-METASYS®

SX-9120 Service Module

* Indicates those sections where changes have occurred since the last printing.

Code No. LIT-6364070

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General Setup Instructions

The SX-9120 is a service module specifically designed to communicate with and configure the DX-9100 Series Controllers (Versions 1, 2, and 3). It enables the user to view data and change parameters in the controller, and to upload and download a configuration.

> ⚠ CAUTION: Since the SX-9120 communicates directly with the program stored in the DX-9100, use caution when making changes. Changes made via the SX-9120 are permanent in that there is no way to release the changes back to a previous value. Careless online modification of an installed controller's internal parameters could also result in damage to attached field equipment. It is strongly recommended that you familiarize yourself with the operation of the SX-9120 Service Module in a bench test environment before applying it in field situations.

Model Codes

Table 1: Model Codes

Model	Ordering Code
SX-9120 Service Module with 220/240V battery charger.	SX-9120-8101
SX-9120 Service Module without battery charger (North American version).	SX-9120-8110

Power Supply

The service module is powered by a standard rechargeable 9V battery. A 12V battery charger for connection to 220/240 VAC power source is supplied with the module to recharge the battery or to supply power to the module (European version only).

The battery will provide about five hours of continuous operation and can be recharged in approximately 12 hours with the service module switched off.

The rechargeable battery may be replaced by a standard non-rechargeable battery for eight hours or more of normal operation, depending on the type of battery. In this case the battery charger must not be used.

The service module is switched on and off by a switch located on the right-hand side of the device.

Display, Keyboard, and DIP Switches

The service module has a two line, 16-character Liquid Crystal Display (LCD), a 24-key tactile keyboard and a set of three DIP switches at the side of the module.

- DIP Switch 1 is a Calibration Protection switch and must be set to Off to enable the modification of calibration values in the controller. Set the switch to On to protect the calibration values in the controller.
- DIP Switch 2 is a Configuration Protection switch and must be set to Off to enable the configuration or modification of the data base in the controller. Set the switch to On to protect the data base from changes.
- DIP Switch 3 is a RAM Battery Backup switch and must be set to On to permanently connect the internal battery supply to the service module RAM, overriding the ON/OFF switch. In the On position an uploaded configuration will be retained in RAM as long as the battery has sufficient charge. In the Off position the configuration will be lost when the service module is switched off.

Connection to DX-9100

The service module communicates with a Version 1 (DX-9100-8154), Version 2 (DX-9100-8454), or Version 3 (DX-9120-8454) controller by way of a cable supplied with the service module. The cable is plugged into the side of the service module and into the service module connector on the DX-9100 Controller. Both the service module and the DX-9100 Controller must be powered for communication to be established.

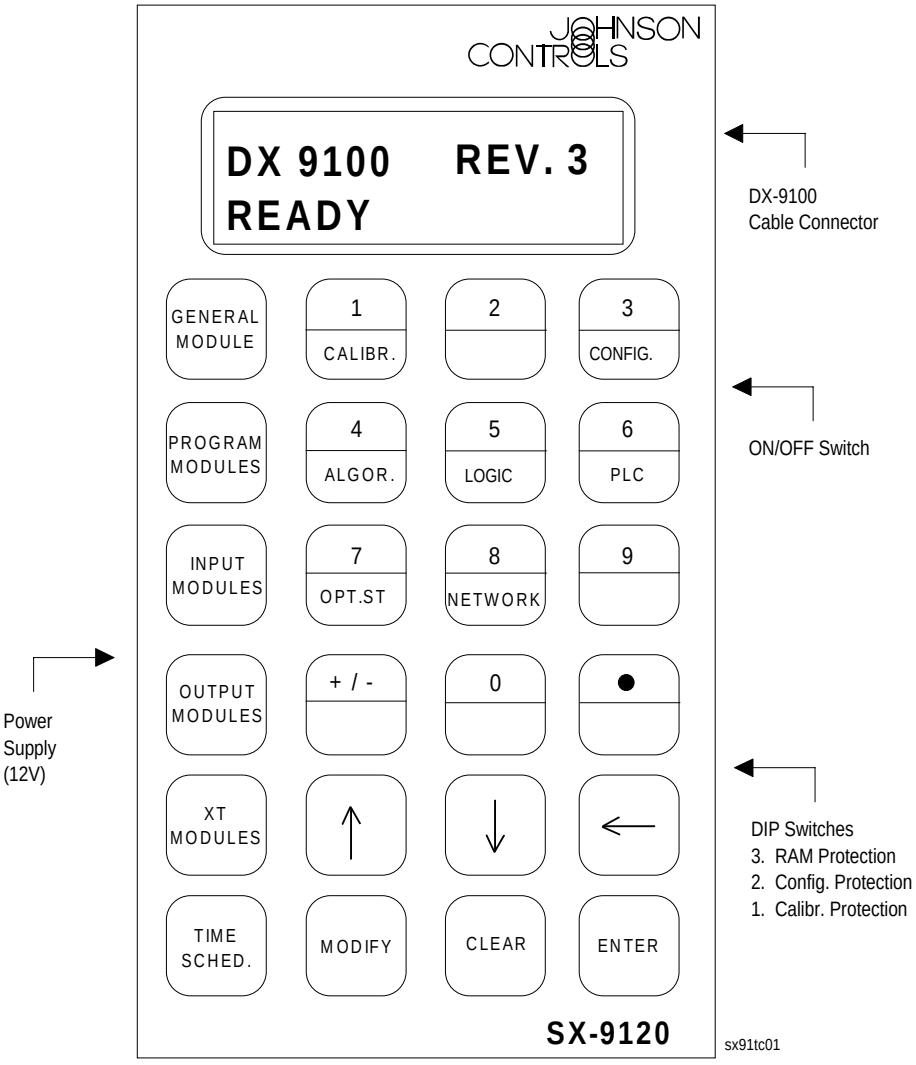

Figure 1: Keyboard Layout

General Configuration Information

> **CAUTION:** Since the SX-9120 communicates directly with the program stored in the DX-9100, use caution when making changes. Changes made via the SX-9120 are permanent in that there is no way to release the changes back to a previous value. Careless online modification of an installed controller's internal parameters could also result in damage to attached field equipment. It is strongly recommended that you familiarize yourself with the operation of the SX-9120 Service Module in a bench test environment before applying it in field situations.

Relative Index and Item Tags

The configuration of the controller is determined by the contents of its data base memory locations called Items. The data base is organized in modules: General Module, Programmable Modules, Analog Input Modules, etc., and each item has a Relative Index (RI) and an Item Tag within its module.

The relative index of an item is a decimal number, which is entered into the service module to view or modify the contents of the item memory location.

The service module will display the item tag to confirm the correct item selection.

Refer to the *DX-9100 Configuration Guide (LIT-6364030)* in this manual for a list of modules, item tags, and relative index numbers.

Absolute Item Addresses

Each module occupies a range of absolute item addresses in the data base memory of the controller. The absolute item address is given by the sum of the relative index and the absolute address of the first item in the module. Absolute item addresses in decimal form are used in numeric connections.

Refer to the *DX-9100 Configuration Guide (LIT-6364030)* in this manual for a list of modules with the absolute addresses, and items with relative index numbers in decimal form.

Logic Variables

Individual bit positions in the bytes of status items are also called logic variables and are listed in the *DX-9100 Configuration Guide (LIT-6364030)*. Each logic variable has a bit number (1-8) and a byte address (0-255). Logic variables are used in logic connections and in the PLC program.

Modifying an Item

All items, except those which are read only, can be modified when the item value is displayed in Config mode. This mode is obtained by first selecting the module in which the item to be modified is located and then pressing the CONFIG key.

The RI (Relative Index) of the item is then entered and confirmed by pressing the ENTER key. The selected item is then displayed with its current value.

To change the value of an item, press the MODIFY key and enter the new value in the same format as the displayed value. Press the ENTER key to confirm the new value, or the CLEAR key to retain the previous value.

Number

```
HIA1        +90.50
RI3    --> +
```

Value with sign and decimal point.

ENTER NEW VALUE (e.g., +85.0)

Integer (1 Byte)

```
PC5              255
RI26    --> 0
```

Decimal equivalent of binary value.

ENTER NEW VALUE (0-255)

Status (1 Byte)

```
AOT1      10000011
RI0     -->
```

Binary values X8...X1.

ENTER NEW VALUE (8 Bits)

Status (2 Bytes)

```
AIT8      00000010
RI0       01100001
```

High Byte X16...X9
Low Byte X8...X1

MODIFY KEY

```
1 = HIGH BYTE
0 = LOW BYTE
```

SELECT 0 (low) or 1 (high)

```
HIGH      00000010
       -->
```

ENTER NEW VALUE (8 Bits)

Counter (4 Bytes)

```
CNTR3      1234567
RI15    -->
```

Decimal equivalent of binary value.

ENTER NEW VALUE (0 - 9,999,999)

If an item is read only, the message UNCHANGEABLE will appear in the display window when the MODIFY key is pressed.

Connections (Numeric)

```
AO@2          124
RI1       NUMERIC
```

Absolute address (decimal) of connected numeric item

Connections (Logic)

```
DO@7        1 025
RI1         LOGIC
```

Logic variable bit + byte address (decimal)

MODIFY KEY

```
1 = NUMERIC
0 = LOGIC
```

SELECT 0 or 1

Numeric Connection (1)

```
DO@7
RI1    --> 0
```

ENTER ABSOLUTE ADDRESS OF ITEM TO BE CONNECTED
(USE MINUS SIGN (-) FOR NEGATION)

Logic Connection (0)

```
ENTER   BIT   1-8
      --> 0
```

ENTER BIT NUMBER OF LOGIC VARIABLE TO BE CONNECTED

```
BYTE  ADDR  0-255
      --> 0
```

ENTER BYTE ADDRESS OF LOGIC VARIABLE TO BE CONNECTED (USE MINUS SIGN (-) FOR INVERSE)

Destination (Version 3 Controller Only)

```
NDO1 > 1   2  80
RI4     DEST. ADX
```

MODIFY KEY

```
DEST. INPUT 1-8
      --> 0
```

ENTER INPUT NUMBER IN DESTINATION CONTROLLER

```
DEST. ADX 0-255
      --> 0
```

ENTER ADDRESS OF DESTINATION CONTROLLER

Configuration Instructions

CAUTION: Since the SX-9120 communicates directly with the program stored in the DX-9100, use caution when making changes. Changes made via the SX-9120 are permanent in that there is no way to release the changes back to a previous value. Careless online modification of an installed controller's internal parameters could also result in damage to attached field equipment. It is strongly recommended that you familiarize yourself with the operation of the SX-9120 Service Module in a bench test environment before applying it in field situations.

Startup

When the service module is switched on, one of the following messages will be displayed.

- `DX 9100 READY` indicates that the service module is communicating with the connected controller, and that the controller can be configured. The version number of the controller is also displayed.
- `DX 9100 CHARGE BATTERY` indicates that the service module battery contains insufficient charge to support configuration operations, and should be charged or changed.
- `COMMUNIC. ERROR - PRESS ANY KEY` indicates there is no communication between the service module and the DX-9100. The controller may not be powered or may not have the correct EPROM, or the connection cable may be damaged or not properly inserted. When the problem has been corrected, the user must press any key on the keyboard to reset the service module and resume normal operation from the `DX 9100 READY` display.

