MYCRO 351
Triple-Loop Digital Controller

CONFIGURATION HANDBOOK

MOORE PRODUCTS CO., Spring House, PA 19477
INTRODUCTION
This handbook provides a quick summary and reference for users of the MYCRO 351 Triple-Loop Digital Controller (Model 351 TLDC). Included are an explanation of the general design of the MYCRO 351, the operating controls and displays, and individual descriptions of all the available function blocks for each of the three loops that are included in a Model 351. The Model 351 is similar in design to the Moore Products MYCRO 352 Single-Loop Digital Controller and the MYCRO 382 Logic and Sequence Controller. Users familiar with the easily understood, modular, function block design and configuration concept can easily configure the Model 351.

Additional information concerning the capabilities of the MYCRO 351 is provided in the following publications:
MYCRO 351 User’s Manual, AD351-10
MYCRO 351 Configuration Documentation, AD351-30
MYCRO 351 Linx Communications User’s Manual, AD351-40
MYCRO 351 Installation and Service Instructions, SD351

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</table>

**DIGITAL CONTROLLER TUNING**

REAR TERMINAL ASSIGNMENTS

FACTORY CONFIGURED OPTIONS
1 5 Digit Display
Displays variables, settings, and configuration values. Both numeric and alphanumeric selections can be displayed.

2 Display Identifier (P, S, V, X, Y)
Used to indicate nature of variable being displayed in 5 Digit Display. D (Display) pushbutton used to sequentially step through P (Process), S (Setpoint), V (Value), X and Y identifiers. Active Display identifier will be backlit.

3 Dedicated Bargraphs
A dedicated bargraph for each of the three loops which continuously displays the process and setpoint for that particular loop, and is configurable to flash thereby designating an important status in that loop.

4 Valve Bargraph
Used to indicate value of valve variable.

5 C.L (Console Local) Pushbutton
Used to select Console or Local operating mode of the selected loop. This is operational only when the controller contains a Local Instrument Link Option Board and when the Local Instrument Link Function Block (FB198, FB296 or FB398) is configured for the selected loop. A backlit letter indicates which mode is active (Green C Console, Red L Local).

6 E I (External Internal) Pushbutton
Active only when the E I Transfer function block (FB111, FB211 or FB311) is configured for the selected loop. A backlit letter indicates which mode is active (Green E External, Red I Internal).

7 A.M (Auto Manual) Pushbutton
Active only when the A M Transfer function block (FB114, FB214 or FB314) is configured for the selected loop. A backlit letter indicates which mode is active (Green A Auto, Red M Manual).

8 Pus Key
Used to change setpoint and valve variables on-line, and select configuration parameters.

9 4-Character Alphanumeric Display
During configuration mode, displays configuration data. While not in configuration mode, displays status, error code or tag information.

10 Loop Selector Pushbutton
Used to select the individual loop for viewing and changing configuration data. The selected loop is designated by its highlighted loop number.

11 ACK (Acknowledge) Pushbutton
Pushbutton used to acknowledge flashing bargraph displays.

12 D (Display) Pushbutton
Used to select display variable on the 5 digit display. A backlit letter will turn on to indicate the P, S, V, X or Y variable.

13 Configuration Controls
Pushbuttons used to select and define Function Blocks. NOTE: during operation the EXIT pushbutton lights all LEDs to ensure their proper operation.

14 Quick Access Pushbuttons
Used to provide quick access to certain values in the S (Soft) configuration mode for the selected loop.

Station Identification (not shown)
Removable label on front of flip-down access door allows tagged, individual stations to be identified.
GENERAL CONFIGURATION PROCEDURE

The first step in any configuration is to draw a diagram of the blocks and how they are to be interconnected. The diagram should include the inputs and outputs that will be used on each block along with the identifying letters and numbers. Individual diagrams can include more or less detail as required. The main function of the diagram is to provide information on the operation of the controller and assist in filling out the Configuration Documentation Booklet AD351-30.

The documentation booklet should then be completed—some soft configuration (e.g., controller tuning) may not be known and can be added at a later time. Each function block that is to be used must be assigned an execution sequence number (ESN). The ESN is usually not critical, but inputs to a block should normally be executed before the block is executed. It is a good idea to skip ESN numbers to allow for future additions. Numbers 00 to 99 can be used with 00 indicating that the block is not being used.

In hard (H) configuration, each block can be assigned specific functions as well as inputs from other blocks. These block inputs can be assigned numbers from 00 to 99 with 00 representing no input and 01 to 99 being specific output identifiers from other blocks.

Soft (S) configuration allows for setting of gain, time constants, etc. within each block.

Generally, controllers are shipped from the factory calibrated for 1-5 Vdc inputs and 4-20 mA dc outputs and should not require recalibration. Calibration data is stored in EEPROM along with other configuration data.

**NOTES:**

- X: In the alphanumeric display indicates the menu selection is locked out. The pulser and store button will not function at the value level.

- Only blocks selected in the T mode will be displayed in the S and H modes.

- After the store button is pushed within a specific menu selection you cannot re-enter the menu level (exit and then re-enter configuration).

CONFIGURATION INFORMATION

**A. General**

In order to establish an operating system to perform a specific control function, the MYCRO-351 must be configured. The user has three paths to select from in order to establish the proper configuration (operating system):

1. Use a factory configured option (FCO) already stored in the station memory.
2. Use a factory configured option (FCO) with modification.
3. Develop a completely new configuration based on the specific needs of a particular application.

If the required operating system is reasonably similar to an FCO, it is generally quicker to take path #2.

**T = Table of Function Blocks**

The T mode lists all Function Blocks available in a Model 351 for the selected loop, and allows for the selection of those blocks needed for a particular configuration. This mode also allows the assignment of Execution Sequence Numbers (ESNs) which determines the order of block execution. Loop 1 Function Blocks are executed first, followed by Loop 2 Function Blocks next and Loop 3 Function Blocks executed last. Each of the three independent loops has available ESNs between 01 and 99 (therefore all three loops could have blocks with identical ESNs).

**H = Hard Configuration Mode**

The H mode of configuration is used to select Function Block inputs and attributes (block options like square root extraction, controller type, etc.). Function Block inputs are selected from unique output numbers of other blocks. Function Block output numbers range from 101 to 399. The first digit of the three digit block output number specifies the loop in which the block resides (i.e., one, two or three) with the second two digits specifying the function output number.

**S = Soft Configuration Mode**

The S mode of configuration is used to define specific numerical parameters (gain, bias and tuning values, alarm inputs, etc.) which determine the exact algorithm the block will execute. Not all blocks require soft configuration entries. Soft configuration values requiring frequent change have been moved to the quick access pushbuttons on the controller faceplate.

**F = Factory Configured Option Mode**

Common control strategies are preconfigured and stored in the controller as Factory Configured Options (FCOs). These FCOs can be recalled with just a few simple steps. Each independent loop has its own library of available FCOs which are listed at the end of this handbook.

**V = View Mode**

The V mode is used to view the output value (in percent of scale units) for each of the block outputs of the TLDC. This mode allows for the inspection of intermediate block outputs for checking configuration parameters.

**C = Calibration**

A configuration mode that allows you to zero and span input and output function blocks.

**B. Configuration Development Procedure**

It is recommended that the procedure listed below be followed.
Step 1. Select the loop to be configured. Draw a block diagram showing the function blocks to be used in the operating system (configuration). It is a good idea to lay out the diagram as you would P & ID drawings with inputs at the top and outputs at the bottom and the intermediate function blocks arranged in a logic flow path in the middle.

