)*20,000psi *(Conditioned Low-Level Analog Signal Voltage)*

Standard Mid Gain (250) Indirect Sensor Scaling Notes

The full scale entered for an indirect sensor will be its full scale force rating. The DART*Scanner*™ will provide either a 0 to 20mV signal or a 0 to 10V signal relating to 0 to 1/2 of the full scale rating of the transducer.

Example: A DART*Scanner*™ utilizing an indirect sensor with a full scale rating of 2,000 lb. sitting under a 1/4" ejector pin will provide a voltage of 2.5V or 5mV when the indirect sensor's cavity is pressurized to 10,186psi.

Pressure = (Signal Voltage/Maximum Signal Voltage) / (Full Scale Force/Ejector Pin Area)

Pressure = 10,186psi = (2.5V/10V)*(2,000lb./0.04909in²) *(Conditioned High-Level Analog Signal Voltage)*

Pressure = 10,186psi = (5mV/20mV)*(2,000lb./0.04909in²) *(Conditioned Low-Level Analog Signal Voltage)*

Important Installation Notes

Refer to Table 6 for a Machine Control Connector pin and pigtail cable guide. If only one control channel is being wired use those control signals labeled MPT1 (pins G, H, A, B, J and M). If the machine is to be wired for more than two channels of control, additional Machine Control Connectors can be added. Please refer to Tables 9 and 10 for important installation ratings.

Minimum control voltage output resistance	
Conditioned high-level analog output	1k Ohms
Conditioned low-level analog output	100k Ohms

Table 9: Minimum control voltage output resistance

NOTE: The DART*Scanner*™ supplies its own excitation to the transducer. Do *not* wire the machine controller's transducer excitation voltage to the

Control relay contact ratings	
Item	**Rating**
Maximum switching power	50 watts
Maximum switching voltage	500 VDC or Peak AC
Maximum switching and carry currents	1 A (limited by current limit fuse)
Maximum control contact switching time after seeing set-point	13mS

DART*Scanner*™.

Table 10: Control relay contact ratings

NOTE: The control relay is not horsepower rated and should not be used to control the machine solenoids directly.

4.4 Transducer Connector Interface Installation

The DART*Scanner*™ is configured with multiple channels of signal conditioning for the following types of signals:

- Strain Gage Type Hydraulic Transducers
- Strain Gage Type Mold Pressure Transducers
- Potentiometric Type Displacement Transducers
- LVDT Mold Deflection Transducers
- "J" or "K" Type Thermocouples (Extra signal conditioning may be required)

4.4.1 Transducer Inputs

The bank of five Bendix connectors is used to input high or low level analog signals to the DART*Scanner*™. These 6 pin female connectors are labeled HYD, MP1, MP2, MP3 and MP4, respectively. Typically, low level strain gage based signals from mold pressure sensors or hydraulic pressure sensors are input at these connectors. If properly configured, high level voltage signals may be inputted to any or all channels by switching the channel gain on the powered down DART*Scanner*™, setting up the channel in DART*Vision*™ and re-calibrating the channel. See Section 4.4.3 for more information on the gain switches.

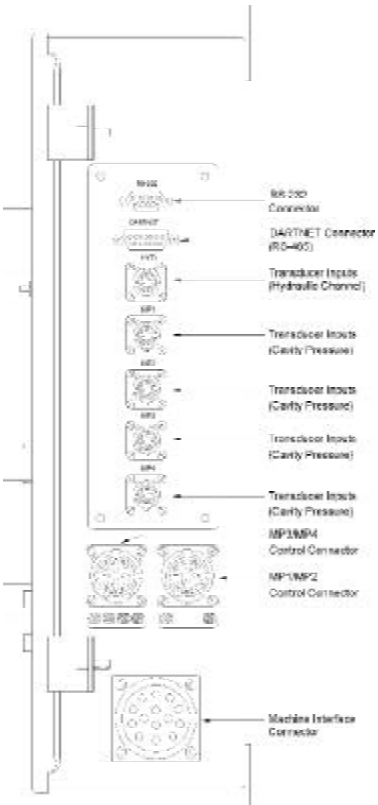


Figure 8: DART*Scanner*™ transducer input connectors

Pin	Signal	Signal Flow
A	EXC+	From DART*Scanner*™ to transducer
B	EXC-	From DART*Scanner*™ to transducer
C	SIG+	From transducer to DART*Scanner*™
D	SIG-	From transducer to DART*Scanner*™
E	SHIELD	From DART*Scanner*™ to transducer
F		N/A

Table 11: Transducer input connector pin-out guide

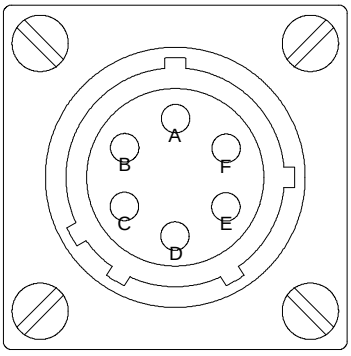


Figure 9: Pin-out guide

NOTE: No metal tools should be used when working inside this box. Always power down this unit before opening the front panel door. Contact RJG, Inc. for technical assistance before attempting to reconfigure any channels in the field (231-947-3111).

4.4.2 Initial Factory Settings

Unless otherwise specified, the DART*Scanner*™ is configured with the following standard channel assignments and associated gain settings:

Channel	Assignment	Gain setting
1	Hydraulic pressure	250
2	Cavity pressure	250
3	Cavity pressure	250
4	Cavity pressure	250
5	Cavity pressure	250

Table 12: Channel assignments & gain settings

A gain of 250 works for most hydraulic and mold pressure applications. However, in low-pressure applications, some loss of resolution may be experienced. If transducer pressures are running under half scale for the entire cycle you may switch to a gain of 500 which will provide more resolution. In this case you must be careful of going over half-scale.

An example of going over 50% of the full-scale force rating is: Using a Model T-405, which is a 500 lb. rated mold pressure transducer, under a 1/4" ejector pin. If there is force on the ejector pin equal to 490 lbs. (10,000 psi), which exceeds ½ of the rated transducer force, the gain should be set back to 250 for this channel on the DART*Scanner*™ box.

NOTE: Contact a Customer Support representative at RJG, Inc. if you are unsure as to what gain setting is required for your mold pressure application (231-947-3111).

4.4.3 Gain Set Switches

Access to the Gain Switches is found inside the DART*Scanner*™ enclosure on the circuit board, which is mounted to the front panel door. Each channel on the DART*Scanner*™ can be configured with a gain of 1,250 or 500 depending on the specific application.

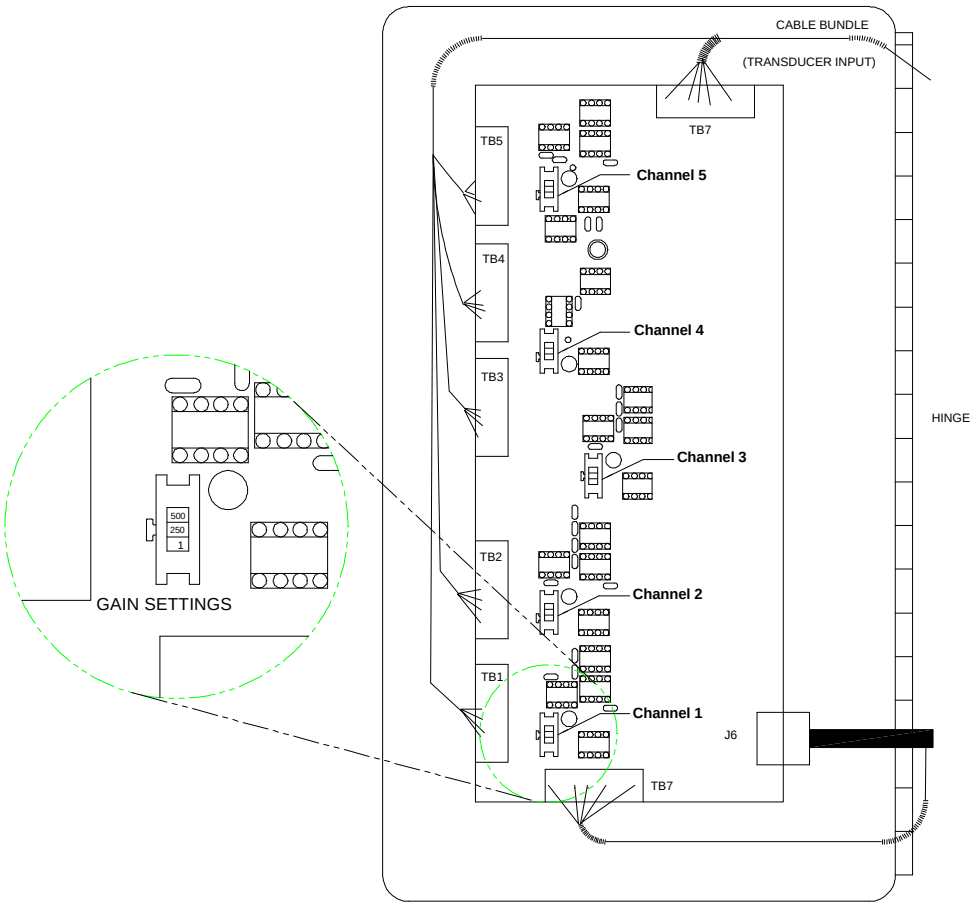


Figure 10: DART*Scanner*™ Inside Front Panel

Refer to Table 13 for the corresponding input signal level designations for the respective gain settings.

