IntelliMold Systems
OEM Integration:
Van Dorn

Revision Level: 002
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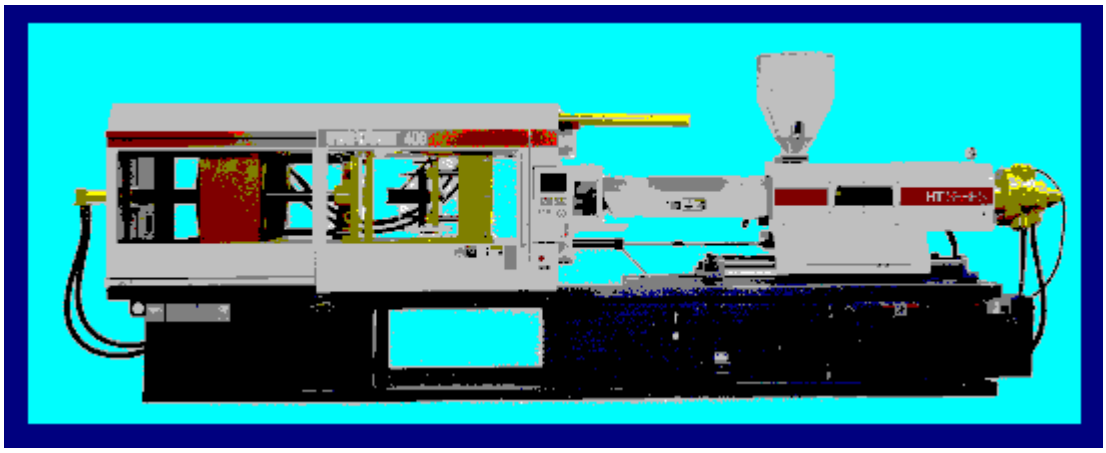
The following information is for reference only. It is subject to change and may not be identical on all types of Van Dorn Controls.

The following information has been gathered to help in start-up, set-up and troubleshooting any problems that have to do with the successful operation of the IntelliMold System on a Van Dorn Injection Molding Machine.

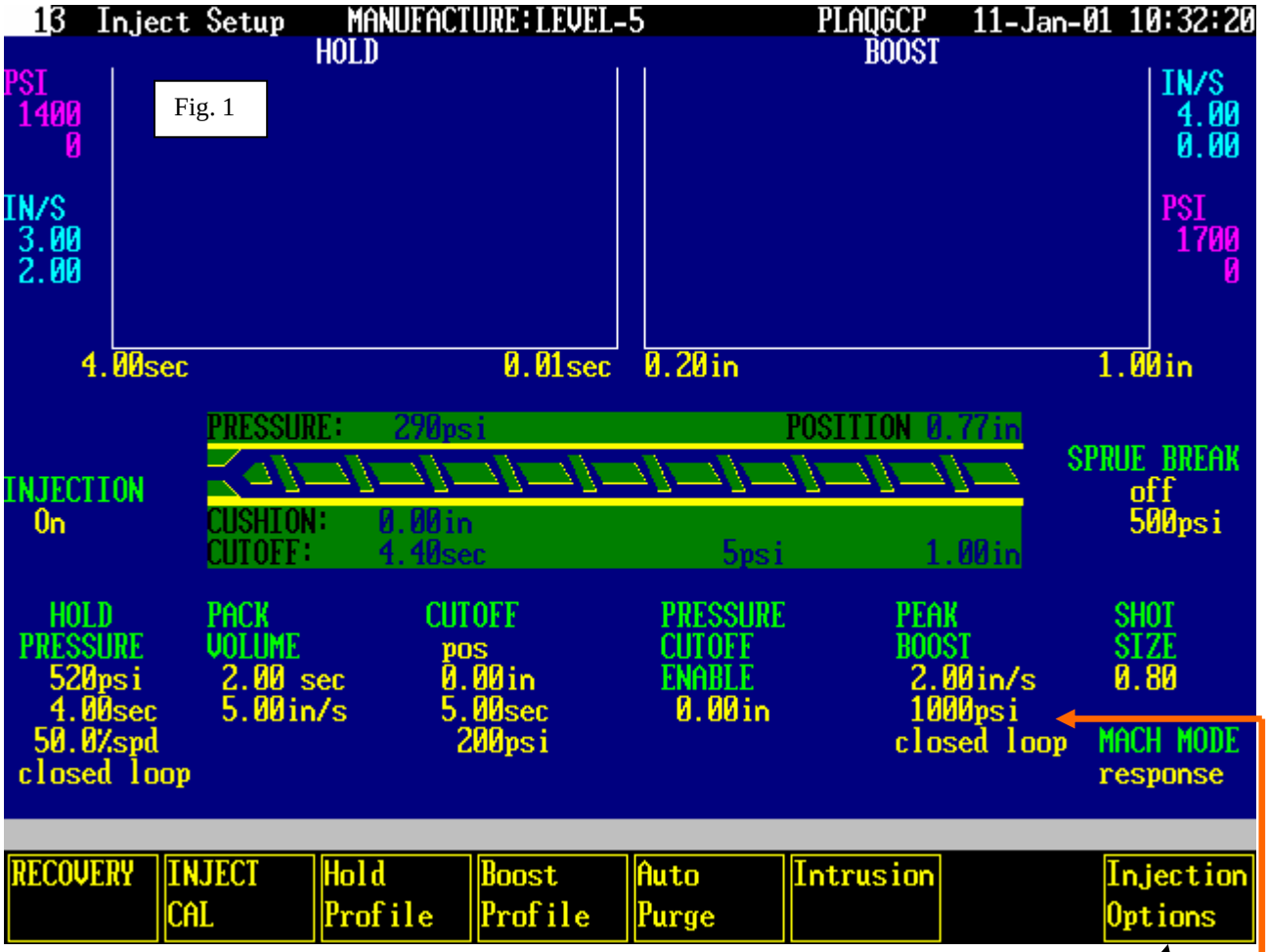


What is IntelliMold™?

IntelliMold™ is a unique process control method that provides measurements and control of pressure transition throughout the cavity in real time. This is achieved by generating a new process parameter called internal melt pressure, IMP. IMP is generated from real-time measurements, every 2 milliseconds, from a transducer in the nozzle extension and at the last place to fill in the cavity. The real-time value of the IMP is compared with the operator-entered set point and the hydraulics are manipulated in a manner to bring the actual value to the set point. The IMP replaces the need for boost, pack and hold profiles.

In addition to the 2 pressure transducers, the cavity is also charged with 200 psi of air prior to the start of injection. We provide an air amplifier that will boost normal plant air between 50-150 psi to the specified 200 psi. The primary purpose for this is to give the transducers a known start point prior to the start of injection. An additional advantage of this pressure within the cavity is that it helps make the material more dense as it fills the cavity. Using this in conjunction with the material based control of injection provides parts with a more even density throughout the part. With this method and process control, each section of an injection molded part solidifies in an equal, pressure-balanced and stress free environment.

