



**Plastic Engineering &
Technical Services, Inc.**

VALVE GATE SEQUENCER

PANELVIEW 1000 TOUCH SCREEN

DESCRIPTION OF OPERATION

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SYSTEM OPERATION

The valve sequencer controls the sequencing of solenoid valves on a valve gate manifold based on screw position or time delays. The sequencer uses a linear- to-rotary motion transducer to determine the position of the screw. The sequence controller monitors the *Mold Closed* switch, the *Run Timers* switch, the motion transducer and the time delays to determine when to turn the valve gates ON and OFF. System variables are displayed and modified with an Allen-Bradley Panel view 1000 Touch Screen operator interface panel mounted on the front of the controller cabinet.

While the mold is open, the screw is considered to be in the home position (0 inches) and the hydraulic pressure relief valve is open (on hydraulic units). When any Auto Mode is selected, the relief valve closes when the *mold closed signal* is applied, and hydraulic pressure is obtained (on hydraulic units). The *mold closed signal* is supplied by the *mold closed switch*, which should be a N.O. contact from the mold machine. If Auto Position – Position Mode or Auto Position – Time Mode is selected, the position of the screw relative to the Home position is monitored once the *mold closed signal* is applied. When the screw position is sensed to be greater than 0, and greater than or equal to the programmed ON Position of valve gate #1, valve gate #1 is turned ON and remains ON until the screw reaches the OFF Position in the case of Position – Position Mode or until the ON Duration time delay has expired in the case of Position – Time Mode. This process is the same for each of the fifteen possible valves. If Auto Time Mode is selected, the time delay starts as soon as the mold is closed and the *Run Timers* switch is closed. The *Run Timers* switch should be a N.O. contact from the mold machine indicating that injection forward has begun. Closure of both the *Mold Closed* switch and the *Run Timers* switch will start the timing sequence. When the programmed On Delay time delay for a valve gate expires, the valve gate is turned ON and remains ON for the On Duration time delay programmed for the valve gate. In Auto Position Mode and Auto Time Mode, when the screw returns to its home position and the mold opens, the program is initialized for the next cycle.

Valve gate ON Positions, ON delay time delays, OFF positions, and ON Duration times are individually programmable for each of the valve gates. In addition, *Pack/Hold ON Position, Pack/Hold OFF Position, Pack/Hold ON Delay, and Pack/Hold ON Duration time* are programmable for each recipe. One group of parameters for all valve gates and the Pack/Hold parameters (sixty-three programmed variables) is called a recipe. The controller can store and retrieve ten recipes. All valve gate parameters and recipes can be viewed, modified, and selected with the operator interface panel mounted on the front of the control cabinet.

SEQUENCER FAULTS

A sequencer fault is an indication that the controller has sensed an abnormal condition in the system. A sequencer fault is caused by either of the following:

- A sequencer position limits being exceeded.
- A sequencer time-out occurring.

When a fault occurs, the message **FAULT** will be displayed on all auto mode screens and all of the valve gate outputs are turned ON. A sequencer fault is reset when the mold machine returns to its home position (the mold is opened).

OPERATOR INTERFACE TOUCH SCREEN

The operator interface touch screen allows easy entry of all variable data into the program. Using sharp objects to enter data can damage the screen. Touching an area which requires a numeric entry brings up a numeric pad. Numbers are touched in sequence. Each new numeric entry shifts the previous entries to the left. The decimal point is fixed and does not have to be entered. The value is entered when the *ENTER* key is touched. If a mistake is made while entering a value, the short arrow key (*BACKSPACE* key) to the left of the *ENTER* key can be used to erase the value being entered and allow the operator to reenter the value. The “-“ area can be used to make a value negative. The “_“ area is not used in this application.

Allowable parameter values are shown in the value prompt box when a value is being entered.

VALVE SEQUENCER DISPLAY OPERATION

The display is programmed with ten application screens: *Main Menu*, *Select Tool*, *Auto Position-Position Mode*, *Auto Position-Time Mode*, *Auto Time Mode* and *Manual Mode*. When power is applied to the display, it displays the last screen displayed prior to turning it off. To return to the main menu from any screen, press the Main Menu area.

The application screens monitor the valve sequencer operation. All screens will display a **REPLACE PLC BATTERY** message if battery voltage is low. A description of each screen follows.

Main Menu Screen:

The main menu screen, shown in Figure 1, is used to access all the other screens. Navigation touch areas are located at the bottom of the main menu screen.

