



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

VALVE GATE SEQUENCER

PANELVIEW 1000 KEYPAD 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, 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 KEYPAD

The operator interface keypad and function keys are located below and to the right of the display area as shown in figures 1 – 10. The numeric keys are used to enter numeric values. The function keys are used to perform functions defined on the various screens. The cursor control keys located to the right of the function keys are used to move the on-screen cursor to a programmable field.

After entering a numeric value, the *ENTER* key (below the “0” and “-“keys in the lower right corner of the keypad) must be pressed. If a mistake is made while entering a value, the short arrow key (*BACKSPACE* key) to the right of the *ENTER* key can be used to erase the value being entered and allow the operator to reenter the value. The “-“key can be used to make a value negative. The “_“key is not used in this application.

Programmable parameters on the screens can be set by moving the cursor with the right and left cursor control keys (the cursor is a blinking vertical line) to the left side of the parameter to be changed. Pressing the *ENTER* key or a numeric key will prompt the user to enter a value. Use the *BACKSPACE* key to erase typing mistakes and/or cancel the entry.

Decimal points are fixed and do not have to be entered. 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 seven application screens: *Main Menu*, *Select Tool*, *Auto Position-Position Mode*, *Auto Position-Time Mode*, *Auto Time-Time Mode* and *Manual Mode*. When power is applied to the display, it displays the last screen displayed prior to turning it off. To get to the main menu from any screen, press F16 key.

The application screens monitor the valve sequencer operation. 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. Function key descriptions are located at the bottom of the main menu screen.

- Pressing **function key F1** brings up the Tool Selection screen.
- Pressing **function key F2** puts the valve sequencer in auto position-position mode.
- Pressing **function key F3** puts the valve sequencer in auto-position-time mode.
- Pressing **function key F4** puts the valve sequencer in auto-time-time mode.
- Pressing **function key F5** puts the valve sequencer in manual mode.

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 set the controller parameters for a tool, press F1 and enter the recipe number associated with the tool. Press F8 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-Time Mode screens.

Auto Position-Position Mode Screens:

The auto 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 with a cursor line located on their left, and “#” shown where their values are displayed. The programmable parameters are changed as described in the Operator Interface Keypad section of the 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 valve gate.
- **FAULT** – flashes when a sequencer fault occurs.
- **Programmed ON Position** - the position relative to the home position (in inches) at which the valve gates will be turned ON.
- **Programmed OFF Position** – the position relative to the home position (in inches) at which the valve gates will be turned OFF. **If the Programmed 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 to pack the mold. **If the Programmed Off Position is set to 0 (zero), the valve gate will not fire.**
- **Status** – indicates the present ON/OFF status of each valve gate.
- The current status of the **Mold Closed** limit switch is shown in the lower right corner of the screen.
- Pressing **F14** will toggle between gates 1-10 and 11-15.
- Press **F16** 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 with a cursor line located on their left, and “#” shown where their values are displayed. The programmable parameters are changed as described in the Operator Interface Keypad 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.
- **Programmed ON Position** – the position relative to the home position (in inches) at which the valve gates will be turned ON.
- **Programmed ON Duration** – the amount of time (in seconds) that the valve gate will be open after firing before being closed again. **If the Programmed ON Duration 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 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.
- The current status of the **Mold Closed** limit switch is shown in the lower right corner of the screen.
- Pressing **F14** will toggle between gates 1-10 and gates 11-15.
- Press **F16** to return to the main menu.

Auto Time-Time Screens:

The auto time-time mode screens are shown in figures 7 and 8. Figure 7 displays screen for gates 1 thru 10. Figure 8 displays screen for gates 11 thru 15. There are 61 programmable parameters on the screens with a cursor line located on their left and #'s shown where their values are displayed. The programmable parameters are changed as described in the Operator Interface Keypad 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.
- **Programmed On Delay** – The amount of time (in seconds) after the mold closes and run timers switch closes before the valve gate will fire.
- **Programmable On Duration** – the amount of time (in seconds) that the valve gate will open after firing before being closed again. **If the Programmed Off Delay 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 Off delay 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 is shown in the right side of the screen.
- The current status of the **Mold Closed** limit switch is shown in the lower right corner of the screen.
- Pressing **F14** will toggle between 1-10 and 11-15.
- Press **F16** 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 right side of the screen show the current status of the **Mold Closed** limit switch and the **Run Time Mode** timers switch.
- The **Function Keys** are used to toggle the status of each valve gate as indicated
- **F11** is used to toggle the pneumatic purge ON/OFF (on pneumatic units).
- **F15** is used to toggle the hydraulic pressure ON/OFF (on hydraulic units).
- **F14** is used to toggle between 1-10 and 11-15.
- Press **F16** to return to the main menu.