Step 2. On the diagram, assign an execution sequence number to each block appearing in the diagram. The ESN is not critical, but inputs to a block should normally be executed before the function block operation is executed. It is a good idea to skip ESN’s to allow for future additions to the configuration. Numbers 00 to 99 can be used with 00 indicating that a particular block is not being used. Enter the ESN’s on the Configuration Documentation.

Step 3. On the diagram identify the source for each of the inputs to each function block. Normally the source for an input will be either the rear mounted terminal strip or an output of another function block. Identification for these sources (101 to 399) can be found in this book. Also note the input identification label. Then enter this hard configuration data in the documentation sheets.

Step 4. Review each function block which is being used in the configuration in order to establish the need for additional hard configuration data (i.e., selection of square root extractor on an analog input). This can be most easily done by looking under the “H” column of the configuration documentation sheet.

Step 5. Complete the soft configuration “S” column of the configuration documentation sheet for the function blocks used. It may be useful to note this information on the block diagram. Some soft configuration data (i.e., controller tuning) may not be known and will have to be added later.

Step 6. Establish calibration values for all inputs and outputs. Enter this information on both the block diagram and the configuration documentation sheet. Generally, controllers are shipped from the factory calibrated for 1-5 Vdc inputs and 4-20 mADC outputs and should not require recalibration. Calibration data is stored in EEPROM along with other configuration data.

Step 7. Review the completed configuration documentation sheet. At this point all the function blocks to be used in the operating system should be completely filled out under the T, H, S & C columns and you are now ready to configure the station.

C. Actual Configuration
1. Compare configuration developed above with available FCO’s. If they are identical or similar, enter the appropriate FCO and make modifications (if required).
2. If there are no similar FCO’s, erase any previous configuration by setting all ESN’s to 00. This can be accomplished by calling up FCO 00 or FCO 10. Then reconfigure the station by storing all data from configuration documentation sheet. Enter all “T” mode information, then “H” mode, the “S” mode and the “C” mode directly from the columns in the configuration sheets.
OPERATING CONTROLS
PULSER KNOB

Used for operating changes such as setpoints and valve adjustments, and quick access changes.

PUSHBUTTONS

A green C on the faceplate indicates operation from a console computer which does not allow for configuration and operation changes from the operator's display panel. A red L indicates the loop can be operated locally from the operator's display panel.

Functions as a two position switch monitored by FB *11. A green E indicates FB *11 is in the EXTERNAL position and a red I indicates FB *11 is in the INTERNAL position (see description of FB11 in AD351-10).

Functions as a two position switch monitored by FB *14. A green A indicates FB *14 is in the AUTOMATIC position and a red M indicates FB *14 is in the MANUAL position (see description of FB14 in AD351-10).

Used to change the loop being displayed. A green backlit display indicates the selected loop (Loop 1, Loop 2, or Loop 3). All operation or configuration changes are made to the selected loop.

Used to acknowledge a flashing bargraph display of the selected loop or any of the loops if that particular loop's HACK in FB *15 is configured as YES.

Used to change the displayed variable on the 5 digit display. A backlit letter will turn on to indicate the variable P, S, V, X or Y.

Quick Access Buttons

- Four pushbuttons will provide quick access to the S (Soft) configuration mode at the value level for the particular function blocks of the selected loop.

  TUNE

  Provides access to the tuning parameters of the controller block (FB *13) of the selected loop.

- You can advance to the next parameter by pushing the tune button again.

- The controller action A can be viewed but not changed in this mode.

  ALARM

  Provides access to the alarm parameters associated with the alarm block (FB *12) of the selected loop.

- You can advance to the next parameter by pushing the alarm button again.

  RATIO

  Provides access to the ratio parameter associated with the ratio block (FB *07) of the selected loop.

  BIAS

  Provides access to the bias parameter associated with the bias block (FB *08) of the selected loop.

- When the store button is pushed the controller will store the parameter value and then exit the configuration mode.

* Replace with loop designator 1, 2 or 3.

When the Mode is not in the configuration mode, this pushbutton is used to scroll the Loop Tag Name (LTN), Engineering Units (EU), Link Station Address (LSA), Data Base Revision Number (DRN), Station Identification (SID) and Configuration File name (CFN).

* Replace with loop designator 1, 2 or 3.
FUNCTION BLOCK TABLE

The following table lists all Function Blocks available in the Model 351 Triple-Loop Digital Controller and in which loop they reside. Please note that all Function Blocks are not available in all three loops. However, the Function Blocks may be configured for use in other loops than the particular loop in which they reside.

<table>
<thead>
<tr>
<th>FUNCTION BLOCK TYPE</th>
<th>LOOP 1 FB#</th>
<th>LOOP 2 FB#</th>
<th>LOOP 3 FB#</th>
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<td>201</td>
<td>301</td>
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<td>303</td>
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<td>DIGITAL OUTPUT #1</td>
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<td>N/A</td>
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<td>N/A</td>
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<td>MATH</td>
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<td>#3 ANALOG INPUT OPTIONS</td>
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**LOOP 1 FUNCTION BLOCKS**

- **FB101**
  - ANALOG INPUT #1
    - A1+ (A4)
    - 1-5 Vdc
    - V XTR
    - OUTPUT
    - FILTER BREAKPOINT FREQ: 3.00 Hz to 50.0 Hz
    - ZERO INPUT: 0.0 to 1.0 Vdc
    - FULL SCALE INPUT: 4.0 to 5.0 Vdc
    - VERIFY INPUT: -1.0 to 1.0 Vdc
    - SQUARE ROOT EXTRACTOR: YES

- **FB102**
  - ANALOG INPUT #2
    - A2+ (A6)
    - 1-5 Vdc
    - V XTR
    - OUTPUT
    - FILTER BREAKPOINT FREQ: 3.00 Hz to 50.0 Hz
    - ZERO INPUT: 0.0 to 1.0 Vdc
    - FULL SCALE INPUT: 4.0 to 5.0 Vdc
    - VERIFY INPUT: -1.0 to 1.0 Vdc
    - SQUARE ROOT EXTRACTOR: YES

- **FB103**
  - ANALOG OUTPUT
    - AO1+ (A7)
    - ANALOG OUTPUT 4-20 mADC
    - SIGNAL: A
    - ON-OFF: B
    - ZERO OUTPUT: 4.0 mADC
    - FULL SCALE OUTPUT: 20.0 mADC
    - VERIFY OUTPUT: -1.0 to 1.0 Vdc
    - INPUT A (SIGNAL): 000 to 399
    - INPUT B (ON-OFF): 000 to 399
FB113 CONTROLLER (cont'd)

- INPUT P (PROCESS) 0.00 to 5.00
- INPUT S (SETPOINT) 0.00 to 5.00
- INPUT F (FEEDBACK) 0.00 to 5.00
- INPUT A (ADAPTIVE GAIN) 0.00 to 5.00
- INPUT C (TRACK COMMAND) 0.00 to 5.00