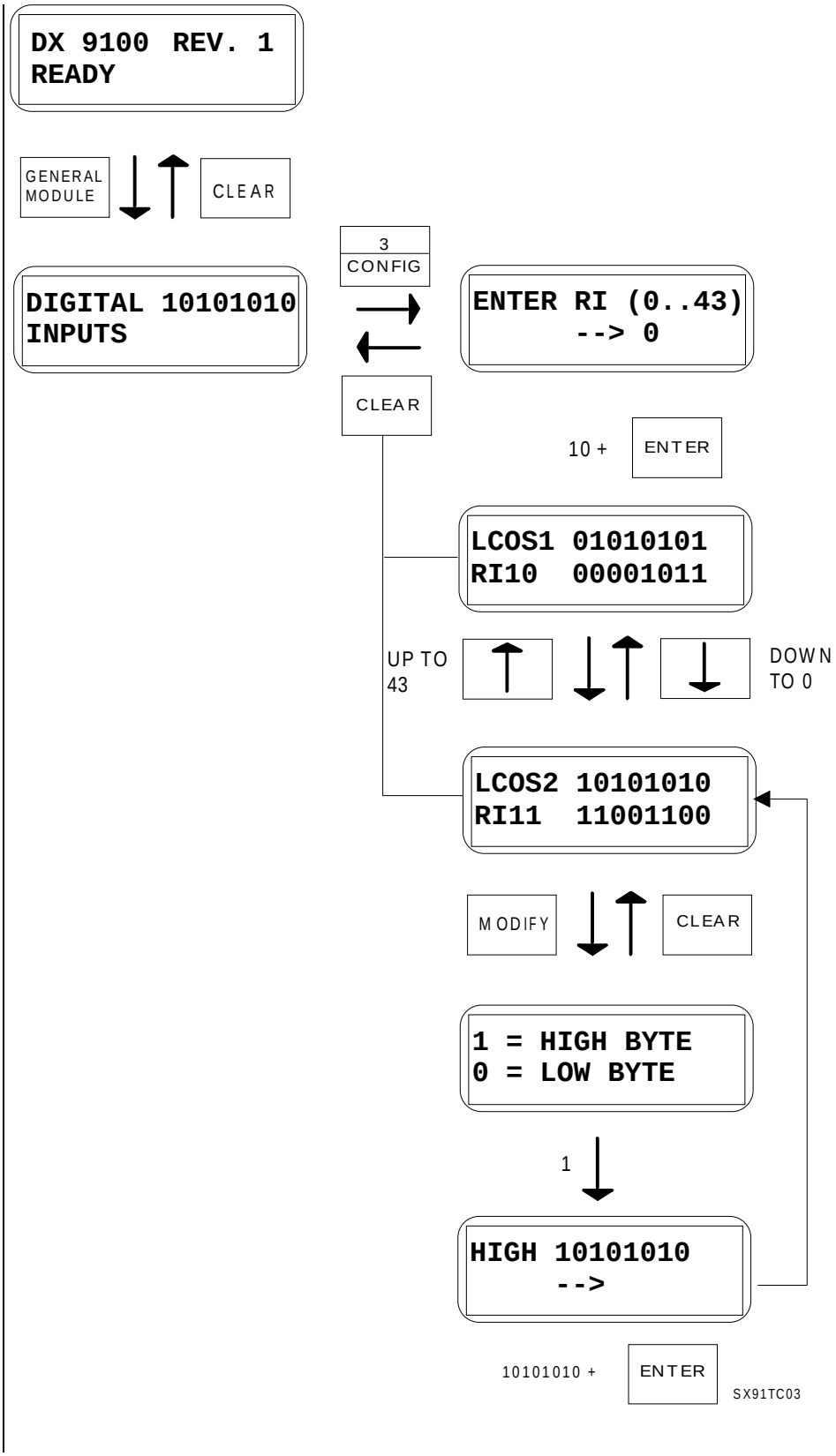

Figure 2: Startup

General Module

When the GENERAL MODULE key is pressed, the service module displays the status of the eight digital inputs to the controller in binary format.

```
DI8, DI7, DI6, DI5, DI4, DI3, DI2, DI1
```

To display or change the contents of an item in the general module, press the CONFIG key, enter the RI (Relative Index) of the item and press ENTER.

The upper line of the display will show the item tag (e.g., LCOS1) and the current value of the item. The lower line will show the RI number and indicate whether a connection is numeric or logic. For 2-byte status items, the most significant (high) byte is displayed in the upper line, and the least significant (low) byte is displayed in the lower line.

By pressing the up/down arrow keys, all items in the general module can be successively displayed. To change the value of an item, press the MODIFY key.

To return to the previous display, press the CLEAR key.

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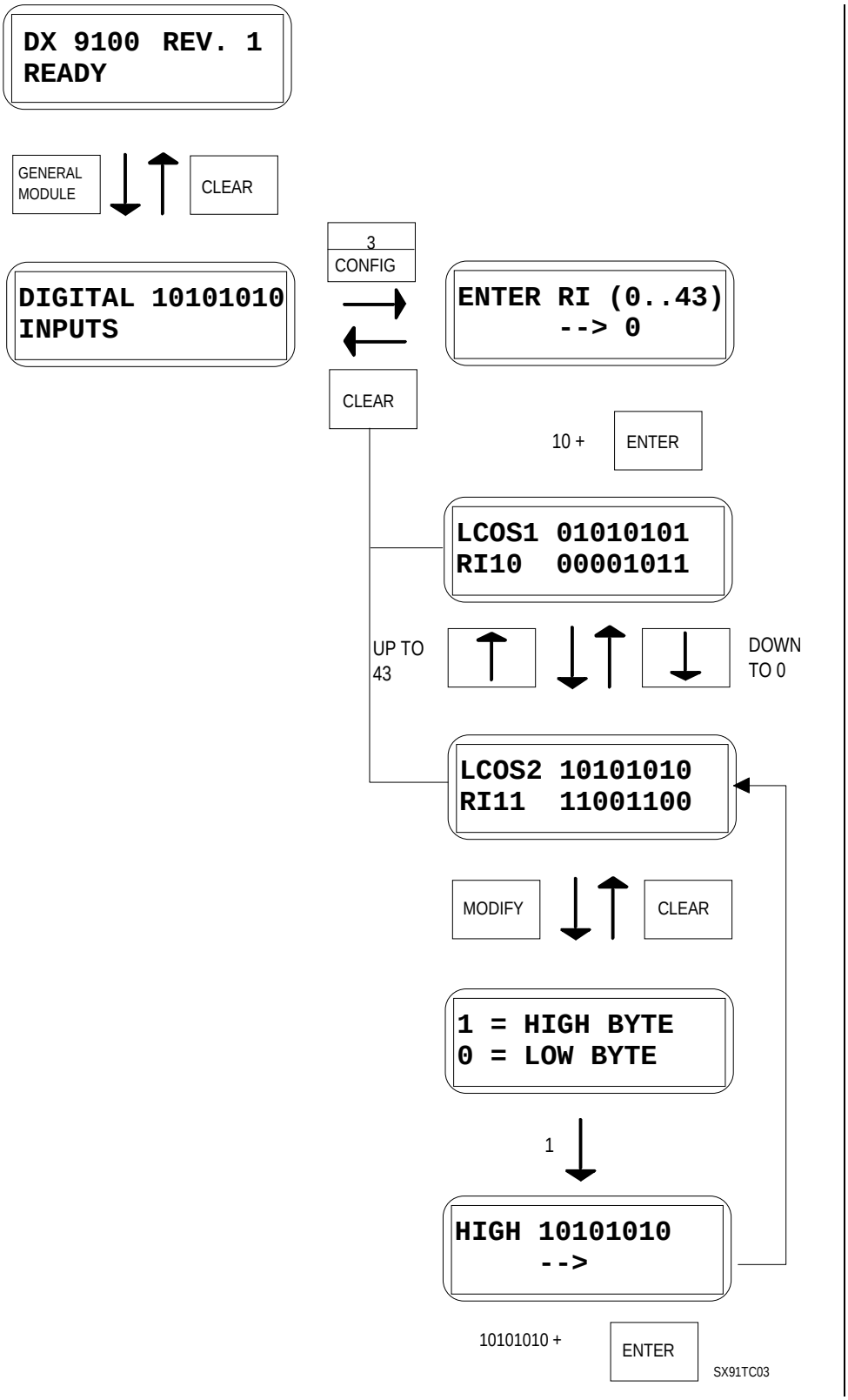

Figure 3: General Module

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Programmable Modules

When the PROGRAM. MODULES key is pressed, the service module displays the Algorithm Type for Programmable Module 1. The upper line of the display shows the tag "PM1" and the lower line shows one of the following:

Table 2: Programmable Modules

PID CONTROL	Control Module with analog output
ON/OFF CONTROL	Control Module with logic output
DUAL PID CONTROL	Heating/cooling control with analog output
DUAL ON/OFF CONTR	Heating/cooling control with logic output
AVERAGE	Average calculation from 8 inputs
MINIMUM SEL.	Minimum select from 8 inputs
MAXIMUM SEL.	Maximum select from 8 inputs
PSYCHROM. °C	Enthalpy, dew point, wet bulb calculator
PSYCHROM. °F	Enthalpy, dew point, wet bulb calculator
LINESEGMENT	Line segment (linearization) module
INPUT SELECT	Selector module with 4 inputs
CALCULATOR	Calculator module (2 equations)
TIMERS	8 channel timer module
TOTALIZATION	8 channel event counter/integrator/runtime counter
COMPARATOR	8 channel comparator module
SEQUENCER	Sequence control module
4 LINESEGMENT	4 channel line segment module
8 CALCULATOR	8 channel calculator (6 functions)
NOT CONFIGURED	Item PMn TYP not configured

To step through all 12 programmable modules of the controller, press the up/down arrow keys.

To display or change the contents of an item in a programmable module, first select the desired module as indicated by the tag “PM1 - PM12,” and then press the CONFIG key. Enter the RI (Relative Index) of the item and press ENTER. The upper line of the display will show the item tag (e.g., PM1PV@) and the current value of the item. The lower line will show the RI number and indicate whether a connection is numeric or logic. For 2-byte status items the most significant (high) byte is displayed in the upper line and the least significant (low) byte is displayed in the lower line.

By pressing the up/down arrow keys all items in the selected programmable module can be successively displayed. To change the value of an item, press the MODIFY key.

To return to the previous display, press the CLEAR key.

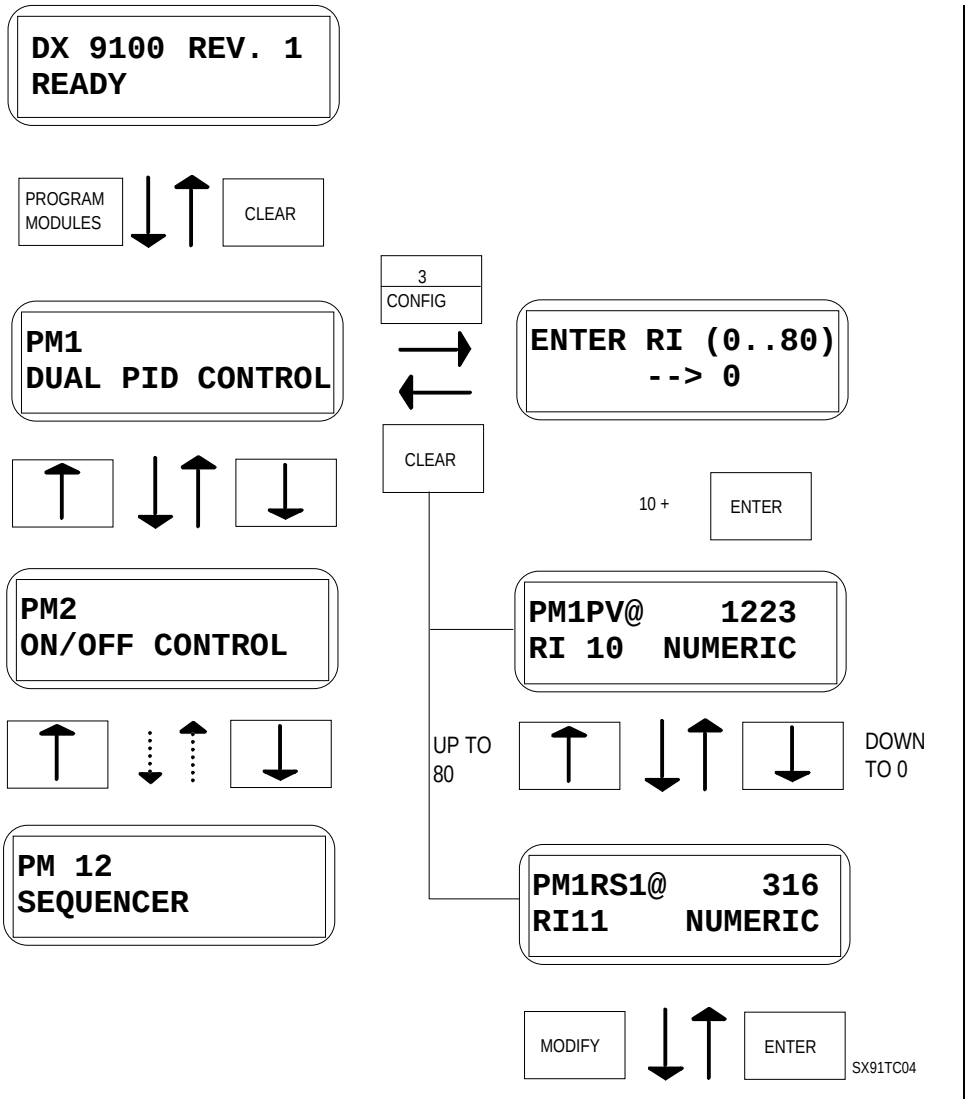

Figure 4: Programmable Modules

Note: This example assumes that the DX-9100 has been downloaded with the program modules configured.