Typical transducer type	Gain switch position	Input range*
Position, temperature or deflection sensors	Low gain (1)	0 to 5V, 0 to 10V
Hydraulic pressure transducers	Mid gain (250)	-20mV to +20mV
Mold pressure transducers	Mid gain (250)	-20mV to +20mV
*Maximum DC common mode rejection to ±10V		

Table13: Gain Switch Positions, Transducer Input Ranges

NOTE: The standard Gain switch position for a DART*Scanner*™ channel with an MPT input is Mid Gain (250). If you switch to High Gain (500) you must be watchful of your sensor going over half scale. If your pressure climbs above the transducer's half scale, the measurement will "peg out" or plateau at the half scale level. In the software this will manifest itself in a curve that seems to have its top cut off. If this happens, changing that channel's Gain switch to Mid Gain (250) and re-calibrating that channel will give you the full scale range of the transducer. If the problem still exists, then you may have to re-evaluate your pin size or you may need an RJG mold pressure transducer with a higher rated load.

4.4.4 Interfacing With An STX-25V Stroke/Velocity Transducer

The following describes how to interface an STX-25V Stroke/Velocity Transducer to the DART*Scanner*™:

1. Power down the DART*Scanner*™.

2. Change the gain settings for the stroke and velocity channels to 1.

3. Power up the DART*Scanner*™.

4. In DART*Vision*™ select the STX-25V and STX-VEL measurements for transducer scaling.

5. Recalibrate the channels.

4.4.5 Interfacing With A Mold Deflection Transducer

The following describes how to interface a T-250 Mold Deflection Transducer to the DART*Scanner*™ unit. Properly interfacing the transducer and DART*Scanner*™ requires the selected channel to be rewired using a pair of internally mounted signal selection jumpers. **Failure to do so will result in incorrect or non operation of the mold deflection transducer**. If you are at all hesitant about which jumpers to move or are reluctant to make the required changes to your DART*Scanner*™ unit, please call RJG's Customer Service for assistance **(231-947-3111).**

1. Turn the power off to the DART*Scanner*™.

2. Attach a T-520MD cable to the T-250 transducer.

3. Attach the other end of the cable to the channel you have designated for Mold Deflection. The channel's Bendix connector is located on the top panel of the DART*Scanner*™.

4. Open the Rear Access door of the DART*Scanner*™ unit to change the position of the following jumpers (See Figure 11). Move only those channel jumpers which you have selected to interface with the mold pressure transducer. (i.e. If you will be using Channel 3 for mold deflection, move only those jumpers for Channel 3.)

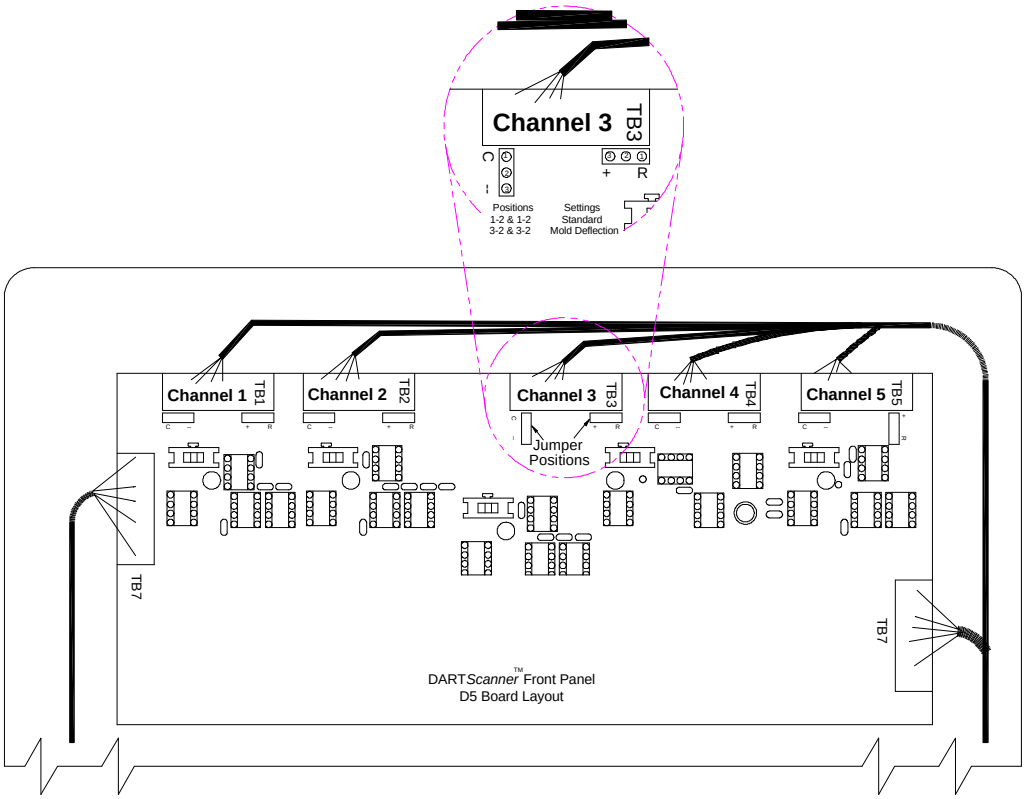


Figure 11: Board with jumpers

Channel	+EXC selection jumper	-EXC/Ground selection jumper
1	JP2	JP1
2	JP4	JP3
3	JP6	JP5
4	JP8	JP7
5	JP10	JP9

Table 14: Mold deflection jumper assignments

Move your selected channel jumpers to the position A-B, respectively. Be sure to include the mold deflection transducer in your DART*Vision*™ software setup.

4.5 Computer and Network Interface Installation

A DART*Scanner*™ can communicate with a computer either as a stand-alone unit via the RS-232 connector or on a network with other DART*Scanners*™ through the DARTNET (RS-485) connector.

4.5.1 RS-232 (Stand-alone Computer Interface)

A computer can be made to communicate with one stand alone DART*Scanner*™ by using the connector and the proper cable (see Figure 12). No converters are needed but remember that using the RS-232 connection limits the number of DART*Scanner*s™ connected to the computer to one.

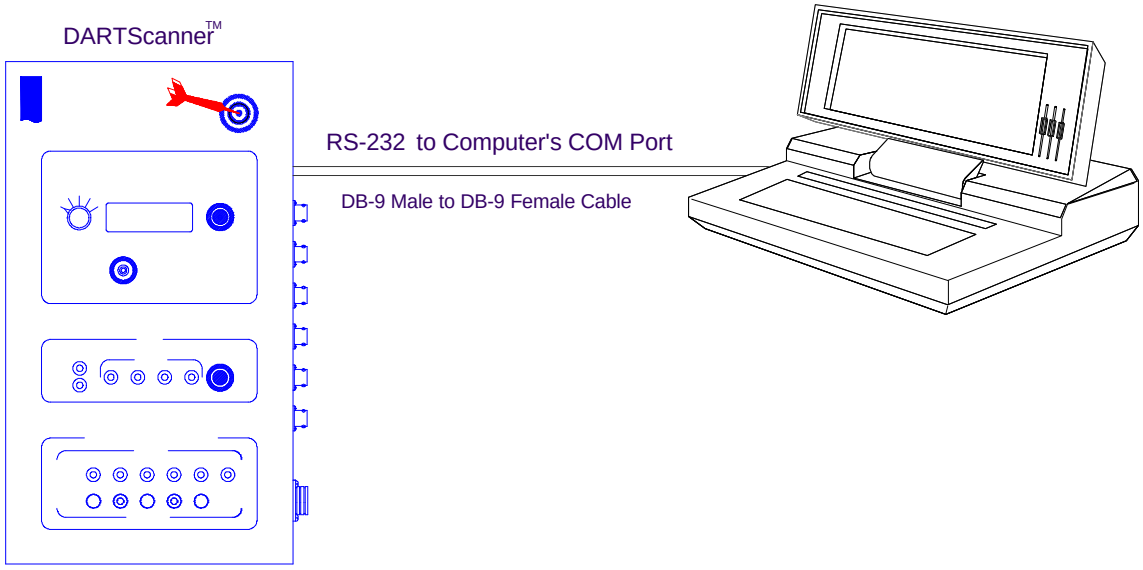


Figure 12: Interfacing a DART*Scanner*™ to a stand-alone computer using the RS-232

Computer Hook-up on the DART*Scanner*'s™ side panel
A standard male DB-9 to a female DB-9 serial cable provides the connection between a DART*Scanner*™ and a standard RS-232 serial port. Refer to Table 15 for a pin-out guide.