"You can't control that which you can't measure; yet, that is what we, the molders, have been trying to do for many years."
- Milko Guergov



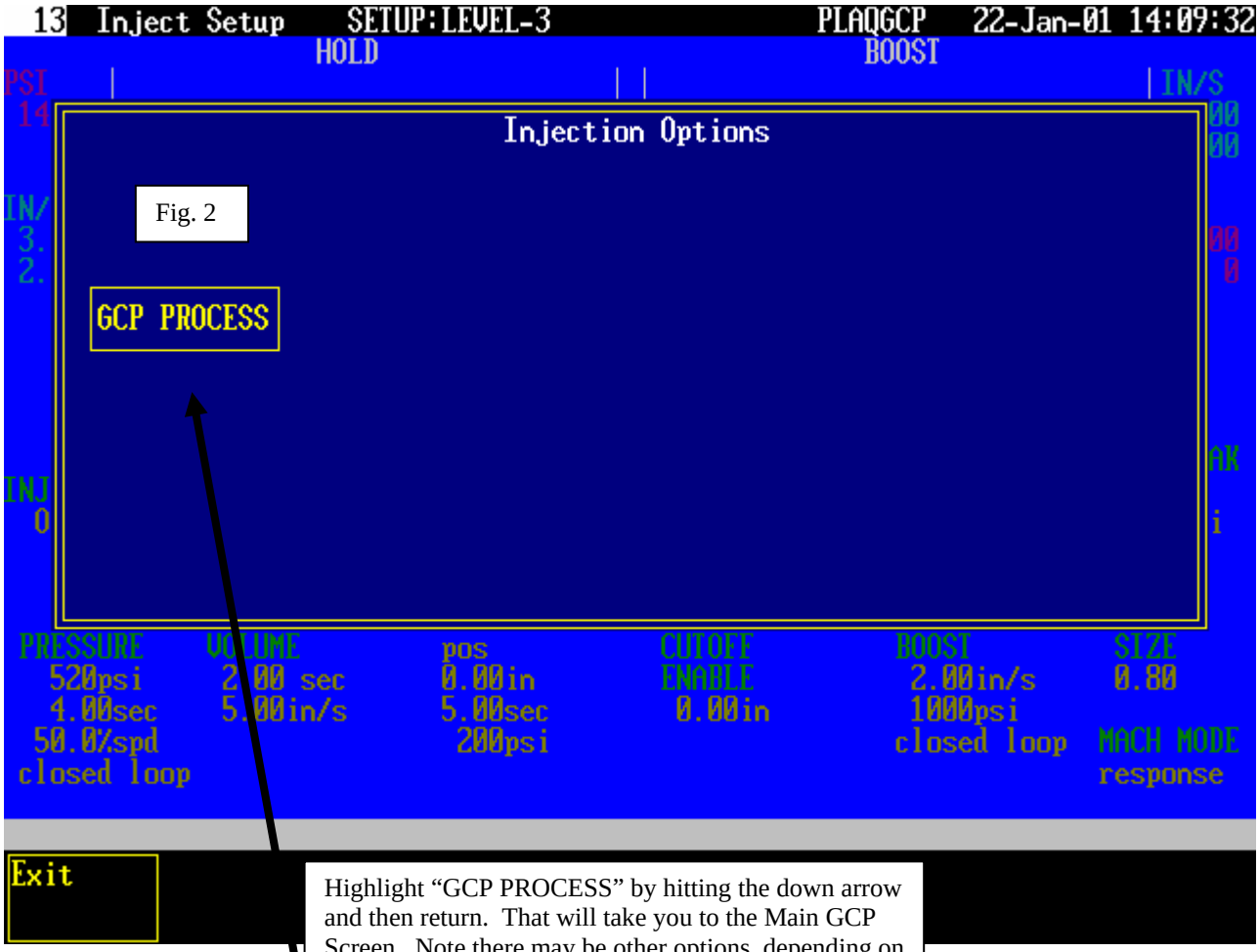
Above screen is the conventional injection screen from a Pathfinder 5000 Control. Although it may very slightly, It is pretty common among the Pathfinder series. It is from this screen that you access the Intellimold System (GCP). Note: IntelliMold is also known as GCP on earlier systems.

To navigate to the IntelliMold screens a.k.a. GCP, select "Injection Options" from the main injection screen.

It is important to note that earlier versions of software would allow Peak Boost to limit IMP from obtaining required pressure. This has since been addressed but it is recommended that it be checked. You can do so by lowering peak boost to a value of 100psi while processing with IntelliMold (GCP). Verify you obtained the IntelliMold set point, If not enter maximum in/s and psi values allowed in this field.

Attention: On some versions of software conventional set points may interfere with Intellimold operation. CUTOFF and PEAK BOOST have been known to interfere in the past. Although this problem has been addressed it is important to verify that In/Sec Pressure and Time setting do not effect Intellimold operation.

The Following is the Conventional Injection Options screen. You can access it by selecting the **"Injection Options**" button on the main Injection screen. From this screen you access the main IntelliMold a.k.a. GCP screen. It is done by highlighting GCP PROCESS and hitting ENTER. Depending on the machine their may be other options in this menu. A common option on the newer Van Dorn's is a Cavity Pressure Menu. Although our process utilizes a cavity pressure and/or temp transducer IntelliMold is not related to this cavity pressure transfer option.



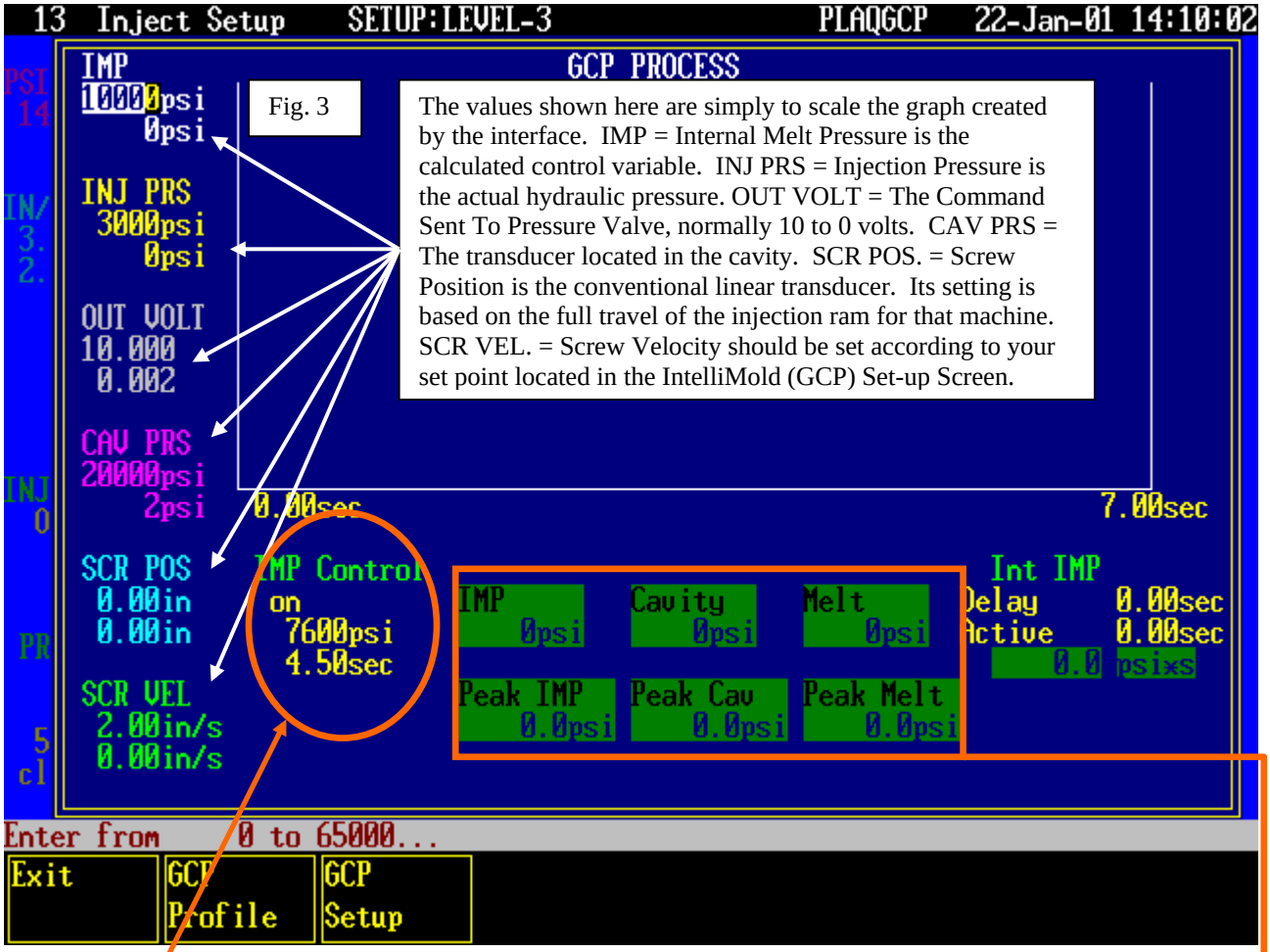


Fig. 3

The values shown here are simply to scale the graph created by the interface. IMP = Internal Melt Pressure is the calculated control variable. INJ PRS = Injection Pressure is the actual hydraulic pressure. OUT VOLT = The Command Sent To Pressure Valve, normally 10 to 0 volts. CAV PRS = The transducer located in the cavity. SCR POS. = Screw Position is the conventional linear transducer. Its setting is based on the full travel of the injection ram for that machine. SCR VEL. = Screw Velocity should be set according to your set point located in the IntelliMold (GCP) Set-up Screen.