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Analog Inputs

When the INPUT MODULES key is pressed, the service module displays the current data for Analog Input 1.

The upper line of the display shows the item tag “AI1” and its value.

The lower line shows the following:

Unit of measurement:	--, °C, °F
Normal or square root:	NOR, SQR
Type of sensor:	0...10V, 2...10V, 0...20 mA,
	4...20 mA
	NI 1000J, NI 1000E, A 99, PT 1000, NI 1000L, NI 1000D
	J: JCI type
	E: Extended Range
	L: L and G type
	D: DIN standard

To step through all eight input modules of the controller, press the up/down arrow keys.

To display or change the contents of an item in an analog input module, first select the desired module as indicated by the tag “AI1-AI8,” and then press the CONFIG key. Enter the RI (Relative Index) of the item and press ENTER. The upper line of the display will show the item tag (e.g., AIT3) and the current value of the item. The lower line will show the RI number and indicate whether a connection is numeric or logic. For 2-byte status items the most significant (high) byte is displayed in the upper line and the least significant (low) byte is displayed in the lower line.

By pressing the arrow keys, all items in the selected analog input module can be successively displayed. To change the value of an item, press the MODIFY key. To return to the previous display, press the CLEAR key.

Calibration Values (Passive/RTD Sensors)

To display or change the calibration values for passive sensors, first select the desired input module as indicated by the tag "AI1-AI8," and then press the CALIBR key. The lower line of the display will show the low passive calibration value (PSnL, where n = 1-8), which can be changed by pressing the up/down arrow keys or entering a value using MODIFY.

Press the CALIBR key once again to display the high passive calibration value (PSnH, where n = 1-8), which can be changed by pressing the up/down arrow keys or entering a value using MODIFY.

If the AI is reading higher than it should, add 13 counts per degree °F (7 per °C) to both of that AI's calibration coefficients (passive reference PSnL, PSnH).

If the AI is reading lower than it should, subtract approximately 13 counts per degree °F (7 per °C) from both of that AI's calibration coefficients (passive reference high and low) PSnL, PSnH.

Example:

AI4 is reading 3°F lower than it should. The AI4 Pass. Ref. High is currently 10812 and the AI4 Pass. Ref. Low is 6050.

Solution:

AI4 Pass. Ref. High calibration value = current value - 13 * (degrees too low)

10812 - 13 * 1.5 = 10773

Enter 10773 in place of 10812.

AI4 Pass. Ref. Low calibration value = current value - 13 * (degrees too low)

6050 - 13 * 3 = 6011

Enter 6011 in place of 6050.

To return to the analog input display, press the CLEAR key.

Note: Factory set calibration values are given with each controller. These values are stored in EEPROM and will not normally need changing. If recalibration is necessary, refer to *Calibration of DX-9100 Analog Inputs/Outputs* at the end of this manual.

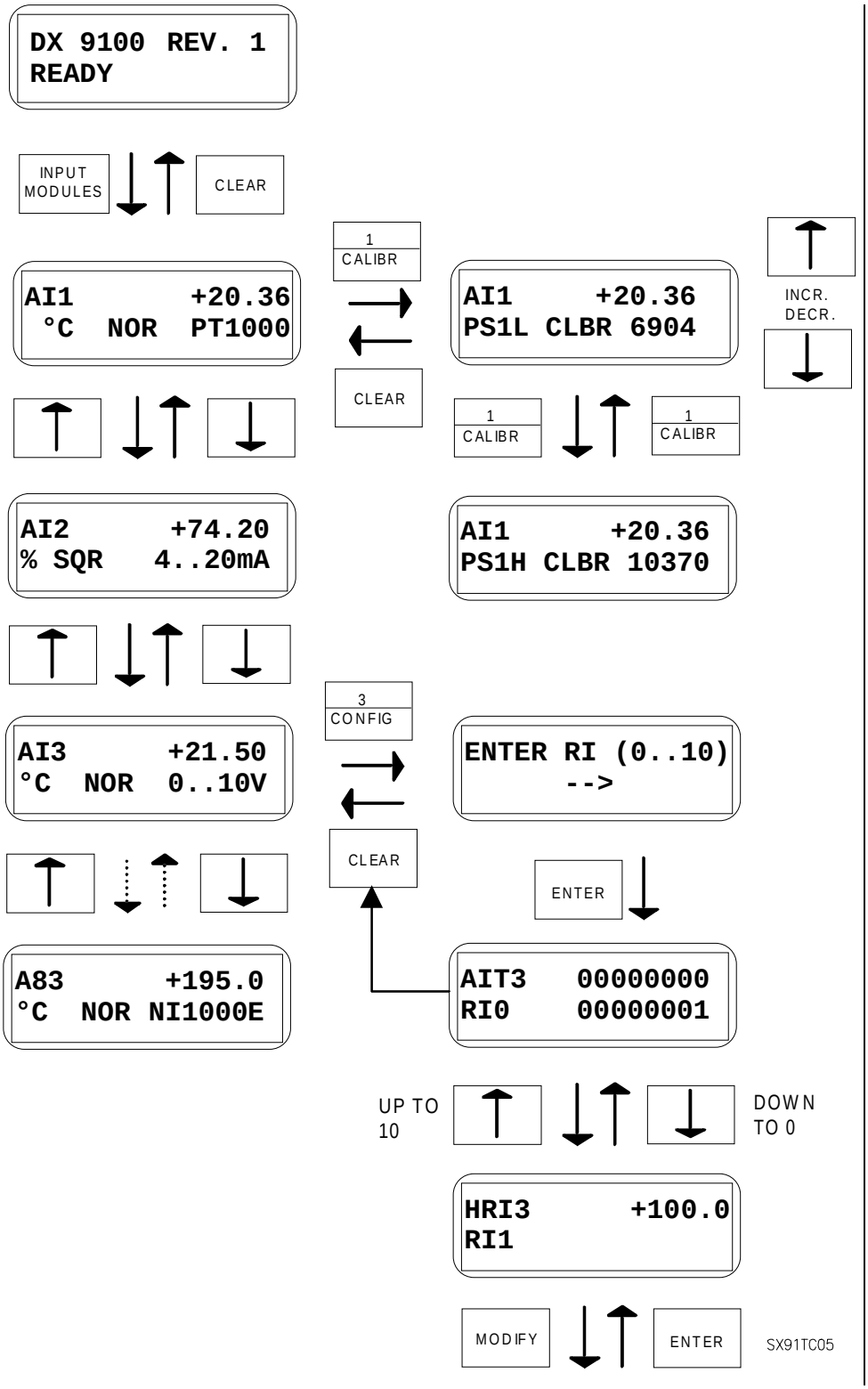

Figure 5: Analog Inputs and Passive RTD Calibration

Analog Inputs (Amplifier Calibration)

As there is only one set of amplifier calibration values for all analog inputs, these calibration values are displayed directly from the `DX 9100 READY` display by pressing the CALIBR key.

There are four calibration values which are successively shown using the up/down arrow keys.

AIHI	Main amplifier high calibration value
AILO	Main amplifier low calibration value
PSPH	Pre-amplifier high calibration value
PSPL	Pre-amplifier low calibration value

The pre-amplifier is used for passive sensor inputs and current (mA) inputs.

To change a calibration value, first display the value and then press the MODIFY key. Enter the new value and press ENTER. Press CLEAR to return to the `DX 9100 READY` display.

Note: Factory set calibration values are given with each controller. These values are stored in EEPROM and will not normally need changing. If recalibration is necessary, refer to *Calibration of DX-9100 Analog Inputs/Outputs* at the end of this manual.

Clock Calibration

The clock calibration value can be accessed using the up arrow key when the PSPL calibr. value is displayed. To change the calibration value, press the MODIFY key. Enter the new value and press ENTER. The value is in units of 0.01 seconds per day. A positive advances the clock and a negative value retards the clock. Press CLEAR to return to the `DX 9100 READY` display. In the example of Figure 6, an entry of 20 would add 0.2 seconds per day.

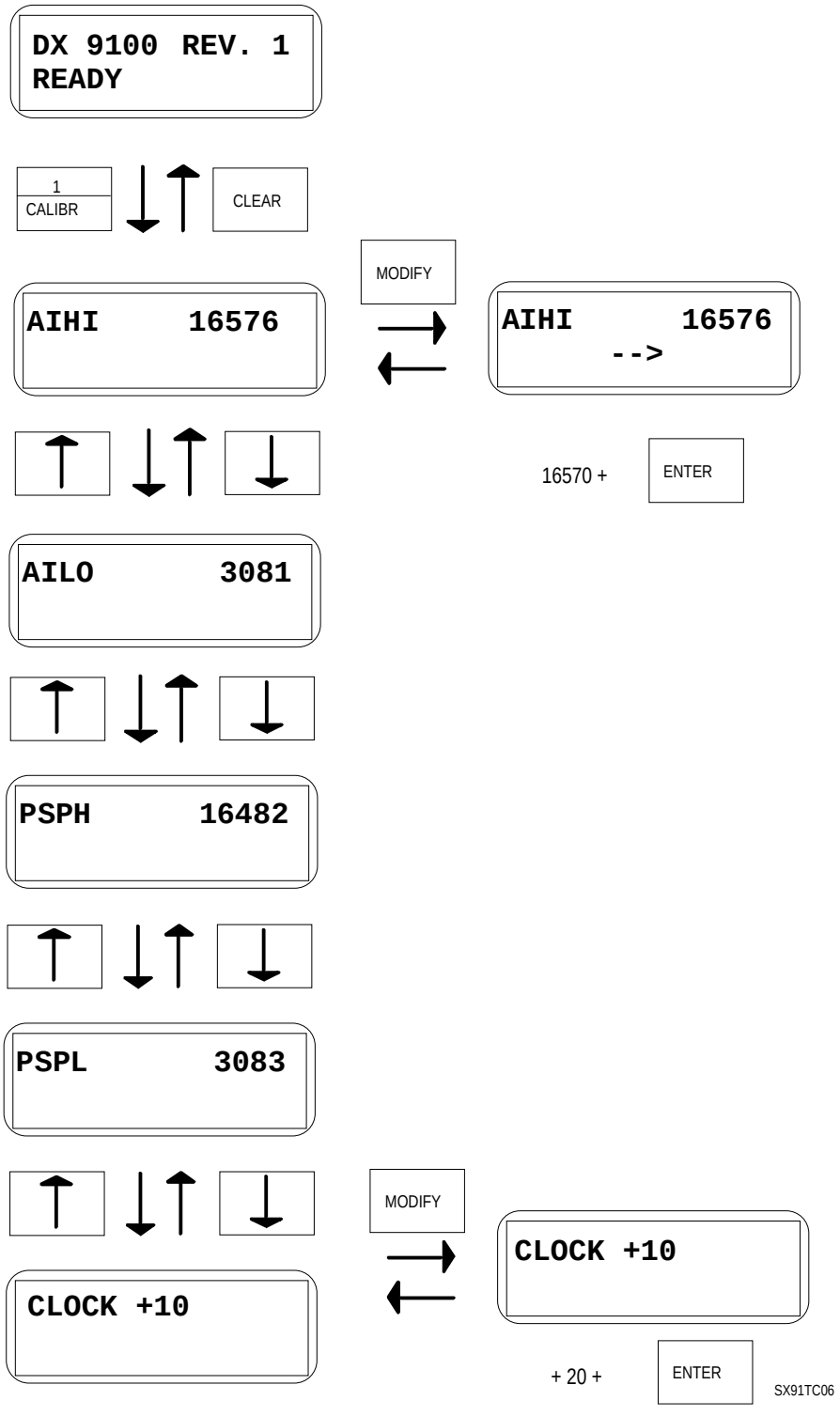

Figure 6: Analog Inputs Amplifier and Clock Calibration

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Output Modules

When the OUTPUT MODULES key is pressed, the service module displays the current data for Analog Output Module 1.