Pin	Signal (RS-232)
2	Receive Data
3	Transmit Data
7	Request to Send
5	Ground - Shield

Table 15: RS-232 pin-outs

4.5.2 DARTNET Connector (RS-485 Computer Interface)

A computer can be made to communicate with multiple DART*Scanners*™ by using the DARTNET connector and the proper cables (see Figure 12). An RS-485 network utilizes a two wire communications "Bus" with terminating resistors on each end. The DART*Scanners*™ are attached to the bus at points called "Nodes" that are attached to the bus using "Stubs". These stubs are best kept as short as possible. In order to keep the stubs electrically short, the bus is run to the DART*Scanner*™ and returned on another pair. Figure 13 details this setup using a SP-321M splitter and related cabling.

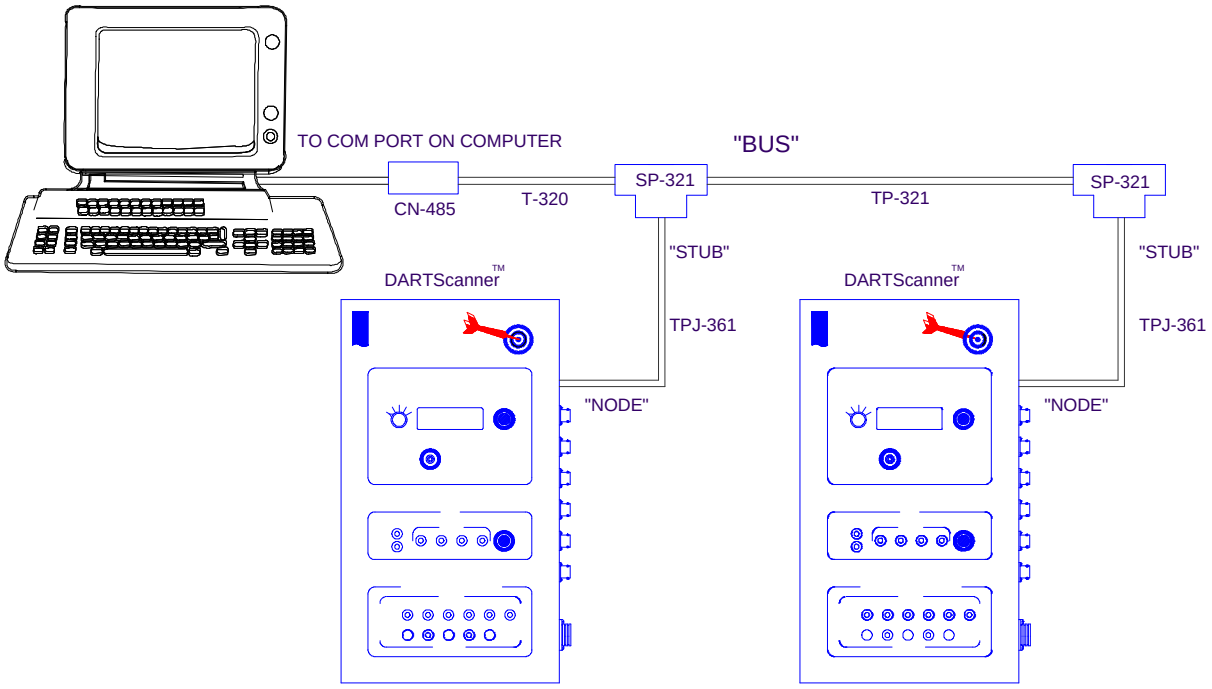


Figure 13: Interfacing a Multi-Machine DART*Scanner*™ Network to a computer using Network Cabling and the RS-485 DARTNET Connector on the DART*Scanner*™

Pin	Signal (RS-485)	Direction
1	System ground	--
4	Transmit/Receive+	BIDIR
5	Transmit/Receive-	BIDIR

Table 16: DARTNET pin-outs

Important Note: Either the RS-232 or the RS-485 DARTNET connector can be used at one time. They cannot be used together.

5 Product Disclaimer

Inasmuch as RJG, Inc. has no control over the use to which others may put this material, it does not guarantee that the same results as those described herein will be obtained. Nor does RJG, Inc. guarantee the effectiveness or safety of any possible or suggested design for articles of manufacture as illustrated herein by any photographs, technical drawings and the like. Each user of the material or design or both should make his own tests to determine the suitability of the material or any material for the design, as well as the suitability of the material, process and/or design for his own particular use. Statements concerning possible or suggested uses of the materials or designs described herein are not to be construed as constituting a license under any RJG Inc. patent covering such use or as recommendations for use of such materials or designs in the infringement of any patent. RJG, Inc. is not responsible for the improper installation of this equipment, or any other equipment, RJG manufactures. Proper RJG equipment installation does not interfere with original equipment safety features of the machine. Safety mechanisms on all machines should never be removed.

