Honeywell

Smart Field Communicator Model STS103

Operating Guide

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Total Plant

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About This Publication

This manual provides operating instructions for the STS103. The operating instructions cover the use of the SFC with the Smart Pressure Transmitter ST 3000, the Smart Temperature Transmitter STT 3000 Models STT350, STT25D, STT25M, STT302 and STT300, the Magnetic Flowmeter MagneW 3000, and the Smart Multivariable Transmitter SMV 3000.

The operating instructions for using the SFC with the SCM 3000 Smart Coriolis Mass Flowmeter, the SGC 3000 Smart Gas Chromatograph, and the Model STT350, STT 3000 Smart Temperature Transmitter are presented in the User's Manual for that specific instrument.

Chapters 1, 2, and 3, in this manual, contain information relating to the common information for the SFC. The specific operating information for using the SFC with ST 3000, STT 3000, MagneW 3000, and SMV 3000 is contained in separate chapters in this manual.

The format of this manual is completely different than the STS102 Operating Guide. The key sequences are graphically laid out to aid you in learning how to use the SFC for the first time, as well as reminding experienced users how to perform operations you have not done in a while. The format of this manual is designed to make finding, reading, and understanding the information presented easier than ever before.

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Acronyms

AP ..... Absolute Pressure
DAC ..... Digital to Analog
DE ..... Digital Communications
DI/DO ..... Digital Input/Digital Output
DP ..... Differential Pressure
DR ..... Dual Range
DVM ..... Digital Voltmeter
GND ..... Ground
GP ..... Gauge Pressure
I/O ..... Input/Output
LCD ..... Liquid Crystal Display
PV ..... Process Variable
SFC ..... Smart Field Communicator
SFI ..... Smart Field Instrument
SR ..... Single Range

Parameters

BRL/P ..... Barrels per pulse
CC/P ..... Cubic centimeters per pulse
DAMP ..... Damping value
EU ..... Engineering units
F/S DIR ..... Failsafe Direction
G/cm ..... Grams per square centimeter
Gal/P ..... Gallons per pulse
I/P ..... Liters per pulse
ID ..... Transmitter I.D.
inHg ..... Inches of mercury
Kg/cm ..... Kilograms per square centimeter
Kgal/P ..... Kilogallons per pulse
KPa ..... Kilopascals
LIN ..... Linear
LRV ..... Lower Range Value
mBAR ..... Millibar
mGAL/P ..... 10-3 gallons per pulse
mH2O ..... Inches of water
mH2O ..... Meters of water
mmH2O ..... Millimeters of water
mmHg ..... Millimeters of mercury
MPa ..... Megapascals
NVM ..... Non-volatile memory
PSI ..... Pounds per square inch
SQRT ..... Square Root
SWVER ..... Software Version Number
URL ..... Upper Range Limit
URV ..... Upper Range Value

References

Publication Title	Publication Number
SFC Information Card	34-ST-10-01
ST 3000 User's Manual (for Series 100e and Series 900 Transmitters)	34-ST-25-11
ST 3000 User's Manual (for Release 300 Transmitters)	34-ST-25-14
ST 3000 Operating Card	34-ST-11-15
STT 3000 User's Manual (Model STT350)	34-ST-25-12
STT 3000 Series STT250 Operator Manual	EN1I-6190
STT 3000 Operating Card	34-ST-11-16
MagneW 3000 User's Manual	36-KI-25-01
MagneW 3000 Operating Card	34-ST-11-17
SCM 3000 Smart Coriolis Mass Flowmeter User's Manual	34-CM-25-01
SGC 3000 Smart Gas Chromatograph User's Manual	34-GC-25-01
SMV 3000 Smart Multivariable Transmitter User's Manual	34-SM-25-02

Section 1 —Smart Field Communicator STS103 Overview

1.1 Introduction

Function

The hand-held Smart Field Communicator(SFC), Model STS103 is a battery-powered device which establishes two-way communications between Honeywell's Smart Field Instruments (SFIs) and an operator over the existing SFI signal lines. The operator can send data to and receive data from the SFI's microprocessor, through the STS103, when connected to the SFI's signal lines at any accessible location from the control room to the Smart Field Instrument.

Smart Field Instruments (SFIs)

There are many current SFIs with which the STS103 communicates. The STS103 is designed for expansion and will be used with other new SFIs as they become available. The current Honeywell smart field instruments with which the STS103 may be used are listed below.

- Smart Pressure Transmitter **ST 3000**,
- Smart Temperature Transmitter **STT 3000**,
- Magnetic Mass Flowmeter **MagneW 3000**,
- Smart Coriolis Mass Flowmeter **SCM 3000**,
- Smart Gas Chromatograph **SGC 3000**, and
- Smart Multivariable Transmitter **SMV 3000**.

ATTENTION

The specific instructions for using the SFC with SCM 3000, and SGC 3000 are contained in User's Manual for that specific instrument.

Operation

You can use the STS103 to

- **Select the Communications Mode** – Command the SFI to transmit its output signal in either an Analog (4-20 mA) mode or in the Digital Communications (DE) mode.
- **Configure** – Enter the desired operating parameters (For example: LRV, URV, Damping, Failsafe Mode, Configuration Parameters) into the Smart Field Instrument.
- **Diagnose** – Access the SFI self-diagnostic capabilities to troubleshoot suspected operation or communication problems.
- **Calibrate** – The SFC provides a simplified procedure for calibrating Smart Field Instruments, thus maintaining excellent accuracy with significantly reduced maintenance requirements.
- **Display** – Readout all the configured operating parameters from the SFI as well as other data such as PROM Serial Number, Device ID, Scratch pad memory, Sensor Temperature, Input values in selected Engineering Units, and others.

Continued on next page

Operation, continued

- **Checkout** – Put the SFI in the Output mode and command the SFI to transmit a precise signal, selectable from 0% to 100% full scale, to assist you in verifying loop operation, loop calibration, or troubleshooting.

Specifications

The STS103's specifications are listed in Table 1-1.

Table 1-1 Model STS103 Specifications

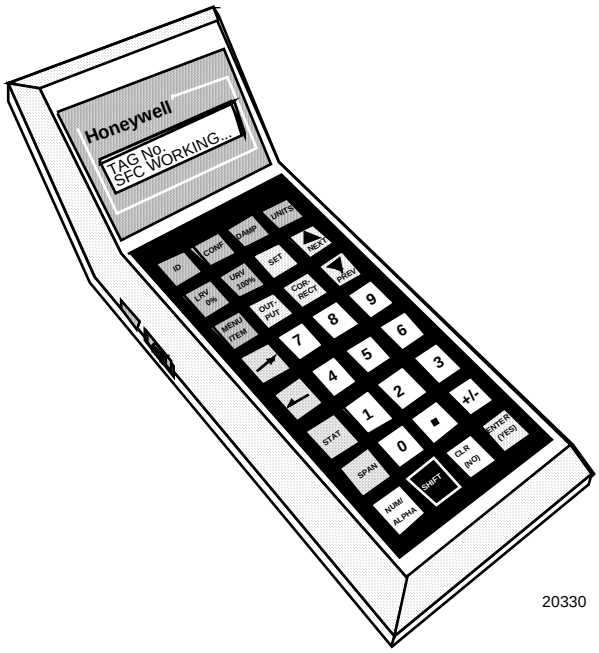
Operating Conditions			
		Operating Limits	**Transportation and Storage**
Ambient Temperature	**°C** **°F**	–10° to 50° 14° to 122°	–20° to 60° –4° to 140°
Humidity	**%**	10% to 90% RH	5% to 95% RH
Vibration **Maximum Acceleration (G)** **Frequency (Hz)** **Amplitude (mm peak to peak)**		 0.2 0 to 100 0.75	 0.5 0 to 100 - - - - -
Shock **Maximum Acceleration (G)** **Duration (ms)**		 5 50	 15 11
Minimum load resistance **@ 24 Vdc Supply Voltage**		250 Ohms	
Performance			
Safety Approvals		FM Intrinsic Safe, Class I, II, III, Div 1, GP A-G Outdoor Nonincendive, Class I, Div 2, GP A-G Outdoor	
CE Conformity, Europe		**89/336/EEC**, the EMC Directive	
Physical			
Dimensions **Overall** **Keypad**		 102 mm x 42 mm x 206 mm (4 In. x 1.7 in. x 8 in.) 86 mm x 136 mm (3.4 x 5.4 in.)	
Weight		470 g (1 lb.)	
LCD Display **Display Character**		2 lines x 16 characters 5 x 7 dots with line for cursor	
Keyboard Type		Tactile feedback embossed membrane, 4 by 8 matrix, 32 keys	
Lead Connectors		Easy hook and alligator clips	
Battery Charger **Input Power** **Output Power** **Time to charge** **Time between charges**		 108 – 120 Vac, 200 – 240 Vac, 50/60 Hz 7 Vdc, 180 mA 16 hours minimum 24 hours minimum, a colon":" in the eighth character position indicates low battery power.	

1.2 STS103 Physical and Functional Description

STS103 physical description

The STS103 is a hand-held unit that has a 2-line by 16-character digital liquid crystal display (LCD) and a keypad. The STS103 connects to the SFI by way of a cable connected to the SFI junction box terminals. A NiCd battery pack allows the STS103 to be used in the field without the need for input power. The STS103 is shown in Figure 1-1.

Figure 1-1 Smart Field Communicator STS103



EMC classification

Industrial Control Equipment, Group 1, Class A, ISM Equipment (ref. EN 55011).

CE Conformity (Europe)

This product is in conformity with the protection requirements of European Council Directive **89/336/EEC**, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed. Deviation from the operating conditions specified may invalidate this product's conformity with the EMC Directive.

ATTENTION

The emission limits of EN 50081-2 are designed to provide reasonable protection against harmful interference when this equipment is operated in an industrial environment. Operation of this equipment in a residential area may cause harmful interference. This equipment generates, uses, and can radiate radio frequency energy and may cause interference to radio and television reception when the equipment is used closer than 30 meters (98 feet) to the antenna(e). In special cases, when highly susceptible apparatus is used in close proximity, the user may have to employ additional mitigating measures to further reduce the electromagnetic emissions of this equipment.

Continued on next page

2-line by 16-character LCD display

The LCD display provides prompts and displays values, keypad input, statuses, and alarms. Each character on the display is in a 5 X 7 dot matrix with a line below the character for the cursor. The STS103 is multi-lingual and can display parameters and statuses in engineering or metric units. The desired language is selected through menus, as is the desired parameter format.

STS103 keypad

Through the STS103's keypad, the parameters and characteristics of each SFI may be viewed and changed. In several instances, several keys are used together to perform certain functions. Figure 1-2 shows the STS103 keypad and LCD display.

Figure 1-2 STS103 Keypad and LCD Display

Continued on next page

STS103 key functions Table 1-2 describes the use and function of the STS103 keypad keys.

Table 1-2 STS103 Key Functions

Key	Function
NUM / ALPHA	The white NUM/ALPHA key toggles between the alpha mode or numeric mode for the STS103. In the alpha mode, the capital letter or character in the upper right-hand corner of the keys is input when that key is pressed. In the numeric mode, the number is input or the indicated first function is performed.
^ SHIFT	The black SHIFT key enables the second function above certain keys to be performed. When shifted functions are enabled, the word “SHIFT–” is displayed on line two of the display. The second function desired must be selected immediately after the Shift key is pressed. The Shift key upper right-hand character, the caret character, is input when in the alpha mode.
CLR (NO)	The white CLR (NO) key cancels the current function or task when pressed and backs out to its previous operating state. The NO, or negative response, function is used in response to questions in the LCD display or decisions.
NON-VOL ENTER (YES)	The orange ENTER (YES) (NON-VOL) key is used to send a write/set command to the RAM memory in an SFI or to answer “Yes” to prompts. The NON-VOL second function writes data into the non-volatile memory of an SFI.
DE READ A ID – 0 Z	The Alpha keys A – Z input the alpha character in the upper right-hand corner when the alpha mode is activated. The alpha mode is available to enter an ID name or to use the Scratch Pad. The cursor is replaced by a “*” character when the alpha mode is activated.
Z 0 – 9 P	The yellow Numeric keys 0 – 9 input the number character when the number mode is activated. When in the numeric mode, the cursor is shown as a blinking ■.
SCR PAD ■	The yellow decimal point (SCR PAD) key inputs a decimal point when in the number mode and a space in the alpha mode. The SCR PAD second function displays data in the SFI’s scratch pad memory.
+/–	The yellow positive/negative key functions as follows: • When entering an ID name or using the Scratch Pad function, the ALPHA/NUM key toggles to allow a (–) hyphen (NUM mode) or a (/) slash (ALPHA mode) to be entered using the +/– key. • In the configuration mode, use the +/– key to enter a positive or negative symbol when entering a value. The NUM/ALPHA key toggles between “+” and “–”.
DE READ A ID	The green ID (DE READ) key reads and displays the device’s tag name (ID) when pressed. In analog devices, the database is also read. The DE READ second function reads the digital enhanced SFI’s database along with the tag name.

Continued on next page

Key functions,
continued

Table 1-2 STS103 Key Functions (Continued)

Key	Description
B **CONF**	The green CONF key starts each SFI's configuration mode. The unique settings are the parameters and characteristics that are configured into the SFI.
C **DAMP**	The green DAMP key displays the damping constant of the SFI. (See Note 1.)
D **UNITS**	The green UNITS key displays the SFI's currently selected engineering units. The units may be changed by repeatedly pressing the key until the desired units appear. (See Note 1.)
E **LRV 0%**	The green LRV 0% key displays the SFI lower range value (LRV) in the engineering unit selected by the UNITS Key. (See Note 1.)
F **URV 100%**	The green URV 100% key displays the SFI upper range value (URV) in the engineering unit selected by the UNITS key. (See Note 1.)
DE CONF I **MENU ITEM**	The green MENU ITEM (DE CONF) key selects the current PV from multi-PV devices. The DE CONF second function displays the current Digital (DE) configuration. Allows the selection of one data item from a series of grouped functions in the configuration mode.
G **SET**	The orange SET key sets the function of the key pressed immediately before this key in the SFI. For example, setting the URV or LRV to the applied PV.
H ▲ **NEXT** — L ▼ **PREV**	The orange NEXT and PREV keys set the damping constant, change the engineering units, increase and decrease numeric values during output D/A calibrations, and displays the next/previous units in the unit selection. These keys also select the next or previous configuration element in an SFI's unique setting mode.
INPUT J **OUT-PUT**	The orange OUTPUT (INPUT) key displays the currently selected transmitted output in percent. The second function displays the SFI's currently selected input in the active engineering units.
RESET K **COR-RECT**	The orange CORRECT (RESET) key is used to make on-line zero corrections and to calibrate output signal and range values. The RESET second function returns the ST and STT transmitters to their original factory calibration states. Resetting the MagneW transmitter is done through the calibration menus.

Note 1. For Multi-PV SFI's, the STS103 displays the value for the currently selected PV.

Continued on next page

Key functions,
continued

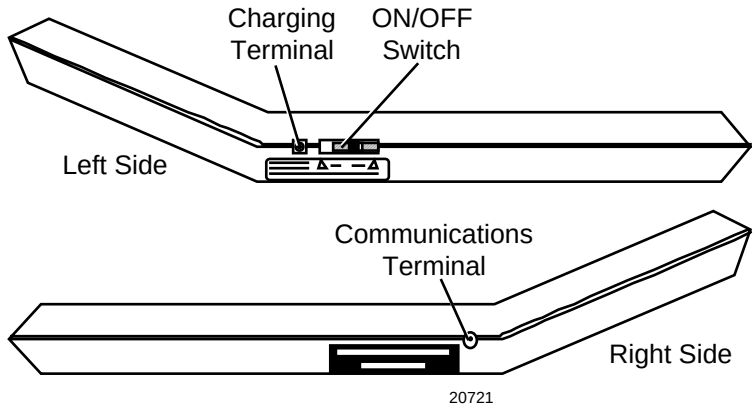
Table 1-2 STS103 Key Functions (Continued)

Key	Description
A <–> DE M → Q ←	The olive cursor keys move the cursor forward or backward one position while the cursor is displayed. In the number mode, the cursor back key performs a backspace function. The A <–> DE second function of the cursor back key toggles the SFI output mode between analog and digital enhanced communication.
F/S DIR U **STAT**	The olive STAT (F/S DIR) key sequentially displays the result of an SFI's diagnostics. The second function displays the failsafe direction, Hi or Lo, for analog SFIs. The failsafe direction is hard-wired in the analog SFI and determines the direction the SFI output goes in burnout (SFI failure).
URL Y **SPAN**	The olive SPAN (URL) key displays the span in Engineering units selected by the UNITS key. The second function displays the upper range limit (URL) value of the SFI.
SW VER X **3**	The yellow 3 (SW VER) key second function displays the software version of the STS103 when not communicating with an SFI, or the software versions of the STS103 and SFI when connected to an SFI.