The upper line of the display shows the Item Tag OUT1 and its value. The lower line shows that the output module is analog and indicates its type:

- 0...10V, 0...20 mA, or 4...20 mA.

To step through all output modules of the controller, press the up/down arrow key. Output Module 2 is also analog. Output Modules 3-8 are shown as digital, and the type of module is shown in the lower line:

- ON/OFF L (Logic source), ON/OFF N (Numeric source), D.A.T., P.A.T., P.A.T.FB (with feedback), STA/STOP, or PULSE.

Controllers DX-9100-8454, Version 2, and *DX-9120-8454, Version 3*: Output Modules 9-16 are shown as analog.

To display or change the contents of an item in an output module, first select the desired module as indicated by the tag "OUT1-8" (also "OUT9-14" in *Versions 2 and 3*) and then press the CONFIG key. Enter the RI (Relative Index) of the item and press ENTER.

The upper line of the display will show the item tag (e.g., DOT 3) and the current value of the item. The lower line will show the RI number and indicate whether a connection is numeric or logic. By pressing the up/down arrow keys, all items in the selected output module can be successively displayed. To change the value of an item, press the MODIFY key.

To return to the previous display, press the CLEAR key.

Calibration Values

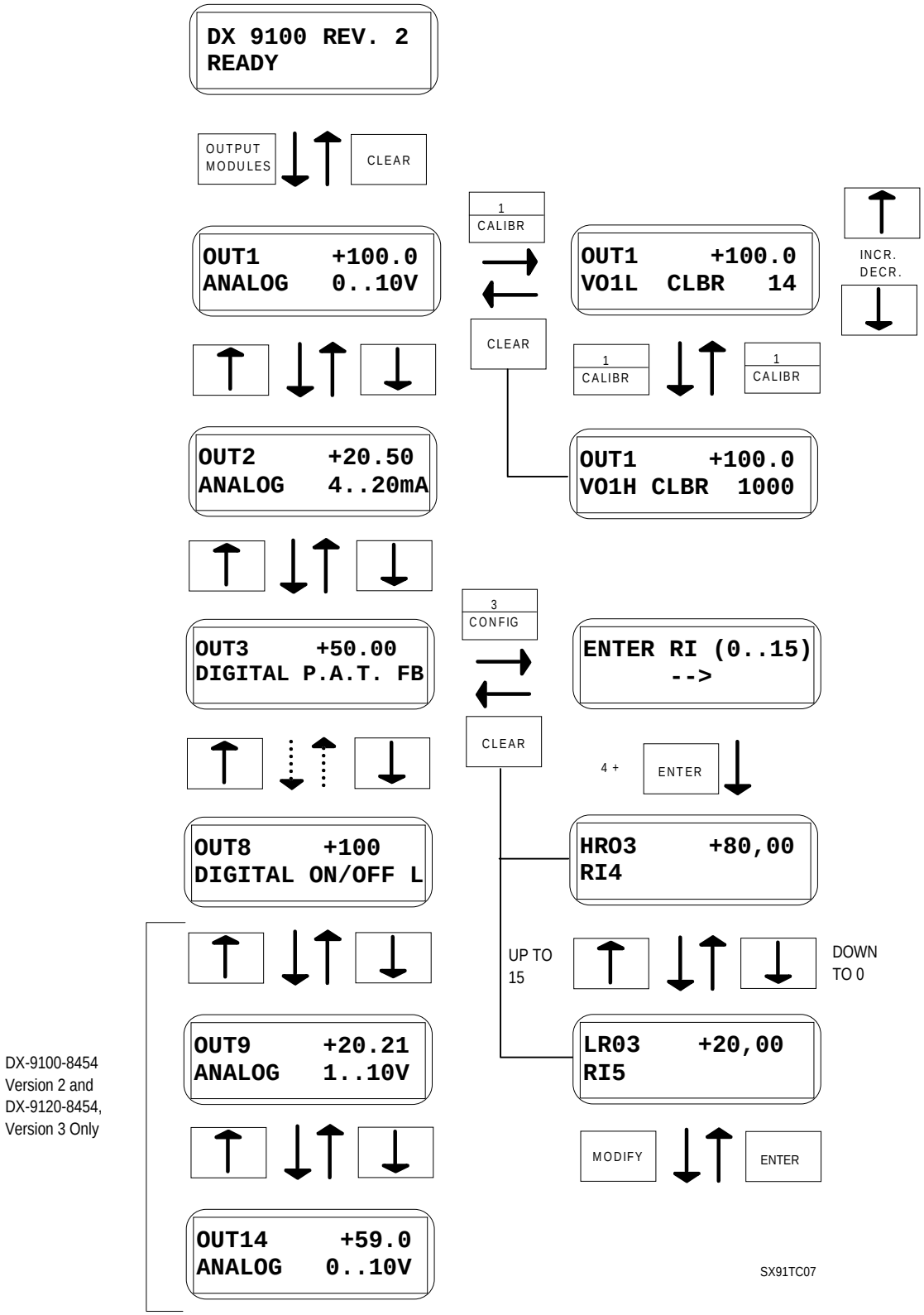
To display or change the calibration values for analog output modules, first select the desired module as indicated by the tag "OUT1" or "OUT2" (or "OUT9"- "OUT14" in controllers DX-9100-8454, *Version 2*, and DX-9120-8454, *Version 3*), and then press the CALIBR key. The lower line of the display will show the low calibration value for voltage mode (VOnL) or current (mA) mode (COnL), depending on the analog output type. The calibration value can be changed by pressing the up/down arrow keys or change value using the MODIFY key and entering a value. Press the CALIBR key to display the high calibration value (VOnH or COnH). The calibration value can be changed by pressing the up/down arrow keys or change value using the MODIFY key and entering a value.

In the DX-9100-8154 Controller, *Version 1,* two analog outputs are available (n = 1 or 2).

In controllers DX-9100-8454, *Version 2*, and DX-9120-8454, *Version 3*, eight analog outputs are available (n = 1, 2, 9-14), but Outputs 11-14 can only be in voltage mode.

To return to the `OUTPUT MODULES` display, press the CLEAR key.

Note: Factory set calibration values are given with each controller. These values are stored in EEPROM and will not normally need changing. If recalibration is necessary, refer to *Calibration of DX-9100 Analog Inputs/Outputs* at the end of this manual.



DX-9100-8454
Version 2 and
DX-9120-8454,
Version 3 Only

Figure 7: Output Modules

Extension Modules

When the XT MODULES key is pressed, the service module displays the communication status of Extension Module 1.

The upper line of the display shows the module number (XT1) and the lower line, the communication status.

To step through all eight extension modules, press the up/down arrow keys.

To display or change the contents of an item, either in the DX-9100 Controller or the XT-9100 Extension Module, first select the desired module as indicated by the tag "XT1-XT8," and then press the CONFIG key.

Enter 0 to configure the DX-9100 items, then enter the RI (Relative Index) of the item and press ENTER. Enter 1 to configure the XT-9100 items, then enter the RI (Relative Index - Decimal) of the item and press ENTER.

The upper line of the display will show the item tag (e.g., XT1AO1 in the DX-9100, AO1 in the XT-9100) and the current value of the item. The lower line will show the RI number (or XT number, XT address, and RI number), and indicate whether a connection is numeric or logic. For 2-byte status items the most significant (high) byte is displayed in the upper line and the least significant (low) byte is displayed in the lower line. By pressing the up/down arrow keys, all items in the selected extension module can be successively displayed. To change the value of an item, press the MODIFY key.

To return to the previous display, press the CLEAR key.

Note: To access items in an XT-9100 module, a valid IOMAP and the correct XTnADX (address) must first be entered into the DX-9100 item data base.

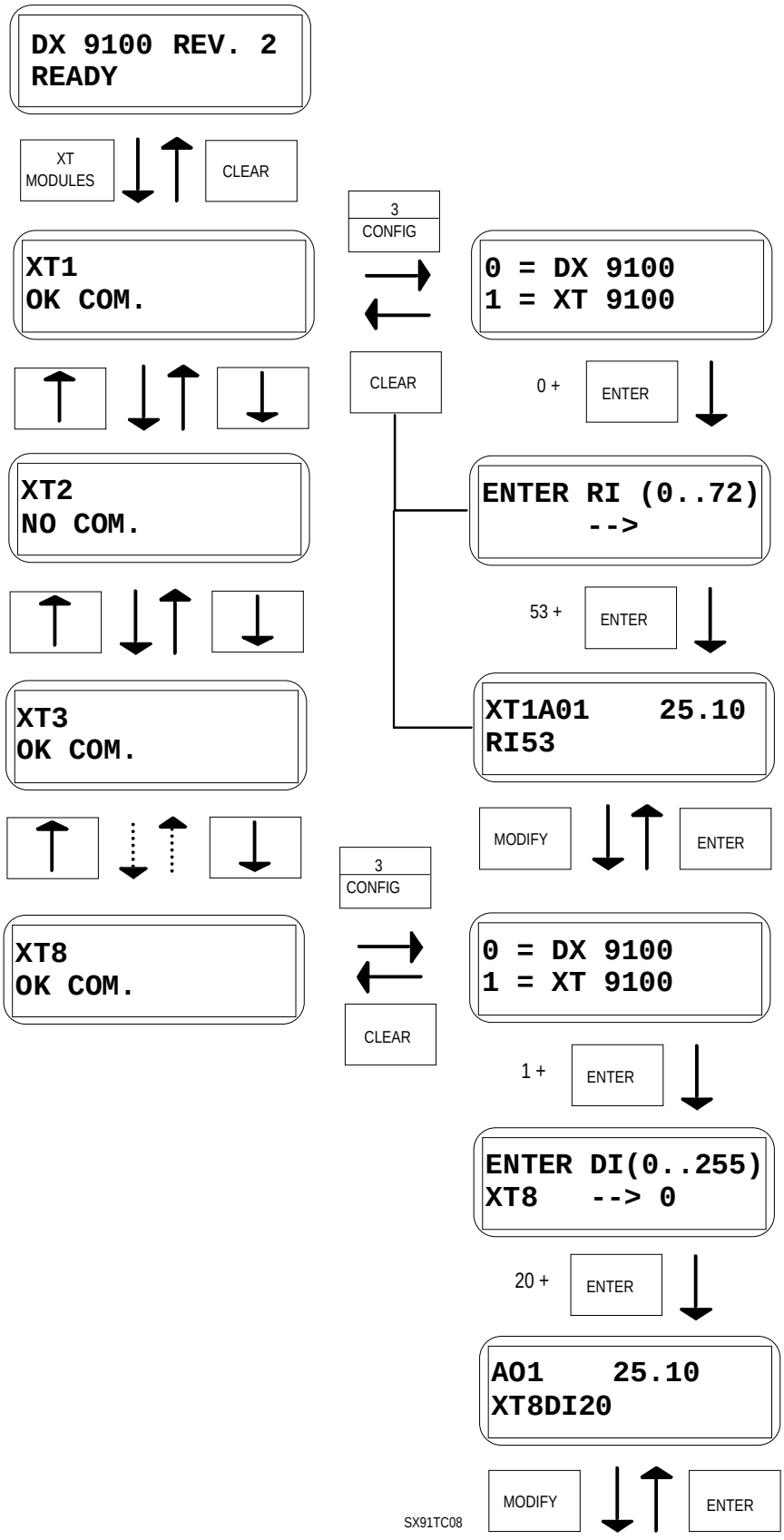


Figure 8: Extension Modules

Time Schedule Modules

When the TIME SCHED key is pressed, the service module displays the current status of the output of Time Schedule Module 1.