6 Appendix

6.1 Appendix A: Installation Notes

6.1.1 DART*Scanner*™ Footprint

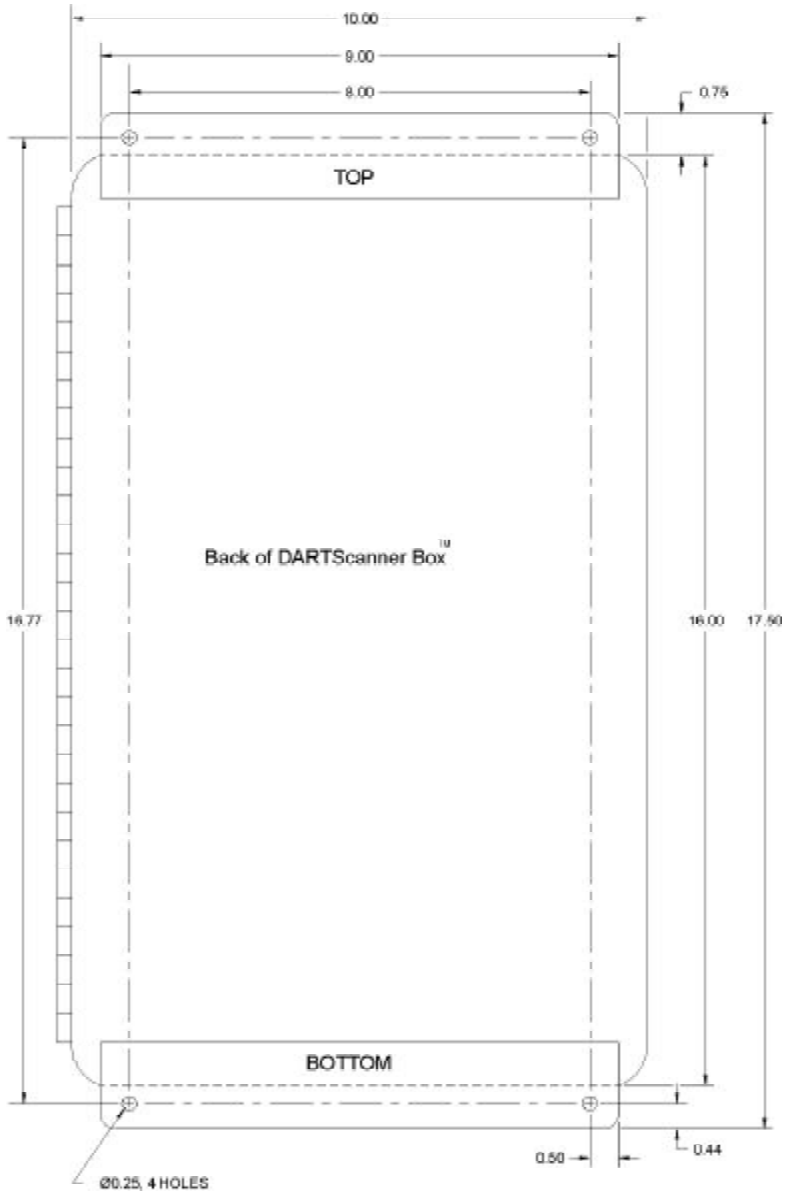


Figure 14: DART*Scanner*™ footprint

6.1.2 Cutouts

6.1.2.1 T-INT14-M Machine Interface Connector Panel Cut Out

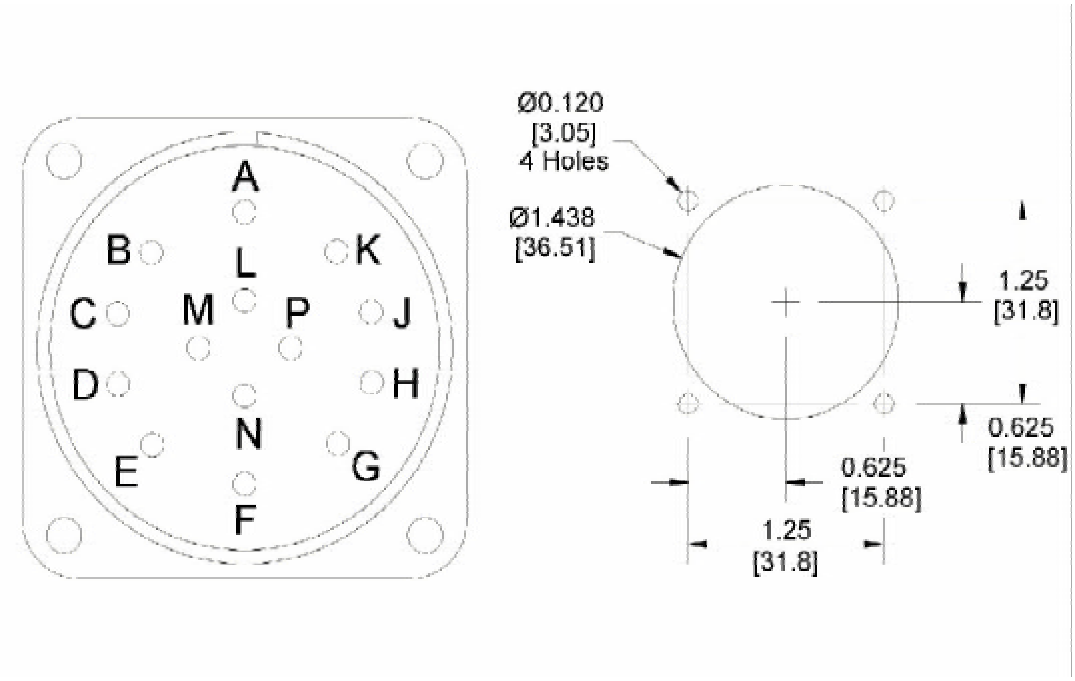


Figure 15: T-INT14-M machine interface connector panel cut out

6.1.2.2 T-CNT12-M Control Connector Panel Cut Out

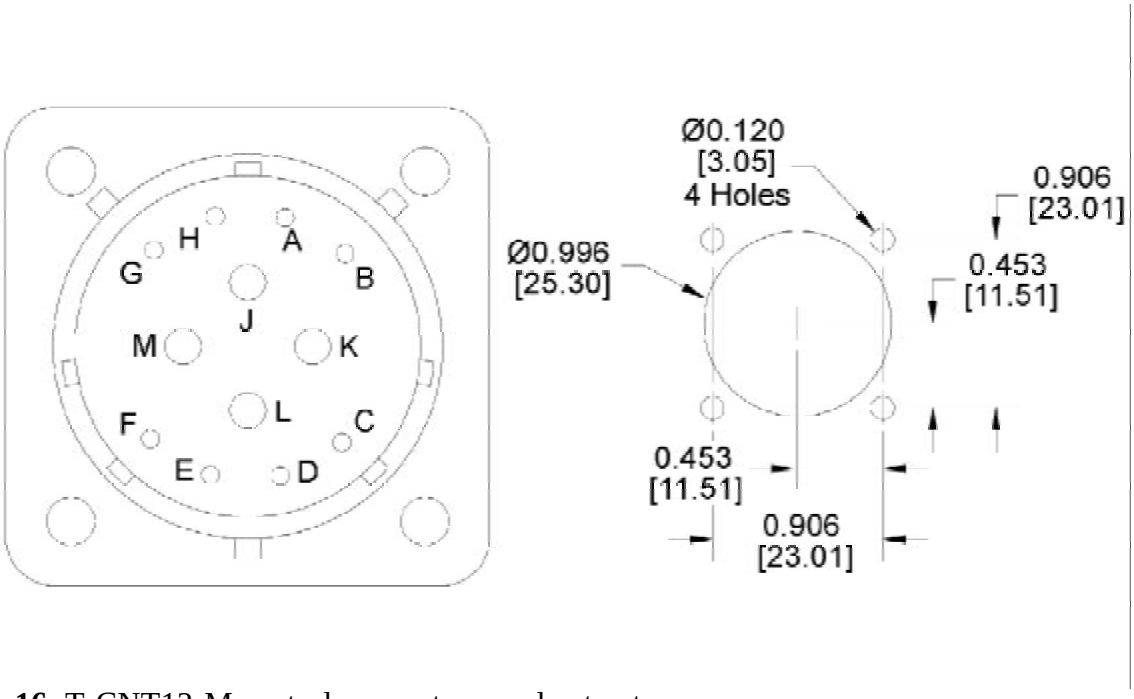


Figure 16: T-CNT12-M control connector panel cut out

6.1.3 Using the T-INT14-Junction

Installing Multiple DART*Scanners*™ on one Molding Machine

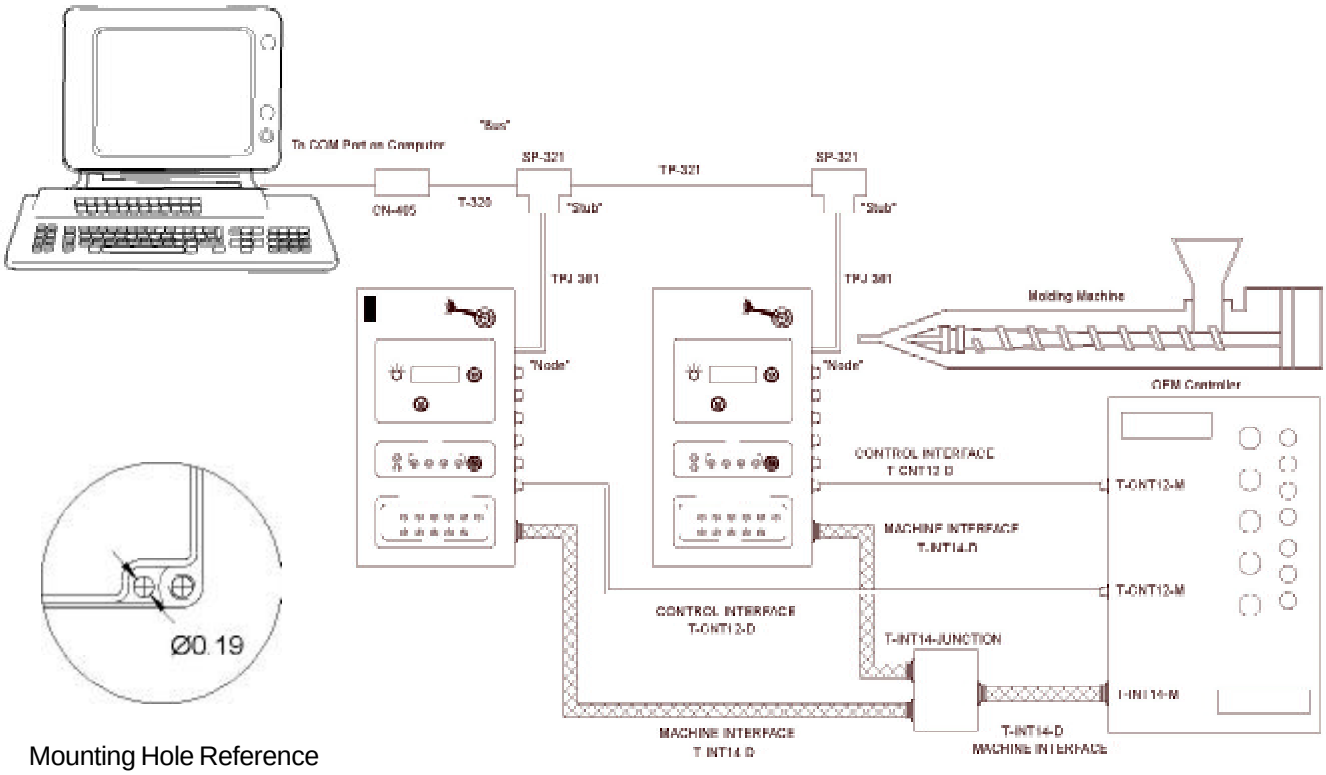
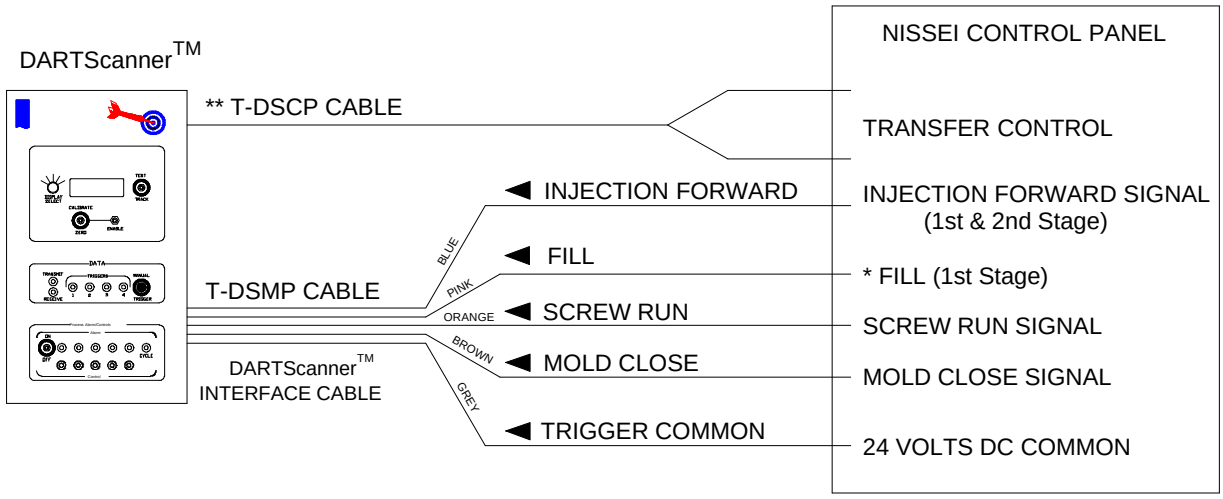


Figure 17: Using the T-INT14-M junction

Using the above diagram, a user can take data on a single molding machine using multiple DART*Scanners*™. Two or more DART*Scanners*™ are wired to all 4 triggers and collect Trigger Inputs from the machine using the three T-INT14-D cables and the T-INT14-Junction box. The two-control interface cables, T-CNT12-D's are used to control the machine. Network communications with the two boxes is accomplished using the SP-321M.