Type 4 only

- FB114
  A/M Transfer

- AUTO INPUT
- EMERG MAN.
- STANDBY SYNC.
- TRACK INPUT

- FB115
  OPERATOR's DISPLAY

- INPUT P
- INPUT S
- INPUT V
- INPUT X
- INPUT Y

- USER STATUS
  1
  2

- OPERATOR's DISPLAY PANEL

- DECIMAL POINT PROCESS
- PROCESS LO
- PROCESS HI
- DECIMAL POINT X
- X LO
- X HI
- DECIMAL POINT Y
- Y LO
- Y HI
- TAG SCROLL TIME
  1 sec

- LOOP 1 TAG NAME
- LOOP 1 ENGINEERING UNITS
- STATION IDENTIFICATION
- INPUT P (PROCESS)
- INPUT S (SETPOINT)
- INPUT V (VALVE)
- INPUT A (ACKNOWLEDGE)
- INPUT X
- INPUT Y

-FLASHER 1
-FLASHER 2
-FLASHER 3
-FLASHER 4
-FLASHER 5

(continued on next page)
FB116 (cont'd)

| HSCF | SELF CLEARING FLASHER | NO:YES |
| HACK | COMMON ACKNOWLEDGE | NO:YES |
| HIN1 | INPUT 1 (USER 1 STATUS) | 000 to 399 |
| HIN2 | INPUT 2 (USER 2 STATUS) | 000 to 399 |
| HUIS | INPUT 1 ALPHANUMERIC DISPLAY STATUS | (**) |
| HUIS2 | INPUT 2 ALPHANUMERIC DISPLAY STATUS | (**) |
| HVB | VALVE BAR DIRECT | NO:YES |

(1) Any one of the following status conditions can be selected to flush the P/S bargraph.

00 (NOT USED) 10 EMERGENCY MANUAL (EM)
01 ALARM #1 (A1) 11 USER DEFINED STATUS 1 (**) 02 ALARM #2 (A2) 12 USER DEFINED STATUS 2 (**) 03 ALARM #4 (A4) 13 ERROR (E) 04 HIGH LIMIT (HL) 14 EMERGENCY INTERNAL (EI) 05 LOW LIMIT (LL) 15 EMERGENCY LOCAL (EL) 09 OVERRIDE (OR) 16 NON-UPDATING INPUT (NU) 03 STANDBY SYNCH (S) 17 ALARM #3 (A3 OR AD)

** Refer to Character Identification Table

### Character Identification

<table>
<thead>
<tr>
<th>Character</th>
<th>Name</th>
<th>Character</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9</td>
<td>Digit</td>
<td>@</td>
<td>at symbol</td>
</tr>
<tr>
<td>!</td>
<td>Exclamation mark</td>
<td>A</td>
<td>capital letter A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#</td>
<td>number sign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$</td>
<td>dollar sign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>percent sign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&amp;</td>
<td>ampersand sign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(</td>
<td>left parenthesis</td>
</tr>
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</tr>
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<tr>
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<td></td>
<td>;</td>
<td>colon</td>
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<tr>
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<td>:</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>&quot;</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>'</td>
<td>single quote</td>
</tr>
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<td></td>
<td></td>
<td>,</td>
<td>decimal point</td>
</tr>
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<td>dollar sign</td>
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</table>

FB116

**FB116 INTEGRATOR/TOTALIZER**

- **INPUT A**
- **TOTALIZER**
- **TOTAL A**
- **TOTAL B**

**FB117 SETPOINT TRACK & HOLD**

- **INPUT T**
- **SETPOINT TRACK & HOLD**

**FB118 GEN. PURPOSE TRACK & HOLD**

- **INPUT T**
- **GEN. PURPOSE TRACK & HOLD**

- **HINT**
- **INPUT C**
- **INPUT T**
FB134
MATH BLOCK

INPUT A
INPUT B
INPUT C

MATH BLOCK
\[-/+/\times/\div\]
OUTPUT

Signal Equation
\( S_0 = (G_0 \times (S_2 \times S_2 + B_0)) \times (S_1 \times S_1 + B_1) + B_0 \)

<table>
<thead>
<tr>
<th>S</th>
<th>G</th>
<th>O</th>
<th>Gain-Output</th>
<th>0.000 to 3.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>G</td>
<td>A</td>
<td>Gain-A Input</td>
<td>0.000 to 3.000</td>
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<tr>
<td>S</td>
<td>G</td>
<td>B</td>
<td>Gain-B Input</td>
<td>0.000 to 3.000</td>
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<tr>
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<td>G</td>
<td>C</td>
<td>Gain-C Input</td>
<td>0.000 to 3.000</td>
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<td>S</td>
<td>B</td>
<td>O</td>
<td>Bias-Output</td>
<td>-3.000 to 3.000</td>
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<tr>
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<td>B</td>
<td>A</td>
<td>Bias-A Input</td>
<td>-3.000 to 3.000</td>
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<tr>
<td>S</td>
<td>B</td>
<td>B</td>
<td>Bias-B Input</td>
<td>-3.000 to 3.000</td>
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<tr>
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<td>B</td>
<td>C</td>
<td>Bias-C Input</td>
<td>-3.000 to 3.000</td>
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<tr>
<td>H</td>
<td>A</td>
<td>O</td>
<td>Operation A</td>
<td>SUB ADD, MUL, DIV</td>
</tr>
<tr>
<td>H</td>
<td>B</td>
<td>O</td>
<td>Operation B</td>
<td>SUB ADD, MUL, DIV</td>
</tr>
</tbody>
</table>

FB198
LINK INTERFACE OPTION

INPUTS
LK → B
LK → B

TO LINK
FROM LINK

OUTPUTS
NU STATUS
COMPUTER/CONSOLE
"C" / LOCAL
EMERGENCY LOCAL

TRANSMITTED DATA
RECEIVED DATA

EMERG. L
NL

LINK STATION ADDRESS
0 to 94

LOOP 1 PROCESS
000 to 399

LOOP 1 LIMITS (SETPOINT)
NO YES

LOOP 1 SETPOINT
000 to 399

LOP 1 VALVE
000 to 399

INPUT LOOP 1 A
000 to 399

INPUT LOOP 1 B
000 to 399

INPUT LOOP 1 L (EMERGENCY LOCAL)
000 to 399

SOURCE ADDRESS, OUTPUT
0 to 54

SOURCE CHANNEL, OUTPUT
00 to 256

NU STATUS TRIGGERED ON
00 to 256

(continued on next page)
LOCAL INSTRUMENT LINK PARAMETERS (EXTERNAL)

The following Model 351 information are configuration parameters for external devices of a Local Instrument Link (e.g., computers, control consoles, etc.). These parameters cannot be configured at the facplate of the Model 351.

- **FB198**
  - HA7: SOURCE ADDRESS, OUTPUT 171
  - HC7: SOURCE CHANNEL, OUTPUT 171
  - NN7: NU STATUS TRIGGERED ON 171
  - HL0: RECORD TRANSFER LOCKOUT
  - HP0: PARAMETER COMMAND LOCKOUT

- **FB199**
  - A9: TRACK INPUT
  - B10: TRACK COMMAND
  - A10: VOLTAGEN INPUT
  - B9: OUTPUT

- **FB199**
  - SF: FILTER BREAKPOINT FREQUENCY
  - FB: 0.5 to 10.00 Hz
  - ZI: ZERO INPUT
  - C1: 0.0 to 0.3 Vdc
  - CF: FULL SCALE INPUT
  - FI: 0.0 to 5.0 Vdc
  - V: VERIFY INPUT
  - TI: 0.3 to 103.3%
  - INT: INPUT T
  - IC: 000 to 999
  - IN: INPUT C
  - HE: SQUARE ROOT EXTRACTOR
  - RE: NO YES

ATW - Alarm Type Word is a 12-bit word that defines the alarm type. Details on each type word can be found in the Model 351 Link Communications User’s Manual AI0351-A0.
### FB199
**Optional Input, Millivolt or Thermocouple**

- A13+ (A10)
- A13- (B10)
- A13E (A9)

- **Track Input**
- **Track Command**
- **Output**

Used with Computer Pulse Input only.