The upper line of the display shows the module number (TSI) and the output status (On or Off). The lower line indicates that the module has a logic output.

To step through all eight time schedule modules of the controller, press the up/down arrow keys. To display or change the contents of an item in a time schedule module, first select the desired module as indicated by the tag "TS1-TS8," and then press the CONFIG key. Enter the RI (Relative Index) of the item and press ENTER. The upper line of the display will show the item tag (e.g., TS1EXT) and the current value of the item. The lower line will show the RI number, and indicate whether a connection is numeric or logic.

By pressing the up/down arrow keys all items in the selected time schedule module can be successively displayed. To change the value of an item, press the MODIFY key. To return to the previous display, press the CLEAR key.

To change other parameters of the time schedule modules (start/stop times, days of the week, holidays) and the realtime clock, the front panel of the controller must be used. Refer to the *DX-9100 Extended Digital Controller Technical Bulletin (LIT-6364020)* in this manual for details.

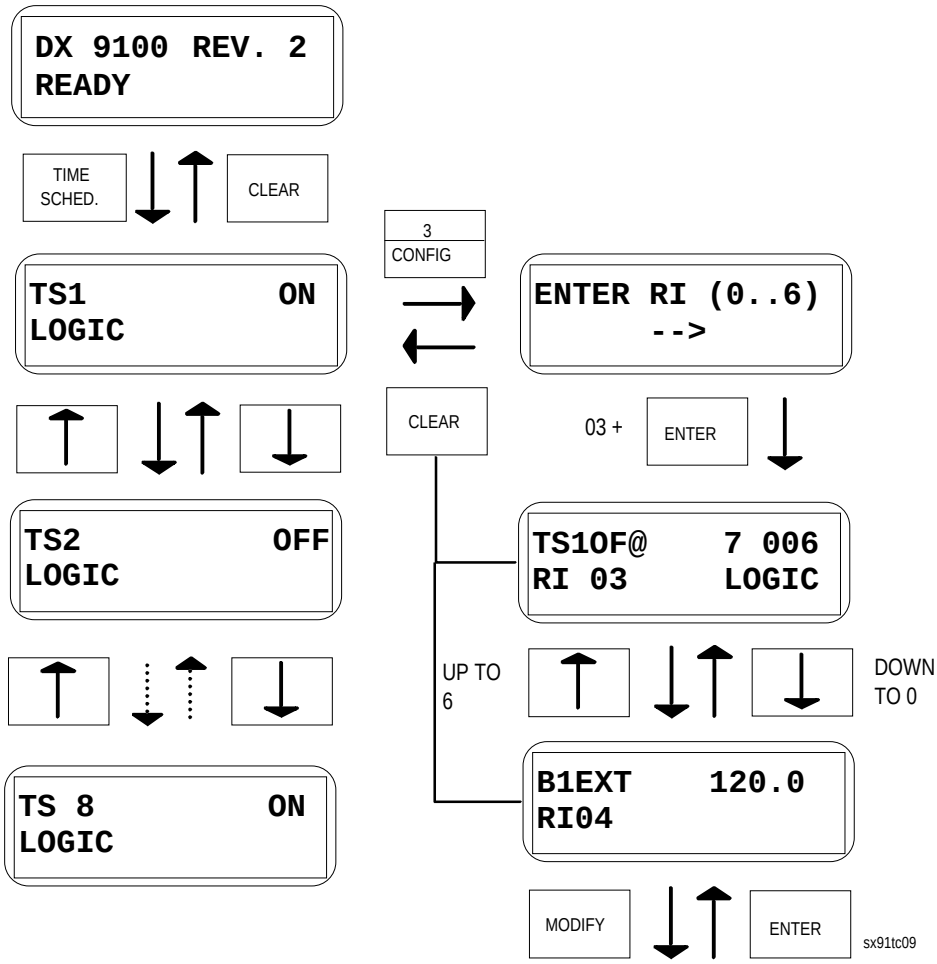


Figure 9: Time Schedule Modules

Optimal Start Modules

When the OPT ST key is pressed, the service module displays the current status of Optimal Start Module 1.

The upper line of the display shows the module number (OS1) and the status as follows:

OFF --: the module output is Off.

ON PRE : the module output is On in pre-heating or pre-cooling mode (before the occupancy time).

ON -- : the module output is On (during the occupancy time).

OFF STO: the module output is Off in optimal stop mode (before vacancy time).

The lower line of the display indicates whether the module calculates the optimal start time for heating plant only, for cooling plant only, or for plant which can heat/cool (both heating and cooling). To view the status of Optimal Start Module 2, press the up arrow key. To return to Optimal Start Module 1, press the down arrow key.

To display or change the contents of an item in the selected module, press the CONFIG key. Enter the RI (Relative Index) of the item and press ENTER. The upper line of the display will show the item tag (e.g., OS1ZT@) and the current value of the item. The lower line will show the RI number and indicate whether a connection is numeric or logic. By pressing the up/down arrow keys, all items in the selected optimal start module can be successively displayed.

To change the value of an item, press the MODIFY key. To return to the previous display, press the CLEAR key.

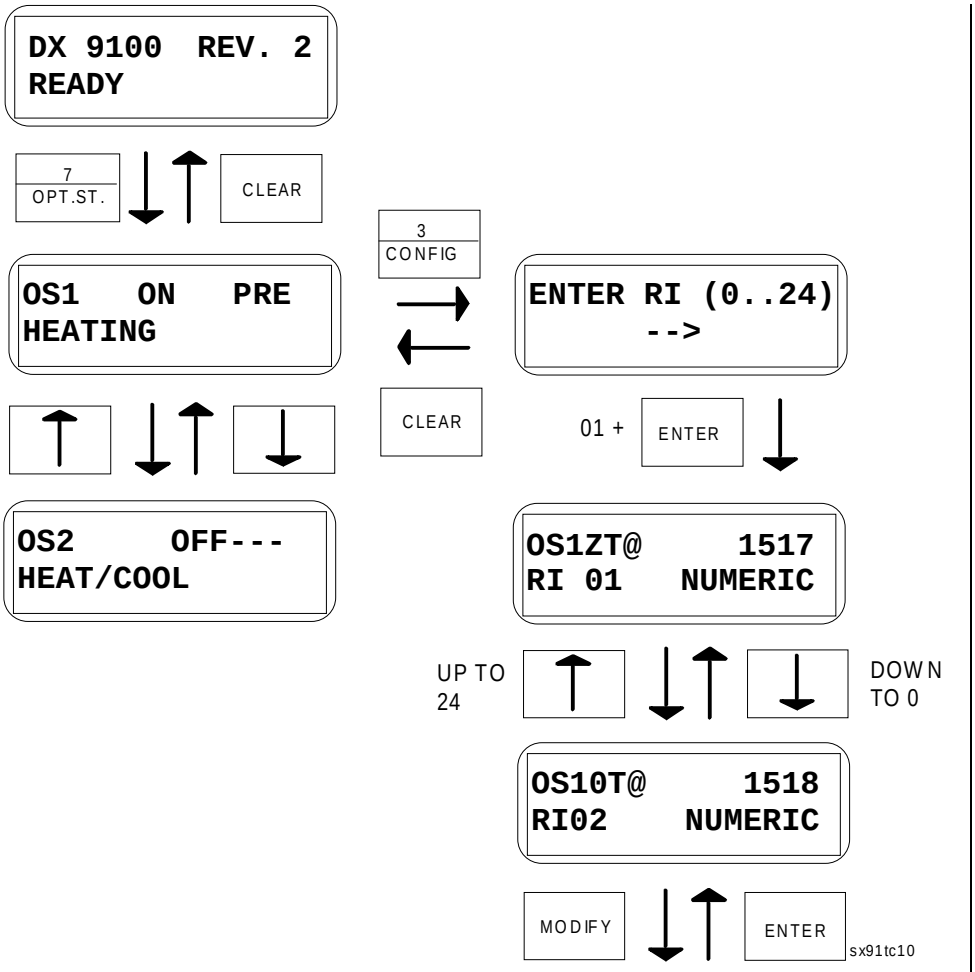


Figure 10: Optimal Start Module

Network Information (Version 3 Controller Only)

When the NETWORK key is pressed, the service module gives access to network data.

To gain access to general network information, press GENERAL MODULE.

To display and modify the contents of an item in the network information module, press the CONFIG key, enter the RI (Relative Index) of the required item, and press ENTER. The upper line of the display will show the item tag (e.g., NVADX) and the current value or data of the item. The lower line will show the RI number.

By pressing the arrow keys, all items in the network information module can be successively displayed. To change the value or data of an item, press the MODIFY key. To return to the previous display, press the CLEAR key.

Note: The data in the network information module is directly related to the configuration of the network input and output modules and should not be modified without a full understanding of the operation of the network modules. Refer to the *DX-9100 Configuration Guide (LIT-6364030)* in this manual for details.

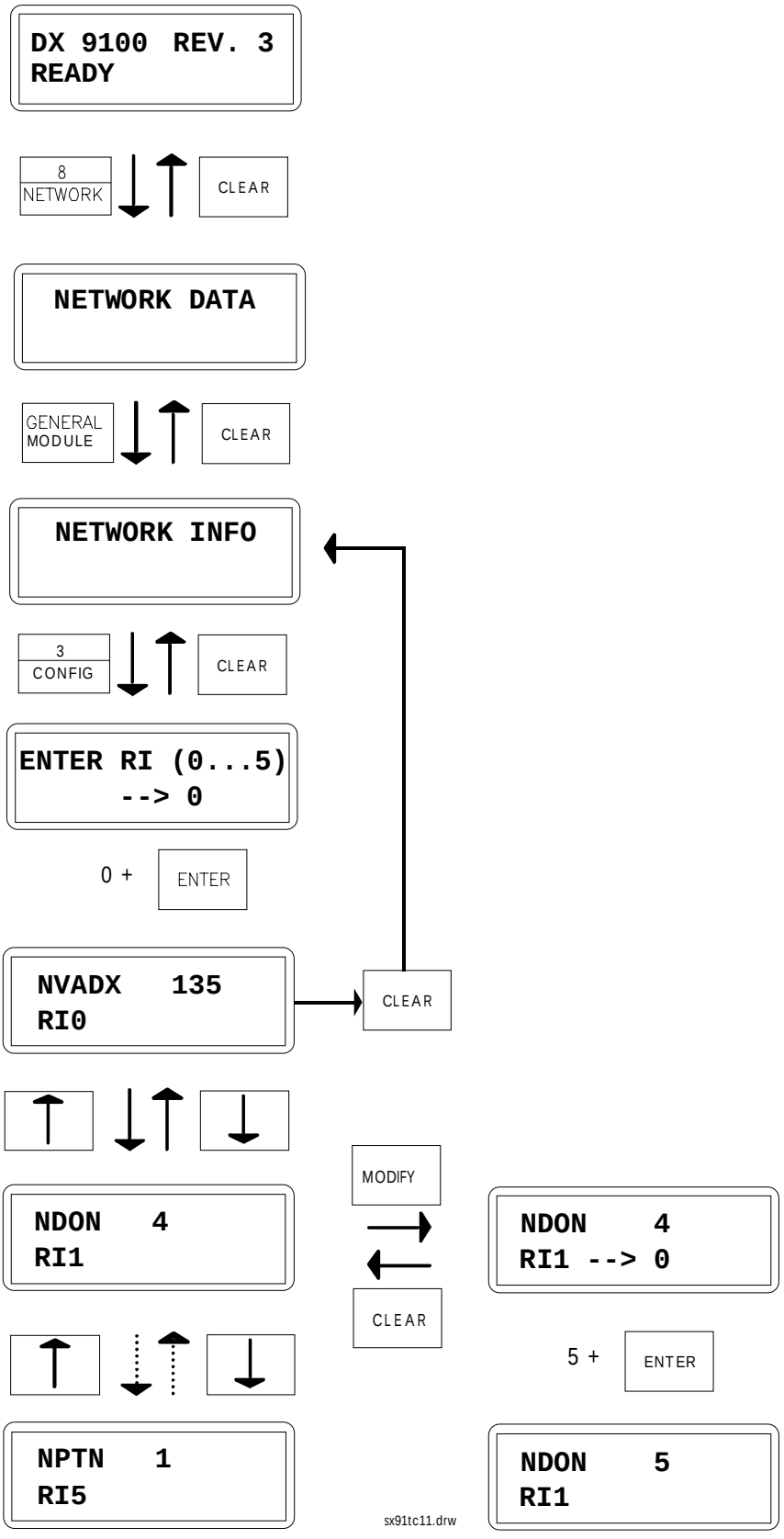


Figure 11: Network Information

Network Inputs (Version 3 Controller Only)

When the NETWORK key is pressed, the service module gives access to network data (data sent to or received from other controllers on the same network bus segment).