6.1.4 Interfacing with Nissei machines

Interfacing with Nissei Machine Outputs:



**Inputs to the Controller for Pack (P2) to Hold (P3) Transfer

Figure 18: Interfacing with the Nissei machines

The DART*Scanner*™ provides a Contact Closure signal (not horsepower rated) capable of transferring the machine from Pack to Hold. Nissei machines are only able to take advantage of this by special request to Nissei. The green & black colored pigtailed wires on the T-DSCP cable provide the Contact Closure.

Outputs (24 VDC) from Controller for RJG Triggers:

Injection Forward	Trigger 1	Output to stay ON for duration of 1st and 2nd Stage	Mandatory
*Fill	Trigger 2	Output to stay ON for duration of 1st Stage (or P1) only	Optional
Screw Run	Trigger 3	Output to stay ON for duration of Screw Recovery	Optional
Mold Closed	Trigger 4	Output to stay ON for duration of Mold Closed	Optional
Trigger Common		24 VDC Common from controller	Mandatory

***NOTE:** Fill (Trigger 2) should be the only special request. All other Triggers should be standard outputs.

Table 17: Outputs (24 VAC) from controller for RJG triggers

6.2 Appendix B: Special Applications

6.2.1 Temp 1 Module

T-TEMP1 Installation & Use

Overview

The RJG T-TEMP1 module takes input from a 'J' type thermocouple and outputs 0 to 5 Volts corresponding to 0 to 500°C. This input can be wired to an input on a DART*Scanner*™ box and be monitored by your DART*Vision*™ software. To mount the T-TEMP1 module, temporarily remove the front cover and utilize the four mounting holes in the box (see Figure 19).

Installation

Use the following steps to hook up and monitor temperature using the T-TEMP1, DART*Scanner*™ box and DART*Vision*™ software:

1. Power down the DART*Scanner*™ box.
2. Set the DART*Scanner*™ box's Channel Gain switch to a gain of 1 (Low Gain Input).
3. Plug in a T-5XX transducer cable between the DART*Scanner*™ box and the T-TEMP1 Bendix connector.
4. Plug in a "J" type thermocouple.
5. Power up the DART*Scanner*™ box.
6. Start a job up in the DART*Vision*™ software and select the Temp Module Measurement in the Machine window (see Figure 20).

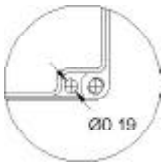


Figure 19: Insert – mounting hole

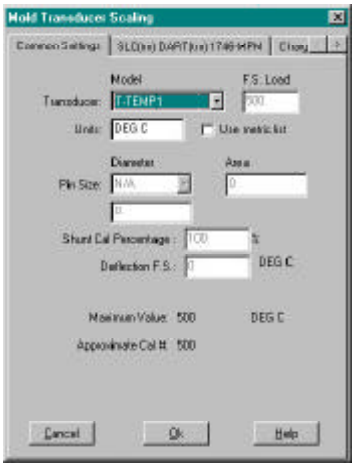


Figure 20: Temp Module setup

7. Calibrate the channel.
8. Zero the channel by pushingthe TEST button and doing a ZERO. This channel will now be reading the temperature of the thermocouple.

6.2.2 DS-5000-C-SHTL Switching Box Supplemental

Overview

The DS-5000-C-SHTL switching box allows a contact closure to switch between control outputs from either Mold "A" or Mold "B" on shuttle or indexing rotary table injection molding machines. This option requires running DART*Vision*™ software Version 4.31 or higher.

Mold Switching

The contact closure's input is a 4 pin Bendix connector on the right side of the box. The contacts used to switch should be rated for 120VAC @ 1Amp. **DO NOT INPUT VOLTAGE ON THE CONNECTORS OF THE DRY CONTACTS. THIS WILL CAUSE DAMAGE TO INTERNAL COMPONENTS.** A Limit switch is provided with a Bendix connector ready to interface with the DART*Scanner*™. The switch should be positioned to activate when the shuttle has moved laterally to bring mold "B" in front of the injection unit. The switch will then return to the normally open position when Mold "A" is in front of the injection unit. Table 18 is provided as a guide for limit switch placement as it relates to the active mold.

Mold	Input state	Mold pressure inputs	Control outputs
A	Contact open (Limit switch relaxed)	Channel 2 Channel 3	Channel 2
B	Contact closed (Limit switch depressed)	Channel 4 Channel 5	Channel 4

Table 18: Guide to shuttle switching

Control Output

Control output for machine transfer is provided on a 6 Pin Bendix connector on the lower right side of the box that provides contact closure, 0-10V and 0-20mV. See your DART*Scanner*™ manual for more details.

Software Setup Notes

When setting up the job in your DART*Vision*™ software two things should be kept in mind. The first is that the Master DART address should always be set to Channel 1 of the box. The second is that if you want to alarm on cycle time, you should do so on Channel 1 but not on the other channels. This is because Channels 2-5 receive triggers only on every other cycle. Because of this when you are collecting data with the DS-5000-C-SHTL, remember that cycle data for Channel 1 always appears but Channel pairs 2-3 and 4-5 alternately appear.

IMPORTANT SOFTWARE NOTE

In the upper right hand portion of the Machine Setup page of the DART*Vision*™ software, the Shuttle Table check box must be checked for correct operation (see Figure 21). Also, make sure the Integration Limit (found on the Mold Setup window) is set lower than the lowest cycle time of either Mold "A" or Mold "B."

Example: Mold "A" Cycle Time is 10.1 seconds and Mold "B" Cycle Time is 9.9 seconds. Set the Integration Limit lower than 9.9 seconds.

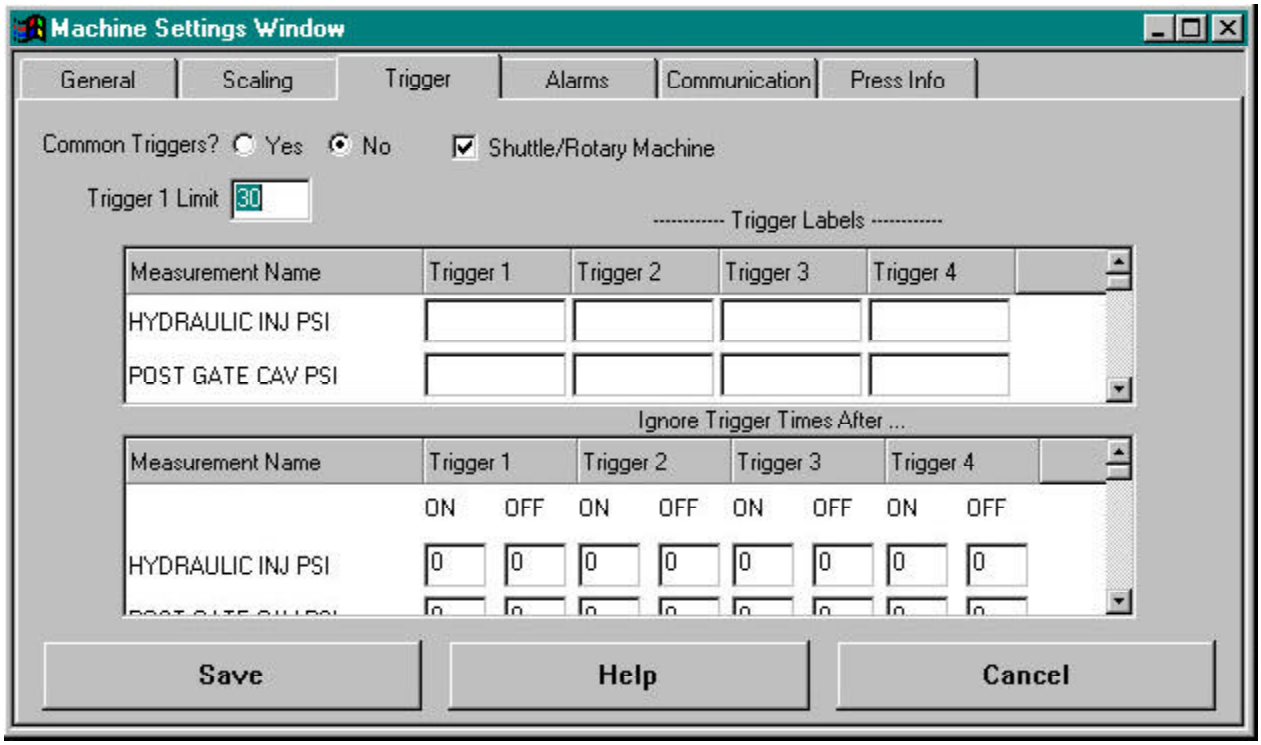


Figure 21: Check the Shuttle Table check box for proper operation.