<table>
<thead>
<tr>
<th>FB199</th>
<th>FILTER BREAKPOINT</th>
<th>0.301 to 1000 Hz</th>
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</thead>
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<tr>
<td>SFB3</td>
<td>RANGE UNITS 1. MV/2.°F/3.°C</td>
<td>1/2/3</td>
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<tr>
<td>SRL</td>
<td>RANGE LOW</td>
<td></td>
</tr>
<tr>
<td>SRH</td>
<td>RANGE HIGH</td>
<td></td>
</tr>
<tr>
<td>CZ13</td>
<td>ZERO INPUT</td>
<td></td>
</tr>
<tr>
<td>CF13</td>
<td>FULL SCALE INPUT</td>
<td></td>
</tr>
<tr>
<td>CV13</td>
<td>VERIFY INPUT</td>
<td>-5.0°C to +5.0°C</td>
</tr>
<tr>
<td>C13T</td>
<td>INPUT 3 TYPE</td>
<td>000 to 399</td>
</tr>
<tr>
<td>HINT</td>
<td>INPUT T</td>
<td>000 to 399</td>
</tr>
<tr>
<td>HINC</td>
<td>INPUT C</td>
<td>000 to 399</td>
</tr>
</tbody>
</table>

### FB199
**Optional Input, RTD**

- A13+ (A10)
- A13- (B10)
- A13E (A9)

- **Track Input**
- **Track Command**
- **Output**

Used with Computer Pulse Input only.

<table>
<thead>
<tr>
<th>FB199</th>
<th>FILTER BREAKPOINT</th>
<th>FREQ RANGE</th>
<th>0.001 to 10.00 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRT</td>
<td>RANGE TYPE</td>
<td>DINUS</td>
<td></td>
</tr>
<tr>
<td>SHR</td>
<td>RANGE UNITS (°F/°C)</td>
<td>FC</td>
<td></td>
</tr>
<tr>
<td>SRL</td>
<td>RANGE LOW</td>
<td>PCE</td>
<td></td>
</tr>
<tr>
<td>SRH</td>
<td>RANGE HIGH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CZ13</td>
<td>ZERO INPUT</td>
<td>-200 to 200°C</td>
<td></td>
</tr>
<tr>
<td>CF13</td>
<td>FULL SCALE INPUT</td>
<td>200 to 200°C</td>
<td></td>
</tr>
<tr>
<td>CV13</td>
<td>VERIFY INPUT</td>
<td>100°C to 130°C</td>
<td></td>
</tr>
<tr>
<td>C13T</td>
<td>INPUT 3 TYPE</td>
<td>000 to 399</td>
<td></td>
</tr>
<tr>
<td>HINT</td>
<td>INPUT T</td>
<td>000 to 399</td>
<td></td>
</tr>
<tr>
<td>HINC</td>
<td>INPUT C</td>
<td>000 to 399</td>
<td></td>
</tr>
</tbody>
</table>

1. SRL: 300 to 800°F (-185 to 425°C)
2. SRH: -275 to 1200°F (-171 to 650°C)

### FB199
**Optional Input, Frequency**

- A13+ (A10)
- A13C (B10)
- A13E (A9)

- **Track Input**
- **Track Command**
- **Output**

Used with Computer Pulse Input only.

<table>
<thead>
<tr>
<th>FB199</th>
<th>FREQ RANGE</th>
<th>MIN</th>
<th>0.0 Hz to 1250 KHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMIN</td>
<td>FREQ RANGE</td>
<td>MAX</td>
<td>0.0 Hz to 2500 KHz</td>
</tr>
<tr>
<td>SMAX</td>
<td>2500 Hz</td>
<td>3000 Hz</td>
<td></td>
</tr>
<tr>
<td>Z200</td>
<td>ZERO DROP OUT (% of RANGE)</td>
<td>0.0 to 250°C</td>
<td></td>
</tr>
<tr>
<td>CIPV</td>
<td>INPUT PEAK VOLTAGE</td>
<td>30 V to 300 V</td>
<td></td>
</tr>
<tr>
<td>CLIN</td>
<td>INPUT VALLEY VOLTAGE</td>
<td>30 V to 300 V</td>
<td></td>
</tr>
<tr>
<td>CIL</td>
<td>INPUT VOLTAGE LEARN</td>
<td>30 V to 300 V</td>
<td></td>
</tr>
<tr>
<td>HINT</td>
<td>INPUT T</td>
<td>000 to 399</td>
<td></td>
</tr>
<tr>
<td>HINC</td>
<td>INPUT C</td>
<td>000 to 399</td>
<td></td>
</tr>
</tbody>
</table>
LOOP 2 FUNCTION BLOCKS

- **FB201**
  - **ANALOG INPUT #1**
  - **FB201**
  - **ANALOG INPUT #1**
    - **A1+** (D4)
    - **A1-** (D5)
    - **FILTER BREAKPOINT FREQ.** 0.001 to 10.00 Hz
    - **ZERO INPUT** 0.0 to 5.0 Vdc
    - **FULL SCALE INPUT** 4.0 to 5.0 Vdc
    - **VERIFY INPUT** -3.3 to 133.3%
    - **SQUARE ROOT EXTRACTOR** NO/YES
  - **OUTPUT**

- **FB202**
  - **ANALOG INPUT #2**
  - **FB202**
  - **ANALOG INPUT #2**
    - **A1+** (D6)
    - **A1-** (D5)
    - **FILTER BREAKPOINT FREQ.** 0.001 to 10.00 Hz
    - **ZERO INPUT** 0.0 to 1.0 Vdc
    - **FULL SCALE INPUT** 4.0 to 5.0 Vdc
    - **VERIFY INPUT** -3.3 to 133.3%
    - **SQUARE ROOT EXTRACTOR** NO/YES
  - **OUTPUT**

- **FB203**
  - **ANALOG OUTPUT**
  - **FB203**
  - **ANALOG OUTPUT**
    - **AO1+** (D9)
    - **AO1-** (D10)
    - **ZERO OUTPUT** 4.0 mAdc
    - **FULL SCALE OUTPUT** 20.0 mAdc
    - **VERIFY OUTPUT** -3.3 to 133.3%
    - **INPUT A (SIGNAL)** 000 to 399
    - **INPUT B (ON/OFF)** 000 to 399
  - **SIGNAL**
  - **ON/OFF**

- **FB206**
  - **DIGITAL INPUT**
  - **FB206**
  - **DIGITAL INPUT**
    - **DI1+** (C7)
    - **DI1-** (C8)
    - **ON/OFF**

- **FB207**
  - **RATIO**
  - **FB207**
  - **RATIO**
    - **INPUT A**
    - **INPUT B**
    - **INPUT C**
    - **INPUT D**
    - **RATIO** 0 to R = A • B
    - **OUTPUT**
    - **TRACK OUTPUT**
    - **RATIO PB DISABLED** NO/YES