To display network input data, press INPUT MODULES followed by the 1 key for the Network DI Mod (Network Digital Inputs Module) or the 2 key for the Network AI Mod (Network Analog Inputs Module).

To display the contents of an item in the selected module, press the CONFIG key, enter the RI (Relative Index) of the required item and press ENTER. The upper line of the display will show the item tag (e.g., NDI3) and the current value of the item. The lower line will show the RI number. For 2-byte status items the most significant (high) byte is displayed in the upper line and the least significant (low) byte is displayed in the lower line.

By pressing the arrow keys, all items in the selected network input module can be successively displayed. To return to the previous display press the CLEAR key.

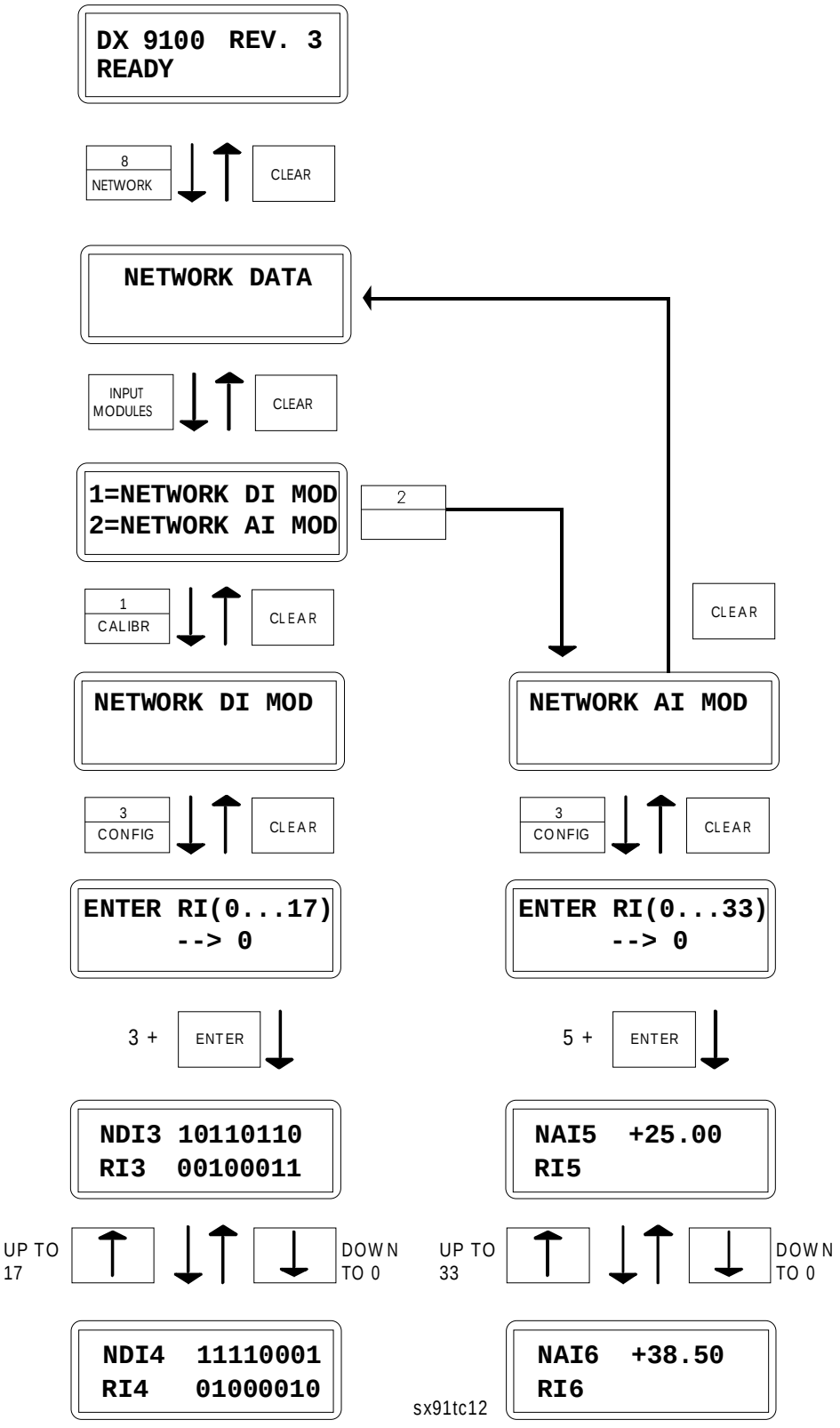


Figure 12: Network Inputs

Network Digital Outputs (Version 3 Controller Only)

When the NETWORK key is pressed, the service module gives access to network data (data sent to or received from other controllers on the same network bus segment).

To gain access to network digital output data, press OUTPUT MODULES followed by the 1 key. The upper line of the display will show `NETWORK DO MOD 1`. Use the up/down arrow keys to select one of the eight network digital output modules.

To display and modify the contents of an item in a network digital output module, press the CONFIG key, enter the RI (Relative Index) of the required item, and press ENTER. The upper line of the display will show the item tag (e.g., NDO1>1) and the current value or data of the item. The lower line will show the RI number and will display logic for a connection and "DEST" and "ADX" for a destination. For a 2-byte status item, the most significant (high) byte is displayed in the upper line, and the least significant (low) is displayed in the lower line.

By pressing the arrow keys, all items in the selected output module can be successively displayed. To change the value or data of an item, press the MODIFY key. To return to the previous display, press the CLEAR key.

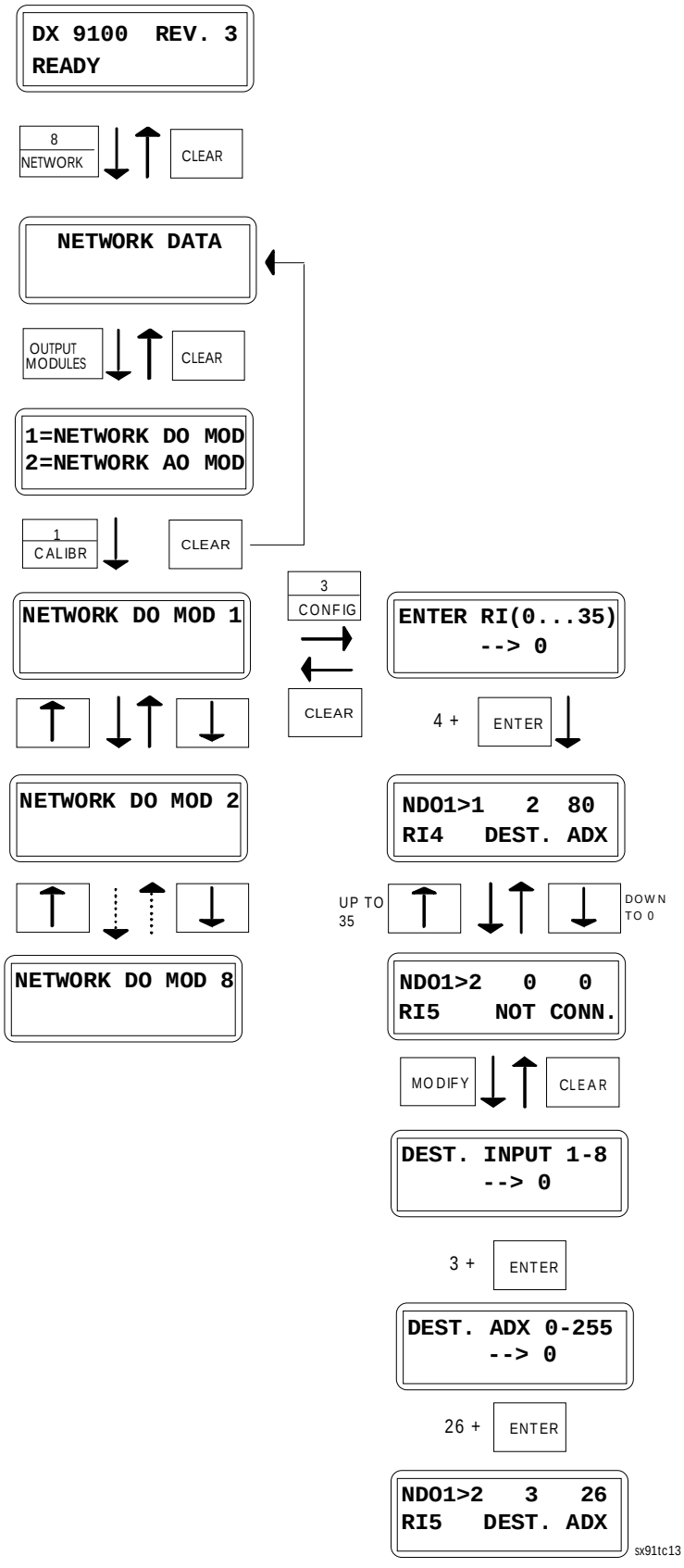


Figure 13: Network Digital Outputs

Network Analog Outputs (Version 3 Controller Only)

When the NETWORK key is pressed, the service module gives access to network data (data sent to or received from other controllers on the same network bus segment).

To gain access to network analog output data, press OUTPUT MODULES followed by the 2 key. The upper line of the display will show `NETWORK AO MOD 1`. Use the up/down arrow keys to select one of the 16 network analog output modules.

To display and modify the contents of an item in a network analog output module, press the CONFIG key, enter the RI (Relative Index) of the required item and press ENTER. The upper line of the display will show the item tag (e.g., NAO1>2) and the current value or data of the item. The lower line will show the RI number and will display numeric for a connection and "DEST" and "ADX" for a destination. For a 2-byte status item, the most significant (high) byte is displayed in the upper line, and the least significant (low) is displayed in the lower line.

By pressing the arrow keys, all items in the selected output module can be successively displayed. To change the value or data of an item, press the MODIFY key. To return to the previous display, press the CLEAR key.