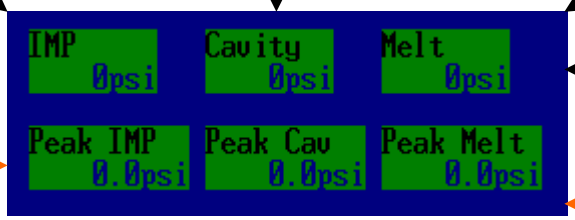
IMP Control Values: There are three settable fields on this screen. The system is turned on or off, IMP pressure is set for a signal stage profile, and injection time is adjusted. If there is a need to use more than one segment of pressure during injection (other wise known as profiling) you must set your values in the IntelliMold (GCP) Profile screen. See page 7 Note: If you are unable to add a value in this screen you must re-scale the input values in the IntelliMold (GCP) Setup Screen. See page 8. You must also re-input your profile shown on page 67

This field will display actual IMP during injection or anytime a force is exerted on one or both transducers.

This field will display actual cavity pressure it is normal for a delay. Since the cavity transducer is usually at the last place to fill.

This field will display actual Melt Pressure during injection and recovery, or anytime pressure is exerted on it.

There has been a problem in the past with Peak IMP displaying an incorrect value. This problem has been addressed and is corrected using a software fix. If you encounter this problem contact your IntelliMold representative.



Note: These fields are not able to display negative values. A transducer that is in a negative range will show a zero on the interface.

This field will capture the peak IMP Pressure.

This field will capture the peak Cavity Pressure.

This field will capture the peak Nozzle Pressure.

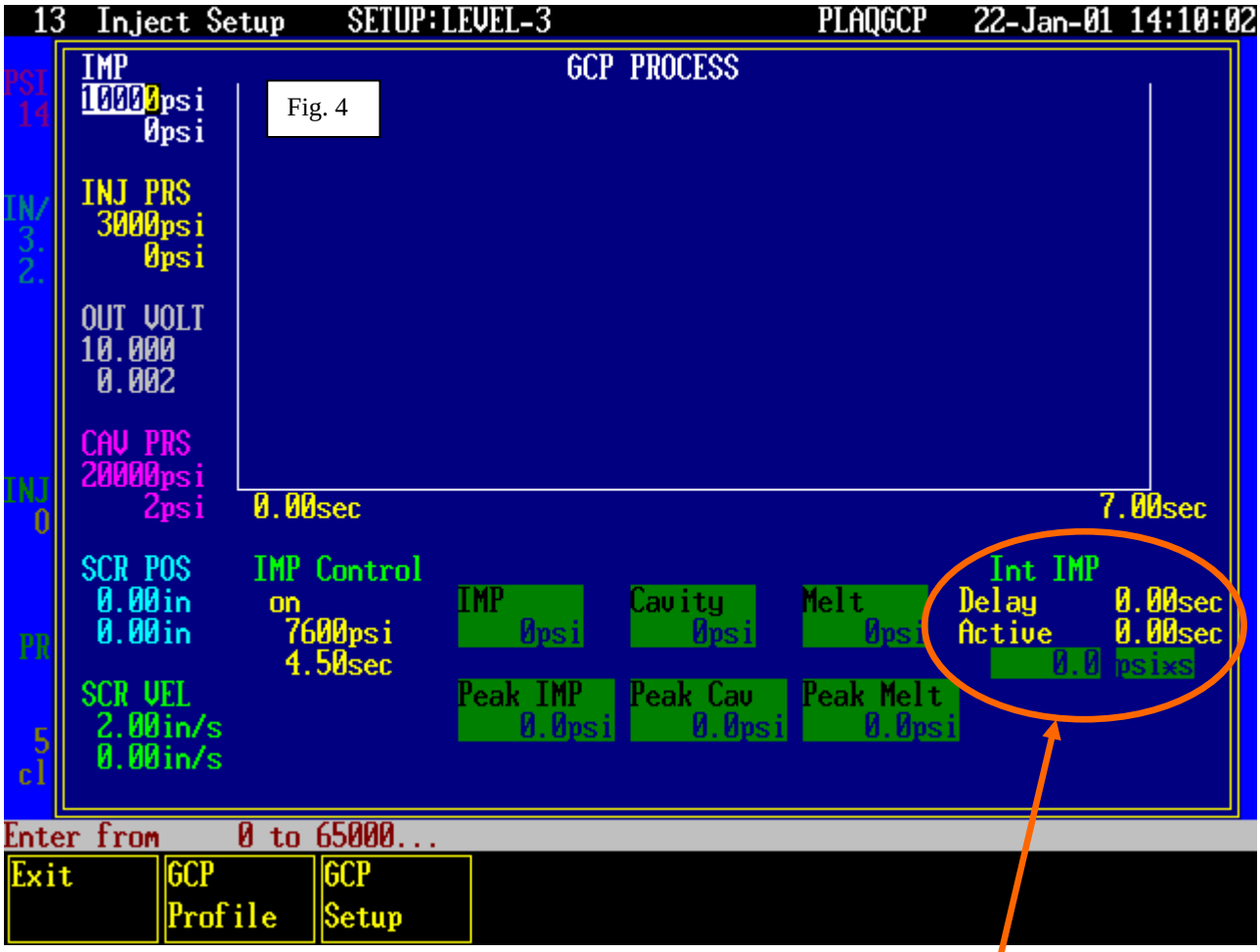


Fig. 4

Int IMP (Integral IMP) gives the ability to calculate 1st Integral in a PSI vs. Time format. This is used to calculate Rheology. If you refer to the figure below it shows a typical IMP curve, as it would be displayed on the Main IntelliMold (GCP) Screen. By specifying a delay to start time and an active time you are able to calculate the area under the IMP line, or otherwise known as the 1st integral.