STS103 switch and terminals

Figure 1-3 shows the STS103 ON/OFF switch and the terminals on the sides of the unit.

Figure 1-3 STS103 Switch and Terminals



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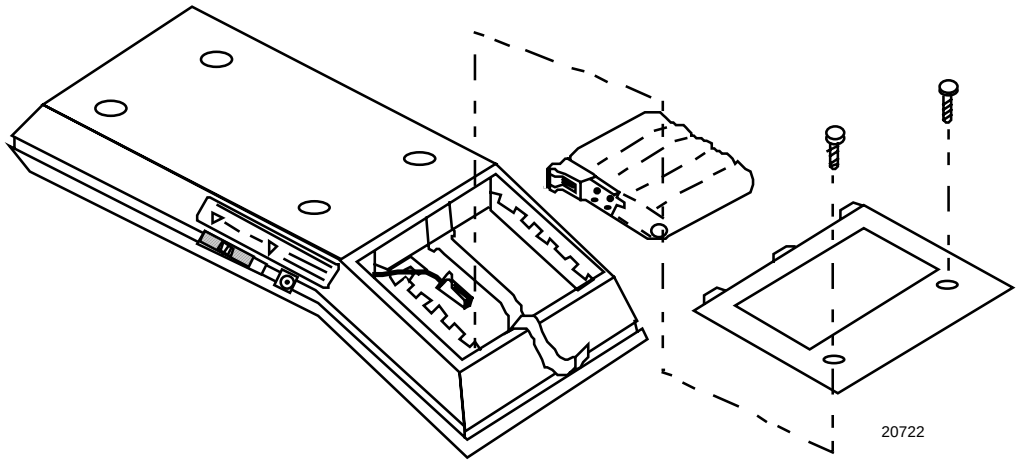
Battery pack location

The battery pack is located behind the LCD display and is accessed through a back panel. Two hex screws need to be removed to access the battery pack. Figure 1-4 shows the location of the battery pack and how it fits into the STS103.

Figure 1-4 STS103 Battery Pack



Charging the batteries

The battery pack is charged by plugging the battery charger into an outlet and inserting the lead into the charging terminal of the STS103. The battery pack takes a minimum of 10 hours to charge and the STS103 may be used continuously for up to 24 hours before the battery pack needs recharging. A colon (:) will be appear in the middle of the top line on the LCD display when the battery pack needs charging.

STS103 charging terminal

The battery pack is charged through a battery charger that plugs into the charging terminal. The charger inputs 110 or 220 Vac 50/60 Hz and outputs 7 Vdc 180 mA to the NiCd battery pack. The connector of the battery charger is inserted into the charging terminal on left side of the STS103 by the ON/OFF switch.

Self-diagnostics

When the STS103 is turned on, it automatically runs diagnostics on its functions. Upon successful completion of the diagnostics, the message,

"PUT LOOP IN MAN" (analog communications) or
"DE-XMTR PRESS ID" (digital communications)

appears. If an error occurs, the message,

"CRITICAL STATUS" appears.

Refer to Section 3 for a description of the STS103 errors or the individual device sections for device specific error messages.

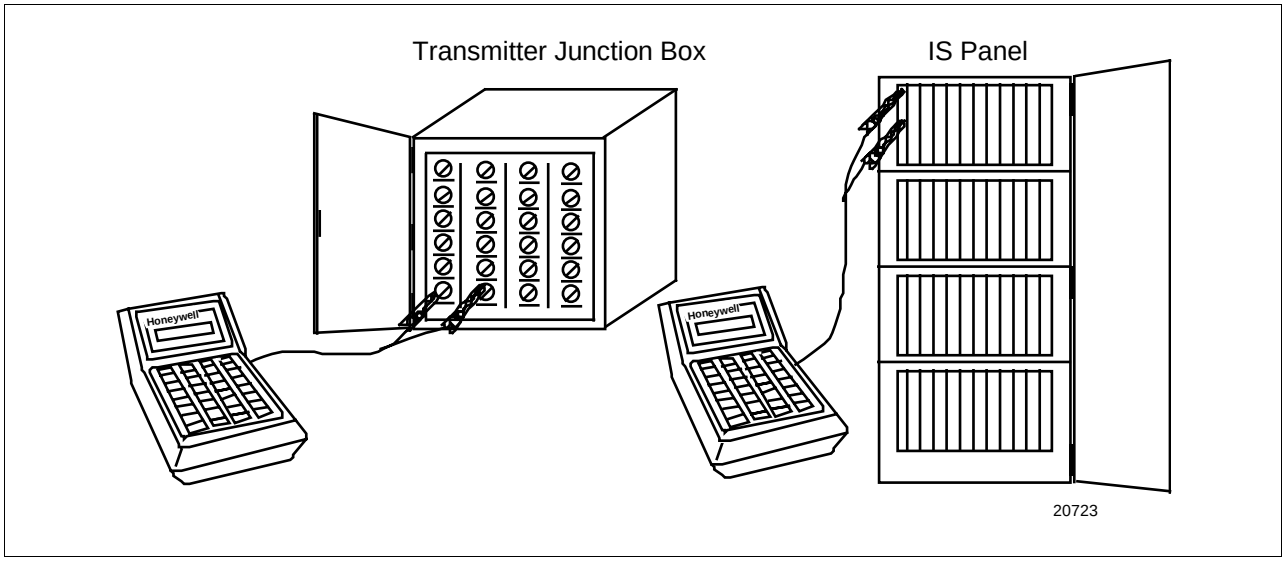
1.3 Connections

Connecting the STS103 to junction boxes and IS panels

The STS103 connects to SFIs, IS panels, and junction boxes through a pair of wires with alligator clips on the ends. The STS103 communications terminal end of the wires has a stereo phone jack connection that is inserted into the communications terminal. The other end of the wires are clipped onto terminals in the junction box or IS barrier panel, or directly to the transmitter. The red SFC lead connects to the junction box or SFI positive terminal, the black lead to the negative terminal.

Figure 1-5 shows the STS103 connected to a junction box and an IS barrier panel.

Figure 1-5 STS103 –Junction Box and IS Connection



Connecting the STS103 to a smart field instrument (SFI)

The STS103 connects directly to the positive and negative terminals on the SFI. The STS103 can connect to only one SFI at a time.

REFER TO THE INDIVIDUAL DEVICE SECTIONS IN THIS MANUAL for instructions on how to wire the STS103 to your particular device (SFI).

1.4 STS103/SFI Communication

How data is transferred

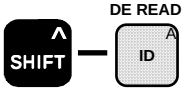
Sending and receiving data to and from an SFI is done over the transmitter's 4-20 mA wires. When the STS103 is connected to a transmitter and turned on, it automatically determines what type of transmitter it is communicating with. When data is sent to a transmitter, a request is sent to the transmitter and a response is sent back to the STS103. When the STS103 and SFI are communicating, the message "SFC Working..." is displayed on the STS103.

Types of communication

The message handling routines are transparent to you. The way the request and response messages are handled depend on whether the transmitter is an analog only model or an analog/digital model, and the mode configuration.

Analog communications uses half duplex communication (data can be sent in one direction at a time, to the transmitter or to the STS103) while the digital communication uses half duplex with or without broadcast (4 or 6 bytes). Table 1-3 describes the communication formats used.

Table 1-3 Communication Format Description

Format	Description
Analog Communication Mode 	Analog communication uses a half-duplex , variable-length message with a wake-up pulse for on-demand requests and responses. While the messages travel back and forth, the transmitter's output varies between 4-20 mA, therefore, the control loop must be in manual so the data exchange does not interfere with the control loop.
Digital (DE) Communication Mode 	Digital communication also uses a half-duplex , variable-length message with no wake-up pulse for on-demand requests and responses (not including data uploads). The data is piggybacked on the process variable data being sent on the control loop. The broadcast 4-byte format is rarely used because no database protection can be performed when used in the TDC 3000 system. This mode is only used when faster PV update rates are required. One byte is for transmitter status and configuration data; the other three are for process data. The broadcast 6-byte format is used for uploading the transmitter's database to the STS103's hold memory. The bytes are similar to the 4-byte format, but it includes two additional bytes of transmitter database information.

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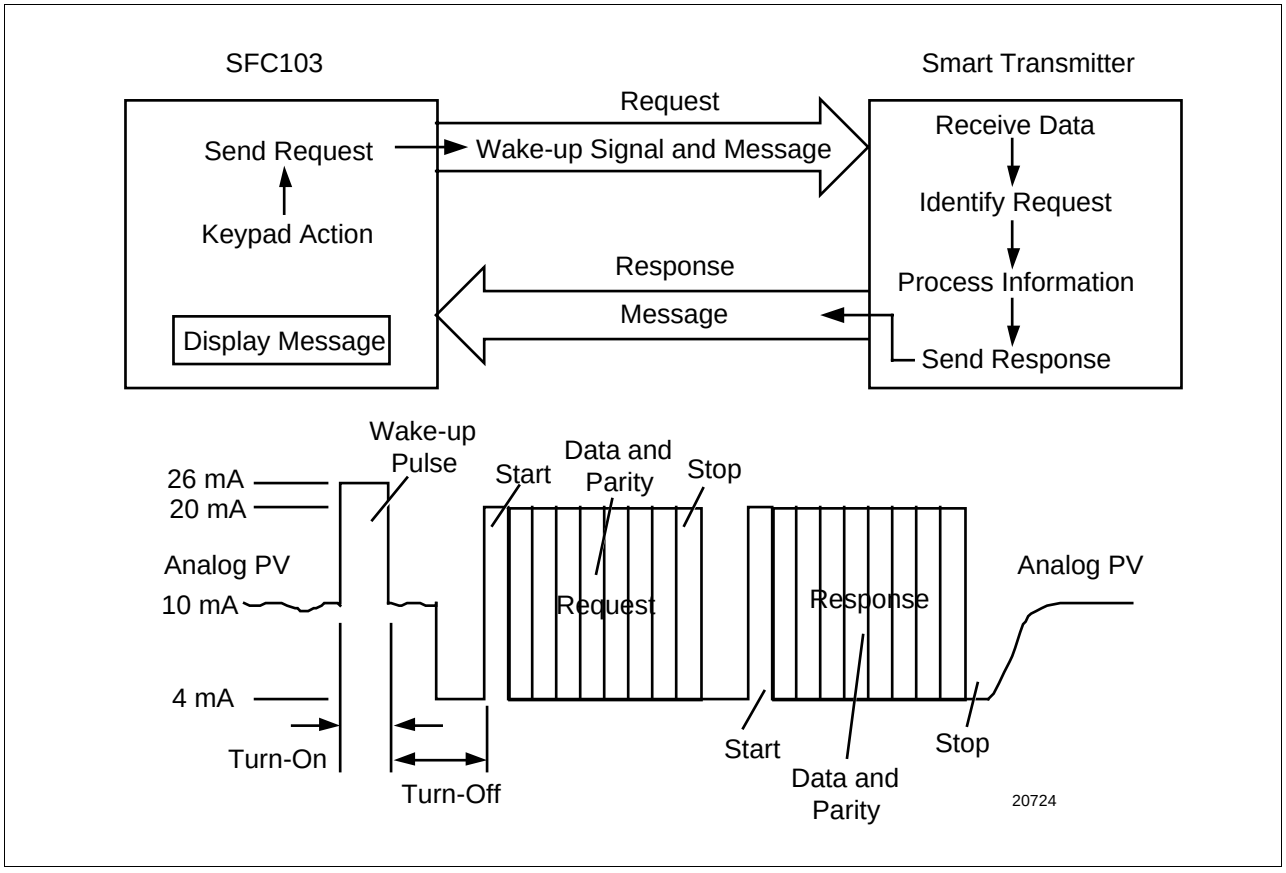
Analog data exchange

When the STS103 communicates with an analog transmitter, a 26 mA wake-up pulse is sent to the transmitter to put the device into the communication mode. The pulse also causes the current drawn by the device to drop to 4 mA. Data is then exchanged in an analog fashion (4-20 mA) between the STS103 and SFI. Figure 1-6 shows a typical analog data exchange using the STS103.

Figure 1-6 Typical Analog Data Exchange



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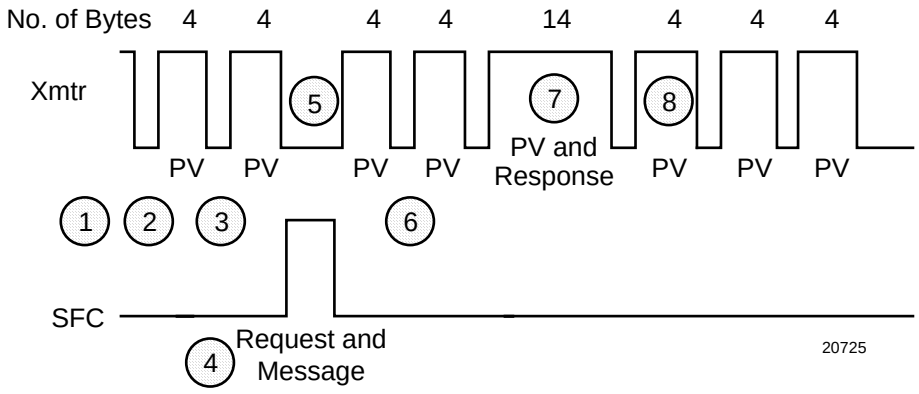
Digital data exchange

Data exchanges between the STS103 and digital devices are in ASCII. The exchange starts off with the STS103 requesting the transfer and the SFI then responds. Figure 1-7 shows a typical digital data exchange using the STS103 and Table 1-4 Describes the sequence of events.

Figure 1-7 Typical Digital Data Exchange



Digital data exchange sequence of events

Table 1-4 describes the sequence of events in a typical digital data exchange. The steps correspond to the numbers in Figure 1-7.

Table 1-4 Typical Digital Data Exchange Sequence of Events

Step	Occurrence
1	The STS103 waits at least 100 msec for any digital communications.
2	The STS103 detects the transmitter message length and gap location.
3	The STS103 synchronizes its operation with the next transmitter message.
4	The STS103 transmits a request and message during the next inter-message gap.
5	The transmitter halts broadcasting process variable (PV) data when the request is detected.
6	After receipt of a complete message, the transmitter returns to its configured broadcast mode and processes a response message.
7	After completion of processing, the transmitter sends the response message in half duplex protocol after the next PV data broadcast.
8	Upon completion of the data transfer, the transmitter returns to its configured broadcast mode within 100 msec.

Section 2 —STS103 User Interface Guidelines

1.2 STS103 Overview

Introduction

This section describes the User Interface functions and guidelines for the STS103 Smart Field Communicator (SFC).

There are several features of the STS103 that will make communicating with a Smart Field Instrument (SFI) easier to accomplish. They are:

- Common operation for all Smart Field Instruments
- A two-line LCD display
- A new keypad with improved key responsiveness
- Direct key access for the “most used” functions
- Configuration key access for SFI-specific configuration and “lesser used” functions

What’s in this section?

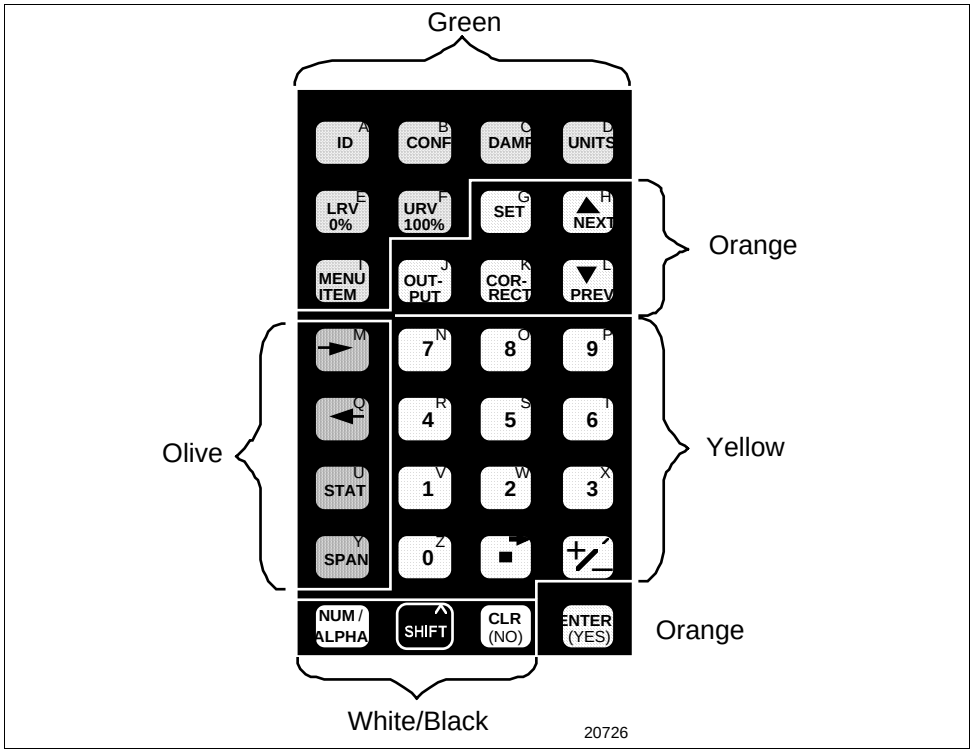
This section contains the following topics:

2.2 Keypad Functions

Keypad color groups

The keypad keys are grouped in several different colors that correspond to specific functions. Figure 2-1 shows the grouping of the STS103 keys.