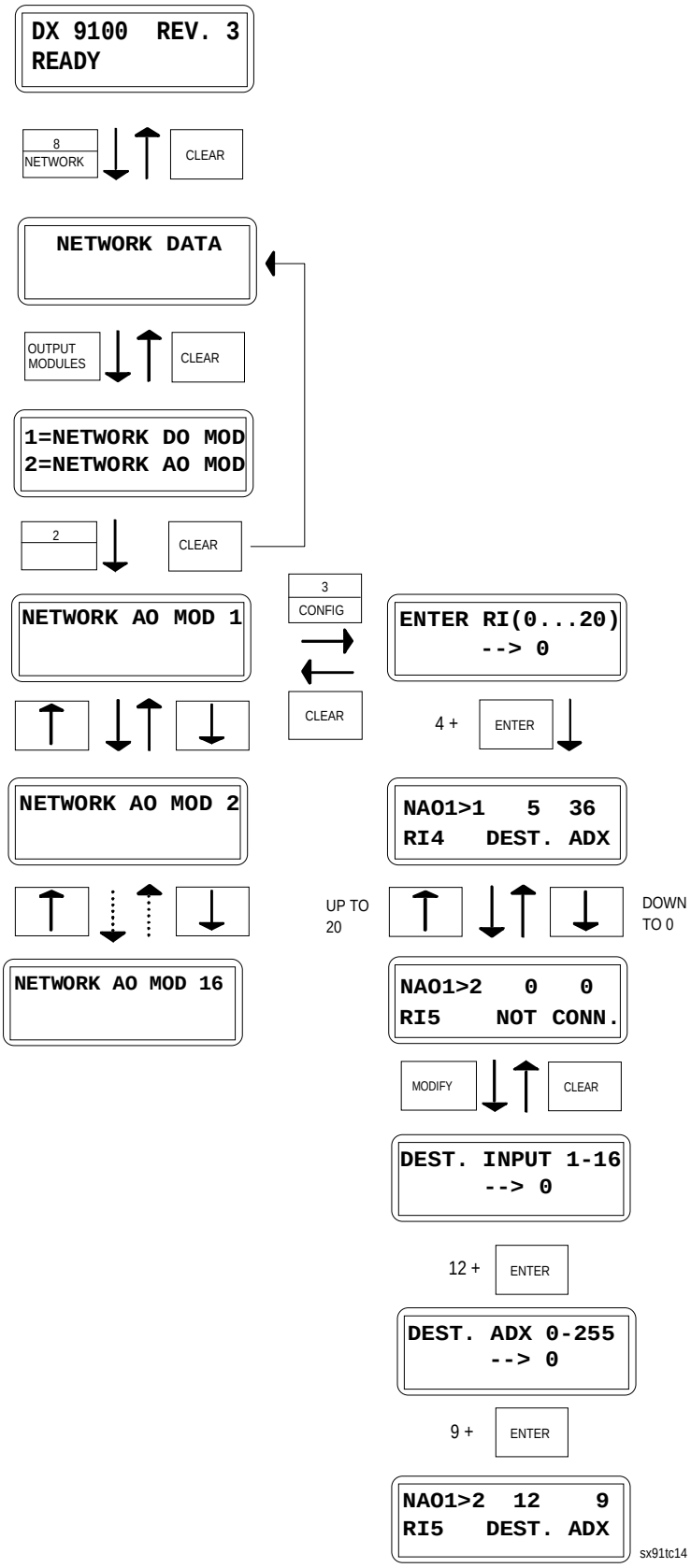


Figure 14: Network Analog Outputs

Logic Variables (View)

When the LOGIC key is pressed, the service module requests the byte address of the desired logic variable in decimal format.

Enter the byte address and press ENTER. The service module then requests the Bit number of the desired logic variable.

Enter the Bit number and press ENTER.

The upper line of the display will show the tag of the logic variable (e.g., DI4) and its current status. The lower line will show the bit number and byte address of the logic variable.

Logic variables cannot be modified from the display. Configurable logic variables may be modified only via the corresponding item display.

To return to the previous display, press the CLEAR key.

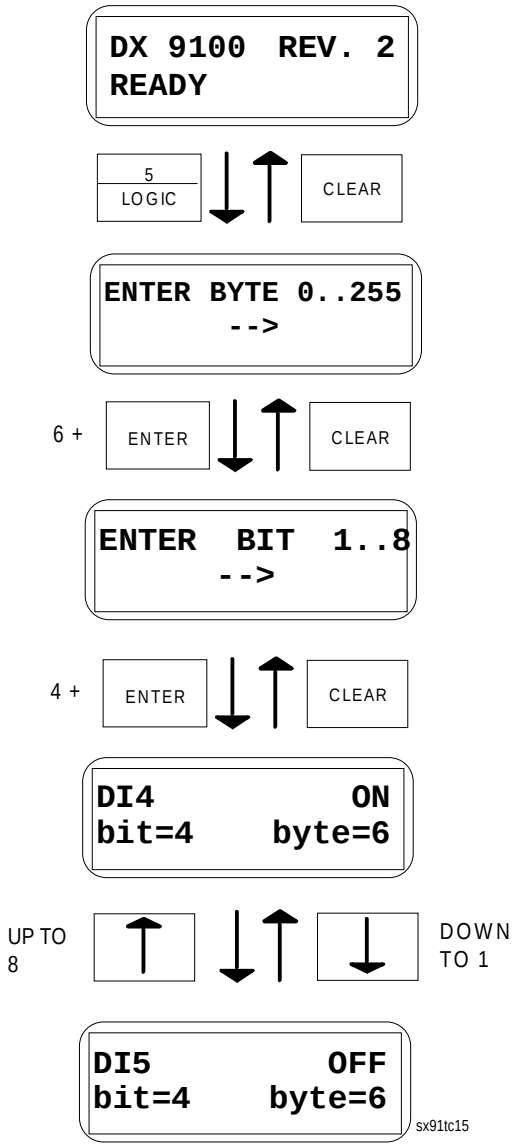


Figure 15: Logic Variables (View)

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Programmable Logic Controller (PLC)

When the PLC key is pressed, the service module requests the line number of the PLC program to be displayed. Enter the line number and press ENTER.

The upper line of the display will show the selected line number and the lower line will show the instruction name, the bit number (1-8) and the byte address (0-255) of the referenced Logic Variable (LV). The INSTRUCTION NAMES are as follows:

Table 3: PLC Instructions

NOP	(Code 0)	No operation
LOAD	(Code 1)	LOAD status of LV to start block or sub-block
LOAD NOT	(Code 2)	LOAD inverse status of LV
AND	(Code 3)	AND status of LV
AND NOT	(Code 4)	AND inverse status of LV
OR	(Code 5)	OR status of LV
OR NOT	(Code 6)	OR inverse status of LV
AND B	(Code 7)	AND status of sub-block (close sub-block)
OR B	(Code 8)	OR status of sub-block (close sub-block)
OUT	(Code 9)	Transfer PLC status to LV.
OUT NOT	(Code 10)	Transfer inverse PLC status to LV.
COS	(Code 11)	Set PLC status on positive Change-of-State from previous instruction.
SET	(Code 12)	SET LV if PLC status is 1.
RESET	(Code 13)	RESET LV if PLC status is 1.
END	(Code 31)	END program and restart at given program address (line number)

The referenced address for the end instruction is not a Logic Variable (LV), but the line number at which the PLC program will restart. Refer to the *DX-9100 Configuration Guide (LIT-6364030)* in this manual for detailed information.

To step through all instructions of the PLC, press the up/down arrow keys. To display a specific line number, press CLEAR and enter the line number and press ENTER. To modify an instruction line, first display the desired line number, then press MODIFY.

The service module will request the instruction code. Enter the code number (0-13,31) of the instruction and press ENTER. The service mode will then request the bit number. Enter the bit number (1-8) of the logic variable to be referenced by the instruction and press ENTER. The service module will request the byte address. Enter the byte address (0-255) of the logic variable to be referenced by the instruction and press ENTER.

If the code 31 (END) was entered the service module requests the program address (0-511) at which the program will restart at the next execution cycle.

When all entries are correctly made, the entered instruction will be displayed with the line number.

To return to the `DX 9100 READY` display, press the CLEAR key twice.

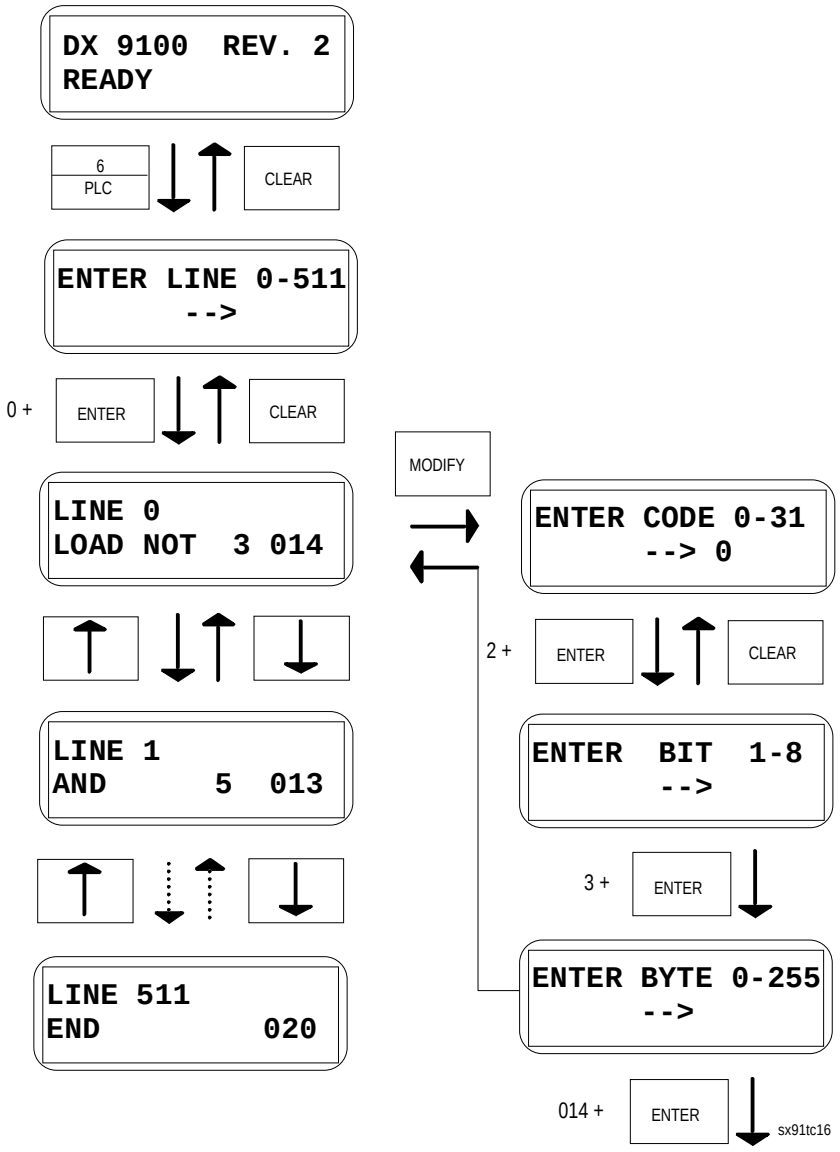

Figure 16: Programmable Logic Controller (PLC)

Algorithm Upload/ Download

The configuration entered into the DX-9100 Controller may be stored in the service module as an algorithm for transfer to another controller.

Note: To retain the configuration in the service module RAM after the power has been switched off, position DIP Switch 3 to the On position.

When the ALGOR key is pressed the service module will request an upload or download.

To save a configuration, press 1 to upload.

To load a configuration into the connected controller, press 2 to download.

Note: When downloading a configuration, ensure that all equipment connected to the DX-9100 Controller is switched off or isolated. During download, unexpected switching of outputs may occur due to an incomplete configuration in the data base of the controller.

The progress of the upload or download process is indicated on the display.

Press the CLEAR key when the process is complete to return to the `DX 9100 READY` display.

Note: Calibration values *are not* part of the stored algorithm as these values will differ from controller to controller.

