MODEL 352 OVERVIEW
AN INTRODUCTION TO THE CONTROLLER AND A LITERATURE SUPPLEMENT

The packet of literature supplied with your Model 352 provides detailed information on these topics: configuration, operation, tuning, installation and servicing. Additional resources are available.

Training - Moore Products offers training courses to help you expand your knowledge of control principles and use of the Model 352 for advanced applications. Request a copy of Educational Services bulletin BL006 from your local Moore Products representative.

Telephone Support - The Technical Information Center (TIC) offers direct phone support: see addendum SDA-SRWD in SD352 for details.

Additional Literature - User’s Manual AD352-10 may be requested from your local Moore Products representative for more detailed descriptions of function blocks and factory configured options.

This User’s Manual provides information about the Model 352 that supplements that provided in the accompanying literature. Topics are listed below.

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OPERATING DISPLAYS AND CONTROLS

The Display Assembly is the operator interface to the Model 352 and the process. This section briefly discusses the LED bargraph displays, pushbuttons, and other display features.

Process and Setpoint Vertical Bargraphs
These displays usually show the controlled process measurement and setpoint but can be user configured to show other variables. Resolution is 64 LED segments. The vertical bargraphs can also be configured to flash on alarm status.

Valve Horizontal Bargraph
This bargraph is typically configured to show valve position (controller output). Increasing controller output moves the bargraph from closed to open, left to right. The display can be reversed so the bargraph moves right to left with increasing controller output. To reverse the display, configure FB15 (parameter HVBD - No/Yes). Enter No if increasing output closes the valve. Enter Yes if increasing output opens the valve.
NOTE

Reversing the valve bar does not reverse the V indication on the 4½ digit display (i.e., output equals 100% when fully closed), which may result in some confusion reading the valve position. This can be avoided by inverting the valve signal to the display with FB39 (Inverter) and using the direct acting valve bar.

In addition, FB14 clockwise Manual, HCWM can be configured so that clockwise pulser rotation increases the process measurement regardless of the effect on the valve. Clockwise manual YES increases the output on clockwise rotation; clockwise manual NO decreases the output. For direct acting controllers where increasing the output decreases the process measurement, clockwise manual "NO" should be entered.

4½ Digit Display
This display can show process, setpoint, valve position, and two X and Y variables of the user's choice. P, S, X, and Y are in engineering units, with a moveable decimal point. Valve position is shown 0-100%.

When control is switched to manual, the display shows valve position. When switched to auto, it shows setpoint. Display pushbutton D is used to change the variable displayed.

In addition to P, S, X, Y, and V, the digital display is used to show:

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Alphanumeric Display
In operation, this display shows status information, primarily related to function block states:

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<th>FUNCTION</th>
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<tr>
<td>SS</td>
<td>Standby</td>
<td>FB14</td>
</tr>
<tr>
<td>EM</td>
<td>Emergency Manual</td>
<td>FB14</td>
</tr>
<tr>
<td>EI</td>
<td>Emergency Internal</td>
<td>FB11</td>
</tr>
<tr>
<td>EL</td>
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<td>FB98</td>
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<tr>
<td>U1. U2</td>
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<td>NU</td>
<td>Non-Updating</td>
<td>FB98</td>
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The display also shows the number of active status codes, e.g., H1 2 (indicates two conditions) or EM*3 (indicates three conditions). The * indicates that one or more of the status conditions is an alarm from FB12. The ACK pushbutton is used to scroll through the status display.

The alphanumeric display is also used to identify quick access variables and in configuration mode to identify menus, function blocks, parameters, and values.

Pulser
The pulser knob is rotated to adjust the variable shown in the digital display, typically the valve position and controller setpoints. The pulser can provide an input to various function blocks. For example, when the controller is in manual, and the valve position or the process measurement is in the digital display, the pulser provides the input to the A/M function block (FB14) to adjust the valve position.
An important feature of the pulser knob is its acceleration function. The percent change per revolution increases as the speed of rotation increases. This permits large changes to be made rapidly, by turning the knob rapidly.

The pulser is also used with the quick access buttons and in configuration.

**Mode Switches** A/M, E/I, and C/L.

These pushbutton switches change the position of the transfer switch function blocks:

- **A/M (FB14)** Used for automatic/manual switching.
- **E/I (FB11)** Used for selecting the setpoint to a controller, typically for cascade and ratio control.
- **C/L (FB98)** Used to indicate local or computer, and to switch from local to remote console operation, via the link interface.