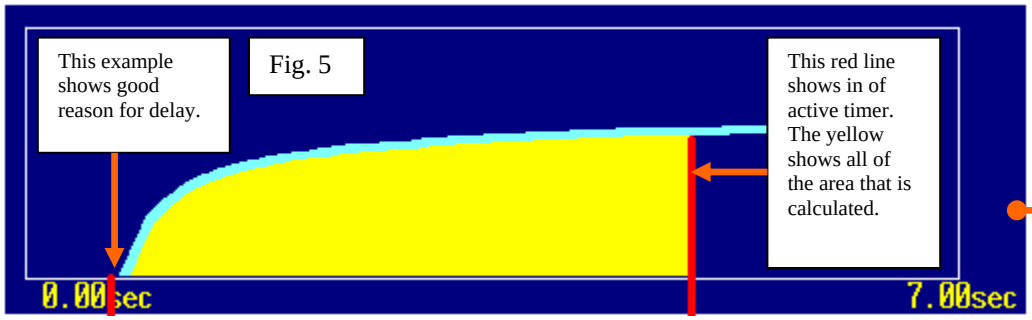
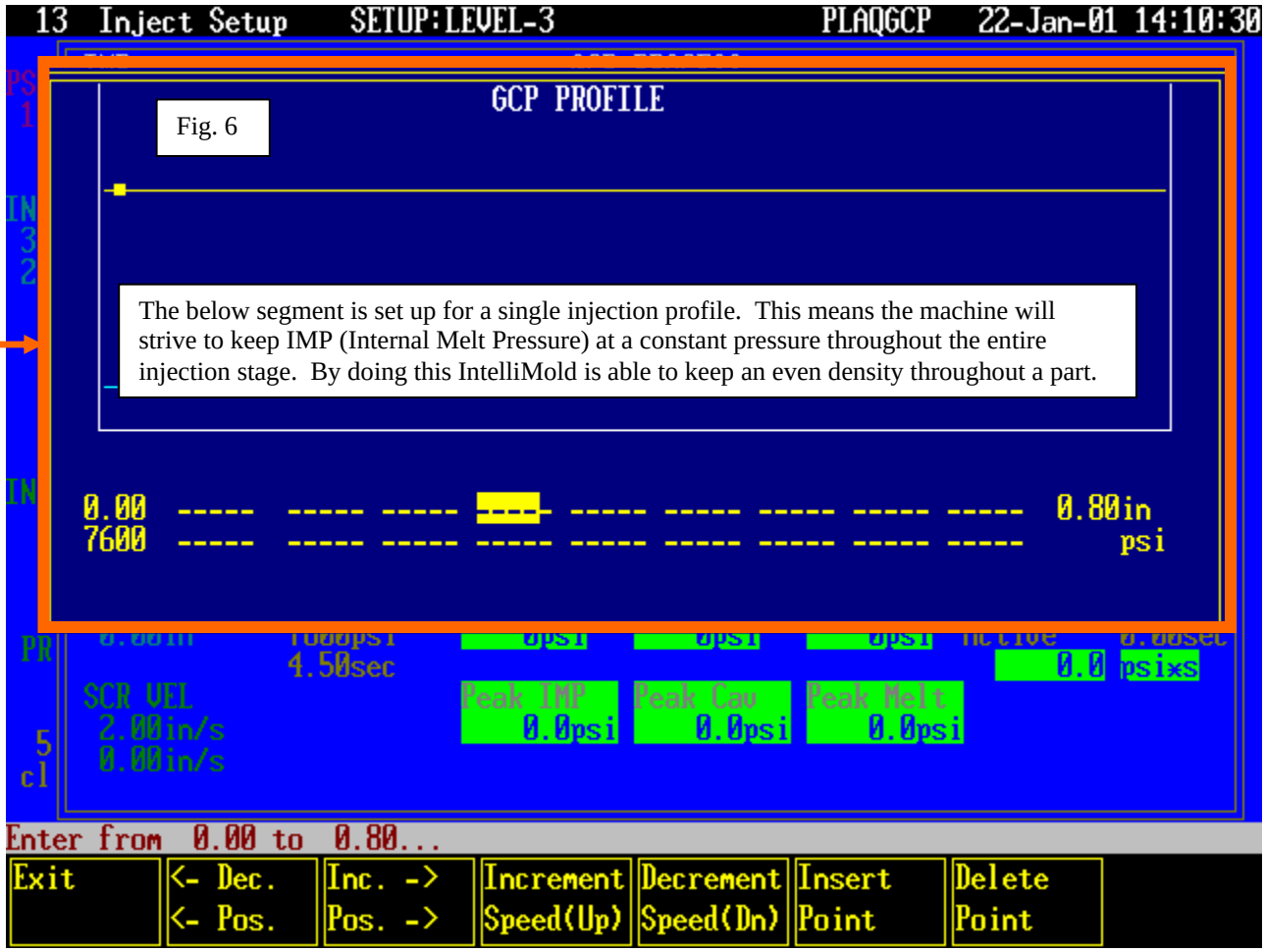


Fig. 5



On this screen you have the ability to set up to ten segments of Pressure Vs Position. This screen works much like the Van Dorn Conventional profile screen with the exception of its psi. Value. The psi. Value used on this screen is the same used on the Main IntelliMold (GCP) Screen on page 4. Take into account that these values pertain to IMP (Internal Melt Pressure) and are calculated after the intensification ratio. If you have a hydraulic pressure of 1,000, the IMP value would be roughly 10,000 psi. Depending on the intensification ratio of your machine. Keep in mind that an intensification ratio of ten was used for this analogy and can vary depending on the machine.

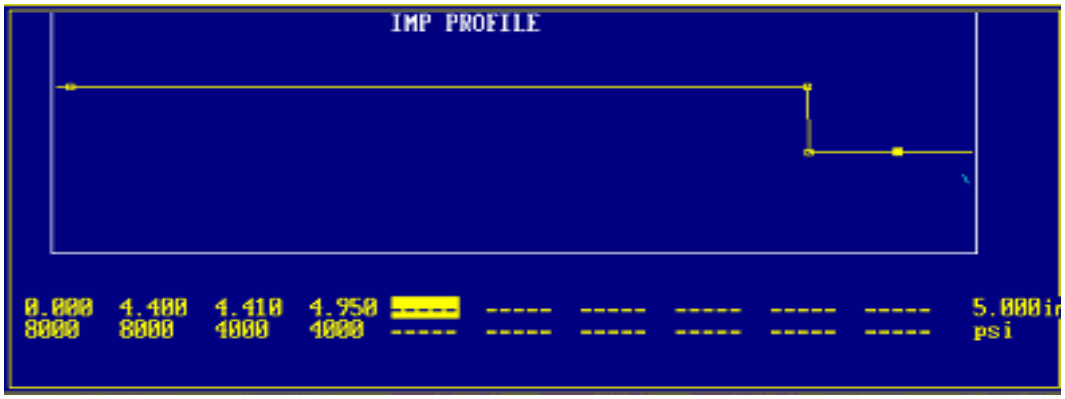


Fig. 7
(Left)
Demonstrates the ability to do a four-segment profile with IMP pressure Vs Position. This profile is only active when IMP Control is on.