Figure 2-1 STS103 Keypad Color Groups



Key color group description

Table 2-1 describes the key color grouping on the STS103.

Table 2-1 STS103 Key Color Group Description

Key Color	Description
Green	The green keys are used to enter and verify SFI configuration data.
Orange	The orange keys are keys the operator uses to control the actions of the STS103 and SFIs. These keys also select and set parameters for the SFIs.
Yellow	The primary function of the yellow keys is to enter numeric data into the STS103. Data may be entered into the scratch pad memory of certain SFIs and the software version may be displayed through these keys.
White/Black	The white and black keys enter the alpha or numeric modes and enable the STS103's second functions to be activated. CLR (no) key takes you to a previous function level.
Olive	The olive keys allow backspacing or advancing in certain modes, switching from analog to digital modes for communicating with different SFIs, and viewing the status of SFIs. Allows viewing of Span and Upper Range Limit.

2.3 Display Functions

LCD display

The STS103 uses a two-line display.

Table 2-2 lists the data that may appear on each line of the display and some examples of each.

Table 2-2 LCD Display Functions

Line	Display Data	Examples
Upper	Type of transmitter	MAG SR, LIN DP, STT, etc..
	Tag Name	(User defined ID name)
	A label that identifies the value, message, or sub-level title on the lower line.	LRV1, OUTPT2, SPT CONFIG, etc.
	Configuration sub-level title for which the menu selections or settings are shown on the lower line.	RANGE CONFIG?, PROBE CONFIG? CONFORMITY?, etc.
	The non critical status indicator	(#)
	The low battery indicator	(**:** **)**
Lower	Alpha-numeric string for ID name or Scratch Pad entries.	(user defined name or message)
	The numerical value and units for the parameter defined on the upper line.	53.99%, 23.121°C, 28.763 Gal/hr, etc.
	Configuration sub-level title with a “?” indicating that the next configuration level may (“YES”) or may not (“NO”) be selected for viewing.	CONFORMITY?, RANGE CONFIG?, TOTALIZER MENU?, etc.
	Pre-set or menu selectable configuration values (Configuration level 2 or 3).	CURRENT PV: 1, F/SAFE UPSCALE, VELOCITY, (for MagneW UNITS KEY), etc.
	STS103 processor status messages.	SFC WORKING..., READY..., ENTERED IN SFC, etc.
	STS103 communication status messages.	NO TRANSMITTER RESPONSE, IN OUTPUT MODE, etc.

2.4 Prompt Character Definitions

Definitions and general rules

Certain characters on the LCD display indicate to you which type of response is permitted.

Table 2-3 shows these characters and the rules and what the STS103 is looking for in the way of input.

Table 2-3 STS103 LCD Character Definitions and General Rules

Character	Display Example	Requested Action
“ _ ”	When the display contains a cursor, for example, LRV = 1.22	The STS103 is asking you to enter a numerical value at the cursor point. Type in a new value and press the ENTER key to store the value. Numeric entries are also allowed in the ID name and Scratch Pad messages.
“ = “	When the display shows an item after an equal (=) sign, for example, F/S = B/O Lo	The STS103 is asking for a selection after the equal sign. Your selection can be made using the MENU key or the → or ← keys from a pre-defined list of values or selections.
“ ? ”	When the display shows an item with a question mark (?) after the item, for example, Range Config?	The STS103 is asking if you want to enter a particular group of configuration parameters. If the parameters are what you desire, press the YES key. Press the CLR key to cancel from the current configuration level and return the SFC display to the next highest configuration level. Press NEXT or PREV to go on to the next or previous group of parameters.
“ * “	When the display shows an item with a “ * “, for example: ABC *	The STS103 is asking you to enter an alpha character. This prompt is used only when entering an ID name or Scratch Pad messages.

Continued on next page

2.5 Function Keys Data Entry

Function keys

To access the basic functions or parameters which are common to all SFIs, press any one of the labeled function keys. These common items are:

- ID
- SPAN/LRV/URV/URL
- INPUT/OUTPUT
- INPUT and OUTPUT CORRECTS
- LRV and URV CORRECTS and SETS
- RESET CORRECTS
- STATUS
- UNITS
- DAMPING
- FAILSAFE DIRECTION
- DE OPERATIONS
- SW VERSION
- SCRATCH PAD

Multiple process variables

In some cases, more than one Process Variable is available. Press the MENU key to select which PV will be referenced when the following operating parameters are displayed:

- SPAN/LRV/URV/URL/LRL
- INPUT/OUTPUT
- DAMP
- UNITS

For example, consider an SFI that may analyze up to four components. Each time the MENU key is pressed, the display will step through the available Process Variables (PVs)-(CURRENT PV:1, CURRENT PV:2, CURRENT PV:3, CURRENT PV:4).

If PV:2 were selected and the SPAN key pressed, “SPAN 2” (the span for input 2) would be displayed.

Continued on next page

2.5 Function Keys Data Entry, Continued

Function key sequence

Most of the common operating parameters are numerical values which may be altered by the operator. To display and/or change these values, follow the key sequence procedure in Table 2-4.

Table 2-4 Function Key Sequence

Step	Action
1	Press the desired Function key. The display will show the current setting or value of the selected parameter. A numerical value may be changed only if the first digit of the currently displayed value is underlined.
2	Enter a new value by pressing the appropriate number keys. For some values, such as Damping, the ▲ and ▼ keys may be used to step through a menu of permitted selections.
3	Press the ENTER (yes) key to store the new data in the STS103. **ATTENTION** If the operator exits the display using any other key, the data will not be downloaded to the SFI.
4	The CLR key may be used at any time to return to the normal operating display without making any changes.

2.6 Configuration Key Data Entry

Configuration key

Press the CONF key to access SFI-specific configuration menus. SFI configuration is divided into two or three levels.

- Level 1 – contains a list of configuration categories which is unique to each SFI.
- Level 2 – contains a list of configuration parameters for each of the level 1 categories *(two level configuration)*, or a sub-level of categories which pertains to the level 1 categories *(three level configuration)*.
- Level 3 – contains a list of configuration parameters for each of the level 2 categories.

Configuration key sequence

To display and/or change configuration, follow the key sequence procedure in Table 2-5.

Table 2-5 Configuration Key Sequence

Step	Action
1	Press the CONF key. Configuration level 1 is accessed.
2	Press the NEXT or PREV keys, if necessary, to reach the desired category. The " ? " prompt at the end of each selection indicates: • the YES key will access configuration level 2 (or 3*). • the NO key will exit the current configuration level and will return the STS103 display to the next higher level.
3	Press the ENTER (yes) key when the desired category is displayed. Configuration level 2 (or 3*) is accessed. ** for 3-level configuration, repeat steps 2 and 3 to access level 3.*

Table continued on next page

Configuration key sequence, continued

Table 2-5 Configuration Key Sequence, continued

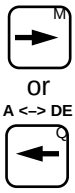
Step	Action
4	At this point you may: • press the [MENU] key to step through the menu of allowable settings for the displayed parameter, or • press the [→] or [←] keys to step forward or backward through the menu settings, or • enter a numerical value. (Numbered entries allowed when the first digit of the current numerical value is underlined. • press the [ENTER] (YES) key to enter a new value or setting. The new data is stored in the SFC and "ENTERED IN SFC" is displayed. **ATTENTION** If you use any other key to exit the new value or setting display, the data will not be changed. • press the [NEXT] or [PREV] keys to reach other configuration parameters within the selected category. • press the [CLR] (NO) key to exit the current configuration level and return to the next higher level.
5	When any configuration values or settings in a given category have been updated, the SFC will display the prompt "DOWNLOAD CHANGES?" before returning to level 1. You may : • press the [ENTER] (YES) key to download the new settings to the SFI, or • press the [CLR] (NO) key to exit configuration level 1 without downloading the new settings to the SFI. Configuration values in the SFC will also revert to their original setting.

2.7 Other Key Sequences

Other keys

Table 2-6 lists several other keys that are available on the keyboard and how they are used for data entry.

Table 2-6 Other Key Sequences

Key(s)	Usage
	• When entering an ID name or using the Scratch Pad, the right and left arrow keys move the cursor within any alphanumeric string. • These keys are also used to step forward or backward through the parameter menus in configuration levels 2 and 3 (see “Configuration Key Method”).
	This key toggles the keys of the SFC keyboard between the function/number printed on the key and the alpha characters which are printed in the upper right hand corner of each key. Use this key to enter letters, numbers, “+”, “—”, space, “^”, “,”, “.”, “/” when entering an ID name and when using the Scratch Pad.
	Pressing the SHIFT key, followed by a second key, selects the function printed above the second key.
	The CLR(NO) key: • clears the current display and returns it to the main “READY” display (See Function Key Method), or • clears the current display to the next highest configuration level (see “Configuration Key Method”), or • clears a typed-in numerical value before it has been entered (ENTER key)

Section 3 —STS103 Operation

3.1 Overview

This section contains all the information you will need to know in order to operate the STS103 Smart Field Communicator with a Smart Field Instrument.

Refer to the individual device User's Manual for transmitter operating and installation information.

The STS103 operations given here are more or less the same for every SFI. See the individual device sections in this manual for operations specific to your particular SFI.

This section gives you the keystrokes and displays that are specific for SFC communications with the Smart Field Instruments.

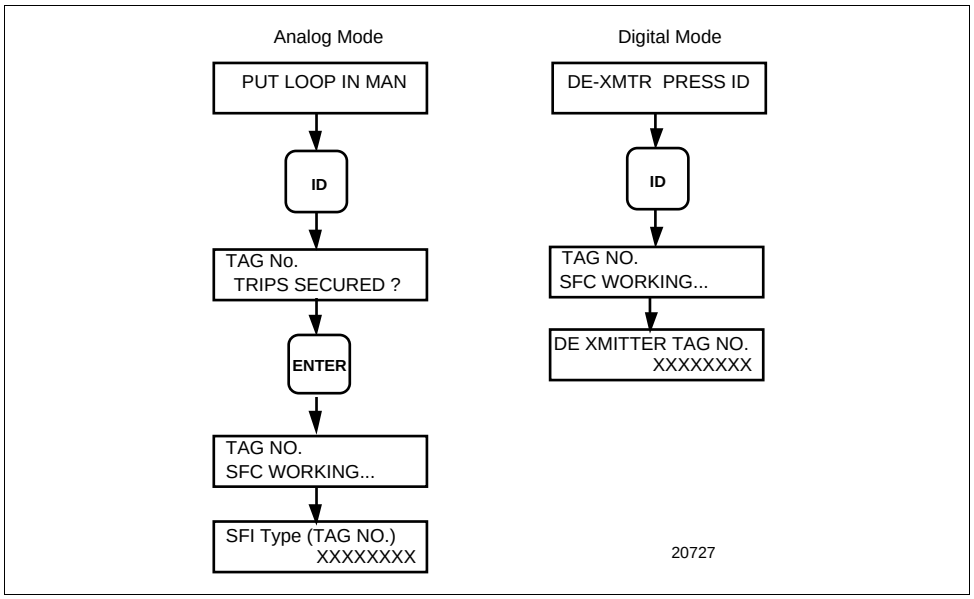
What's in this section? This section contains the following topics:

3.2 Power Up

Power-up key and display sequences

After connecting the leads directly to the transmitter or through the junction box or IS panel, and the STS103 is turned on, the key and display sequences depend on whether your SFI is an Analog or Digital mode instrument. Figure 3-1 shows the displays and key presses for both modes.

Figure 3-1 Power Up Sequence

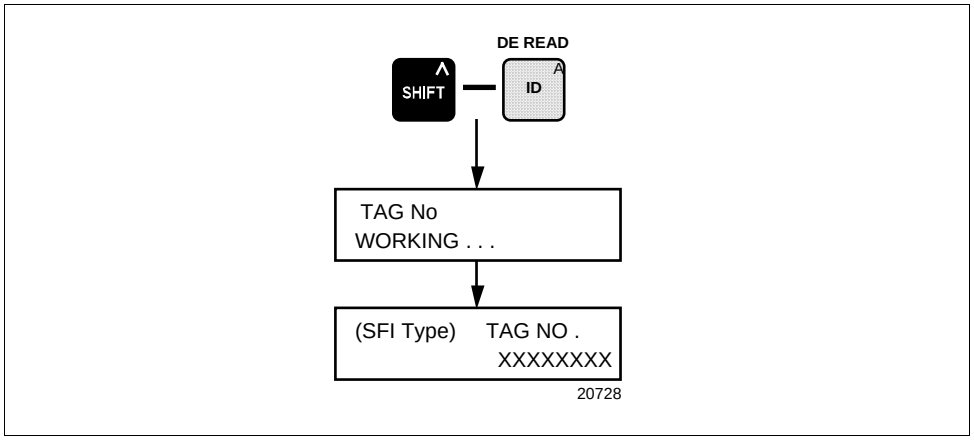


When the ID key is pressed, the ID of the device is read in.

For Analog devices, the database is also read in along with the ID.

For digital devices, the second function of the ID key reads in the database of the digital transmitter. Figure 3-2 shows an example of the key presses and display that may appear.

Figure 3-2 Read Digital Database



3.3 Diagnostics and SFC Messages

Introduction

The STS103 and the SFIs both run continuous self-diagnostics.
This means that they are constantly testing the communications, the loop, and themselves.

Any time you want results of these diagnostics, press the STAT key.

The SFC displays its report, in the form of messages, which identify diagnostic conditions.
Diagnostic conditions are broken down into three categories:

- an OK condition
- a critical condition
- a non-critical condition

OK Status

An OK condition means no problem exists, and the display looks like this:

```
STATUS  XXXX
STATUS CHECK=OK
```

Critical status

A critical condition means that the SFI is not functioning properly. When this occurs, the SFI goes into upscale burnout and maintains an output of 21.8 mA, or into downscale burnout and maintains an output of less than 3.9 mA. This message CRITICAL STATUS interrupts your operation and is followed by the message PRESS STATUS.

After the PRESS STATUS message, you press the STAT key to find out what problem exists. You will receive one or more messages. Take whatever corrective action necessary to solve the problem. Remember that the SFI will stay in upscale or down scale burnout until the condition is corrected.
If the SFI sends more than one message, each message will be displayed in the order of importance for about 5 seconds. If you need to see them again, press the STAT key again.

Non-critical status

A non-critical condition means that although a problem exists, the SFI is still operating. When a non-critical condition occurs a "#" character appears on the right side of the display, along with whatever you're displaying at the time.

This character means press the STAT key because some type of a problem exists. Again, one or more messages will appear on the display for about five seconds each.

Low battery voltage

When the battery voltage becomes low, a colon "**:**" will appear in the middle of the display. It stays on the display until you either charge or replace the batteries.

Continued on next page

Diagnostic Messages

Table 3-1 is a list of all the diagnostic messages that are common to the STS103 when used with a Smart Field Instrument (SFI).They are listed in alphabetical order along with the problem associated with the message and the corrective action to take when the message appears.

ATTENTION

Refer to the individual device sections for a comprehensive list of error messages and troubleshooting procedures specific to that particular device.

Table 3-1 Diagnostic Messages for SFC

Message	Problem	Corrective Action
SFC FAULT or **SFC FAILURE**	SFC communication is not possible due to a detected SFC problem.	• Press [STAT] key to obtain other messages. • Replace the SFC.
COMM ABORTED	Communication aborted by user.	
ENTRY>SENS RNG	The number entered is beyond 1.5 times the upper range limit of the sensor.	• Press the [CLR] key, check the parameter, and start again.
EXCESS ZERO CORR	The ZERO correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value.
EXCESS SPAN CORR	The SPAN correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value.
FAILED COMM CHK	The SFC failed a communication diagnostic check. This could be a SFC electronics problem or a faulty or dead communication loop.	• Try communicating again. • Press the [STAT] key. If a loop fault message appears, do the corrective action and try again. • If the Comm error continues, replace the SFC.
HI RES/LOW VOLT	Either there is too much resistance in the loop (open circuit), the voltage is too low, or both.	• Check the wiring connections and the power supply. There must be 11 Volts minimum at the SFI to permit operation.
H.W. MISMATCH	Hardware mismatch. Part of Save/Restore function.	• None - SFC tried to restore as much of the database as possible.
ILLEGAL RESPONSE	SFC received an illegal response from the SFI.	• Try communicating again.
INVALID DATABASE	The database of the SFI was not correct at power up.	• Try communicating again. • Verify the database, recalibrate the SFI and then manually update non-volatile memory.
INVALID REQUEST	• The SFI is being asked to correct or set its URV to a value that results in too low a span, or being asked to correct its LRV or URV while in the output mode. • The given key function is not valid for the associated SFI.	• Check that the proper calibrated URV input is being applied to the SFI, or that the SFI is not in the output mode. • Check that the key function is applicable for your particular SFI.