**Acknowledge Pushbutton**

Any five status conditions (three in “A” or “B” level) may be selected to flash the bargraph. Usually these are FB12 alarm conditions. The acknowledge button stops the flashing. Once the flashing is acknowledged the ACK button is used to scroll through the stack of two digit status displays.

**Quick Access Buttons**

The Quick Access buttons are:

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<td>FB45</td>
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<tr>
<td>Ratio/Bias</td>
<td>Set Ratio or Set Bias</td>
<td>FB07/FB08</td>
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</table>

Ratio/bias alternately selects ratio and bias settings. The alphanumeric display identifies the variables (SR or SB). The Quick Access Pushbuttons located with the configuration buttons are used in the operating mode to read and adjust certain configuration values. Pressing a quick access button transfers the alphanumeric and digital displays, and the pulser to this service. The alphanumeric display identifies the variable whose value is shown in the digital display. The pulser is used for adjustment of those values. Pressing the STORE button saves the displayed variable in controller memory and returns the pulser and displays to normal service. Pressing the STORE button also initializes the controller function block to prevent a bump due to a change in controller outputs.

A lockout switch can be used to prevent unauthorized alarm and tuning adjustments (see SD352 Figure 5-3 and CONFIGURATION in this Manual). When a lockout switch is in the locked out position, the alarm and tuning buttons are used only to read the settings. The settings cannot be changed and EXIT must be pushed to return to normal operation.

If the STORE (or EXIT, when locked out) pushbutton is not used within 102 seconds after actuating one of the quick access pushbuttons, the pulser and displays will automatically return to normal (on-line) service.

**TAG 1 and TAG 2 Pushbuttons**

Pressing the Tag 1 and Tag 2 pushbutton from the on-line mode will scroll a message through the alphanumeric window. The information scrolled through the window is divided into parts; each part is preceded by the indicated acronym.

- **TAG - Tag Name** FB15
- **ENG - Engineering Units** FB15
- **LSA - Link Station Address** FB98
- **DRN - Data Base Revision #** **
- **SID - Station Identification** FB15
- **CPN - Configuration Filename** FB98

** DRN counts the number of times the configuration is modified i.e., each time you EXIT from a configuration menu after pressing STORE and each time you press STORE in quick access.

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Arrow Pushbuttons
The arrow pushbuttons are used only in the configuration of the TAG information in FB15. The arrow buttons step through each position of a given parameter. Selection of different characters is possible at each position via the pulser knob.

CONFIGURATION

Function Blocks
Function blocks, equivalent to familiar hardware devices, are the basic configuration elements. There are I/O and internal function blocks. I/O function blocks, both analog and digital (on/off), connect to the SLDC field terminals. Internal function blocks, connected to the I/O blocks, are arranged to accomplish the required control strategy.

The operator's display (FB15) is a unique function block that provides all of the operator interface functions.

Entering the Configuration
A configuration is designed by first arranging the function blocks to be used in a fashion similar to a P&ID. The numerical and calibration values should be determined next, followed by filling out a Configuration Documentation Form. The configuration is entered into the controller through three configuration menus.

Configuration Menus

T Menu - Table of Function Blocks
In the T menu, the function blocks to be used are selected by assigning to each block an execution sequence number from 01 to 99. ESN 00 indicates that a block is not being used. FB15, the operator display, is always used and is automatically assigned ESN 40. Only blocks selected in the T menu will be called up in the H and S menus below. ESNs are used to activate a function block and to determine the order in which active blocks are executed. Whenever possible, ESNs should be assigned in a systematic manner. ESNs may be critical in circuits requiring a particular sequence of discrete (on/off) operations. Some circuits may not provide the proper results unless executed in the proper sequence.

H Menu - Hard Configuration
In the H menu, inputs to each block are assigned, and certain block options are selected. For example, the optional square root extractor on input blocks is specified in the H Mode. Function block inputs are the outputs from other blocks which have numbers ranging from 01 to 99, or from the pulser.

S Menu - Soft Configuration
In the S Menu, numerical calibration values are assigned. Included are display ranges, alarm settings, gain and bias settings, and controller tuning. Quick Access adjustments are all soft configuration values. Alarm settings, controller tuning, and ratio and bias values can be assigned during configuration or adjusted in the quick access mode.

F Menu - Factory Configured Options (FCOs)
Many applications use the same basic control algorithms. The controller has a library of pre-configured circuits that can be used as is or modified to suit a specific application, including PID control, cascade control, and feedforward control. These Factory Configured Options (FCOs) are listed later in this manual.