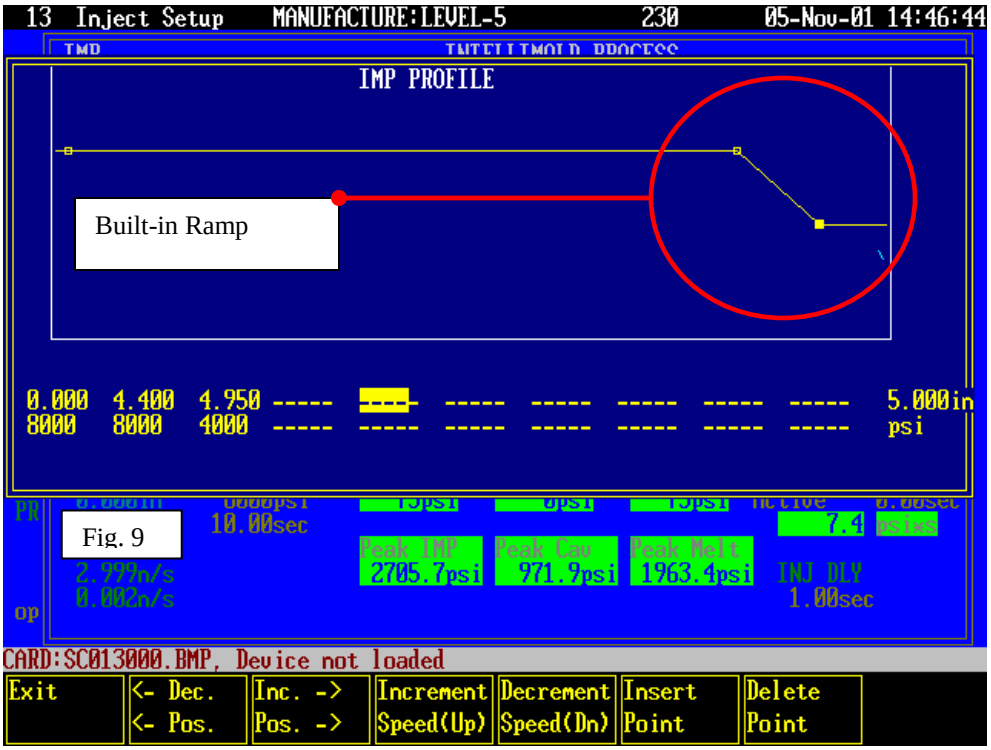


Fig. 9

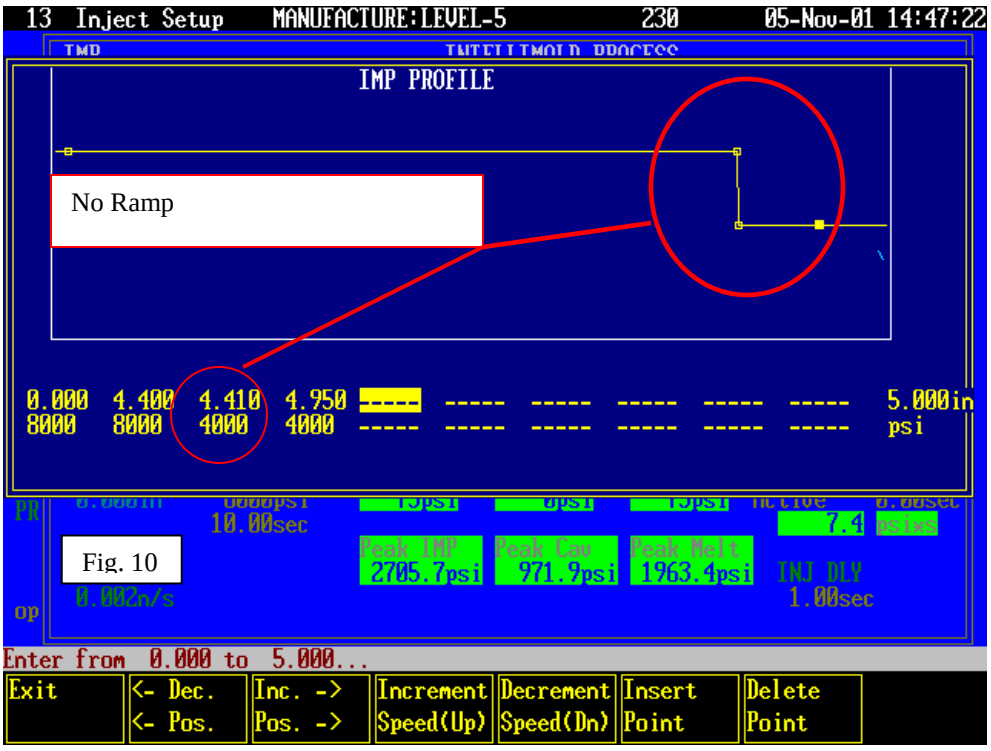


Fig. 10

Notice the built in ramp on figure 9, to eliminate any unwanted ramps in the Van Dorn control specify the start position and pressure as well as the end position and pressure.

This will display IMP actual during injection.

This will display actual cavity pressure.

This will display actual nozzle pressure.

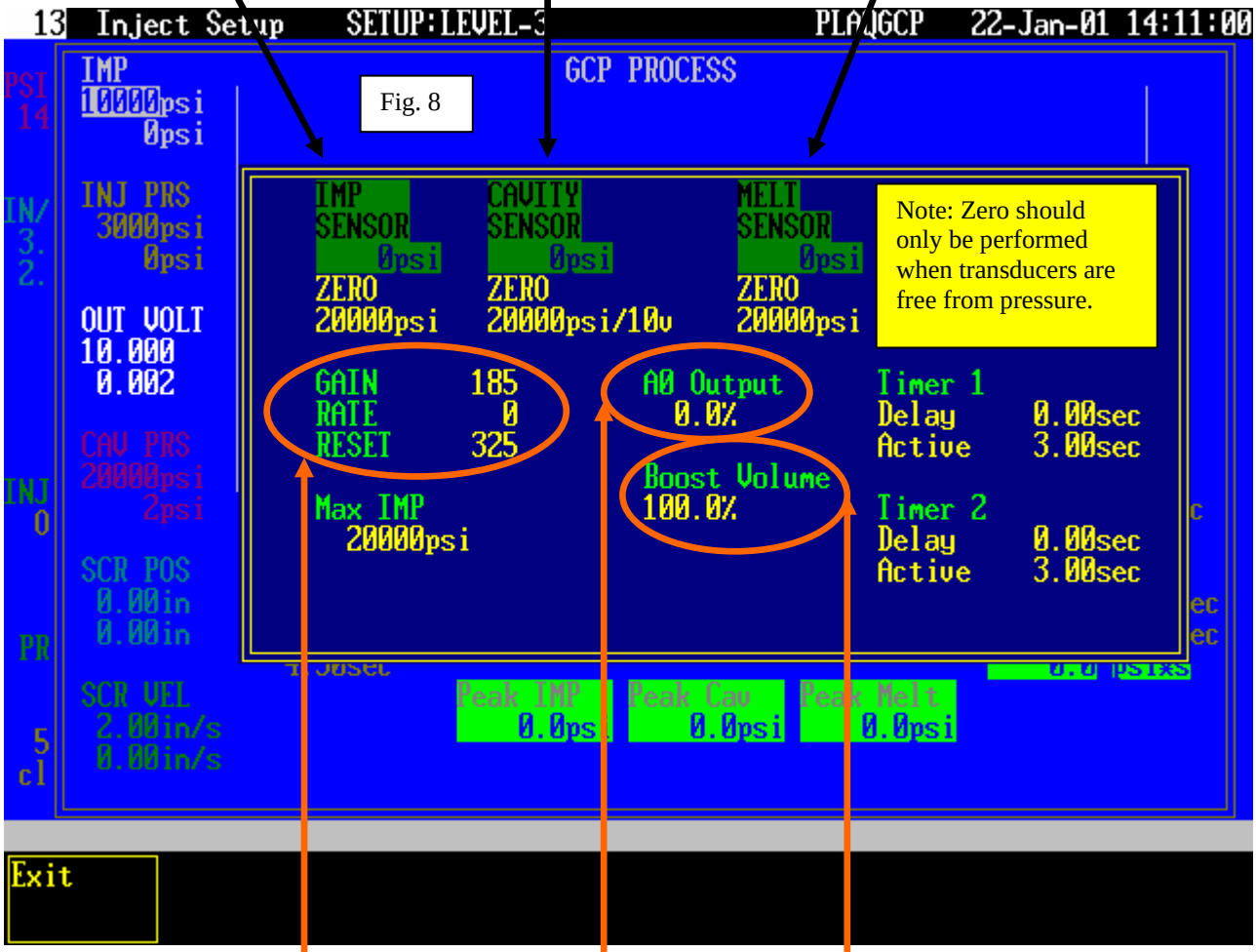


Fig. 8

In this field you are able to adjust the GAIN, RATE, RESET.
Gain = Proportional
Rate = Derivative
Reset = Integral
The tuning values you assign in this field are used on the calculated process variable. (IMP) It is only used when IntelliMold (GCP) is turned on.