6.3 Appendix C: Using Accessories

6.3.1 *Sensor Simulator* use instructions

Introduction:

The *Sensor Simulator* is a transducer simulator capable of checking the operations of DART*Scanner*™ and DART*PAK*™ data collecting devices and accompanying cables. This test device utilizes a 350Ω star bridge built with precision resistors. The *Simulator* provides the following outputs and corresponding load (or psi) simulation for various RJG sensor models:

Strain-Gage Switch Positions (mVolts)

Output*	T-405/T412 T-425	T-406/T-413 T-426	T-410 T-414	T-3000U
LOW: 4mV 20% FS	100 lb.	400 lb.	25 lb.	600psi
MID: 8mV 40% FS	200 lb.	800 lb.	50 lb.	1200psi
HIGH: 16mV 80% FS	400 lb.	1600 lb	100 lb.	2400psi

Table 19: Strain-gage positions

High-Level Switch Positions (Volts)

Output*	STX-25V (Stroke)	STX-25V (Velocity)
LOW 1V	5" (20% FS)	1.6 IPS (20% FS)
MID 2V	10" (40% FS)	3.2 IPS (40% FS)
HIGH 4V	20" (80% FS)	5.4 IPS (80% FS)

Table 20: High-level switch positions

Checking RJG Cables and Data Collecting Devices:

1. Unplug the sensor and cable from the DART*Scanner*™ or DART*PAK*™ that you want to check. (If you are using older RJG equipment, call RJG Technical Support for assistance.)
2. Plug the *Sensor Simulator* into the sensor input channel on the DART*Scanner*™ or DART*PAK*™ device with the provided 1-foot cable.
3. Set the *Sensor Simulator* output to 0V. For complete accuracy, let the *Sensor Simulator* warm-up for about 5 minutes.
4. Zero and calibrate the DART*Scanner*™ or DART*PAK*™ per the unit's instructions.
5. Set the *Sensor Simulator* output to LOW for either a high level or strain gage Input channel.
6. If the DART*Scanner*™ or DART*PAK*™ display reads the correct value, the data acquisition device is working correctly (reference the tables above for the percentage value). The correct value should be within ± 1% of full scale. For example: for a full scale of 40,744, your expected 20% value range would be 8,067psi to 8,230psi.
7. If the DART*Scanner*™ or DART*PAK*™ is working correctly, then test the suspect cable by replacing the 1-foot *Sensor Simulator* cable with the cable to test.
8. Repeat steps 3-5.

1. If the display reads the correct value, then the cable is working correctly also.
2. Hook the cable back up to the transducer.

NOTE: After completing Steps 1-8 and if the problem still exists, call Tech Support @ 1-231-947-3111 and reference document Tech Note #105.doc. If you have a Sensor Tester, use it to verify proper sensor operation and reference document Tech Note #112.doc.

6.3.2 Transducer Cable Tester instructions

Introduction

The RJG, Inc. Transducer Cable Tester is a portable device capable of testing all pins of a standard RJG T-5XX transducer cable (Pin F not applicable). It can also test those cables used by other manufacturers that utilize a Bendix connector shell size of 10 and a male pin configuration of 6.

Testing Cables

Follow these steps to test a transducer cable:

1. Plug the ends of the cable to be tested into the female cable connectors on the Transducer Cable Tester.

2. Press the *PIN A/+EXC* button. If the Pin A LED does not light then that wire of the cable is open. If the Pin A LED is lit along with one or more other LEDs, there is a short between these pins.

3. Repeat step 2 for all Pins (Pin F is not supported on most cables).

4. If any test fails, have the cable repaired immediately to prevent possible damage to equipment.

Dimensions	5.8"x3.4"x1.5" (147mm x 86mm x 38mm)
Environmental	NEMA 1
Power Requirements	3 Volts provided by 2 AAA batteries
Current Drain	25mA
Connectors	Bendix bayonet style female Shell size 10 Pin configuration 6
Buttons	Momentary membrane switches
Continuity Lights	Green LEDs

Table 21: Specifications

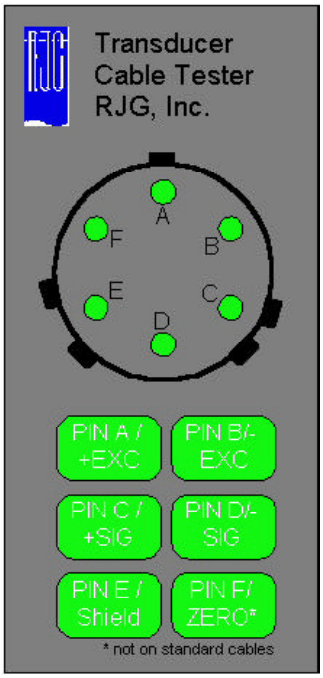


Figure 23: Transducer cable tester

6.4 Appendix D: Troubleshooting Guide

Table 22: Troubleshooting Guide

	Problem	Possible Cause(s)	Solution
1	**No display when the unit powers up**	This could be due to the power wires not being connected properly.	Double check installation.
		No power due to a blown fuse inside of the power supply.	Replace the blown fuse.
		Is the machine T-INT14-D machine interface cable connected to the DART*Scanner*™ unit?	Connect the cable
2	**No communication between the computer and the DART*Scanner*™ unit**	A bad communication (COMM) cable.	Replace the cable.
		Is the COMM cable connected between the DART*Scanner*™ and the serial port?	Connect the cable.
		Is the COMM port that is being used selected in the DART*Vision*™ software?	Select the correct COMM port.
		Do the DART*Vision*™ software settings correspond to the DART*Scanner*™ settings? i.e. Correct DART addresses.	Correct the settings. (See the DART*Vision*™ software manual for more information.)
		More than one machine in the DART*Vision*™ software may be trying to talk to the same DART*Scanner*™	Check the addresses of all the machines in the DART*Vision*™ software.
		More than one DART*Scanner*™ may be responding to the same address.	Check the addresses of all the DART*Scanners*™ on the network.

	Problem	Possible Cause(s)	Solution
3	**Trigger LED Indicators are not operating correctly**	Are the triggers installed/wired to the machine correctly?	Check the installation.
		Is the machine T-INT14-D machine interface cable connected to the DART*Scanner*™ unit?	Check the cable connection.
		Are the machine interface cable and the mating harness cable connected together correctly?	Check the connection.
4	**No data being displayed on the computer screen**	Are the transducer cables connected to the correct corresponding channel inputs?	Check the transducer's output. See the Mold Pressure Transducer Manual for more information on RJG's mold pressure transducers.
		Is the trigger 1 (INJ FWD) LED coming on?	Refer to Problem 3.
5	**Display won't zero or calibrate**	Possibly a defective cable.	A replacement cable is needed.
		Transducer has a large amount of pre-load.	Remove the pre-load from the transducer.
		Wrong gain switch settings.	Check the gain switch settings.
		Possibly a defective transducer.	Check the transducer.

	Problem	Possible Cause(s)	Solution
6	**Process alarm LEDs are not lighting up**	The alarms may not be "ON" in the DART*Vision*™ software.	Check the alarm settings in the DART*Vision*™ software.
		Are the alarm values in the DART*Vision*™ software correct for the corresponding channel assignments?	Make corredtions to the alarm values.
7	**When using a DART*Scanner*™ to monitor hydraulic or mold pressure, the curve displayed in the DART*Vision*™ software seems to be pressure limited, or "chopped off" at the half acale value of the transducer.**	The standard gain switch position for a DART*Scanner*™ channel with MPT input is Mid Gain (250). However, if you are using High Gain (500) and your presssure climbs above the transducer's half scale, the measurement will "peg out" or plateau at the half scale level. In the software this will manifest itself in a curve that seems to have its top cut off.	change that channel's gain switch vack to the Standard Mid Gain (250) and recalibrate that channel. This will give you the full-scale range of the transducer. If the problem still exists, then you may have to re-evaluate your pin size or you may need an RJG mold pressure transducer with a higher rated load.

6.5 Appendix E: Failsafe Alarms Overview

Standard DART*Scanner*™ Alarm Outputs:
Standard DART*Scanners*™ have 2 contact closure alarm outputs that can be used for sorting parts. The first output is for standard alarms (any alarm from DART*Vision*™), while the second output is reserved specifically for cycle time alarms. These outputs are *normally open* contacts that close as soon as the DART*Scanner*™ detects an alarm during its cycle.