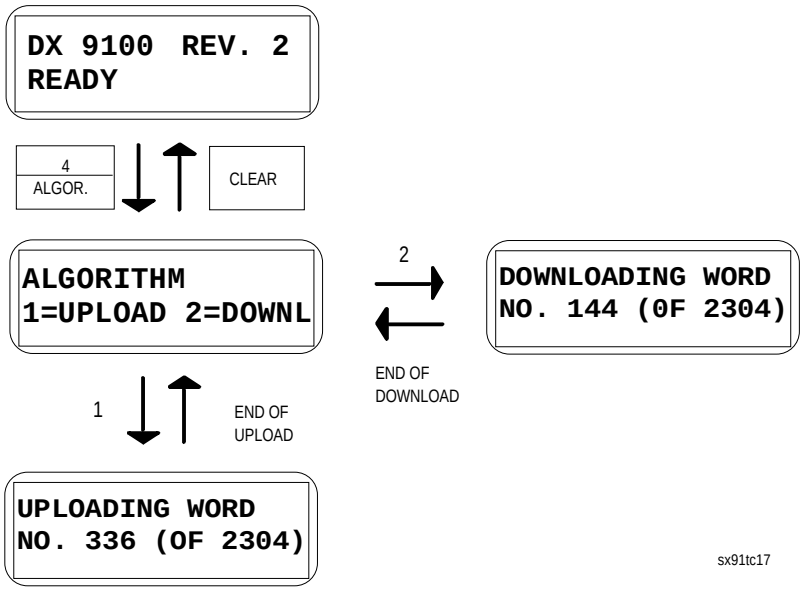

Figure 17: Algorithm Upload/Download

Calibration of DX-9100 Analog Inputs/Outputs

CAUTION: Since the SX-9120 communicates directly with the program stored in the DX-9100, use caution when making changes. Changes made via the SX-9120 are permanent in that there is no way to release the changes back to a previous value. Careless online modification of an installed controller's internal parameters could also result in damage to attached field equipment. It is strongly recommended that you familiarize yourself with the operation of the SX-9120 Service Module in a bench test environment before applying it in field situations.

The DX-9100 incorporates one main amplifier and one Analog-to-Digital Converter, which is common to all analog inputs; a pre-amplifier, which is used for 0 to 20 mA inputs and passive RTD sensors; and one Digital-to-Analog Converter for each analog output. Each analog input also has two calibration values for passive RTD sensors.

When the controller is calibrated in the factory, calibration values are stored in the controller's EEPROM to enable the controller to properly convert the various types of analog input signals into digital values for display and processing, and to properly convert internal digital values into analog output signals, allowing for the specific characteristics of the converters and amplifiers in the controller.

The calibration values are printed on a label which is supplied with the controller. Calibration values can be re-entered in the field using the Graphic Configuration Software or the service module.

The calibration values to be entered are as follows:

Table 4: Calibration Values

Main amplifier AIHI	High Calibration (10V input)
Main amplifier AILO	Low Calibration (0V input)
Pre-amplifier PSPH	High Calibration (2V input or 20 mA)
Pre-amplifier PSPL	Low Calibration (0V input or 0 mA)
Analog Input n PSnH	RTD High Calibration (1500 ohm for Ni 1000)
Analog Input n PSnL	RTD Low Calibration (750 ohm for Ni 1000)
where n = 1 to 8	
Analog Output 1 VO1H	High Calibration (10V output)
Analog Output 1 VO1L	Low Calibration (0V output)
Analog Output 2 VO2H	High Calibration (10V output)
Analog Output 2 VO2L	Low Calibration (0V output)

DX-9100-8454 and DX-9120-8454:

Analog Output n VOnH	High Calibration (10V output)
Analog Output n VOnL	Low Calibration (0V output)
where n = 9 to 14	

Analog Output 1 CO1H	High Calibration (20 mA output)
Analog Output 1 CO1L	Low Calibration (0 mA output)
Analog Output 2 CO2H	High Calibration (20 mA output)
Analog Output 2 CO2L	Low Calibration (0 mA output)

DX-9100-8454 and DX-9120-8454:

Analog Output 9 CO9H	High Calibration (20 mA output)
Analog Output 9 CO9L	Low Calibration (0 mA output)
Analog Output 10 CO10H	High Calibration (20 mA output)
Analog Output 10 CO10L	Low Calibration (0 mA output)

If for any reason the factory calibration values have been lost, or the user wishes to verify the calibration values, this can be done with the procedure given below.

Calibrate Main Amplifier (One set of values for all inputs)

1. Set the Low Range of Analog Input 1 to 0 and the High Range to 100. Set JP3-1 to the 10 V position in the DX-9100-8154. Insert a jumper for 10V in Position 1 for analog inputs in the DX-9100-8454.

Low Range Calibration

2. Apply a 0 VDC signal to Analog Input 1.
3. Enter a Low Calibration Value (AILO) of 3000.
4. Read Analog Input 1 Digital Display Value and modify the Low Calibration Value until the display reads `0.0`. The final value should be within ± 5 % of the default value of 3000.

High Range Calibration

5. Apply a 10 VDC signal to Analog Input 1.
6. Enter a High Calibration Value (AIHI) of 16400.
7. Read Analog Input 1 Digital Display Value and modify the High Calibration Value until the display reads `100.0`. The final value should be within ± 5 % of the default value of 16400.
8. Check again the Low Calibration Value and modify if necessary. If the value is changed, the High Calibration Value must be checked again and so on until neither of the values requires modification.

Calibrate Pre-Amplifier (One set of values for all inputs)

1. Calibrate the main amplifier (0 to 10V) as described above.
2. Remove JP3-1 in the DX-9100-8154. Remove the jumper in Position 1 for 0-10V/RTD Analog Inputs in the DX-9100-8454. (Neither 10V nor RTD is selected.)

Low Range Calibration

3. Apply a 0 VDC signal to Analog Input 1.
4. Record the value read on Item ADC1 (Analog Input Module 1, RI09). Enter this value as the Pre-amplifier Low Calibration Value (PSPL). (Default value = 3000.)

High Range Calibration

5. Apply a 2 VDC signal to Analog Input 1.
6. Record the value read on Item ADC1 (Analog Input Module 1, RI09). Enter this value as the Pre-amplifier High Calibration Value (PSPH). (Default value 16460.)
7. Replace the jumper in the required position for Analog Input 1.

Note: If RTD (passive) sensors are not being used, the pre-amplifier can be calibrated using a 0 to 20 mA DC input signal. In this case, place the jumper in JP4-1 (20 mA) in the DX-9100-8154, or in Position 1 for current in the DX-9100-8454. Follow the above procedure using 0 mA and 20 mA input signals on Analog Input 1.

Calibrate Analog Inputs (RTD/ Passive Sensors) (One set of values for each input)

1. Calibrate the pre-amplifier as described above.
2. Set JP3-1 (respectively JP3-2 to JP3-8) to the RTD position in the DX-9100-8154. Insert a jumper for RTD in Position 1 (respectively 2-8) for analog inputs in the DX-9100-8454.

Low Range Calibration

3. Connect a 750 ohm resistance between Analog Input 1 (respectively Analog Inputs 2-8) and Analog Common.
4. Record the value read on ADC1 (RI09) (respectively ADC2-ADC8). Enter this value as the Analog Input 1 (respectively Analog Inputs 2-8) RTD Low Calibration Value (PSnL). (Default value 6860.)

High Range Calibration

5. Connect a 1500 ohm resistance between Analog Input 1 (respectively Analog Inputs 2-8) and Analog Common.
6. Record the value read on ADC1 (RI09) (respectively ADC2-ADC8). Enter this value as the Analog Input 1 (respectively Analog Inputs 2-8) RTD High Calibration Value (PSnH). (Default value = 10390.)

Note: The resistance values of 750 ohm and 1500 ohm should be increased by an Appropriate amount for each input to compensate for the resistance of long lines to the passive RTD sensor.

Calibrate Analog Outputs (0 to 10V) (One set of values for each output)

1. Set Analog Output 1 (respectively Analog Outputs 2, 9-14) to the 0-10V type. Set JP6-1 (respectively JP6-2) to the 10V position in the DX-9100-8154. Insert a jumper for 10V in Position 1 (respectively 2, 9, 10) for analog outputs in the DX-9100-8454/DX-9120-8454.

Note: Outputs 11-14 in the DX-9100-8454/DX-9120-8454 are always the 0-10V type.

2. Set the Low Range of Analog Output 1 (respectively Analog Outputs 2, 9-14) to 0, and the High Range to 100.
3. Set Analog Output 1 (respectively Analog Outputs 2, 9-14) to Manual or Hold.

Low Range Calibration

4. Set Analog Output 1 (respectively Analog Outputs 2, 9-14) to 0.
5. Enter an Analog Output 1 (respectively Analog Outputs 2, 9-14) Low Calibration Value - Voltage Mode of 9 (VO1L, VO2L) in the DX-9100-8154, and 44 (VO1L, VO2L, VO9L-VO14L) in the DX-9100-8454/DX-9120-8454.
6. Read Analog Output 1 (respectively Analog Outputs 2, 9-14) on a voltmeter and modify the Calibration Value until it reads 0 VDC.

High Range Calibration

7. Set Analog Output 1 (respectively Analog Outputs 2, 9-14) to 100.
8. Enter an Analog Output 1 (respectively Analog Outputs 2, 9-14) High Calibration Value - Voltage Mode of 940 (VOlH, VO2H) in the DX-9100-8154, and 3960 (VO1H, VO2H, VO9H-VO14H) in the DX-9100-8454/DX-9120-8454.
9. Read Analog Output 1 (respectively Analog Outputs 2, 9-14) on a voltmeter and modify the Calibration Value until it reads 10 VDC.
10. Check again the Low Calibration Value and modify the value if necessary. If the Low Value needs to be modified, the High Calibration Value must be checked again and so on until neither of the values requires modification.
11. Put Analog Output 1 (respectively Analog Outputs 2, 9-14) back to Automatic.

Calibrate Analog Outputs (0 to 20 mA) (One set of values for each output)

1. Set Analog Output 1 (respectively Analog Outputs 2, 9, 10 to the 0-20 mA type. Set JP6-1 (respectively JP6-2) to the 20 mA position. Insert a jumper for 20 mA in Position 1 (respectively 2, 9, 10) for analog outputs in the DX-9100-8454/DX-9120-8454.

Note: Outputs 11-14 in the DX-9100-8454/DX-9120-8454 cannot be the 0-20 mA type.

2. Set the Low Range of Analog Output 1 (respectively Analog Outputs 2, 9, 10) to 0, and the High Range to 100.
3. Set Analog Output 1 (respectively Analog Outputs 2, 9, 10) to Manual or Hold.

Low Range Calibration

4. Set Analog Output 1 (respectively Analog Outputs 2, 9, 10) to 0.
5. Enter an Analog Output 1 (respectively Analog Output 2) Low Calibration Value - Current Mode of 9 (CO1L, CO2L) in the DX-9100-8154, and 44 (CO9L, CO10L) in the DX-9100-8454/DX-9120-8454.
6. Read Analog Output 1 (respectively Analog Outputs 2, 9, 10) on an ampere meter (current meter) and modify the Calibration Value until it reads 0 mA DC.

High Range Calibration

7. Set Analog Output 1 (respectively Analog Outputs 2, 9, 10) to 100.
8. Enter an Analog Output 1 (respectively Analog Outputs 2, 9, 10) High Calibration Value - Current Mode of 940 (CO1H, CO2H) in the DX-9100-8154, and 3960 (CO1H, CO2H, CO9H, CO10H) in the DX-9100-8454/DX-9120-8454.
9. Read Analog Output 1 (respectively Analog Outputs 2, 9, 10) on an ampere meter (current meter) and modify the Calibration Value until it reads 20 mA DC.
10. Check the Low Calibration Value again and modify the value if necessary. If the Low Value needs to be modified, the High Calibration Value must be checked again and so on until neither of the values requires modification.
11. Put Analog Output 1 (respectively Analog Outputs 2, 9, 10) back to Automatic.

When all calibrations have been completed, reset all jumpers to the required positions, reconnect all inputs and outputs in accordance with the wiring diagrams and reload the controller with the required configuration.

Notes

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