Table continued on next page

Diagnostic Messages,
continued

Table 3-1 Diagnostic Messages for SFC (continued)

Message	Problem	Corrective Action
IN OUTPUT MODE	The SFI is operating as a current source.	• Press the OUTPUT and CLR keys if you want to exit the output mode.
LOW LOOP RES	Not enough resistance in series with the communication loop.	• Check the sensing resistor and verify at least 250 Ohms resistance in the loop.
NACK RESPONSE	The SFI sent a negative acknowledgment because one or more of the commands could not be processed by the SFI.	• Check the configuration and try again.
NO XMTR RESPONSE	No response from the SFI. It may be a SFI or loop problem.	• Try communicating again. • Press the STAT key and do any corrective action required. • Check that the flowmeter's loop integrity has been maintained and that the SFC is connected.
NVM FAULT	Non-volatile memory fault.	• Replace the transmitter.
NVM ON SEE MAN	The SFC's CPU is misconfigured	• Replace the SFC.
OPTION MISMATCH	On a database restore, one or more options do not match.	• None - SFC tried to restore as much of the database as possible.
>RANGE	The value to be displayed is over the range of the display.	• Press the CLR key and start again.
RESTORE FAILED	Part of the Save/Restore function.	• Check the transmitter and try again.
SENSOR TEMP FAIL	The ST 3000 temperature sensor has failed.	• Replace the transmitter.
SFC FAULT	A component of the SFC is not operating properly.	• Try communicating again. If the condition still exists, replace the SFC.
STATUS UNKOWN	Your SFC has an older version of software that cannot decode a "new" diagnostic message from a more recent transmitter.	• Put the SFI into the output mode and press the STAT key. The message will identify where the problem is. In the absence of any other diagnostic messages, the condition is most likely meterbody related. • Check the installation, and if the condition persists, replace the meter body.
TYPE MISMATCH	On a database restore, the transmitter types are not the same.	• None - SFC tried to restore as much of the database as possible.

3.4 Common Key Sequences and Displays

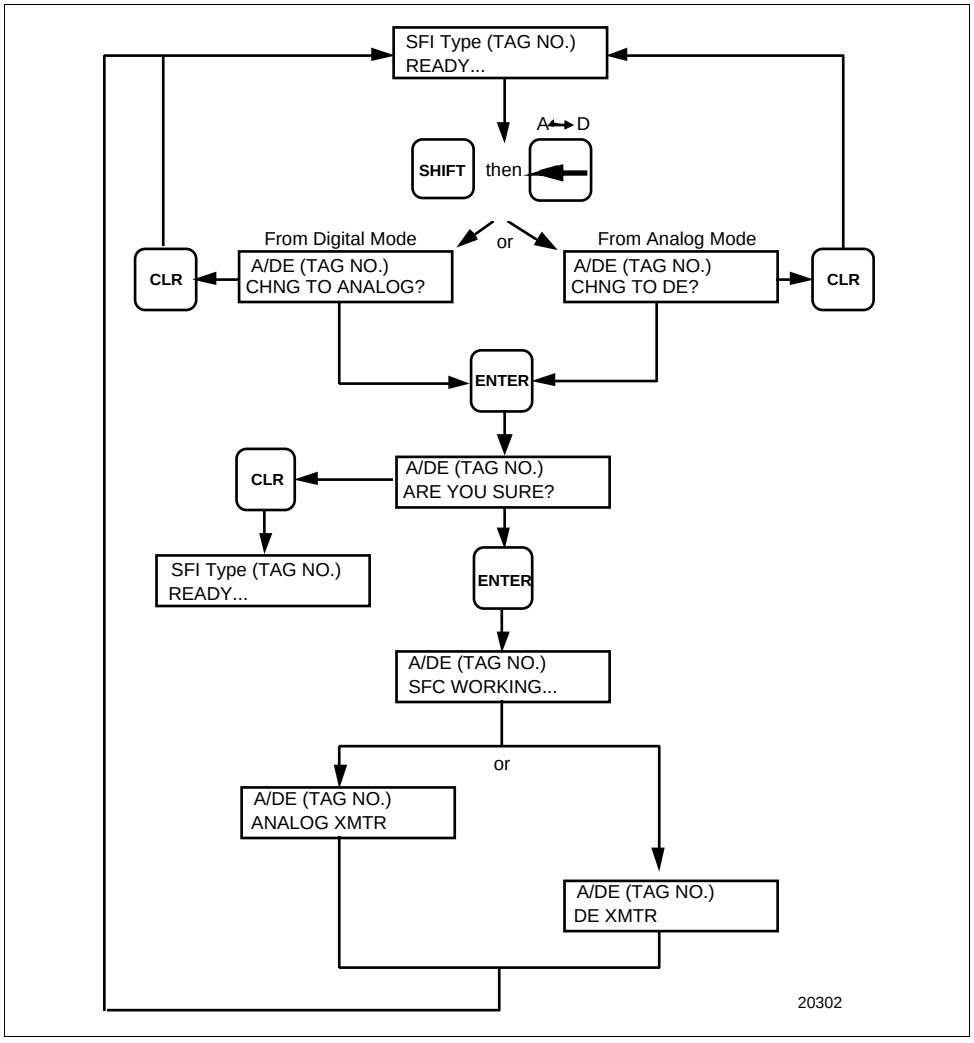
Changing the communications mode

The Smart Field Instruments operate in either an Analog mode or a Digital communications (DE) mode. You can quickly change from one mode to another using the SFC.

See Section 1.4 “STS103/SFI Communication” for format descriptions.

Figure 3-3 is a graphic view of the key presses required to change the communication mode.

Figure 3-3 Changing Communications Mode



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Selecting configuration data for the digital communications mode

You determine how the Digital PV data is handled by configuring the DE configuration elements shown in Table 3-2.

Table 3-2 DE Configuration Elements

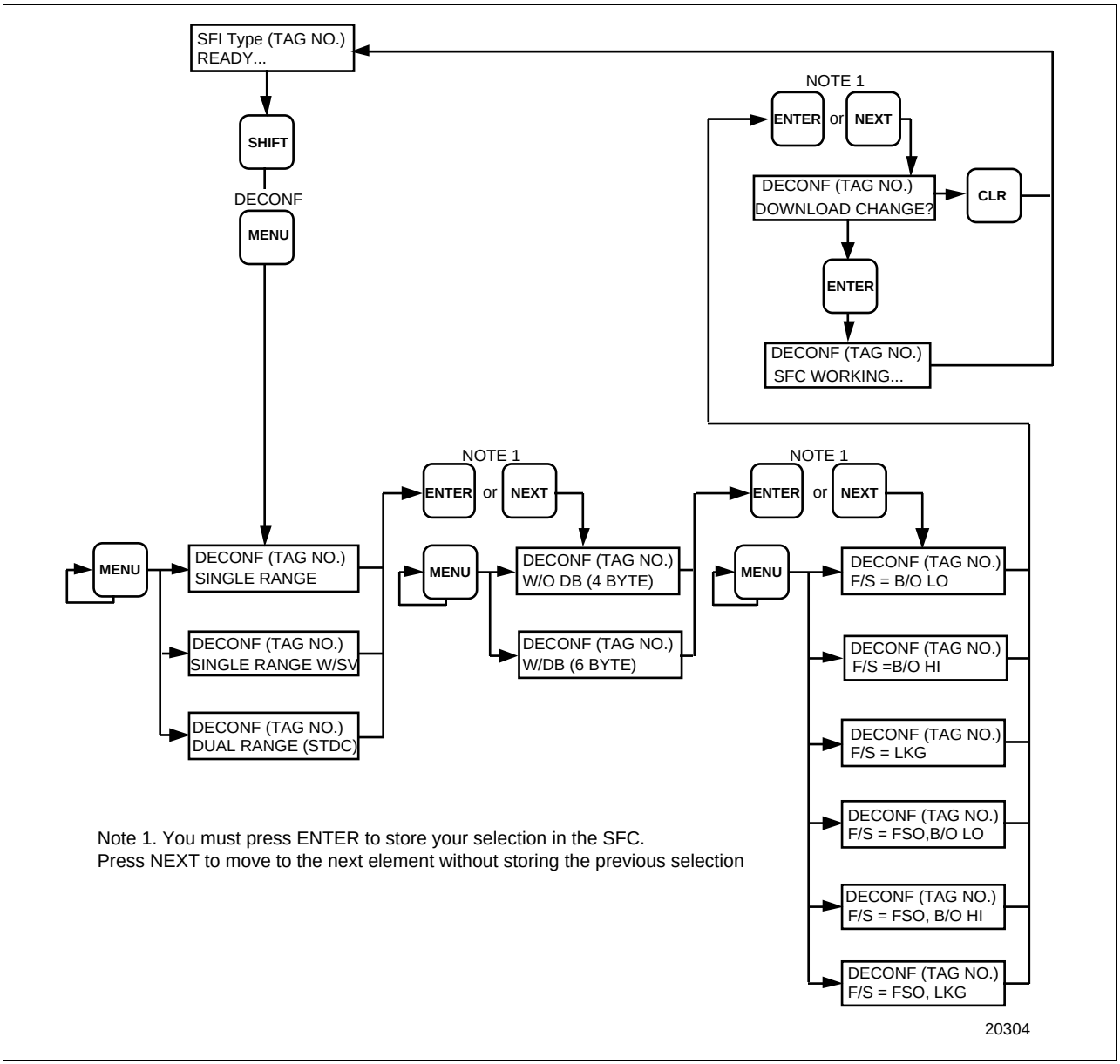
Element	Selections And Definitions
Type of Transmitter	This element selects the type of transmitter operation. The selections are: • **Single Range** Working range PV (PVw) for STDC card or STI module. • **Single Range W/SV** Working Range PV(PVw) with sensor temperature for STDC card or STI Module. • **Dual Range (STDC)** Full range PV (PVt) and Working range PV (PVw) (For STDC only).
Message Format	This element is the message format. The selections are: • **w/o DB (4 Byte)** 4 Byte message format (PV or SV only), without database information. • **W/DB (6 Byte)** 6 Byte message format (PV or SV with database information).
Failsafe Mode for Digital Control System	This element is the Failsafe mode. You configure the flowmeter to tell the control system, via the ST/DC card, which failsafe mode to assume when the card detects a critical failure condition. A critical fault can be due to a critical status indication from the flowmeter or an extended loss of PV data. The selections are: • **F/S=B/O Lo** Burnout low (drives the PV value to the downscale limit). • **F/S=B/O Hi** Burnout high (drives the PV value to the upscale limit). • **LKG** Last known good PV value. • **F/S=FSO,B/O Lo** Freeze slot output and burnout low (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller downscale to trip alarms). • **F/S=FSO, B/O Hi** Freeze slot output and burnout high (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller upscale to trip alarms). • **F/S=LKG** Freeze slot output and last known good PV (ST/DC tells the controller to hold the memory block output at the present value and provides the last known good PV value as the input to the controller).

Continued on next page

Selecting configuration data for the digital communications mode (Single PV Transmitters)

Figure 3-4 is a graphic view of the key presses required to configure the elements for DE Communications mode of a Single PV transmitter.

Figure 3-4 Configuring the Elements of the DE Communications Mode (Single PV Transmitter)



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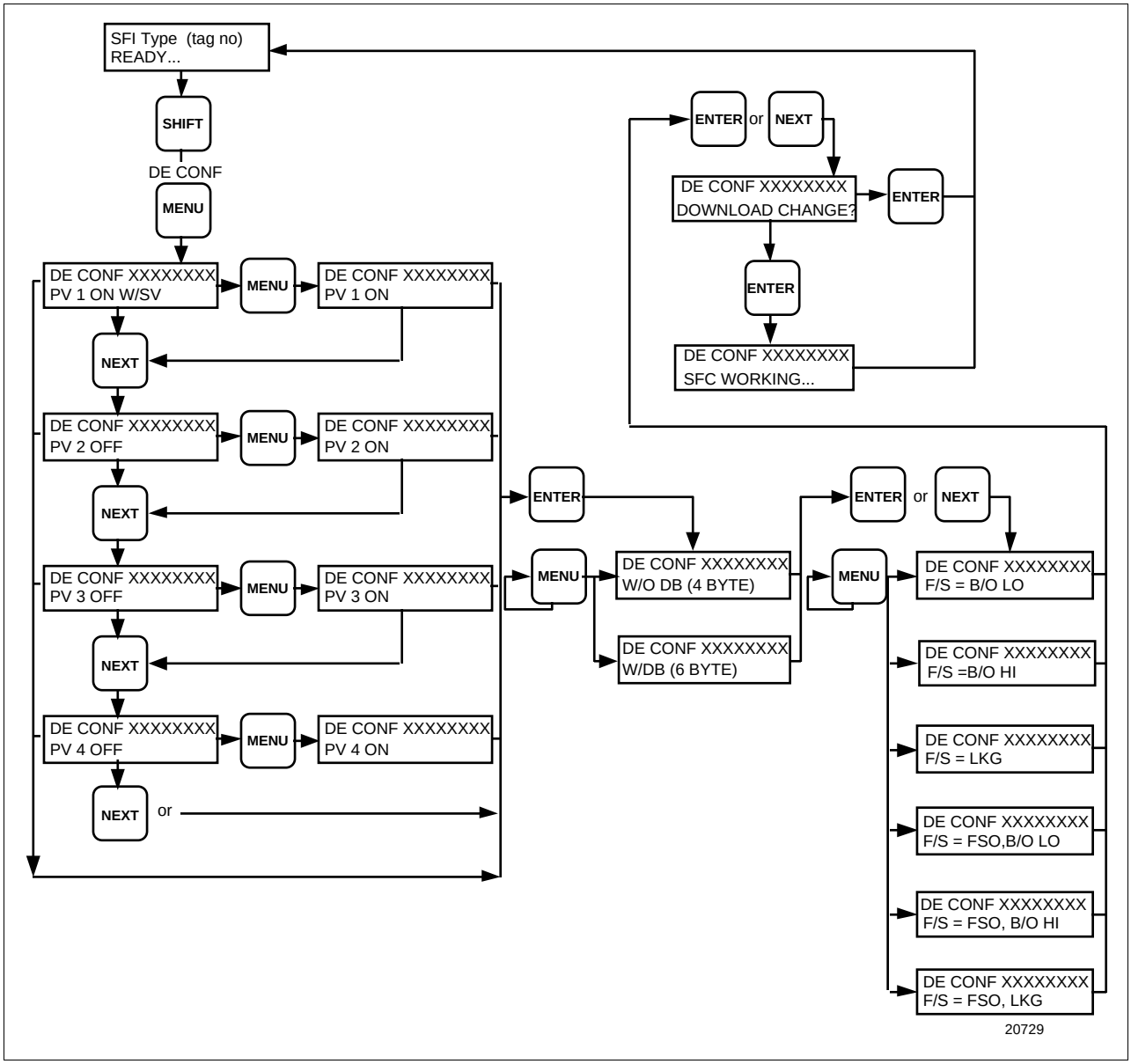
Selecting configuration data for the digital communications mode (Multiple PV Transmitters)

Figure 3-5 is a graphic view of the key presses required to configure the elements for DE Communications mode of a Multiple PV transmitter.

Figure 3-5 Configuring the Elements of the DE Communications Mode (Multiple PV Transmitter)



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Storing data into non-volatile memory

The following sequence downloads data into the SFI's non-volatile memory. Non-volatile memory stores configuration data and retains that data even after the unit is turned off. This prevents having to reconfigure the transmitter every time it is turned off. Table 3-3 shows you the key presses and displays for storing non-volatile memory.

Table 3-3 Storing Data in Non-volatile Memory

Press	Displays will Read	Result
^ SHIFT then NON-VOL ENTER (YES)	SFI Type TAG NO. SFC WORKING . . . then SFI Tyoe TAG NO. DATA NONVOLATILE then SFI Type TAG NO. READY . . .	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.

Continued on next page

Damping current constant

Damping time sets the unit of time for the damping constant which establishes the upper limit of frequency response and the response time characteristics of the transmitter. This is used to reduce the electrical noise effect on the output signal.