- **FB208**
  - **BIAS**
  - **FB208**
  - **BIAS**
    - **INPUT A**
    - **INPUT E**
    - **INPUT C**
    - **INPUT D**
    - **BIAS** 0 to 50.00%
    - **OUTPUT**
    - **TRACK OUTPUT**
    - **BIAS PB DISABLED** NO/YES
FB212 (cont’d)

| HA1R | ALARM 1 RINGBACK | NO/YES |
| HA2R | ALARM 2 RINGBACK | NO/YES |
| HA3R | ALARM 3 RINGBACK | NO/YES |
| HA4R | ALARM 4 RINGBACK | NO/YES |
| HA5R | ALARM 3 ALPHANUMERIC STATUS | A3/A0 |

**FB213**

**CONTROLLER**

| PROCESS | P |
| SETPOINT | S |
| FEEDBACK | F |
| ADAPTIVE GAIN | A |
| TRACK COMMAND | C |

**FB214**

**A/M Transfer**

- **AUTO INPUT**
- **EMERG. MAN.**
- **STANDBY SYNC.**
- **TRACK INPUT**

**FB214**

- **A/M TRANSFER**
- **OUTPUT**

| S | SP | U | M | POWER UP MANUAL | -3.3 to +3.3% |
| H | AO | AUTO ONLY | NO/YES |
| H | PU | POWER UP | A/M/LPBPO |
| H | PL | POWER UP LAST OUTPUT | NO/YES |
| H | CM | CLOCKWISE MANUAL | NO/YES |
| H | NA | INPUT A (AUTO) | 000 to 399 |
| H | NT | INPUT T (TRACK VARIABLE) | 000 to 399 |
| H | NE | INPUT E (EMERG. MAN.) | 000 to 399 |
| H | NS | INPUT S (STANDBY SYNC) | 000 to 399 |

**SA**

ACTION

| S | SP | G |

**ST**

PROPORTIONAL GAIN** | 0.01 to 10.0 |

**STD**

TIME-INTEGRAL | 0.01 to 100.0 MIN |

**SDG**

TIME-DERIVATIVE | 0.01 to 100.0 MIN |

**SMR**

DERIVATIVE GAIN | 0.01 to 100.0 |

**HCT**

MANUAL RESET*** | 0.0 to 100.0 |

**HMT**

MANUAL RESET TRACKING*** | NO/YES |

**HINP**

INPUT P (PROCESS) | 000 to 399 |

**HINS**

INPUT S (SETPOINT) | 000 to 399 |

**HINF**

INPUT F (FEEDBACK) | 000 to 399 |

**HINA**

INPUT A (ADAPTIVE GAIN)*** | 000 to 399 |

**HINC**

INPUT C (TRACK COMMAND) | 000 to 399 |

**Does not apply to Type 3**

**Type 2 only**

**Type 4 only**
FB215
OPERATOR'S DISPLAY

INPUT P
INPUT S
INPUT V
INPUT X
INPUT Y

ACKNOWLEDGE
PULSE-OFF
PULSE-ON
ERROR

USER STATUS

0
1
2
OPERATOR'S DISPLAY PANEL

SDP DP DECIMAL POINT PROCESS
SPL PROCESS LO
SPH PROCESS HI
SDP X DECIMAL POINT X
SXL X LO
SXH X HI
SDP Y DECIMAL POINT Y
SYL Y LO
SYH Y HI
STST TAG SCROLL TIME
HLTN LOOP 2 TAG NAME
HELU LOOP 2 ENGINEERING UNITS
HSID STATION IDENTIFICATION
HINP INPUT P (PROCESS)
HINS INPUT S (SETPOINT)
HINV INPUT V (VALVE)
HIN A INPUT A (ACKNOWLEDGE)
HINX INPUT X
HNY INPUT Y

FL1 FLASHER 1
FLL2 FLASHER 2
FLL3 FLASHER 3
FLL4 FLASHER 4
FLLS FLASHER 5

HB ACK
HIN
HUIT
HUT
HVB

SELF CLEARING FLASHER
COMMON ACKNOWLEDGE
INPUT 1 (USER 1 STATUS)
INPUT 2 (USER 2 STATUS)
INPUT 1 ALPHANUMERIC DISPLAY STATUS
INPUT 2 ALPHANUMERIC DISPLAY STATUS
VALVE BAR DIRECT

NOT USED
ALARM #1 (A1)
ALARM #2 (A2)
ALARM #4 (A4)
HIGH LIMIT (HL)
LOW LIMIT (LL)
OVERRIDE (OR)
STANDBY SYNC (SS)
ALARM #3 (A3 OR AD)

EMERGENCY MANUAL (EM)
USER DEFINED STATUS 1
USER DEFINED STATUS 2
EMERGENCY INTERNAL (EI)
EMERGENCY LOCAL (EL)
NON-UPDATING INPUT (NU)
ALARM #3 (A3 OR AD)

Character Identification Table

<table>
<thead>
<tr>
<th>Character</th>
<th>Name</th>
<th>Character</th>
<th>Name</th>
</tr>
</thead>
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<td>blank</td>
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</tr>
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</tr>
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<td>greater than</td>
<td>0</td>
<td>caret</td>
<td>^</td>
</tr>
<tr>
<td>question mark</td>
<td>0</td>
<td>caret</td>
<td>`</td>
</tr>
</tbody>
</table>

(continued on next page)
LOOP 3 FUNCTION BLOCKS

- **FB301**
  - ANALOG INPUT
    - INPUT LOOPS: 1, 2, 3
    - SOURCE ADDRESS, OUTPUT 270: 0 to 64
    - SOURCE CHANNEL, OUTPUT 270: 0 to 256
    - NU STATUS TRIGGERED ON 270: NO/YES
    - SOURCE ADDRESS, OUTPUT 271: 0 to 64
    - SOURCE CHANNEL, OUTPUT 271: 0 to 256
    - NU STATUS TRIGGERED ON 271: NO/YES
    - RECORD TRANSFER LOCKOUT: NO/YES
    - PARAMETER COMMAND LOCKOUT: NO/YES

  **FB301 ANALOG INPUT**
  - A1+: (D7)
  - A1c-: (D8)
  - 1-5 Vdc
  - OUTPUT
  - FILTER BREAKPOINT FREQ.: 0.001 to 1000 Hz
  - ZERO INPUT: 0.0 to 1.0 Vdc
  - FULL SCALE INPUT: 4.0 to 5.0 Vdc
  - VERIFY INPUT: -3.3 to 103.3%
  - SQUARE ROOT EXTRACTOR: NO/YES

- **FB303**
  - ANALOG OUTPUT
    - AO1+: (C5)
    - AOC-: (C6)
    - 4-20 mA dc
    - ON/OFF
    - ZERO OUTPUT: 4.0 mA
    - FULL SCALE OUTPUT: 20.0 mA
    - INPUT A (SIGNAL): -3.3 to 103.3%
    - INPUT B (ON/OFF): 000 to 255

- **FB306**
  - DIGITAL INPUT
    - D11+: (C9)
    - D11-: (C10)
    - 316 ON/OFF

LOCAL INSTRUMENT LINK PARAMETERS (EXTERNAL)

The following Model 351 information are configuration parameters for external devices of a Local Instrument Link (e.g., computers, control consoles, etc.). These parameters cannot be configured at the faceplate of the Model 351.