Once an alarm has caused a contact to close, this alarm signal stays on until a user-configured trigger is reached. This user-configured trigger is set in the DART*Vision*™ Machine Settings window, using the "Alarm Turn Off" setting. The choices for "Alarm Turn Off" include:

- Next Cy (Next Cycle Start, or Trigger 1 goes ON)
- T4 On (Trigger 4 goes ON, or start of mold closed)
- T4 Off (Trigger 4 goes OFF, or end of mold closed) (Trigger 4 turns ON)

For example, let's say a standard alarm went on at the end of 1st stage injection (such as a fill time alarm) and the "Alarm Turn Off" option in DART*Vision*™ was set to "Next Cy". In this case, the alarm output signal would stay on throughout mold opening and closing, and would go off at the start of injection for the next cycle.

While the standard DART*Scanner*™ alarm configuration works well in most conditions, there are cases where a reject part can end up in a good bin. For example, if power to the DART*Scanner*™ is interrupted, all parts go to the good bin. Also, if there is no alarm but the mold closes on a part (thereby pinching it), the pinched part will fall into the good bin when the mold safety causes the mold to open. The DART*Scanner*™ with the failsafe option addresses these problems.

Failsafe DART*Scanner*™ Alarm Outputs:
The DART*Scanner*™ with the failsafe option utilizes the same outputs as the standard DART*Scanner*™, but configures them differently. Here, the first alarm output becomes a 'Reject Part Indicator' and the second alarm output becomes a 'Good Part Indicator.' If you hook your part divertor to the the 'Reject Part Indicator' output, it will behave very similarly to the first channel on the standard DART*Scanner*™ (divert parts only on alarms). The real power of the failsafe DART*Scanner*™, though, is when you use the 'Good Part Indicator' output for part diverting. Here, the failsafe DART*Scanner*™ *treats all part as rejects until they are proven good*. Here, the part divertor shifts to the 'Reject' bin at the start of the cycle and remains there until a 'Good' part signal is sent. If the power is left off to the DART*Scanner*™, or parts are stuck in the mold and become pinched, parts automatically go to the 'Reject' bin.

Let's look at how the failsafe DART*Scanner*™ does this. Figure 1 shows a timing diagram for a good part. Notice that at the beginning of injection, both the 'Good' and the 'Reject' outputs stay OFF (open). This means the failsafe DART*Scanner*™ is in an "undecided" mode (this can be treated as a third output mode for certain applications). At the end of the integration limit, or at the start of mold opening (Trigger 4 ON), whichever comes first, the failsafe DART*Scanner*™ looks to see if any alarms went off during the cycle. If not, the 'Good' output goes ON (the contact closes), while the 'Reject' output remains OFF. The 'Good' output stays on until the start of injection for the next cycle, *regardless of the "Alarm Turn Off" setting in DARTVision*™.

Next, let's look at the timing diagram for a cycle where an alarm is detected. This is shown in Figure 2.

Again, at the start of injection the failsafe DART*Scanner*™ is in an "undecided" mode, with both outputs off. At the end of the integration limit or the start of mold opening, the failsafe DART*Scanner*™ detects the alarm condition and turns the 'Reject' output ON. This output stays on until the start of injection for the next cycle – again, the "Alarm Turn Off" setting in DART*Vision*™ is disabled.

The failsafe DART*Scanner*™ will also send pinched parts to the 'Reject' bin, as shown in Figure 3. If the DART*Scanner*™ sees a second Mold Opening (Trigger 4) signal before it sees an Injection Forward signal for the next cycle, the output will change to 'Reject' mode (if not all ready there). This 'Reject' signal will stay on until the start of the next cycle. Figure 4 shows the same pinched-part scenario for a cycle that already had alarmed.

Finally, until the failsafe DART*Scanner*™ is fully powered and receives a setup from DART*Vision*™, neither output is enabled. In this manner, the DART*Scanner*™ cannot give an indicator of 'Good' or 'Reject' parts until it is powered and is given sorting parameters. When using the 'Good' output to divert parts, this provides a truly failsafe way of ensuring that 'Reject' parts are never accidentally sent to the 'Good' bin.