Two FCOs are used to erase previously configured data:

FCO 00 - This sets all ESNs to 00, except the operator's display (FB15, ESN 40). Note that this does not erase previously configured hard and soft values, which will appear when a block is reconfigured. This FCO is typically used when function blocks are added to an existing configuration. The ESNs are reassigned in the desired order.
FCO 10 - This sets all ESNs to 00 except the operator's display (FB15). It also sets all inputs to 00 and returns hard and soft configuration values to default values. Before entering a complete new controller configuration, it is recommended that FCO 10 be entered to erase previously entered data. If another FCO is entered, such as FCO 01, then the configuration does not need to be erased first.

To select an FCO:

Press ENTER CONFIG button. Turn pulser knob until F appears in the alphanumeric display. Press STEP DOWN. FCO appears in the alphanumeric display. Turn pulser knob until the desired FCO number appears in the top display. Press the STORE button to download the FCO. Press EXIT to return to operation.

V Menu - View Mode. "C" Level Only
The V Mode is used to view the output value (in percent of scale units) for each of the block outputs in the 352. This mode allows the inspection of the intermediate block outputs for checking configuration parameters.

M Menu - Smart Transmitter "C" Level Only
The M mode is used only when a smart transmitter board (FB97) has been installed and configured and a smart transmitter is on-line. It allows viewing and/or changing of certain transmitter parameters such as range or damping.

C Menu - Calibration
The C menu is used to set analog input and output ranges. Generally, a controller is shipped from the factory calibrated for 1-5 Vdc inputs and 4-20 mAac outputs and should not require recalibration. Calibration can be changed by following procedures in Installation And Service Instruction SD352.

The recommended configuration development procedure is located in Configuration Guide CG352-1.

Configuration Lockout Switch
A lockout switch is accessible by removing the Display Assembly (see SD352 Figure 5-3) and is used to lock out and enable selected configuration modes. When a configuration menu is locked out, configuration values can be read but not changed. An X in the alphanumeric display indicates a menu selection is locked out.

Lockout switch selections include:

- S - Soft Configuration Values
- Alarm - Setting of Alarm FB 12
- Tune - Tuning adjustments for both controllers
- H/T/F - Hard configuration, Table of Blocks, & FCOs
- C - Calibration

Default Values & Unused Inputs
When configuring a new controller or after entering FCO 10, there are already values in hard and soft configuration. These default values are generally the most common or safe values for a particular function. The default value for all block inputs is 00. Unless otherwise specified, this is equivalent to:

- Analog inputs: -3.3%
- Digital inputs: 0%

Specified values of unused inputs are listed in FCO 10.

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Power Interruption
The controller is designed, as much as possible, to anticipate process operating requirements and to provide safe, convenient return to normal operating requirements after a power interruption. The following design features apply to controller operation on power interruption.

For an interruption of less than 100 milliseconds, operation is not affected, except for the momentary drop in outputs and blanking of display. Operation resumes at the last output before the power interruption.

For extended power interruption, configuration data, including ratio, bias, alarm & controller tuning settings are stored in non-volatile RAM and are not affected. A/M transfer block 14 can be configured to power up on auto, manual, or last position before power out. If power up is on manual, the value of the manual output can be specified. E/I transfer block FB11 can be configured to power up on external, internal or last position before power out. Setpoint and general purpose track & hold blocks power up at the last output. PID and PD controllers are initialized.

TROUBLESHOOTING
Troubleshooting the controller is primarily done by error codes. Upon power-up, WAIT will appear in the alphanumeric display until power-up diagnostics are complete. After power-up and during operation, error codes are indicated on the alphanumeric display in response to a failed power-up diagnostic test or to an on-line station error. If the WAIT message remains on the alphanumeric display for more than a few seconds or random characters appear, the instrument is not powering up correctly due to low supply voltage, bad wiring or board failure. The station power supply and wiring should be checked. It is also important to check that the circuit boards are properly seated in the case and the cable connection to the Display Assembly is secure.

Section 6 of SD352 provides additional troubleshooting guidelines and error code information.

IMPORTANT ADDENDA
‘C’ Level Hardware and Software
Addendum SDA352-8 in SD352 discusses software compatibility, display pushbuttons, function block allocation, and additional error codes provided to assist troubleshooting.

Smart Transmitter Interface Board
Addendum SDA352-9 in SD352 describes The Smart Transmitter Interface #3 input board which is configured as function block 97.

Plug-In Power Supply
Addendum SDA352-10 describes the Controller Board plug-in power supply enhancement.