- **A11**
  - CHANNEL L2A ALARM #1 LIMIT: -3.3 to 103.3%

- **A12**
  - CHANNEL L2A ALARM #2 LIMIT: -3.3 to 103.3%

- **A13**
  - CHANNEL L2A ALARM #3 LIMIT: -3.3 to 103.3%

- **A14**
  - CHANNEL L2A ALARM #4 LIMIT: -3.3 to 103.3%

- **B11**
  - CHANNEL L2B ALARM #1 LIMIT: -3.3 to 103.3%

- **B12**
  - CHANNEL L2B ALARM #2 LIMIT: -3.3 to 103.3%

- **B13**
  - CHANNEL L2B ALARM #3 LIMIT: -3.3 to 103.3%

- **B14**
  - CHANNEL L2B ALARM #4 LIMIT: -3.3 to 103.3%

- **A1T**
  - CHANNEL L2A ALARM #1 TYPE WORD: ATW

- **A2T**
  - CHANNEL L2A ALARM #2 TYPE WORD: ATW

- **A3T**
  - CHANNEL L2A ALARM #3 TYPE WORD: ATW

- **A4T**
  - CHANNEL L2A ALARM #4 TYPE WORD: ATW

- **B1T**
  - CHANNEL L2B ALARM #1 TYPE WORD: ATW

- **B2T**
  - CHANNEL L2B ALARM #2 TYPE WORD: ATW

- **B3T**
  - CHANNEL L2B ALARM #3 TYPE WORD: ATW

- **B4T**
  - CHANNEL L2B ALARM #4 TYPE WORD: ATW

ATW – Alarm Type Word is a 12-bit word that defines the alarm type. Details on each type word can be found in the Model 351 Link Communications User's Manual AD351-40.
**FB312 ALARMS**

<table>
<thead>
<tr>
<th>INPUT A</th>
<th>INPUT B</th>
<th>INPUT C</th>
<th>INPUT D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>ALARM #1</td>
<td>ALARM #2</td>
<td>ALARM #3</td>
<td>ALARM #4</td>
</tr>
</tbody>
</table>

**FB312 (cont’d)**

| A | R | ALARM 1 RINGBACK | NO YES |
| H | A | ALARM 2 RINGBACK | NO YES |
| H | A | ALARM 3 RINGBACK | NO YES |
| H | A | ALARM 4 RINGBACK | NO YES |
| H | A | ALARM 3 ALPHANUMERIC STATUS | NO YES |

**FB313 CONTROLLER**

**PROCESS**

- P: CONTROLLER
- S: SETPOINT
- F: FEEDBACK

**ADAPTIVE GAIN**

- A

**TRACK COMMAND**

- C

**ACTION**

- RESET

**PROPORTIONAL GAIN**

- 0.0 to 100

**TIME INTEGRAL**

- 0.0 to 100 MIN

**DERIVATIVE GAIN**

- 0.0 to 100

**MANUAL RESET**

- 0.0 to 100

**TYPE**

- PID, PD, D, PID/AG

**MANUAL RESET TRACKING**

- NO YES

**INPUT P (PROCESS)**

- 000 to 399

**INPUT S (SETPOINT)**

- 000 to 399

**INPUT F (FEEDBACK)**

- 000 to 399

**INPUT A (ADAPTIVE GAIN)**

- 000 to 399

**INPUT C (TRACK COMMAND)**

- 000 to 399

*Note: Only available from Quick Access (continued on next page)*
FB314
A/M Transfer

- AUTO INPUT
- EMERG MAN
- STANDBY SYNC
- TRACK INPUT

S P U M
POWER UP MANUAL
-3.3 to 103.3%

H A O
AUTO ONLY
NO/YES

H P U
POWER UP
A.M. LPBPO

H P U L
POWER UP LAST OUTPUT
NO/YES

H C W M
CLOCKWISE MANUAL
NO/YES

H I N A
INPUT A (AUTO)
000 to 399

H I N T
INPUT T (TRACK VARIABLE)
000 to 399

H I N E
INPUT E (EMERG. MAN)
000 to 399

H I N S
INPUT S (STANDBY SYNC)
000 to 399

FB315
OPERATOR'S DISPLAY

- INPUT P
- INPUT S
- INPUT V
- INPUT X
- INPUT Y

USER STATUS

1
ACKNOWLEDGE

2
PULSE-OFF

OPERATOR'S DISPLAY PANEL

328
PULSE-ON

319
ERROR

1000
DECIMAL POINT PROCESS

0 to 8730

2000
PROCESS LO

3000
PROCESS HI

4000
DECIMAL POINT X

5000
X LO

6000
X HI

7000
DECIMAL POINT Y

8000
Y LO

9000
Y HI

10000
TAG SCROLL TIME

7 to 10 SECONDS

11000
LOOP 3 TAG NAME

12000
LOOP 3 ENGINEERING UNITS

13000
STATION IDENTIFICATION

14000
INPUT P (PROCESS)

15000
INPUT S (SETPOINT)

16000
INPUT V (VALVE)

17000
INPUT A (ACKNOWLEDGE)

18000
INPUT X

19000
INPUT Y

20000
FLASHER 1

21000
FLASHER 2

22000
FLASHER 3

23000
FLASHER 4

24000
FLASHER 5

(continued on next page)
FB315

FB316 INTEGRATOR/TOTALIZER

- FB316

** FB316 INTEGRATOR/TOTALIZER **

<table>
<thead>
<tr>
<th>Character</th>
<th>Name</th>
<th>Character</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>blank</td>
<td>at symbol</td>
<td>blank</td>
<td>at symbol</td>
</tr>
<tr>
<td>exclamation mark</td>
<td>capital letter A</td>
<td>exclamation mark</td>
<td>capital letter A</td>
</tr>
<tr>
<td>quotation mark</td>
<td>capital letter B</td>
<td>quotation mark</td>
<td>capital letter B</td>
</tr>
<tr>
<td>#</td>
<td>number sign</td>
<td>#</td>
<td>number sign</td>
</tr>
<tr>
<td>$</td>
<td>dollar sign</td>
<td>$</td>
<td>dollar sign</td>
</tr>
<tr>
<td>%</td>
<td>percent sign</td>
<td>%</td>
<td>percent sign</td>
</tr>
<tr>
<td>&amp;</td>
<td>ampersand sign</td>
<td>&amp;</td>
<td>ampersand sign</td>
</tr>
<tr>
<td>*</td>
<td>apostrophe</td>
<td>*</td>
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<tr>
<td>(</td>
<td>left parenthesis</td>
<td>(</td>
<td>left parenthesis</td>
</tr>
<tr>
<td>)</td>
<td>right parenthesis</td>
<td>)</td>
<td>right parenthesis</td>
</tr>
<tr>
<td>,</td>
<td>comma</td>
<td>,</td>
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</tr>
<tr>
<td>+</td>
<td>plus sign</td>
<td>+</td>
<td>plus sign</td>
</tr>
<tr>
<td>-</td>
<td>minus sign</td>
<td>-</td>
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<tr>
<td>.</td>
<td>period</td>
<td>.</td>
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<tr>
<td>/</td>
<td>slash right</td>
<td>/</td>
<td>slash right</td>
</tr>
<tr>
<td>0</td>
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<tr>
<td>1</td>
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<td>0</td>
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<td>0</td>
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<td>equals colon</td>
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<td>equals colon</td>
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<td>2</td>
<td>less than</td>
<td>2</td>
<td>less than</td>
</tr>
<tr>
<td>3</td>
<td>greater than</td>
<td>3</td>
<td>greater than</td>
</tr>
<tr>
<td>4</td>
<td>question mark</td>
<td>4</td>
<td>question mark</td>
</tr>
</tbody>
</table>

** Refer to Character Identification Table **

30 (NOT USED) 10 EMERGENCY MANUAL (EM)
31 ALARM 1 (A1) 11 USER DEFINED STATUS 1 (**)
32 ALARM 2 (A2) 12 USER DEFINED STATUS 2 (**)
33 ALARM #4 (A4) 13 ERROR (E)
34 HIGH LIMIT (HL) 14 EMERGENCY INTERNAL (EI)
35 LOW LIMIT (LL) 15 EMERGENCY LOCAL (EL)
36 OVERRIDE (OR) 16 NON-UPDATING INPUT (NU)
37 STANDBY SYNG (SS) 17 ALARM #3 (A3 OR AD)

(1) Any one of the following status conditions can be selected to flash the P/S bargraph.