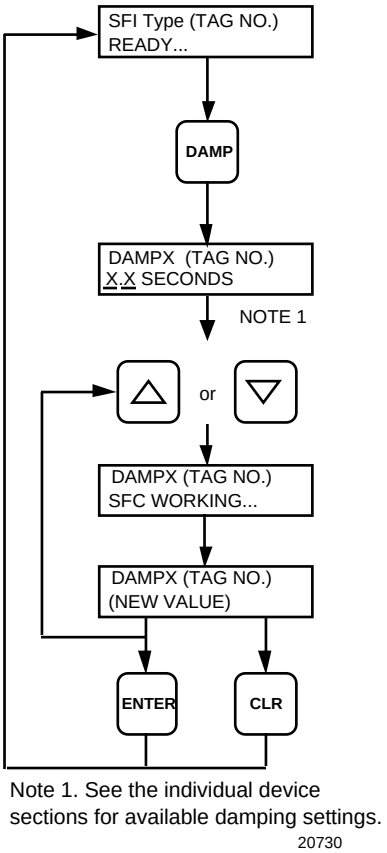
Using the SFC, you can adjust the damping by selecting a value on the SFC and send that value to the transmitter.

Figure 3-6 is a general view of the key presses required to adjust the damping time value and also gives you the selections available.

ATTENTION

REFER TO THE INDIVIDUAL DEVICE SECTIONS FOR THE MINIMUM AND MAXIMUM DAMPING VALUES ALLOWED FOR YOUR SFI AND A MORE DEFINITIVE ENTRY PROCEDURE.

Figure 3-6 Adjusting the Damping Time Value



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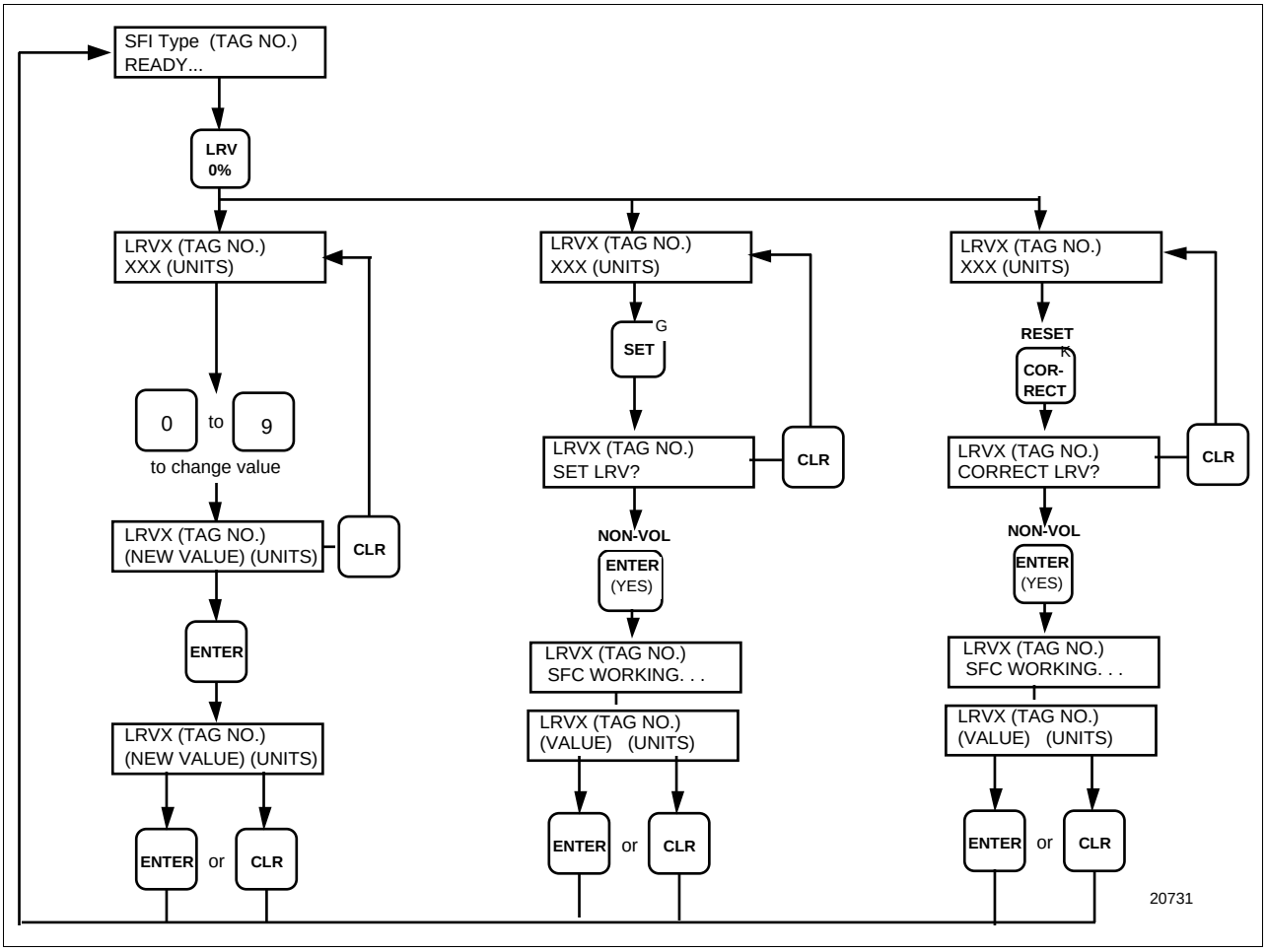
Displaying, setting, and calibrating the lower range value

Figure 3-7 is a general view of the key presses required to display, set, or calibrate the Lower Range Value (LRV) on most SFIs.

ATTENTION

REFER TO THE INDIVIDUAL DEVICE SECTIONS FOR A MORE DEFINITIVE ENTRY PROCEDURE.

Figure 3-7 Displaying, Setting, and Calibrating the Lower Range Value



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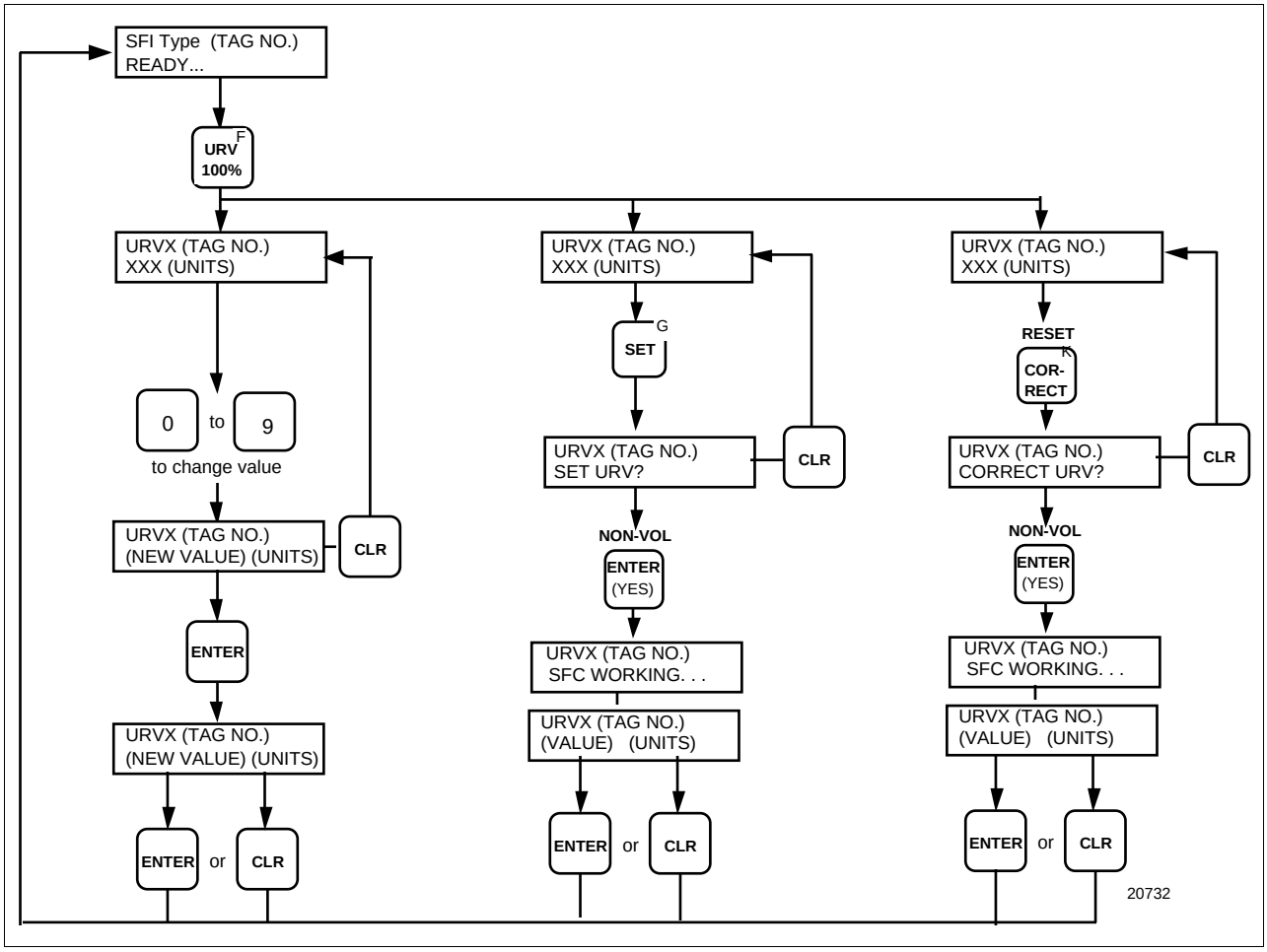
Displaying, setting, and calibrating the upper range value

Figure 3-8 is a general view of the key presses required to display, set, or calibrate the Upper Range Value (URV) on most SFIs.

ATTENTION

REFER TO THE INDIVIDUAL DEVICE SECTIONS FOR A MORE DEFINITIVE ENTRY PROCEDURE.

Figure 3-8 Displaying, Setting, and Calibrating the Upper Range Value



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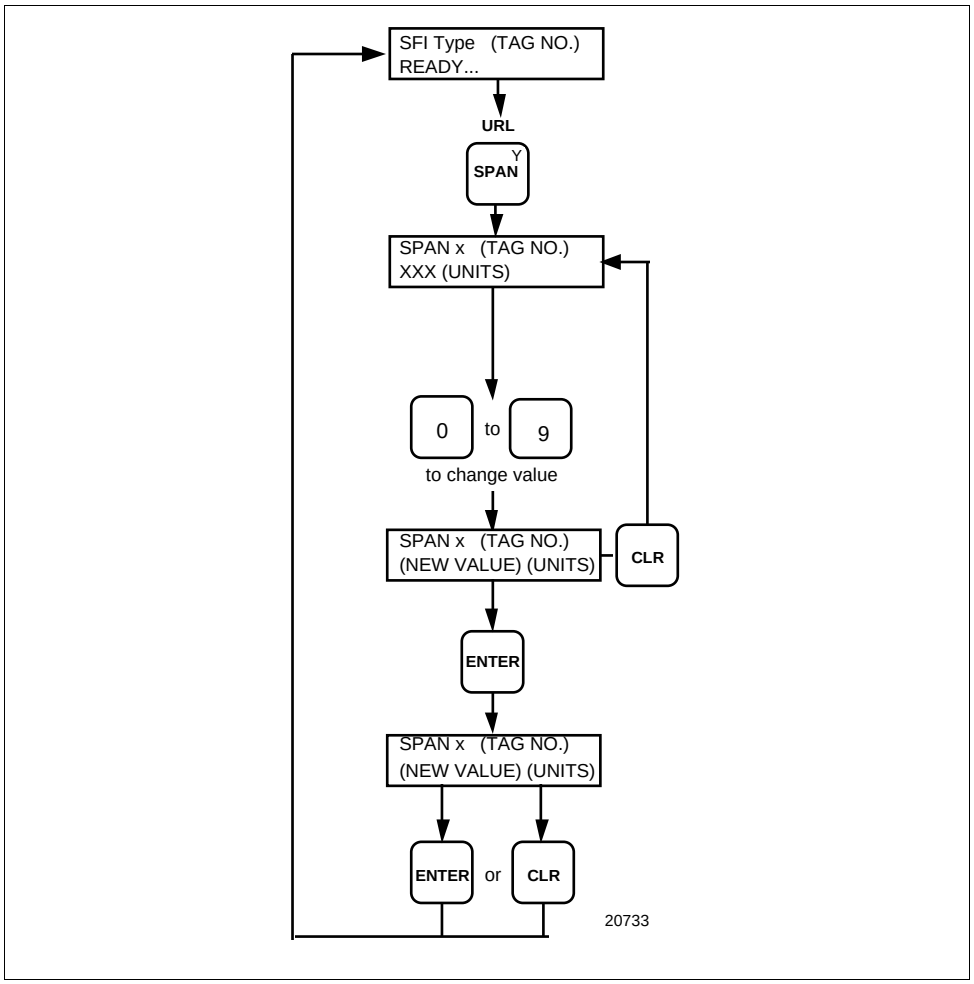
Displaying and changing the span of the device

Figure 3-9 is a general view of the key presses required to read or change the span between the upper and lower measuring limits on most SFIs.

Figure 3-9 Displaying and Changing the Span



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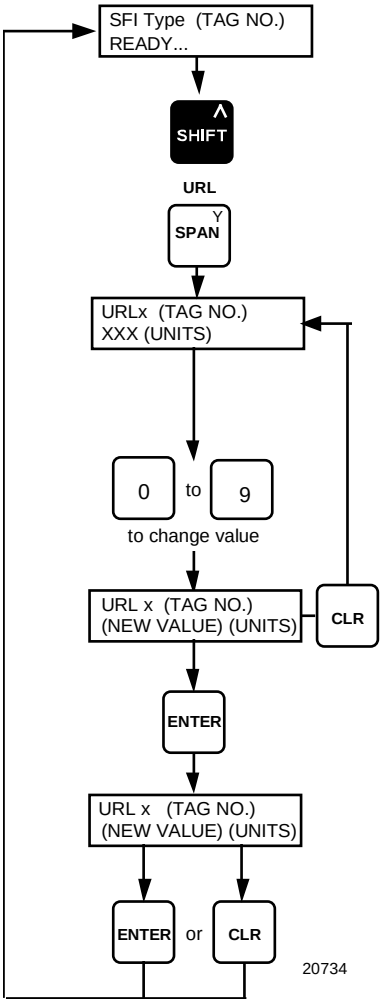
Displaying and changing the upper range limit of the device

Figure 3-10 is a general view of the key presses required to read or change the Upper Range Limit on most SFIs.

Figure 3-10 Displaying and Changing the Upper Range Limit



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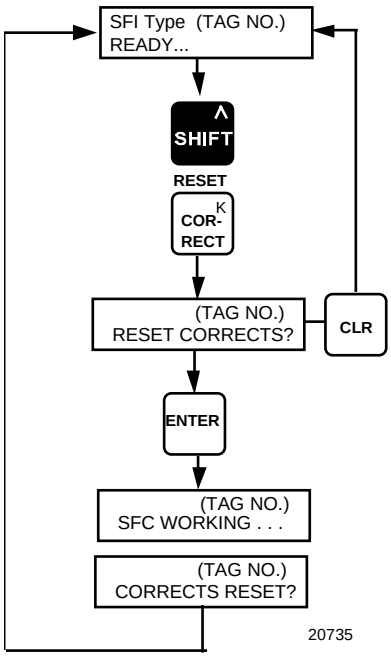
Resetting the SFI

The sequence below, commonly known as Corrects-Reset, shows how to reset most devices to their factory default setting. Corrects-Reset is performed when you need to reset and recalibrate the SFI.

The MagneW 3000 default settings are in the calibration hierarchy called “shipping data.”. See the device section for the procedure.

Figure 3-11 is a general view of the key presses required to reset to factory default settings on most SFIs.

Figure 3-11 Corrects Reset



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Displaying, setting, and clearing the current output

The OUTPUT key has four uses:

- View the output of the transmitter in percent of span,
- Put the transmitter in the current output mode, (see Section 3.5).
- Clear the current output mode, and
- Correct 0% value of the DAC and the span of the DAC (100% value).