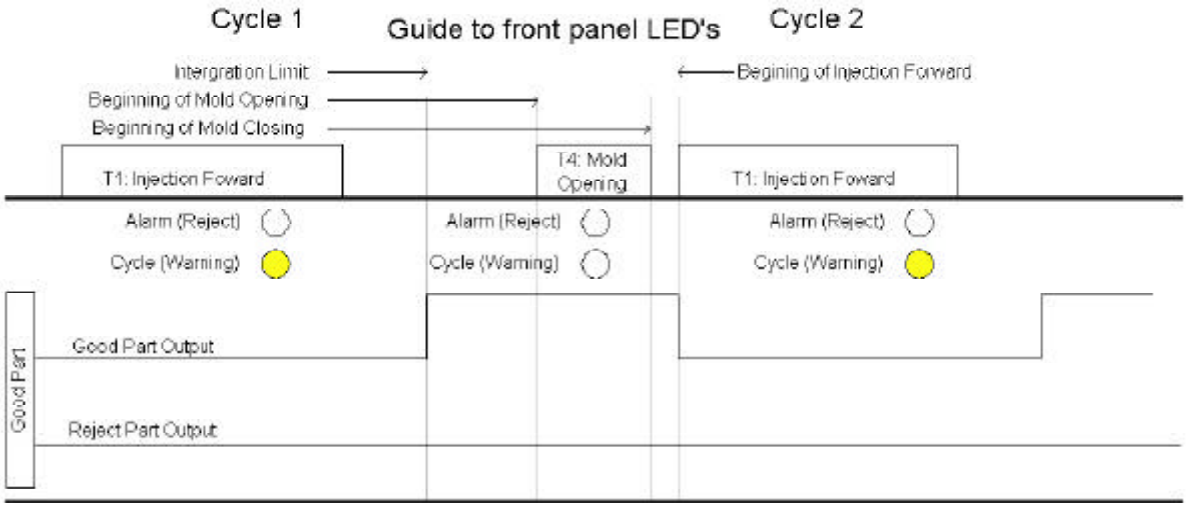


Figure 24: Failsafe Good part cycle

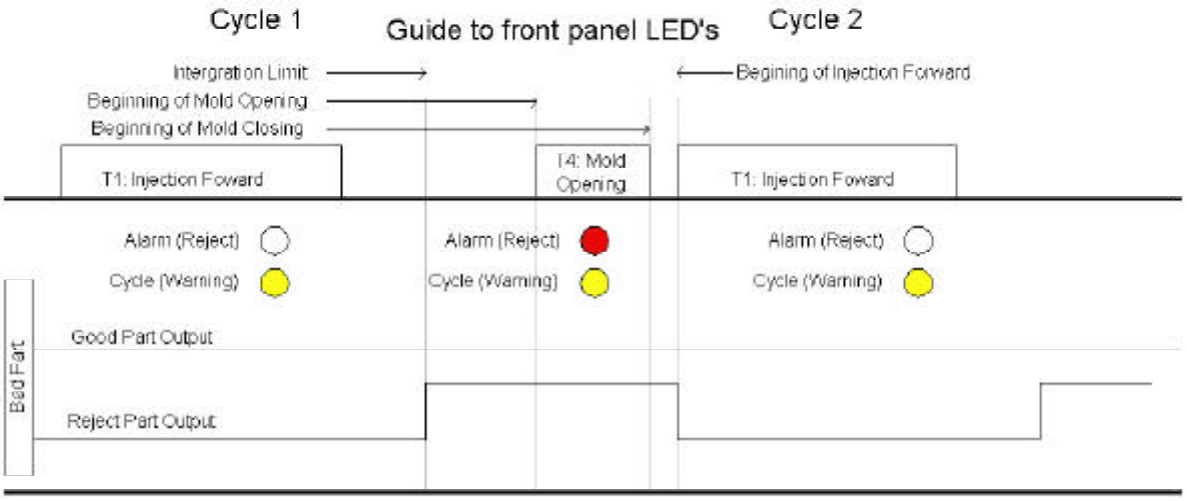


Figure 25: Failsafe Bad part cycle

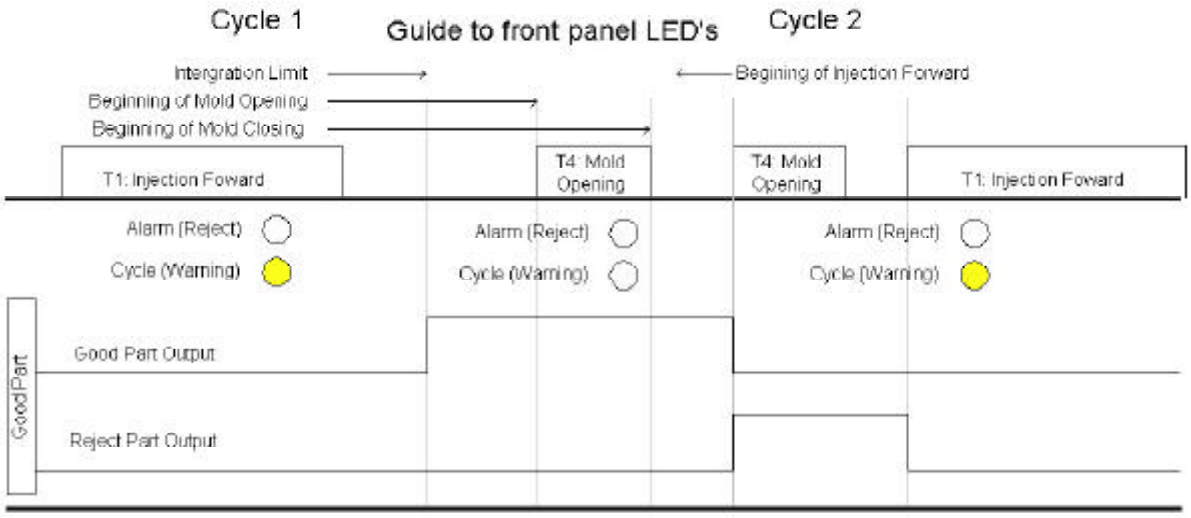


Figure 26: Failsafe Good part cycle with pinched part

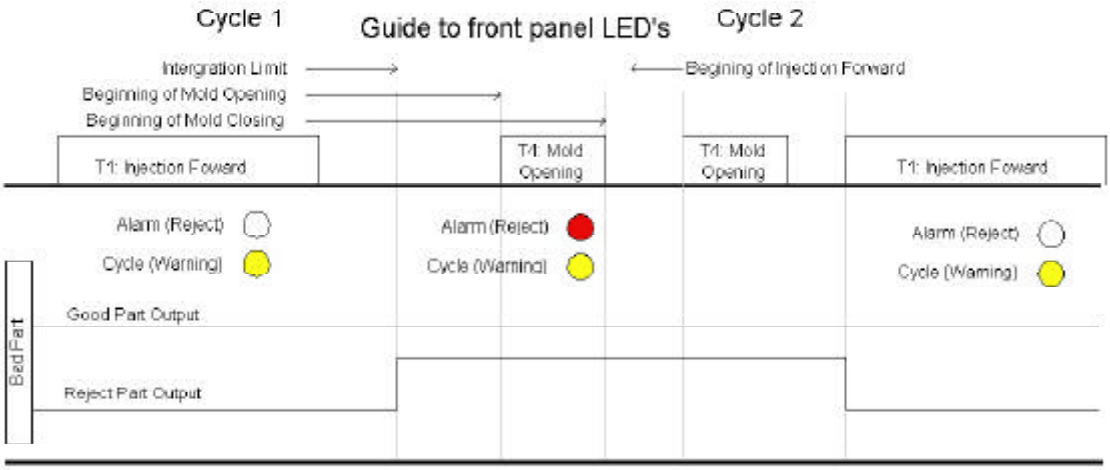


Figure 27: Failsafe Bad part cycle with pinched part

A further illustration of 2-bin sorting using the failsafe using the 'Good' part output is shown in Figure 5. The parts divertor is set up so that it defaults into the 'Reject' parts bin. Figure 5 shows three scenarios – one for no power or no setup loaded, one for a 'Good' part signal, and one for a Reject part signal. When the 'Good' part contacts close, this signal is used to shift the parts to the good part position .

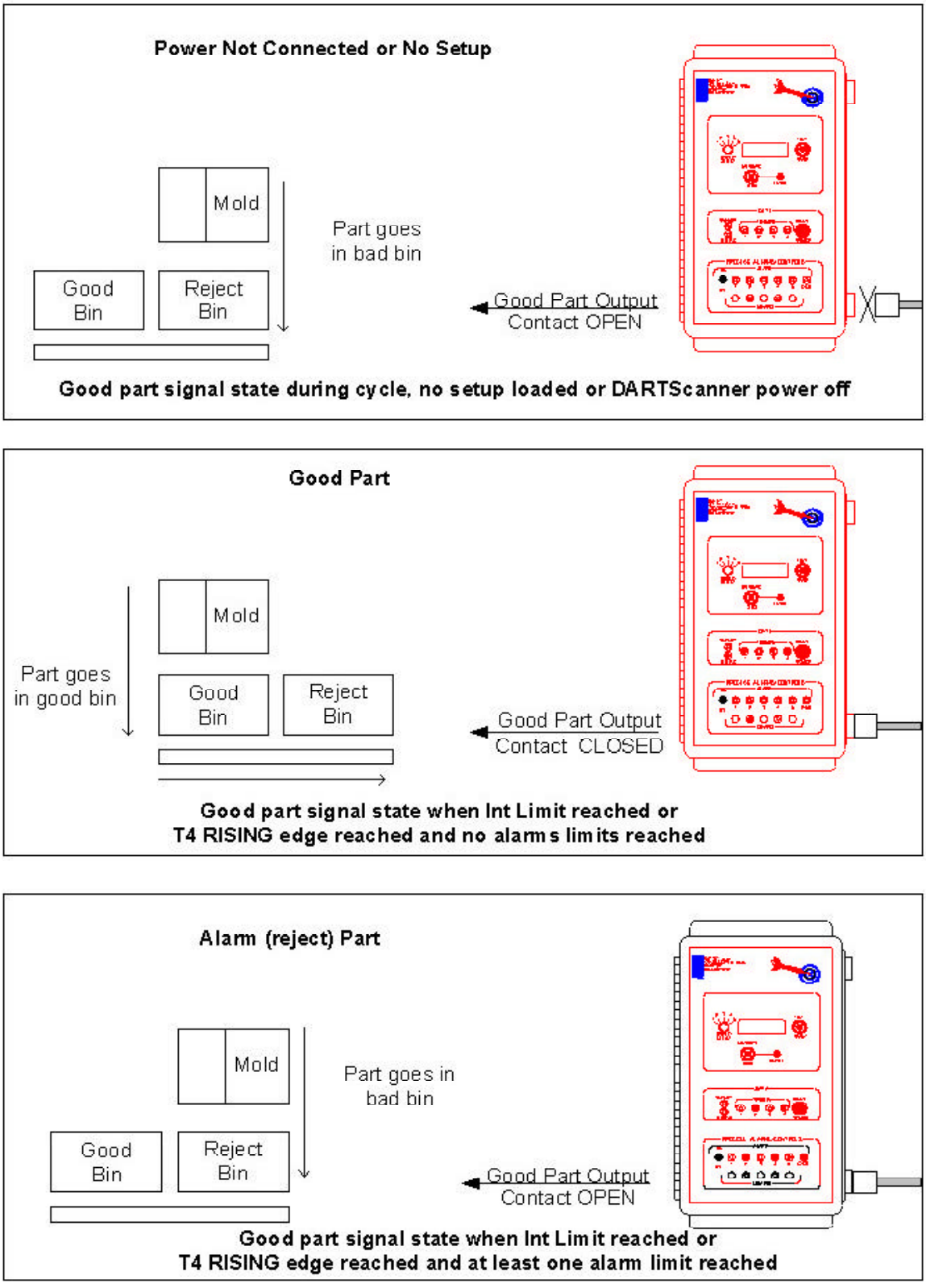


Figure 28: Two bin sorting using DART*Scanner*™ with failsafe option.

Item	Standard DART*Scanner*™	DART*Scanner*™ with failsafe option
Standard Alarm (Reject) output turn ON	As soon as an alarm condition is met during a cycle	As soon as integration limit is reached (or Mold Opening turns ON) and an alarm condition is met
Standard Alarm (Reject) output turn OFF	As set up in the softward. Either T4 (Mold Closed) turns ON or turns OFF or T1 (Injection Forward) turns ON	T1 (Injection Forward) turns ON
Cycle Time Alarm (Good) output turn ON	As soon as a cycle time alarm condition is met during a cycle	As soon as intgration limit is reached (or Mold Opening turns ON) and no alarm condition is met (*NOTE* Cycle Time alarms are now part of the regular alarms, and they effect the outputs the cycle after the alarm)
Cycle Time Alarm (Good) output turn OFF	T1 (Injection Forward) turns ON or as a time delay from rising edge of T1	T1 (Injeciton Forward) turns ON

Table 23: Itemized changes between the standard DART*Scanner*™ and the DART*Scanner*™ with failsafe option:

Important installation notes:

- Integral limit in the software should be reached before Mold Open turns on.
- Both trigger 1 (injection forward) and Trigger 4 (mold opening) are required for operation
- Cycle Time alarms are now part of the regular alarms, and they effect the outputs on the cycle after the alarm occurs

7 Glossary

differential – the degree or amount to which similar things differ

disable – to incapacitate or make powerless

interface (in computer science) – the point of interaction of communication between a computer and another entity, such as a printer

variation – the difference in things that are supposed to be the same

redundant – unnecessarily repetitive

sequence – the following of one thing after another, a number of things or events that follow each other

synchronize – to take place or cause to take place at the same time