50

- FB317 SETPOINT TRACK & HOLD

** FB317 SETPOINT TRACK & HOLD **

- FB318 GEN. PURPOSE TRACK & HOLD

S H [hold value] 0.3 to 0.33
H I N T INPUT T (TRACK VARIABLE) 00 to 399
H I N C INPUT C (TRACK COMMAND) 00 to 399
LOCAL INSTRUMENT LINK PARAMETERS (EXTERNAL)

The following Model 351 information are configuration parameters for external devices of a Local Instrument Link (e.g. computers, control consoles, etc.) These parameters cannot be configured at the faceplate of the Model 351.

- **CHANNEL L3A ALARM #1 LIMIT**: -3.3 to 103.3%
- **CHANNEL L3A ALARM #2 LIMIT**: -3.3 to 103.3%
- **CHANNEL L3A ALARM #3 LIMIT**: -3.3 to 103.3%
- **CHANNEL L3B ALARM #1 LIMIT**: -3.3 to 103.3%
- **CHANNEL L3B ALARM #2 LIMIT**: -3.3 to 103.3%
- **CHANNEL L3B ALARM #3 LIMIT**: -3.3 to 103.3%
- **CHANNEL 3A ALARM #1 TYPE WORD**: ATW
- **CHANNEL 3A ALARM #2 TYPE WORD**: ATW
- **CHANNEL 3A ALARM #3 TYPE WORD**: ATW
- **CHANNEL 3B ALARM #1 TYPE WORD**: ATW
- **CHANNEL 3B ALARM #2 TYPE WORD**: ATW
- **CHANNEL 3B ALARM #3 TYPE WORD**: ATW

ATW - Alarm Type Word is a 12-bit word that defines the alarm type. Details on each type word can be found in the Model 351 Link Communications User's Manual AD351-40.
DIGITAL CONTROLLER TUNING

These are general guidelines taken from Moore Products Co. Application Document AM-35. Tuning should only be attempted by a qualified person who has read AM-35 and is familiar with the process to be tuned, and understands how to prevent the process from entering unsafe conditions during tuning procedures.

Ziegler-Nichols Closed Loop Method

1. Bring the process to desired setpoint on manual control
2. Eliminate integral and derivative action by adjustment - maximum integral time and minimum derivative time.
3. Adjust the proportional gain to the lowest setting and switch the control system to automatic.
4. Simulate a process upset by making a small, momentary change in the setpoint. Look for a sustained cycle in the measurement or controller output. If no cycle results, increase the proportional gain and try again. Repeat until a sustained cycle of continuous amplitude appears.
5. Note the lowest proportional gain at which cycling is sustained. This is the ultimate proportional gain PGu.
6. Time the cycle from peak to peak in minutes. This is the ultimate period Tu.
7. Determine controller adjustments from the table.

Ziegler-Nichols Open Loop Method

1. Bring the process to the desired setpoint on manual control.
2. Change the valve position a small amount Δ V(%). The change should be large enough to produce a measurable response in the process, but not large enough to drive the process beyond normal operating range. A 5% valve change is a good starting point.
3. Measure C and L on the process response curve:
4. Calculate:

\[
P Gu = \frac{2(\Delta V)}{\Delta C}
\]

\[
Tu = 4L
\]

5. Determine controller settings from the table below

<table>
<thead>
<tr>
<th>TYPE OF CONTROLLER</th>
<th>P</th>
<th>PI</th>
<th>PD*</th>
<th>PID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional Gain (PG)</td>
<td>0.5 PGu</td>
<td>0.45 PGu</td>
<td>0.71 PGu</td>
<td>0.6 PGu</td>
</tr>
<tr>
<td>Integral (TI - min.)</td>
<td>0.83 Tu</td>
<td>0.5 Tu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derivative (TD - min.)</td>
<td>0.15 Tu</td>
<td>0.125 Tu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Not from original Z-N paper

(continued on next page)
### Rear Terminal Assignments

**COLUMN “A”**

- **AH** - AC HOT OR DC (+)
- **AN** - AC NEUTRAL OR DC (-)
- **AG** - CASE GROUND
- **A4** - LOOP 1 ANALOG INPUT 1 (+) (FB101)
- **A5** - ANALOG INPUT COMMON (-)
- **A6** - LOOP 1 ANALOG INPUT 2 (+) (FB102)
- **A7** - LOOP 1 ANALOG OUTPUT (+) (FB103)
- **A8** - ANALOG OUTPUT COMMON (-)
- **A9** - OPTIONAL LOOP 1 NO 3 INPUT (FB199)
- **A10** - OPTIONAL LOOP 1 NO 3 INPUT (FB199)

**COLUMN “B”**

- **B1** - LINK (+) (FB198, FB298, FB398)
- **B2** - LINK (-) (FB196, FB296, FB396)
- **B3** - NO CONNECTION
- **B4** - LOOP 1 DIGITAL OUTPUT 1 (+) (FB104)
- **B5** - LOOP 1 DIGITAL OUTPUT 2 (+) (FB105)
- **B7** - DIGITAL OUTPUT COMMON (-)
- **B8** - LOOP 2 DIGITAL INPUT (+) (FB106)
- **B9** - LOOP 2 DIGITAL INPUT (+) (FB106)
- **B10** - OPTIONAL LOOP 1 NO 3 INPUT (FB199)

**COLUMN “C”**

- **C1** - LOOP 2 RELAY OUTPUT NO (FB212)
- **C2** - LOOP 2 RELAY COMMON (FB212)
- **C3** - LOOP 2 RELAY OUTPUT NC (FB212)
- **C4** - NO CONNECTION
- **C5** - LOOP 3 ANALOG OUTPUT (+) (FB301)
- **C6** - ANALOG OUTPUT COMMON (-)
- **C7** - LOOP 3 DIGITAL INPUT (+) (FB296)
- **C8** - LOOP 3 DIGITAL INPUT (+) (FB296)
- **C9** - LOOP 3 DIGITAL INPUT (+) (FB296)
- **C10** - LOOP 3 DIGITAL INPUT (+) (FB296)

**COLUMN “D”**

- **D1** - LOOP 3 RELAY OUTPUT NO (FB312)
- **D2** - LOOP 3 RELAY COMMON (FB312)
- **D3** - LOOP 3 RELAY OUTPUT NC (FB312)
- **D4** - LOOP 2 ANALOG INPUT 1 (+) (FB201)
- **D5** - ANALOG INPUT COMMON (-)
- **D6** - LOOP 2 ANALOG INPUT 2 (+) (FB202)
- **D7** - LOOP 2 ANALOG INPUT 2 (+) (FB202)
- **D8** - ANALOG INPUT COMMON (-)
- **D9** - LOOP 2 ANALOG OUTPUT (+) (FB203)
- **D10** - ANALOG OUTPUT COMMON (-)

### Factory Configured Options

Factory Configured Options are configurations stored in permanent memory (EPROM) of the controller that can be transferred to the configuration memory (EEPROM) with a single keystroke. The FCOs included in each of the three loops of the Model 351 are listed below. Complete documentation for the FCOs can be found in sections 1A, 2 and 3 of the MYCRO 351 User’s Manual A0351-10. As an example, complete documentation for FCO 101 is listed at the end of this section.