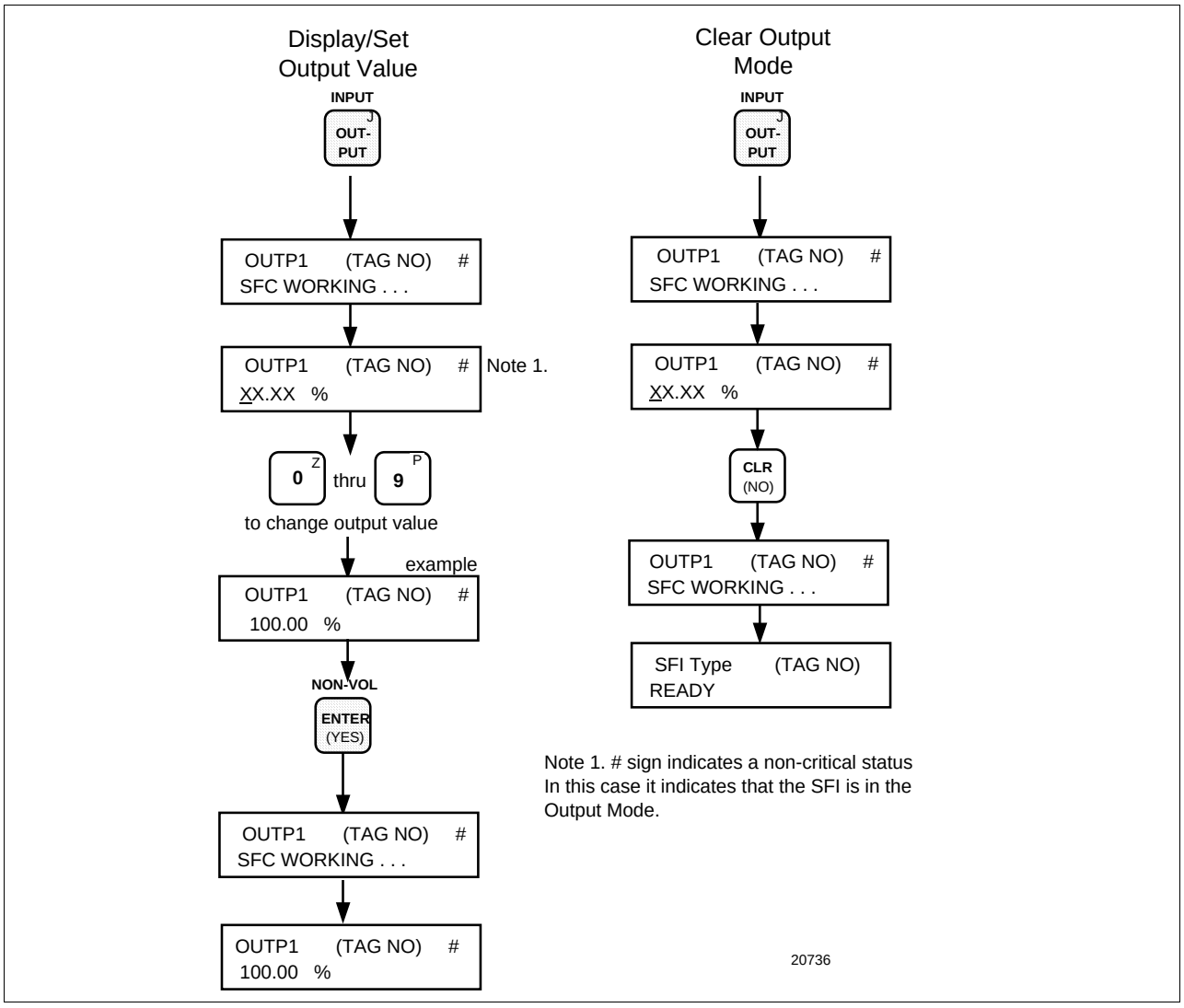
Figure 3-12 is a general view of the key presses required to display and set the output value and clear the current output mode.

The sequence on the left shows how to display the output value and set the output mode. The sequence on the right shows how to clear the output mode.

ATTENTION

REFER TO THE INDIVIDUAL DEVICE SECTIONS FOR ZERO AND SPAN DAC CORRECTIONS.

Figure 3-12 Displaying, Setting, and Clearing the Current Output.



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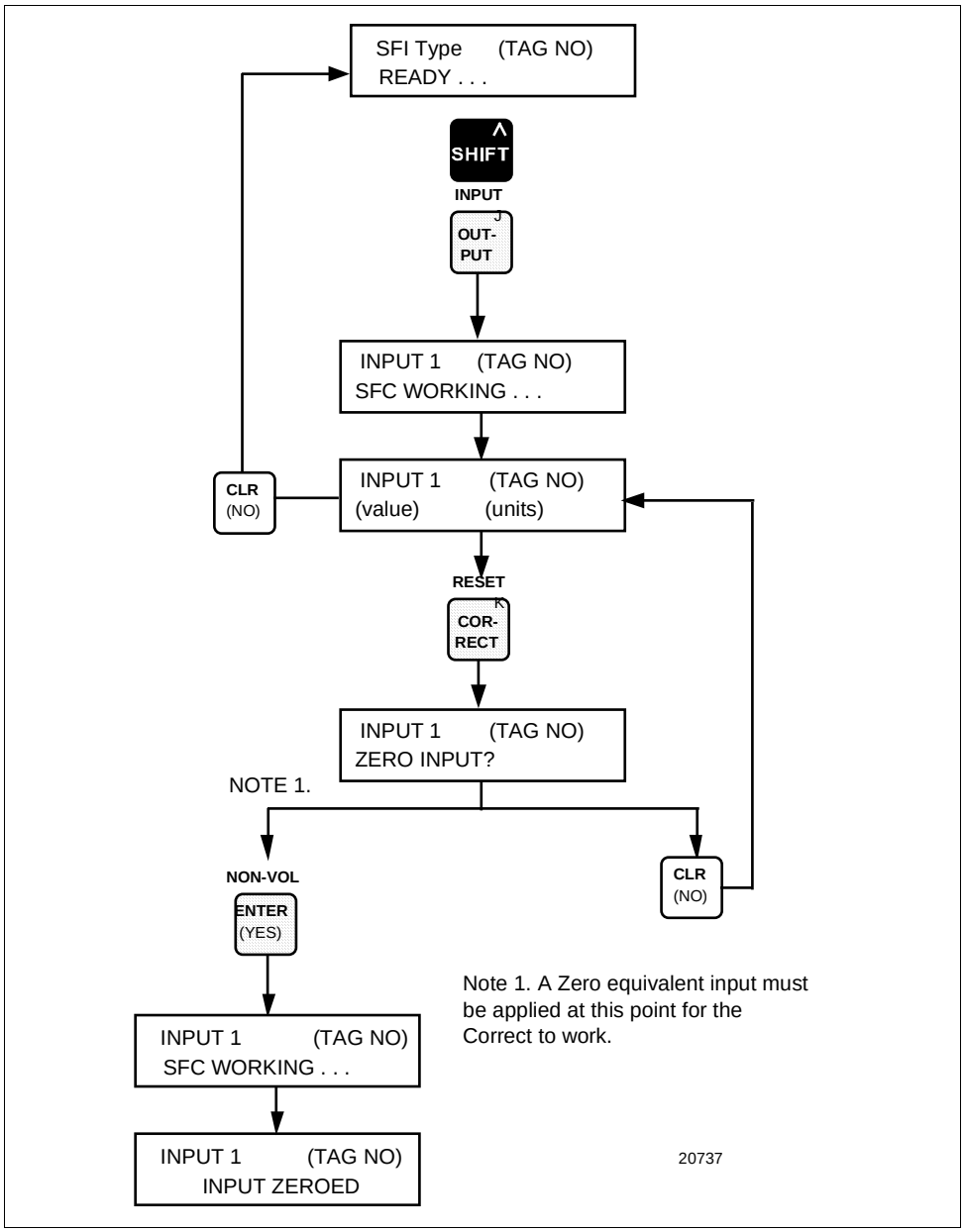
Displaying and calibrating the current input value

Figure 3-13 is a view of the key presses required to display and calibrate the input value.

The sequence below is followed when viewing and/or calibrating most SFI's input value. This function is not available for STT 3000 devices.

Figure 3-13 Displaying and calibrating the Current Input Value



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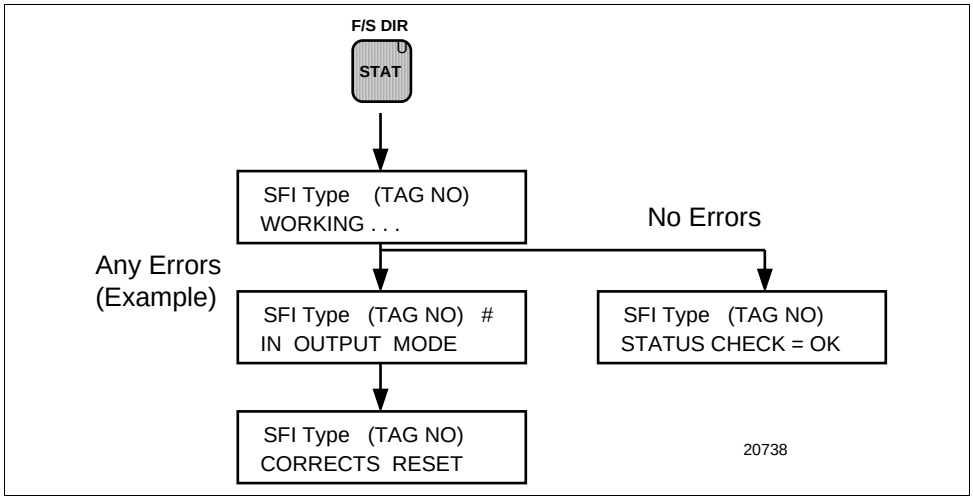
Displaying the SFI diagnostic status

Figure 3-14 is a view of the key presses required to display the SFI's diagnostic status.

Figure 3-14 Displaying the SFI Diagnostic Status

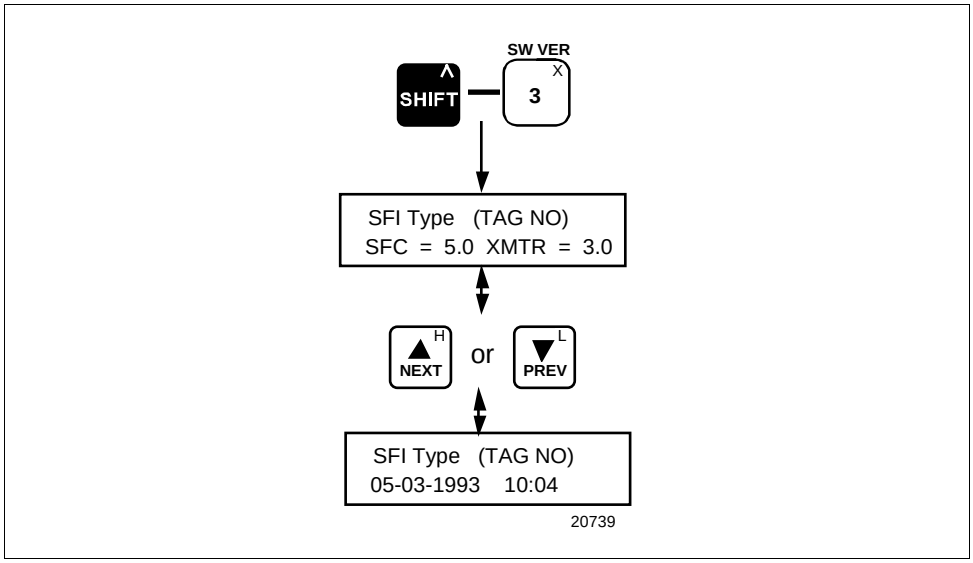


When any errors are detected, each error is displayed for 2 seconds. The message received as a response from the SFI may then be looked up under the specific status messages for that SFI which are shown in each device section.

Displaying the software version

Figure 3-15 is a view of the key presses required to display the SFI's software version. Use the sequence to call up the software version of the STS103 and connected SFI. If the STS103 is not connected to an SFI, only the software version of the STS103 is displayed.

Figure 3-15 Software Version



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Writing data in the scratch pad area

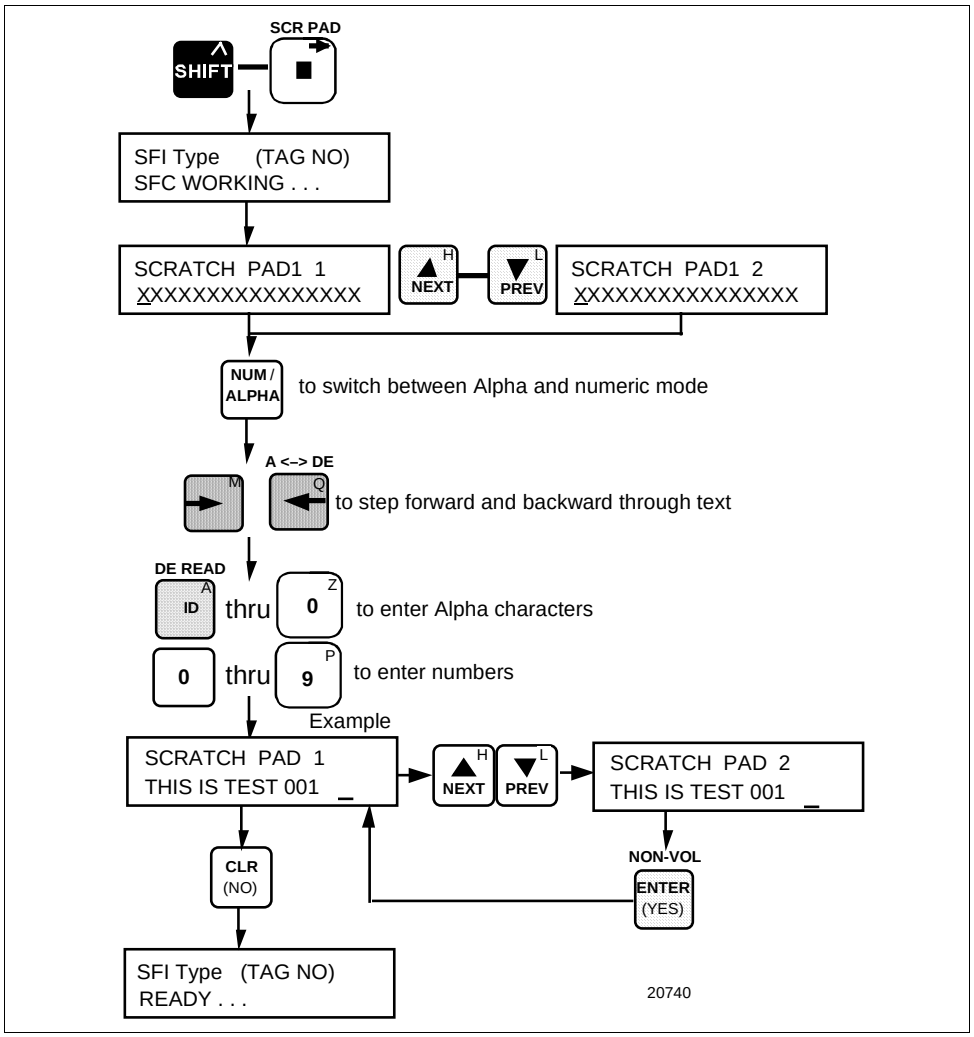
A unique feature of Smart Field Instruments is their ability to store user messages in the scratch pad area of its non-volatile memory. This feature allows you to enter (write) a message or messages consisting of a total of 32 characters in two groups of 16 each (Scratch Pad 1 and Scratch Pad 2).

Procedure

Use the procedure in Figure 3-16 to enter the scratch pad area and step the cursor through each scratch pad display.
The following are some rules to remember when entering data:

- Use the NUM/ALPHA key to switch between alpha and numeric characters.
- Use the → or ← to step forward and backward through the text for editing.
- For spaces use the • key when in the alpha mode.

Figure 3-16 Writing Data in Scratch Pad Area



3.5 Using the Transmitter as a Current Source

Introduction

One of the unique features of a Smart Field Instrument is its ability to be used as a constant current-source. This feature allows you to use it for calibrating other instruments in the loop such as recorders, controllers, and positioners.

As you know, the output of the SFI ranges from 4 to 20 milliamps where 4 mA = 0% output and 20 mA = 100% output. Using the STS103, you can tell the SFI to change its output to any value between 0 and 100% and maintain that output. Then you can use this output as a calibration input source to the other instruments in the loop.

Note that the current "output mode" overrides all other PV data from the SFI including the burnout data in the Digital Communications mode.

ATTENTION

When you use the SFI as a current source, it no longer acts as a SFI. Make sure to clear this output mode when you are finished.

Continued on next page

3.5 Using the Transmitter as a Current Source, Continued

Procedure

Connect an ammeter to read the output of the SFI and connect the STS103 Smart Field Communicator to the SFI. Follow the procedure listed in Table 3-4 to use the SFI as a constant current-source.