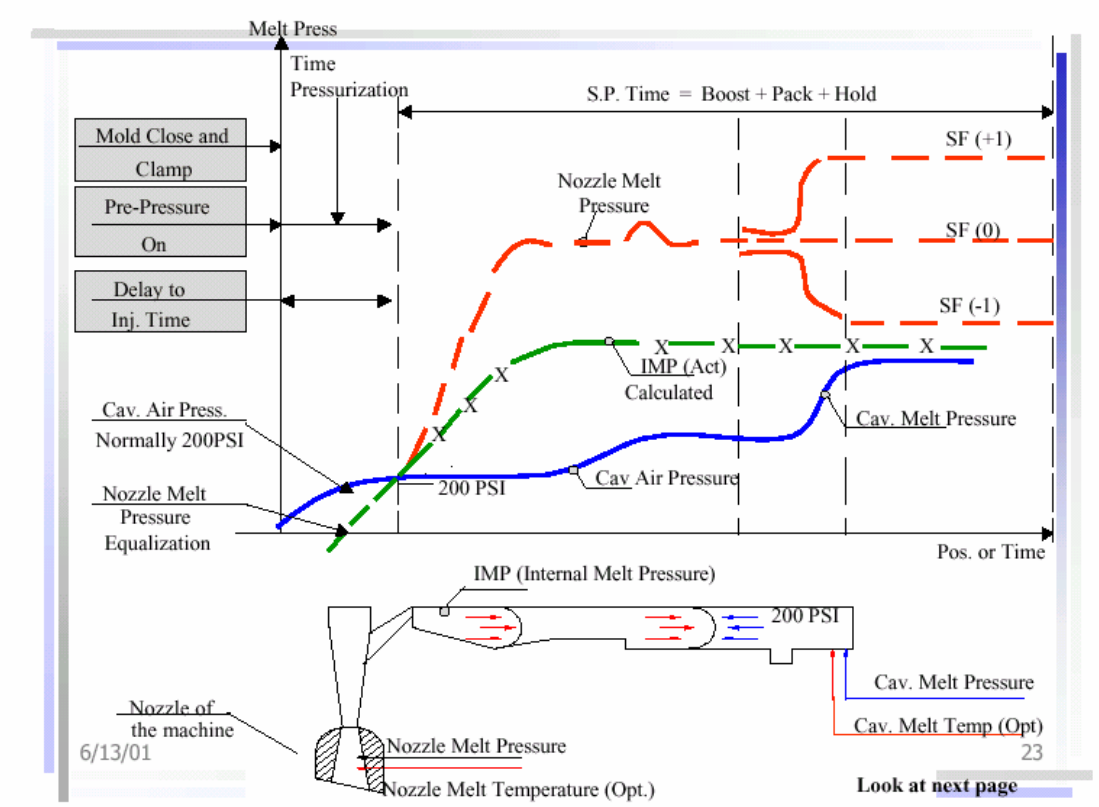
AO Output is also known as process factor A. It is used to change the way IMP is calculated.
00.00% = PFA –1.00
25.00% = PFA –0.50
50.00% = PFA 0.00
75.00% = PFA +0.50
100.00% = PFA +1.00

See page 9 for more on PFA.

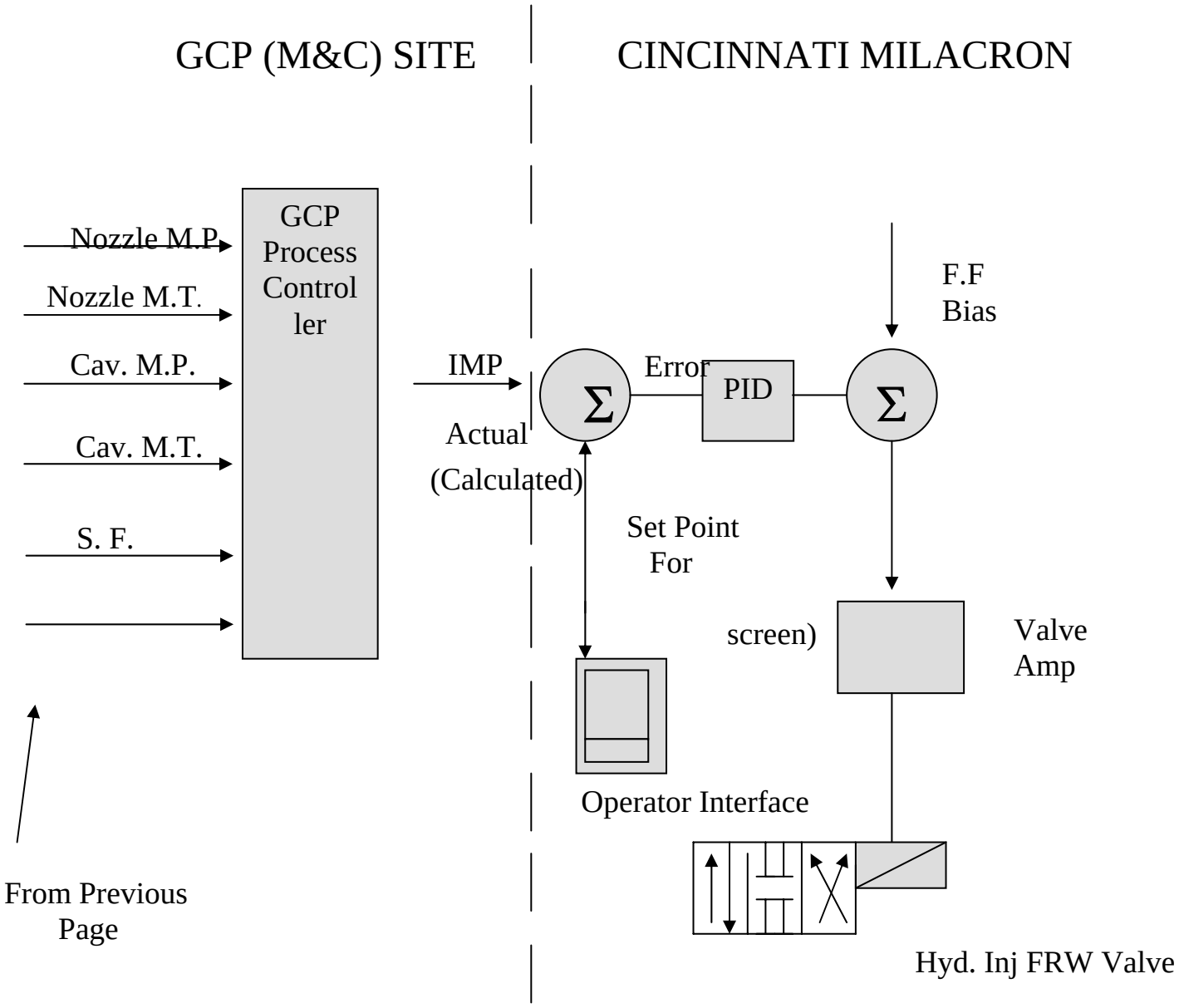
In this field you can adjust Boost Volume. It has been placed here for easy access to velocity control without having to change back to conventional screens.

Process Factor A

The following graphic depicts how PFA affects the IntelliMold™ process. The blue line represents cavity pressure; the red line represents nozzle pressure; the green line represents calculated Internal Melt Pressure (IMP). Notice that there are three separate scenarios for nozzle pressure. With PFA at –1, nozzle pressure is reduced when the cavity is introduced. With PFA at 0 there is no change in nozzle pressure. With PFA at +1 nozzle pressure is increased.