- Pressing **Select Tool** brings up the Tool Selection screen.
- Pressing **Auto Position – Position Mode** puts the valve sequencer in automatic position – position mode and brings up the Auto Position – Position Mode Screen.
- Pressing **Auto Position – Time Mode** put the valve sequencer in automatic position – time mode and brings up the Auto Position – Time Mode Screen.
- Pressing **Auto Time – Time Mode** puts the valve sequencer in automatic time mode and brings up the Auto Time Mode Screen.
- Pressing **Manual Mode** puts the vale sequencer in manual mode and brings up the Manual Mode Screen.

Tool Selection Screen:

The tool selection screen, shown in Figure 2, is used to associate tools with recipes. The controller can store and receive ten recipes. Each recipe can be assigned a tool number on the tool selection screen. To select a recipe, touch the area to the right of **Selected Recipe** and enter the recipe number. To assign a tool number to a recipe, touch the **Tool #** areas on the screen. The **Tool #** area has a four digit area and a two digit area. If a new tool number has been assigned to a recipe, the recipe must be re-selected before the new number is saved. Press **Done** to return to the previous screen and the recipe parameters for the tool will be displayed in the Auto Position – Position Mode, Auto Position – Time Mode, and Auto Time Mode screen. When returning to an Auto Mode screen, the selected recipe is displayed at the top of the screen. Changes to any parameter on the Auto Mode screens are automatically stored to the selected recipe as soon as they are entered.

Auto Position-Position Mode Screens:

The Auto Position – Position Mode screens are shown in figures 3 and 4. Figure 3 displays screen for gates 1 thru 10, while Figure 4 displays screen for gates 11 thru 15. The 63 programmable parameters on the screens are shown in the **ON Position**, **OFF Position**, **Pack/Hold Position** columns and the areas for **pos limit:**, **neg limit:** and **sequencer timeout**. The programmable parameters are changed as described in the Operator Interface Touch Screen section of this document. A description of the parameters on this screen follows:

- The two parameters to the right of the and below **Mode** show the present mode of operation. Since opening the auto position-position screen causes the mode to change to auto position-position, **Auto** and **Position-Position** should always be displayed on this screen.
- **Tool #** - indicates the tool that is associated with the parameters programmed on the screen.
- **Present Position** – indicates the position from home (in inches).
- **pos limit:** parameter – the allowable positive travel limit programmed (in inches) from the home position before a fault is declared.
- **neg limit:** parameter – the allowable negative travel limit programmed (in inches) from the home position before a fault is declared.
- **sequence timeout:** parameter – the maximum time (in seconds) that a cycle can take from the time the first valve gate fires, to the time the mold opens, without causing a sequencer fault.
- **Elapsed Time** – shows the seconds elapsed since the firing of the first valve gate.
- **FAULT** – flashes when a sequencer fault occurs.
- **ON Position** - the position relative to the home position (in inches) at which the valve gates will be turned ON.
- **OFF Position** – the position relative to the home position (in inches) at which the valve gates will be turned OFF. **If the Off Position is set to 0 (zero), the valve gate will not fire.**
- **Pack/Hold Position ON** – the position from the home position (in inches) at which the valve gates will be turned ON to pack the mold.
- **Pack/Hold Position OFF** – the position from the home position (in inches) at which the valve gates will be turned off. **If the Pack/Hold Off position is set to 0 (zero), the pack/hold feature is disabled.**
- **Status** – indicates the present ON/OFF status of each valve gate.
- The current status of the **Mold Closed** limit switch (**Mold OPEN/CLOSED**) is shown in the center right portion of the screen.
- Pressing **Gates 11 -15 (Gates 1 -10)** will toggle between gates 1-10 and 11-15.
- Press **Main Menu** to return to the main menu.

Auto Position-Time Mode Screens:

The Auto Position-Time Mode screens are shown in figures 5 and 6. Figure 5 displays screen for gates 1 thru 10, while Figure 6 displays screen for gates 11 thru 15. The 63 programmable parameters on the screens are shown in the **ON Position**, **ON Duration**, **Pack/Hold Position** and **Pack/Hold Duration** columns and the areas for **pos limit:**, **neg limit:** and **sequencer timeout**. The programmable parameters are changed as described in the Operator Interface Touch Screen section of this document. A description of the parameters on this screen follows:

- The two parameters to the right of and below **Mode** show the present mode of operation. Since opening the auto position-time screen causes the mode to change to auto position-time, **Auto** and **Position-Time** should always be displayed on this screen.
- **Tool #** - indicates the tool that is associated with the parameters programmed on the screen.
- **Present Position** – indicates the position from home (in inches).
- **pos limit:** parameter – the allowable positive travel programmed (in inches) from the home position before a fault is declared.
- **neg limit:** parameter – the allowable negative travel limit programmed (in inches) from the home position before a fault is declared.
- **sequencer timeout:** parameter – the maximum time (in seconds) that a cycle can take from the time the first valve gate fires, to the time the mold opens, without causing a sequencer fault.
- **Elapsed Time** – shows the seconds elapsed since the firing of the first valve gate.
- **FAULT** – flashes when a sequencer fault occurs.
- **ON Position** – the position relative to the home position (in inches) at which the valve gates will be turned ON.
- **ON Duration** – the amount of time (in seconds) that the valve gate will be open after firing before being closed again. **If the Off Position is set to 0 (zero), the valve gate will not fire.**
- **Pack/Hold Position** – the position from the home position (in inches) at which the valve gates will be turned ON to pack the mold.
- **Pack/Hold Duration** – the amount of time (in seconds) that the valve gates will be held open after firing before being closed again. **If the Pack/Hold Duration is set at 0 (zero), the pack/hold feature is disabled.**
- **Status** – indicates the present ON/OFF status of each valve gate.
- The current status of the **Mold Closed** limit switch (**Mold OPEN/CLOSED**) is shown in the center right portion of the screen.
- Pressing **Gates 11 – 15 (Gates 1 – 10)** will toggle between gates 1-10 and gates 11-15.
- Press **Main Menu** to return to the main menu.

Auto Time-Time Mode Screens:

The auto time-time mode screens are shown in figures 7 and 8. Figure 7 displays the screen for gates 1 thru 10. Figure 8 displays the screen for gates 11 thru 15. There are 61 programmable parameters on the screens. The programmable parameters are changed as described in the Operator Interface Touch Screen section of this document. A description of the parameters on this screen follows:

- The two parameters to the right of and below **Mode** show present mode of operation. Since opening the auto time screen causes the mode to change to auto time, **Auto** and **Time** should always be displayed on this screen.
- **Tool #** - indicates the tool that is associated with the parameters programmed on the screen.
- **sequencer timeout** parameter – the maximum time (in seconds) that a cycle can take from the time the first valve gate fires, to the time the mold opens, without causing a sequencer fault.
- **Elapsed Time** – shows the seconds elapsed since the firing of the first valve gate.
- **FAULT** – flashes when a sequencer fault occurs.
- **On Delay** – the amount of time (in seconds) after the mold closes and before the valve gate will fire.
- **On Duration** – the amount of time (in seconds) that the valve gate will open after firing before being closed again. If the **ON Duration** is set to 0 (zero), the valve gate will not fire.
- **Pack/Hold ON Delay** – the amount of time (in seconds) after the mold closes that the valve gate will be turned ON to pack the mold.
- **Pack/Hold Duration** – the time (in seconds) that the valve gate, once fired, will be held ON. If the **Pack/Hold Duration** is set to 0 (zero), the pack hold feature is disabled.
- **Status** – indicates the present ON/OFF status of each valve gate.
- When the time mode timers are running, the **Timers Running** message is displayed above the elapsed time.
- The current status of the **Run Timers** switch (**Cycle Begin Input ON/OFF**) is shown in the center right portion of the screen.
- The current status of the **Mold Closed** limit switch (**Mold OPEN/CLOSED**) is shown in the center right portion of the screen.
- Pressing **Gates 11 – 15 (Gates 1 – 10)** will toggle between 1-10 and 11-15.
- Press **Main Menu** to return to the main menu.

Manual Mode Screens:

The manual mode screens are shown in figures 9 and 10.

- The parameter to the right of **Mode** shows the present mode of operation. Since opening the manual mode screen causes the mode to change to manual, **Manual** should always be displayed on this screen.
- The two indicators on the center right portion of the screen show the current status of the **Mold Closed** limit switch (**Mold OPEN/CLOSED**) and the **Run Timers Switch (Cycle Begin Input ON/OFF)**.
- The **Press to Force gate #_ ON (OFF)** areas are used to toggle the status of each valve gate as indicated.
- **Toggle Hydraulic Pressure ON (OFF)** area is used to toggle the hydraulic pressure ON/OFF (on hydraulic units).
- **Toggle Purge ON (OFF)** area is used to toggle all gates on and off simultaneously.
- Pressing **Gates 11 – 15 (Gates 1 – 10)** will toggle between 1 – 10 and 11 – 15.
- Press **Main Menu** to return to the main menu.
- The status of each gate is shown in the Status column.