Table 3-4 Using the SFI as a Constant Current-source

Step	Press	Display Example	Result or Action
1	INPUT J OUT-PUT	OUTP1 TAG NO. SFC WORKING . . . then OUTP1 TAG NO. # 32.4 %	Your display will look similar to this with your output displayed and it will update every 6 seconds. Remember, when you're ready to press the next key, to wait for the updated display.
2	SW VER X 3 Z 0 NON-VOL ENTER (YES)	OUTP1 TAG NO. SFC WORKING . . . then OUTP1 TAG NO. # 30.00 %	Key in the output you want. For this example, we will use 30%. The display will show the output with a decimal point and two zeros. Also, the SFC adds a "#" character (a non-critical status indicator) on the right side of the display to remind you that in this case you are in the output mode. It will stay on the display as long as your SFI is being used as a current-source.
3			Check the output reading and see that it reads 8.8 mA, which is equal to a 30% output. If your meter shows a different reading or no "#" character appears on the display, go back to the beginning of this procedure and start over. Try a few different percentages and check your meter with the list below: Key-in this value — Your meter reads 0% — 4.0 mA 25% — 8.0 mA 50% — 12.0 mA 60% — 13.6 mA 80% — 16.6 mA 100% — 20.0 mA
4	CLR (NO)	OUTP1 TAG NO. SFC WORKING . . . then SFI Type TAG NO. READY . . .	This clears the output mode. Notice that the "#" character disappeared. **ATTENTION** If you do not press the CLR key and press another key you will not exit the output mode. This means that you cleared the display but are still in the output mode.

3.6 Disconnecting the SFI

Check list

Before you disconnect the STS103 from the Smart Field Instrument, refer to Table 3-5 and follow the Check List given.

Table 3-5 Disconnect Check List

Check	Press	Display Example	Result or Action
1			Be sure the SFI is not in the Output mode or any other error condition. The SFC displays a "#" character on the upper right side of the display indicating the output mode or other non-critical status.
2	INPUT J OUT-PUT then CLR (NO)	OUTP1 TAG NO. SFC WORKING . . . then SFI Type TAG NO. READY . . .	This clears the output mode. Notice that the "#" character disappeared. **ATTENTION** If you press the CLR key without pressing the OUTPUT key, the "#" character stays on the display. This means that you cleared the display but are still in the output mode.
3	^ SHIFT then NON-VOL ENTER (YES)	SFI Type TAG NO. READY . . . then SFI Tyoe TAG NO. DATA NONVOLATILE then SFI Type TAG NO. READY . . .	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.
4			Be sure the STS103 is disconnected from the Smart Field Instrument before returning the loop to the automatic operating mode.

Section 4 —ST 3000 Pressure Transmitter

4.1 Overview

Introduction

This section contains all the information you will need to know in order to wire, set-up, configure, operate, calibrate, and troubleshoot the ST 3000 Pressure Transmitter using the STS103 Smart Field Communicator.

Refer to the ST 3000 User's Manual for transmitter operating and installation information.

Make sure you have become familiar with the STS103 operations that are more or less the same for every transmitter.

This section gives you the keystrokes and displays that are specific for SFC communications with the ST 3000 Pressure Transmitter.

What's in this section?

This section contains the following topics:

4.2 Wiring

Overview

Establish communications with the ST 3000 by connecting the SFC leads to the 4–20 mA line of the transmitter.

Your choices are either at a junction box somewhere along the 4–20 mA line, on the field side of the intrinsic safety barrier panel in the control room, or at the transmitter itself.

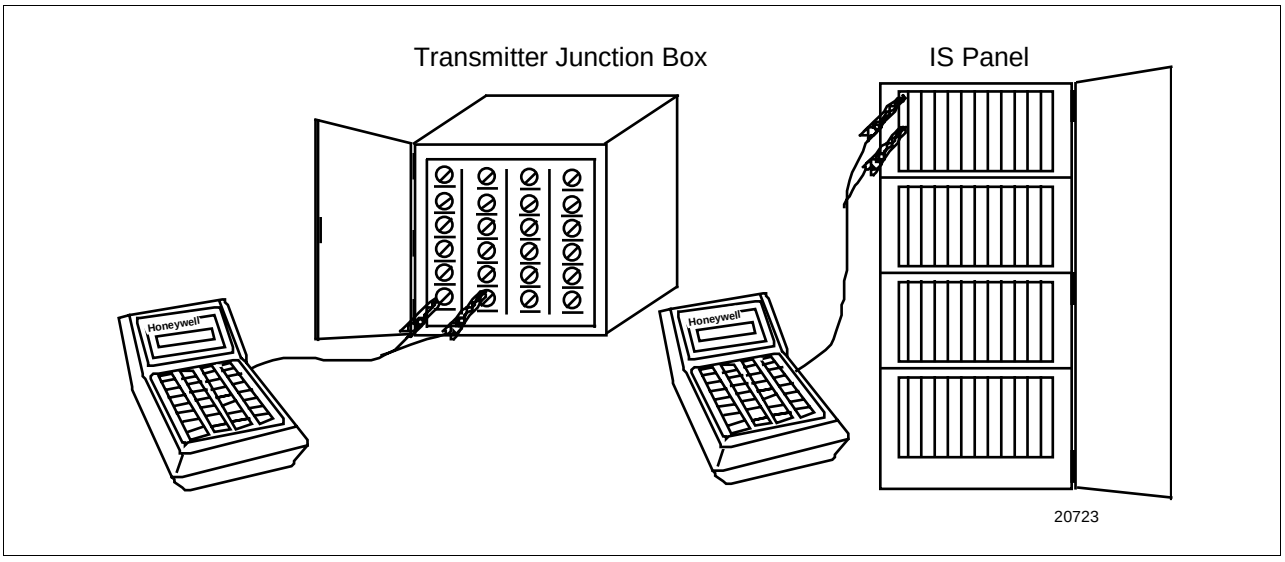
Following are examples for connecting to all these places. Use the one you need.

Connecting the STS103 to junction boxes and IS panels

The STS103 connects to ST 3000 transmitters, IS Panels, and junction boxes through a pair of wires with alligator clips on the ends. The STS103 communications terminal end of the wires has a stereo phone jack connection that is inserted into the communications terminal. The other end of the wires are clipped onto terminals in the junction box or IS barrier panel, or directly to the transmitter. The red SFC lead connects to the junction box or SFI positive terminal, the black lead to the negative terminal.

Figure 4-1 shows the STS103 connected to a junction box or an IS barrier panel.

Figure 4-1 STS103 – Junction Box and IS Connection



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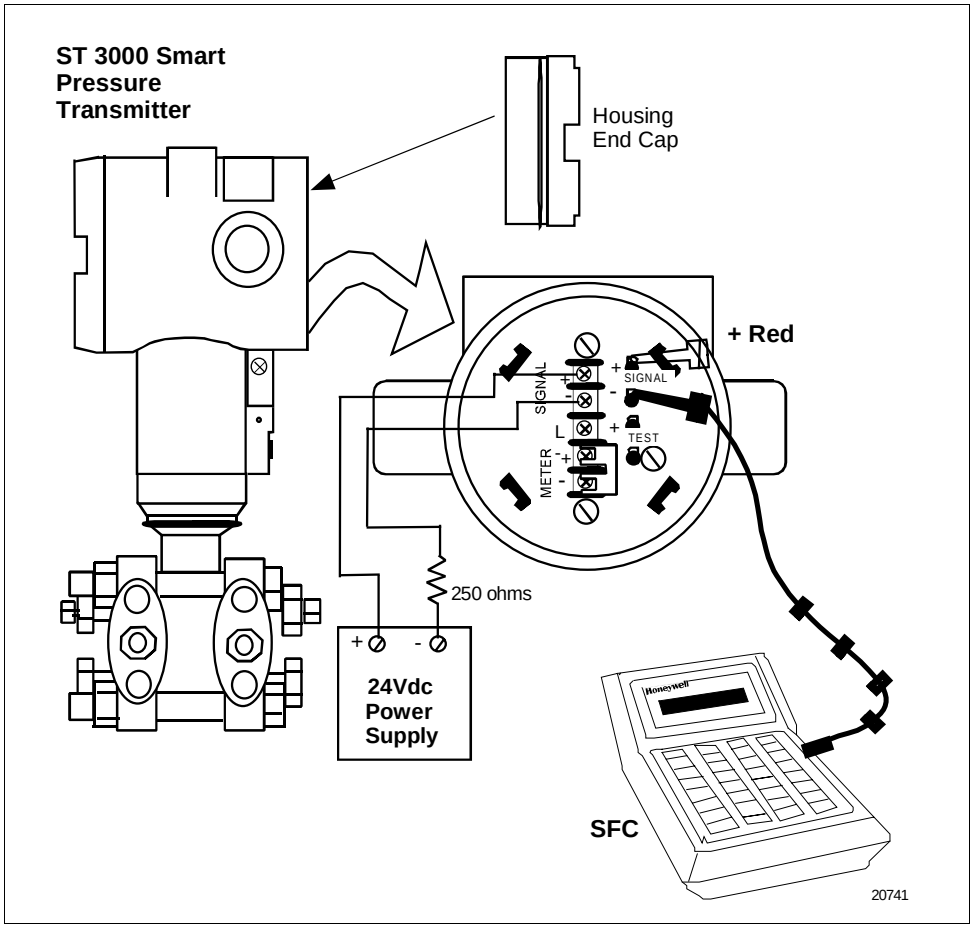
STS103 - ST 3000 connection

Figure 4-2 shows the STS103 connected directly to the positive and negative signal terminals on a typical ST 3000 transmitter. The STS103 can connect to only one ST 3000 at a time.

Figure 4-2 STS103–ST 3000 Connections



WARNING

When the junction box cover on the transmitter is removed, the housing is NOT explosion-proof.

STS103 charging terminal

The NiCd battery pack is charged through a battery charger that plugs into the charging terminal. The charger inputs 110 or 220 Vac 50/60 Hz and outputs 7 Vdc 180 mA to the NiCd battery pack.
The connector of the battery charger is inserted into the charging terminal on left side of the STS103 near the ON/OFF switch.

4.3 Set-up

Overview

Setting up the ST 3000 Pressure Transmitter consists of:

- Keying-in the I.D. and loading the Database.
- Adjusting the Damping time.
- Selecting the units in which to display values.
- Selecting the ST 3000's communication mode.
- Selecting the type of configuration for the transmitter in the Digital Communications (DE) Mode.
- Keying-in the Lower Range value and Upper Range value (Span) using the keyboard.
- Keying-in the Lower Range value and Upper Range value (Span) using applied pressure.

Keying in the I.D. and uploading the database

The procedure listed in Table 4-1 gives you the steps required to key–in an ID and upload the database for the ST 3000.

ATTENTION

You will note in the procedure that:

- The database for an *Analog* transmitter is automatically read or uploaded to the SFC when you press [ENTER] in response to the "TRIPS SECURED" prompt.
- The database for a *Digital* transmitter is read or uploaded when you press the [SHIFT] [I D] keys.

Table 4-1 Keying–in the ST 3000 ID and Uploading the Database Procedure

Step	Press	SFC Display will Read	Result
ANALOG TRANSMITTERS (For Digital Transmitters - see step 4)			
1	DE READ A ID	TAG NO. TRIPS SECURED?.	
	NON-VOL ENTER (YES)	TAG NO. SFC WORKING . . . Then (SFI Type) TAG No. XXXXXXXX	The database is loaded into the SFC at this point for analog transmitters. The top line identifies the type of pressure transmitter and the Output form. (for example: LIN DP = Linear output, Differential Pressure) Notice the line under the first character of the ID on the bottom line. This is the cursor and indicates where you can key–in an ID. Alpha/numeric entries of up to 8 characters are permitted. If the ST 3000 was not given an ID, the line will be blank with a cursor.

Table continued on next page

Keying–in the ID and uploading the database, continued

Table 4-1 Keying–in the ST 3000 ID and Uploading the Database Procedure (continued)

Step	Press	SFC Display will Read	Result
ANALOG TRANSMITTERS, continued			
2	NUM / ALPHA until you see	(SFI Type) TAG No. * or (SFI Type) TAG No. ■	An * indicates that the prompt is looking for an alpha character. The letters are located in the upper right corner of the keys. A ■ indicates the prompt is looking for a number. The numbers are on the yellow keys. Press NUM/ALPHA key to change from Alpha to Numeric mode or vice versa. One of the symbols appears on the display and in place of the first character of the old ID. The rest of the old ID disappears. Key–in your ID using the NUM/ALPHA key and the letters and numbers on the keys.
3	NON-VOL ENTER (YES)	(SFI Type) TAG No. SFC WORKING . . . then (SFI Type) TAG No. (New ID)	The ID is loaded into the transmitter.
DIGITAL TRANSMITTERS			
4	DE READ ID A	TAG NO. SFC WORKING . . . Then DE-XMTR TAG No. XXXXXXXX	The top line indicates that the transmitter is configured for **DE Communications mode**. Notice the line under the first character of the ID on the bottom line. This is the cursor and indicates where you can key–in an ID. Alpha/numeric entries of up to 8 characters are permitted. If the ST 3000 was not given an ID, the line will be blank with a cursor.
5	NUM / ALPHA until you see	(SFI Type) TAG No. * or (SFI Type) TAG No. ■	An * indicates that the prompt is looking for an alpha character. The letters are located in the upper right corner of the keys. A ■ indicates the prompt is looking for a number. The numbers are on the yellow keys. Press NUM/ALPHA key to change from Alpha to Numeric mode or vice versa. One of the symbols appears on the display and in place of the first character of the old ID. The rest of the old ID disappears. Key–in your ID using the NUM/ALPHA key and the letters and numbers on the keys.

Table continued on next page

Keying–in the ID and database, continued

Table 4-1 Keying–in the ST 3000 ID and Database Procedure (continued)

Step	Press	SFC Display will Read	Result
DIGITAL TRANSMITTERS, continued			
6	NON-VOL ENTER (YES)	(SFI Type) TAG No. SFC WORKING . . . then (SFI Type) TAG No. (New ID)	The ID is loaded into the transmitter.
7	^ SHIFT then DE READ A ID	(SFI Type) TAG No. SFC WORKING – XX% then (SFI Type) TAG No. (New ID)	This loads the Digital Transmitter database to the SFC. The display indicates the percent of the database being loaded until it reaches 100%.

Copying data into non-volatile memory

When setting-up or configuring a ST 3000, whether you are changing one element or a full database, you must copy all configuration data into the transmitter's non-volatile memory. This is the transmitter's permanent memory. If the transmitter were to lose power, the values for the database will be saved here.
The transmitter also contains a working memory that loses its contents if the power goes off; and when power is restored, the transmitter copies the contents of the non-volatile memory into the working memory.

There is a failsafe procedure. Thirty seconds after a value is changed, the transmitter automatically copies it into the non-volatile memory. But, if you change an element and power goes down before this runs, you will still lose the data in the working memory. Therefore, whenever you make any changes in the transmitter, always end your procedure as follows:

Press	Displays will Read	Result
^ SHIFT then NON-VOL ENTER (YES)	(SFI Type) TAG No. SFC WORKING . . . then (SFI Type) TAG No. DATA NONVOLATILE then (SFI Type) TAG No. READY	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.

Continued on next page

Adjusting the damping time

Damping time sets the unit of time for the damping constant. This constant establishes the upper limit of frequency response and the response time characteristics of the transmitter. This is used to reduce the electrical noise effect on the output signal.

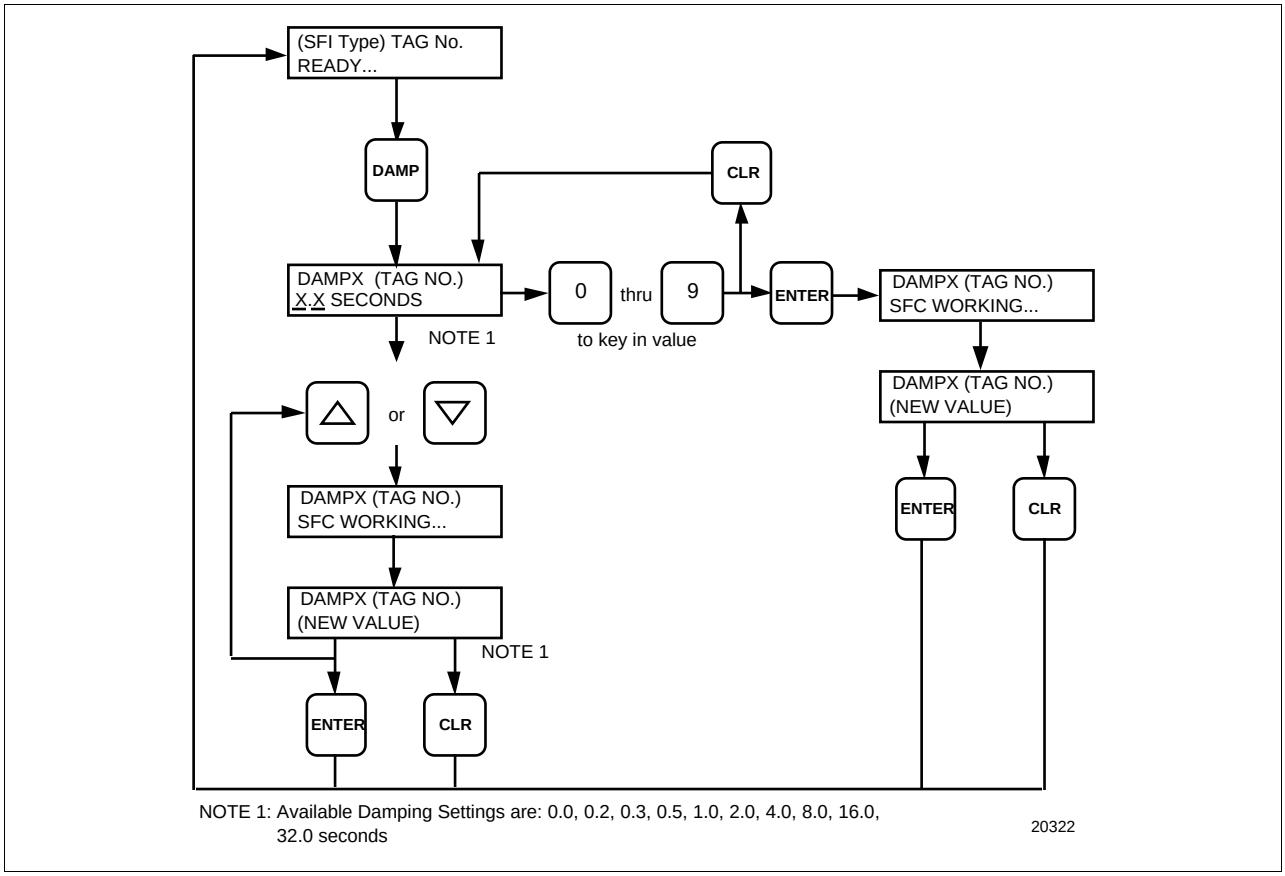
Using the SFC, you can adjust the damping by selecting a value on the SFC and send that value to the transmitter.