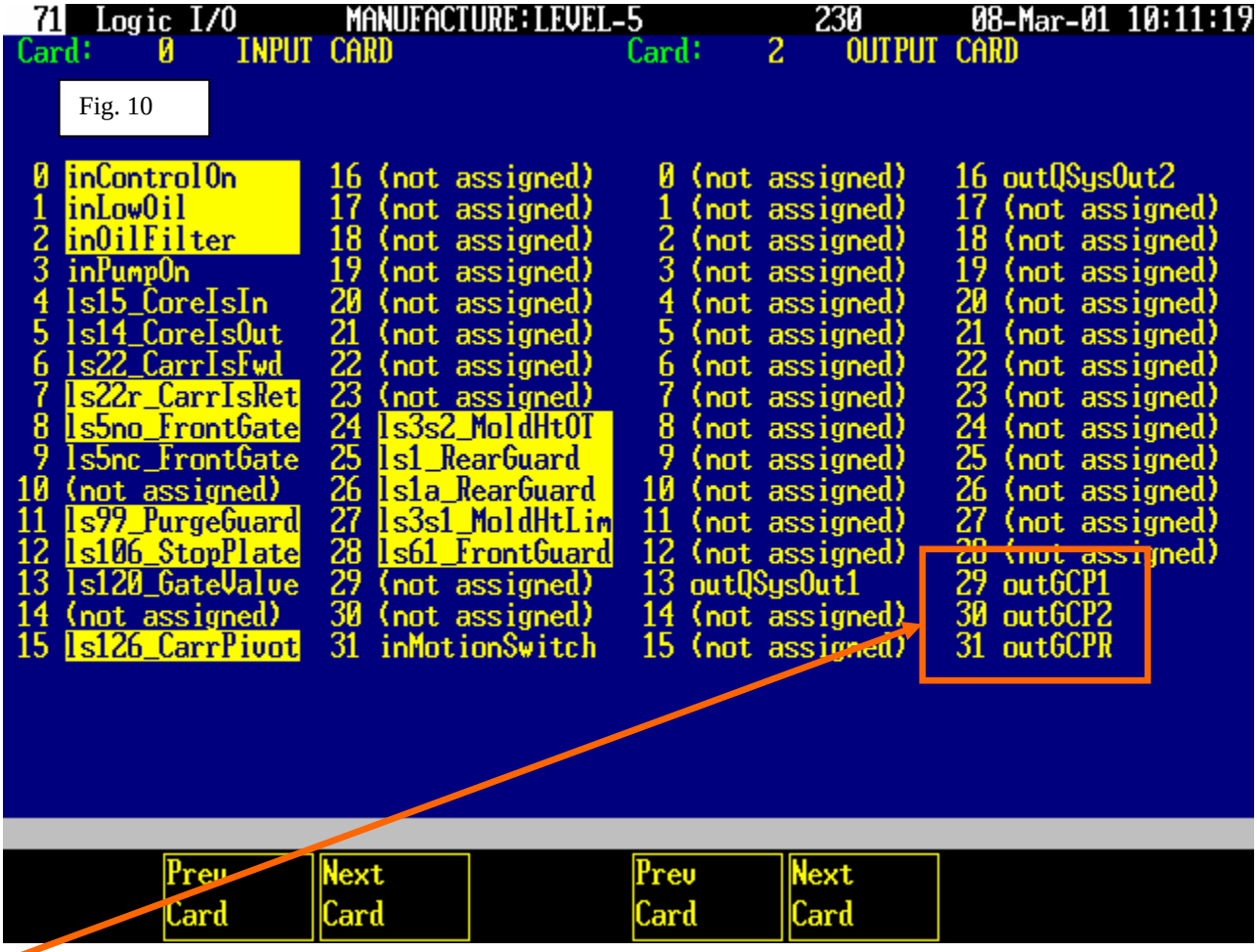
Process Factor A



IntelliMold (GCP) scaling fields. This is the section used to scale the IMP, Nozzle, and Cavity signals that come from the I.C.E. Box to the Analog I/O board of the Van Dorn Control. These three signals are 0-10volts, and the most common transducers used have a max limit of 20,000 psi. This may not always be the case though, so it is important to check the type of transducer running in the machine in question. Another important thing to note is that these fields are only to scale the values on the operator interface as a reference. They have no overall controls on the actual process. For instance, if a part was made with a IMP set-point of 10,000 psi and the scaling was set at 20,000 psi / 10v, for a 20,000 psi transducer, the IMP field would read roughly 10,000 psi and a part would be produced. If on the very next shot the scaling was cut in half to 10,000 psi / 10v and the set point remained the same with the very same transducer, the value would read 5,000 psi. However the machine would have exerted the exact same amount of force and an identical part would have been produced.

Max IMP should be set same as IMP scaling.

The IntelliMold System requires a small pneumatic panel be used to pre-pressurize the cavity of the mold during injection. It utilizes the Digital Output board of the Van Dorn control. (See Fig 10) There are three outputs required to control the pneumatic panel. Timer 1 (as seen above) controls MP1 and timer 2 controls MP2, both normally closed solenoids located on the pneumatic panel. MPR is active whenever either solenoid is energized. MPR is a normally open solenoid designed to port any stored pressure to atmosphere after injection.



As shown in this configuration, digital outputs 29, 30, and 31 on OUTPUT CARD 2 have been used to send the signal to energize the solenoids located on the pneumatic panel. **Note: Output address may vary.**