#### Loop 1 Factory Configured Options

<table>
<thead>
<tr>
<th>FCO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>ESN Reset (ESN = 000)</td>
</tr>
<tr>
<td>101</td>
<td>Single-Loop PID Control (TSP)</td>
</tr>
<tr>
<td>102</td>
<td>Single-Loop PID Control (NTSP)</td>
</tr>
<tr>
<td>103</td>
<td>External-Set PID Control (TSP)</td>
</tr>
<tr>
<td>104</td>
<td>External-Set PID Control (NTSP)</td>
</tr>
<tr>
<td>105</td>
<td>Ratio-Set PID Control (TSP)</td>
</tr>
<tr>
<td>106</td>
<td>Loading</td>
</tr>
<tr>
<td>107</td>
<td>A/M Transfer</td>
</tr>
<tr>
<td>108</td>
<td>A/M Transfer w/Bias</td>
</tr>
<tr>
<td>109</td>
<td>Indicator</td>
</tr>
<tr>
<td>110</td>
<td>Default Configuration</td>
</tr>
<tr>
<td>111</td>
<td>Single-Loop PID Control (TSP) – CL Operation</td>
</tr>
<tr>
<td>112</td>
<td>Single-Loop PID Control (NTSP) – CL Operation</td>
</tr>
<tr>
<td>113</td>
<td>External-Set PID Control (TSP) – CL Operation</td>
</tr>
<tr>
<td>114</td>
<td>External-Set PID Control (NTSP) – CL Operation</td>
</tr>
<tr>
<td>115</td>
<td>Ratio-Set PID Control (TSP) – CL Operation</td>
</tr>
<tr>
<td>116</td>
<td>Loading – CL Operation</td>
</tr>
<tr>
<td>117</td>
<td>A/M Transfer – CL Operation</td>
</tr>
<tr>
<td>118</td>
<td>A/M Transfer W/Bias – CL Operation</td>
</tr>
<tr>
<td>119</td>
<td>Indicator – CL Operation</td>
</tr>
<tr>
<td>140</td>
<td>Computer-Set A/M Transfer</td>
</tr>
<tr>
<td>141</td>
<td>Computer-Set DDC Control</td>
</tr>
<tr>
<td>142</td>
<td>Computer-Set Supervisory Control</td>
</tr>
</tbody>
</table>

*FOC 110, 119, 140 – Only available when link interface installed*

*FOC 140, 142 – Only available when computer pulse board installed*
LOOP 2 FACTORY CONFIGURED OPTIONS

FCO 200 ............................................. ESN Reset (ESN = 000)
FCO 201 ............................................. Single-Loop PID Control (TSP)
FCO 202 ............................................. Single-Loop PID Control (NTSP)
FCO 203 ............................................. External-Set PID Control (TSP)
FCO 204 ............................................. External-Set PID Control (NTSP)
FCO 205 ............................................. Ratio-Set PID Control (TSP)
FCO 206 ............................................. Loading
FCO 207 ............................................. A/M Transfer
FCO 208 ............................................. A/M Transfer w/Bias
FCO 209 ............................................. Indicator
FCO 210 ............................................. Default Configuration
FCO 211 ............................................. Single-Loop PID Control (TSP) – C/L Operation
FCO 212 ............................................. Single-Loop PID Control (NTSP) – C/L Operation
FCO 213 ............................................. External-Set PID Control (TSP) – C/L Operation
FCO 214 ............................................. External-Set PID Control (NTSP) – C/L Operation
FCO 215 ............................................. Ratio-Set PID Control (TSP) – C/L Operation
FCO 216 ............................................. Loading – C/L Operation
FCO 217 ............................................. A/M Transfer – C/L Operation
FCO 218 ............................................. A/M Transfer w/Bias – C/L Operation
FCO 219 ............................................. Indicator – C/L Operation
FCO 211 to 219 – Only available when link interface installed

LOOP 3 FACTORY CONFIGURED OPTIONS

FCO 300 ............................................. ESN Reset (ESN = 000)
FCO 301 ............................................. Single-Loop PID Control (TSP)
FCO 302 ............................................. Single-Loop PID Control (NTSP)
FCO 303 ............................................. External-Set PID Control (TSP)
FCO 304 ............................................. External-Set PID Control (NTSP)
FCO 305 ............................................. Ratio-Set PID Control (TSP)
FCO 306 ............................................. Loading
FCO 307 ............................................. A/M Transfer
FCO 308 ............................................. A/M Transfer w/Bias
FCO 309 ............................................. Indicator
FCO 310 ............................................. Default Configuration
FCO 311 ............................................. Single-Loop PID Control (TSP) – C/L Operation
FCO 312 ............................................. Single-Loop PID Control (NTSP) – C/L Operation
FCO 313 ............................................. External-Set PID Control (TSP)
FCO 314 ............................................. External-Set PID Control (NTSP)
FCO 315 ............................................. Ratio-Set PID Control (TSP)
FCO 316 ............................................. Loading – C/L Operation
FCO 317 ............................................. A/M Transfer – C/L Operation
FCO 318 ............................................. A/M Transfer w/Bias – C/L Operation
FCO 319 ............................................. Indicator – C/L Operation
FCO 311 to 319 – Only available when link interface installed

FACTORY CONFIGURED OPTION FCO 101

Single-Loop PID Control

The following lists the configuration data for a commonly used Factory Configured Option (FCO 101) stored in memory of the Model 351 Triple-Loop Digital Controller.

SINGLE-LOOP PID CONTROL
WITH
HI/LO PROCESS ALARMS
- TRACKING SETPOINT

LOOP DIAGRAM

CONNECTION TO FB115 DISPLAY
### CONFIGURATION PARAMETERS

<table>
<thead>
<tr>
<th>T</th>
<th>H</th>
<th>S</th>
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<tbody>
<tr>
<td>FB101</td>
<td>ESN 05</td>
<td>SRE NO</td>
</tr>
<tr>
<td>FB102</td>
<td>ESN 45</td>
<td>NA 117</td>
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<tr>
<td>FB103</td>
<td>ESN 20</td>
<td>NA 111</td>
</tr>
<tr>
<td>FB104</td>
<td>ESN 25</td>
<td>NA 112</td>
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**FB112 ESN 19**

<table>
<thead>
<tr>
<th>T</th>
<th>H</th>
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(1) Calibration will not be showed as part of the FCC data but stations will normally be shipped calibrated for these values.
(2) Not affected by entering an FCC.

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