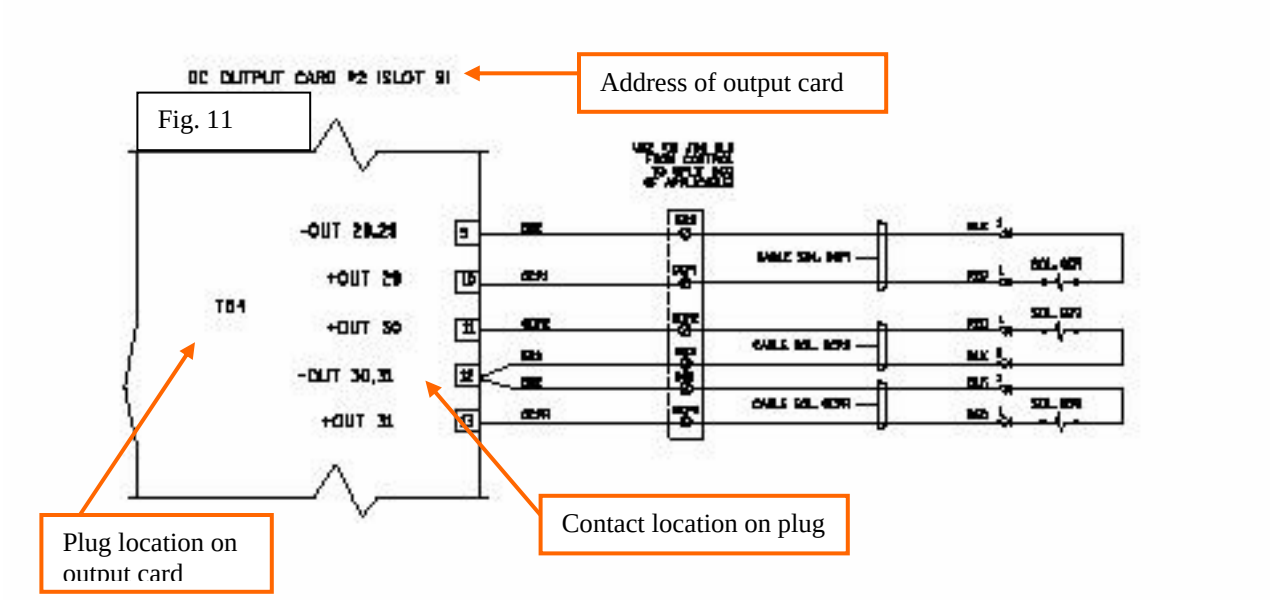


Fig. 11

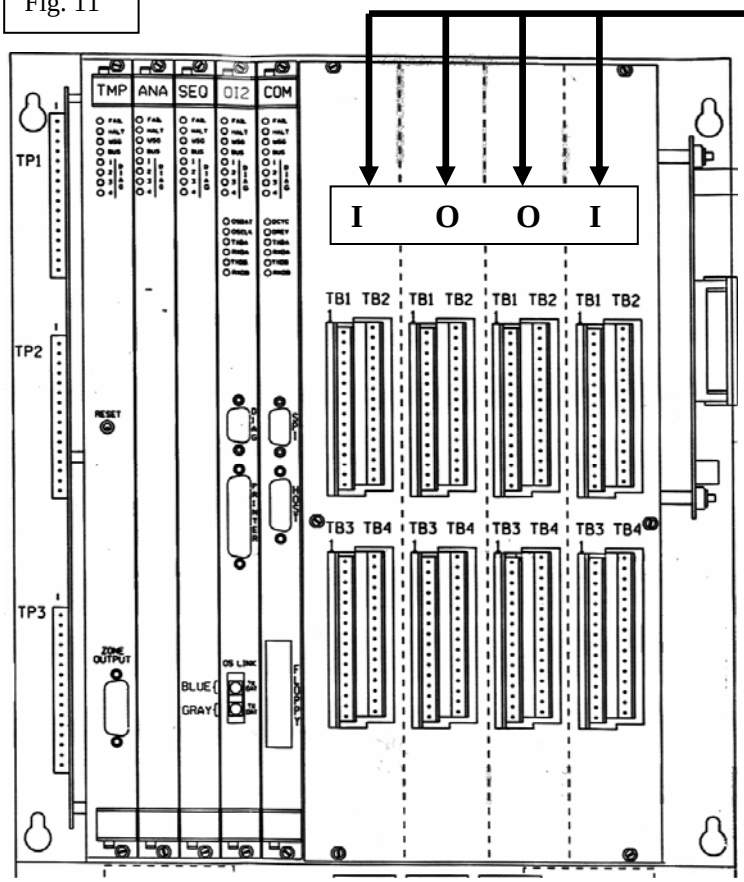
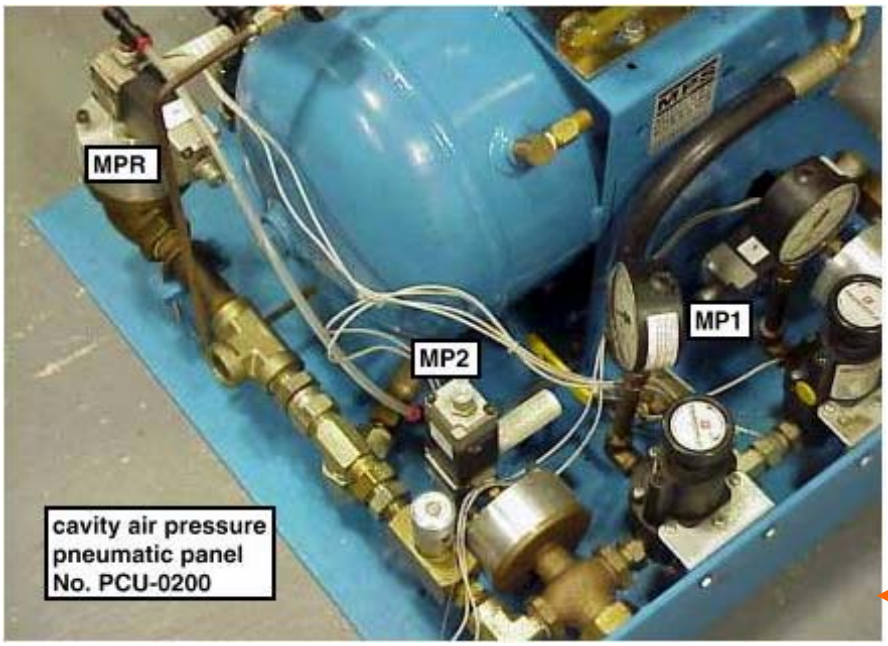
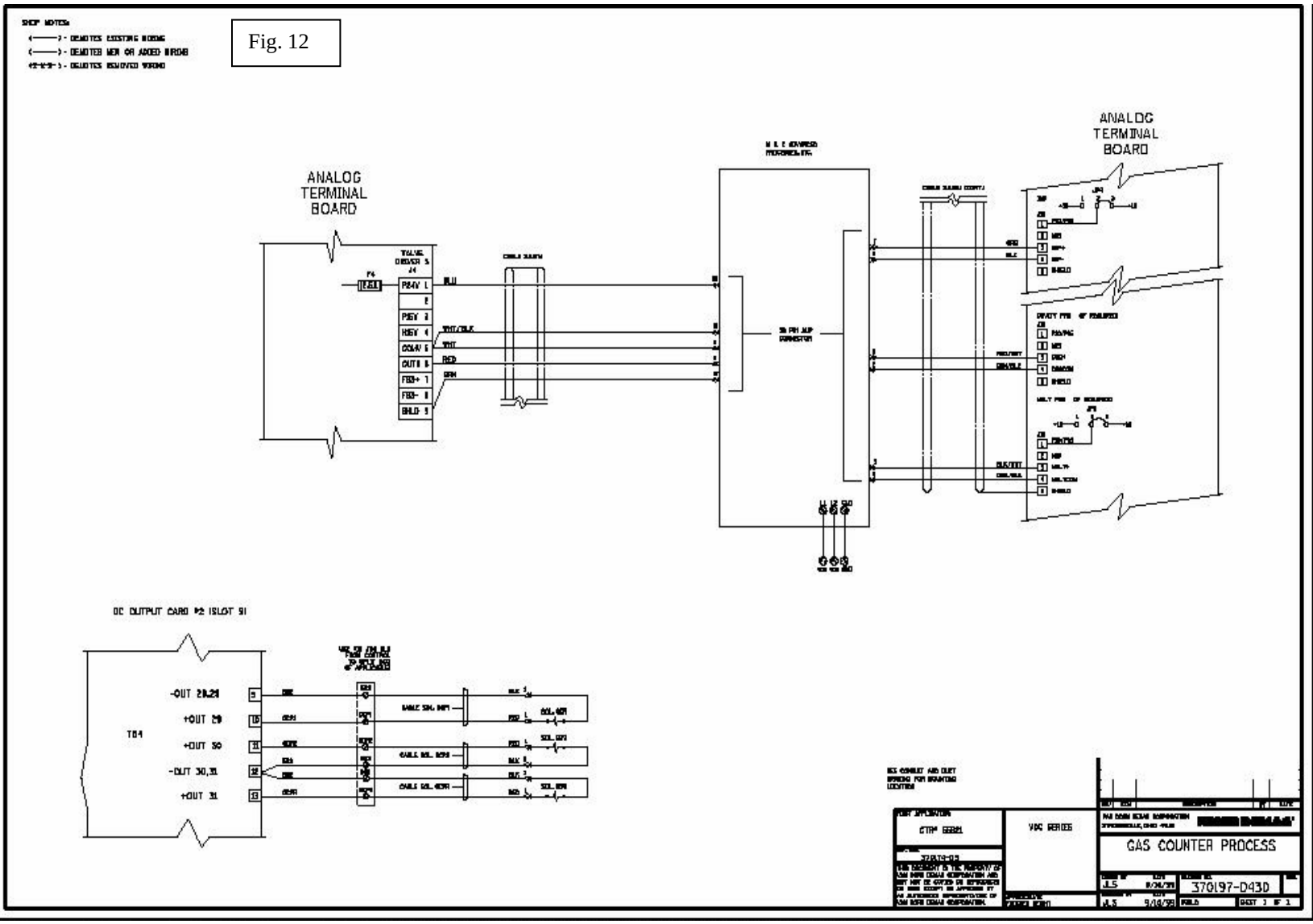


Fig. 11 display the normal location for the digital I/O boards. However not every Van Dorn has the same configuration. It is important to check your machine's drawings. When an upgrade is done for the IntelliMold equipment, software must be written to select witch dry contacts are used. It is important that the company responsible for the upgrade has up-to-date information on any new features that might have been added, if not the possibility of using a contact that already might be utilized exists.



Located on the left is a picture of the most common pneumatic panel used. It clearly shows the location of MP1 (GCP1), MP2 (GCP2), and MPR (GCPR).
There are however more than one option of pneumatic panels available. For more information contact your IntelliMold representative.

Fig. 12


ANALOG TERMINAL BOARD
ANALOG TERMINAL BOARD
GAS COUNTER PROCESS
370197-D430

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Revision History

Revision	Description	Revision Date
Rel.	Document Released	10/19/01
001	Updated with Collins & Aikman logo	1/9/02
002	Page 3 Added note to confirm settings for cutoff and peak boost to avoid interference with Intellimold set points	4/17/02