- The minimum value is 0.0 seconds (no damping).
- The maximum value is 32.0 seconds.

Figure 4-3 is a graphic view of the key presses required to adjust the damping time value and also gives you the settings available.

You can also key–in a value using the numbered yellow keys but the value will default to the closest value listed.

Figure 4-3 Adjusting the ST 3000 Damping Time Value



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Selecting the units in which to display values

Although the most common units for measuring pressure are inches of water or pounds per square inch, you may want it shown in another unit.

The SFC Model STS103 (Software Rev. 3.2 and up) can display the values for LRV, URV, SPAN, URL, and INPUT in one of thirteen pre-programmed units. These are:

- **PSI** Pounds per square inch
- **KPa** Kilopascals
- **MPa** Megapascals
- **mBAR** Millibar
- **BAR** Bar
- **G/cm^2** Grams per square centimeter
- **Kg/cm^2** Kilograms per square centimeter
- **inHg at 32F** Inches of mercury at 32°F
- **mmH2O at 4C** Millimeters of water at 4°C
- **mH2O at 4C** Meters of water at 4°C
- **inH2O at 39F** Inches of water at 39.2°F *
- **inH2O at 68F** Inches of water at 68°F
- **mmHg at 0C** Millimeters of mercury at 0°C

* **ATTENTION** The Honeywell factory standard for the calibration of "inches of water" transmitters is to use inches of water referenced to a temperature of 39.2°F.

When a unit is changed, the SFC automatically performs a calculation for the new value and displays the new value in whichever unit you have selected.

Table 4-2 shows you what keys to press to select a particular unit.

Table 4-2 Selecting the ST 3000 Units

Step	Press	SFC Display will Read	Result
1	D UNITS	UNITS X TAG NO. PSI	Display shows the currently selected PV number (for example: UNITS 1) and the currently selected unit. The example display shows PSI.
2	H ▲ NEXT or D UNITS	UNITS X TAG NO. KPa	Press this key until you see the required unit in the lower display. The available selections are shown above.
3	NON-VOL ENTER (YES)	UNITS X (tag no.) READY...	The SFC will now display the values for LRV, URV, SPAN, URL, and INPUT in the unit selected.

Continued on next page

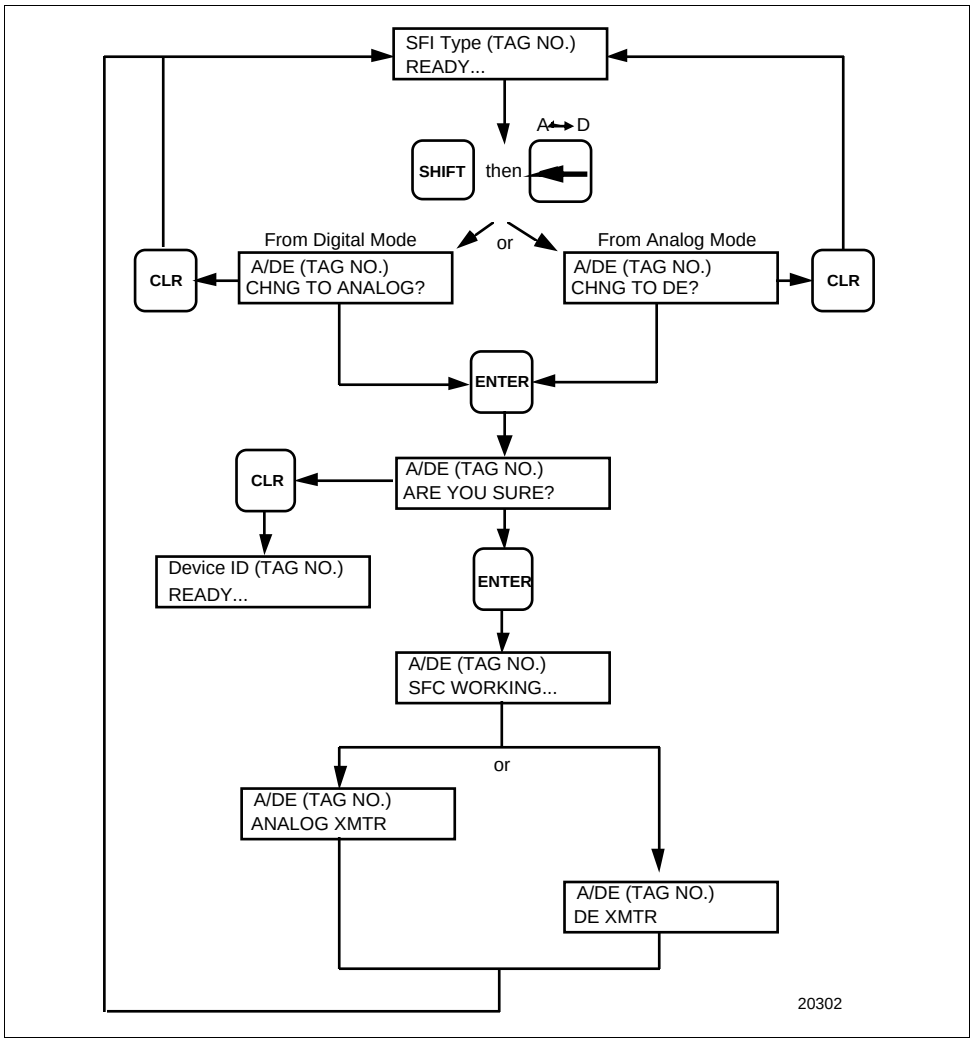
Changing the communications mode

The ST 3000 transmitter operates in either an Analog mode or a Digital mode (DE communications mode). You can quickly change from one mode to another using the SFC.

See Section 1.4 “STS103/SFI Communication” for format descriptions.

Figure 4-4 is a graphic view of the key presses required to change the communication mode.

Figure 4-4 Changing the ST 3000 Communications Mode



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Selecting configuration data for the digital (DE) communications mode

You determine how the Digital PV data is handled by configuring the DE configuration elements as shown in Table 4-3.

Table 4-3 The ST 3000 DE Configuration Elements

Element	Selections And Definitions
Type of Transmitter	This element selects the type of transmitter operation. The selections are: • **Single Range** Working range PV (PVw) for STDC card or STI module. • **Single Range W/SV** Working Range PV(PVw) with sensor temperature for STDC card or STI Module. • **Dual Range (STDC)** Full range PV (PVt) and Working range PV (PVw) (For STDC only).
Message Format	This element is the message format. The selections are: • **w/o DB (4 Byte)** 4 Byte message format (PV or SV only), without database information. • **W/DB (6 Byte)** 6 Byte message format (PV or SV with database information).
Failsafe Mode for Digital Control System	This element is the Failsafe mode. You configure the transmitter to tell the control system, via the ST/DC card, which failsafe mode to assume when the card detects a critical failure condition. A critical fault can be due to a critical status indication from the transmitter or an extended loss of PV data. The selections are: • **F/S=B/O Lo** Burnout low (drives the PV value to the downscale limit). • **F/S=B/O Hi** Burnout high (drives the PV value to the upscale limit). • **LKG** Last known good PV value. • **F/S=FSO,B/O Lo** Freeze slot output and burnout low (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller downscale to trip alarms). • **F/S=FSO, B/O Hi** Freeze slot output and burnout high (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller upscale to trip alarms). • **F/S=LKG** Freeze slot output and last known good PV (ST/DC tells the controller to hold the memory block output at the present value and provides the last known good PV value as the input to the controller).

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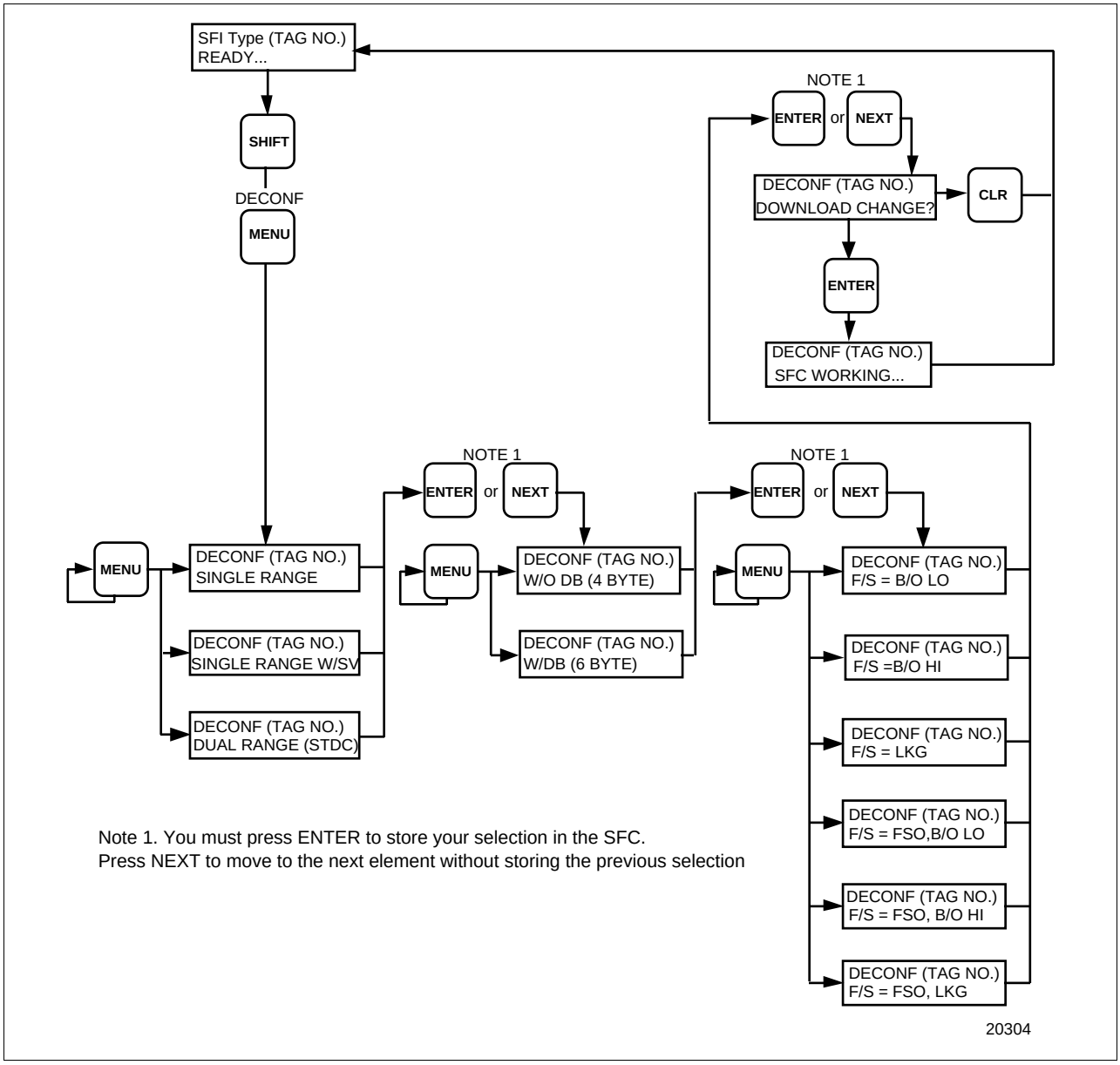
Selecting configuration data for the digital (DE) communications mode, continued

Figure 4-5 is a graphic view of the key presses required to configure the elements for DE communications mode.

Figure 4-5 Configuring the ST 3000 DE Communications Mode



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Keying-in the lower and upper range values

You can re-range a transmitter by changing the transmitter's Lower Range Value (LRV) and Upper Range Value (URV). You can re-range the transmitter to whatever values you need. Use the procedures listed in the figures that follow.

ATTENTION

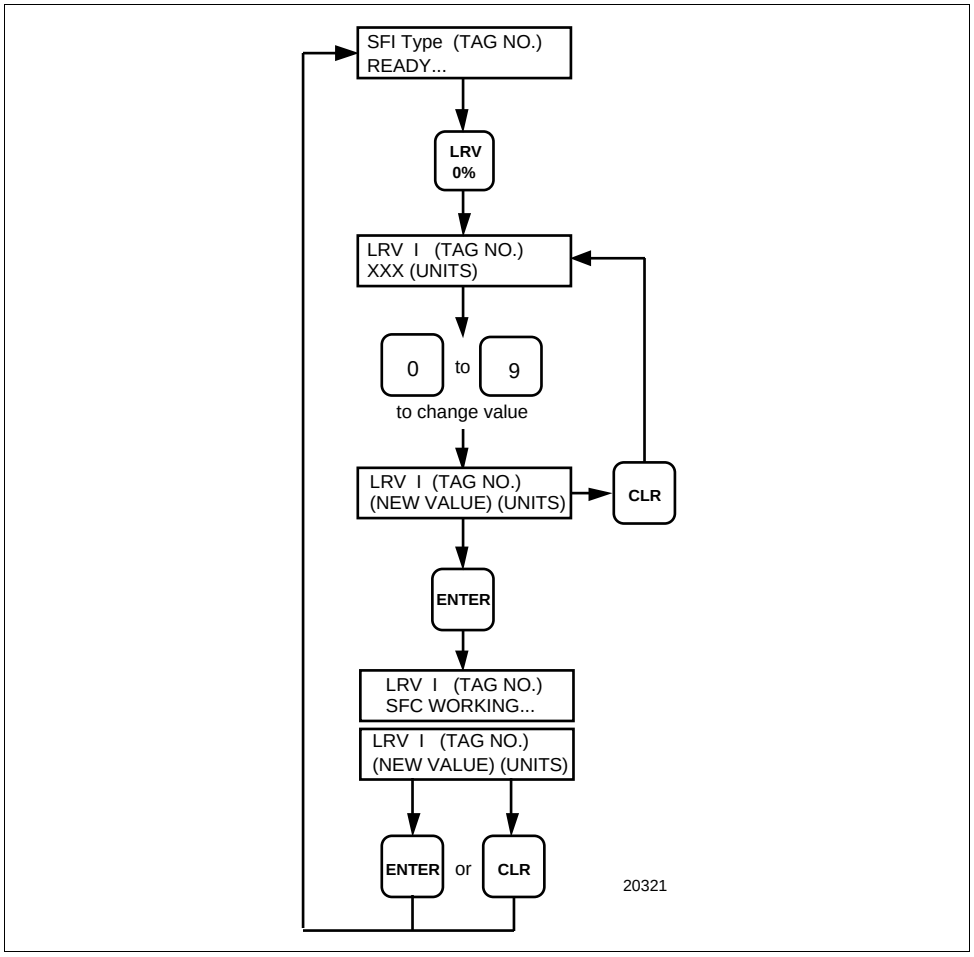
ALWAYS KEY-IN THE LOWER RANGE VALUE FIRST.

Keying-in the lower range value (LRV)

Change the LRV - Lower Range Value of a transmitter as follows:

Locate the LRV key on the keyboard and press. Figure 4-6 is a graphic view of the key presses required to change the Lower Range Value (LRV).

Figure 4-6 Changing the ST 3000 Lower Range Value (LRV)



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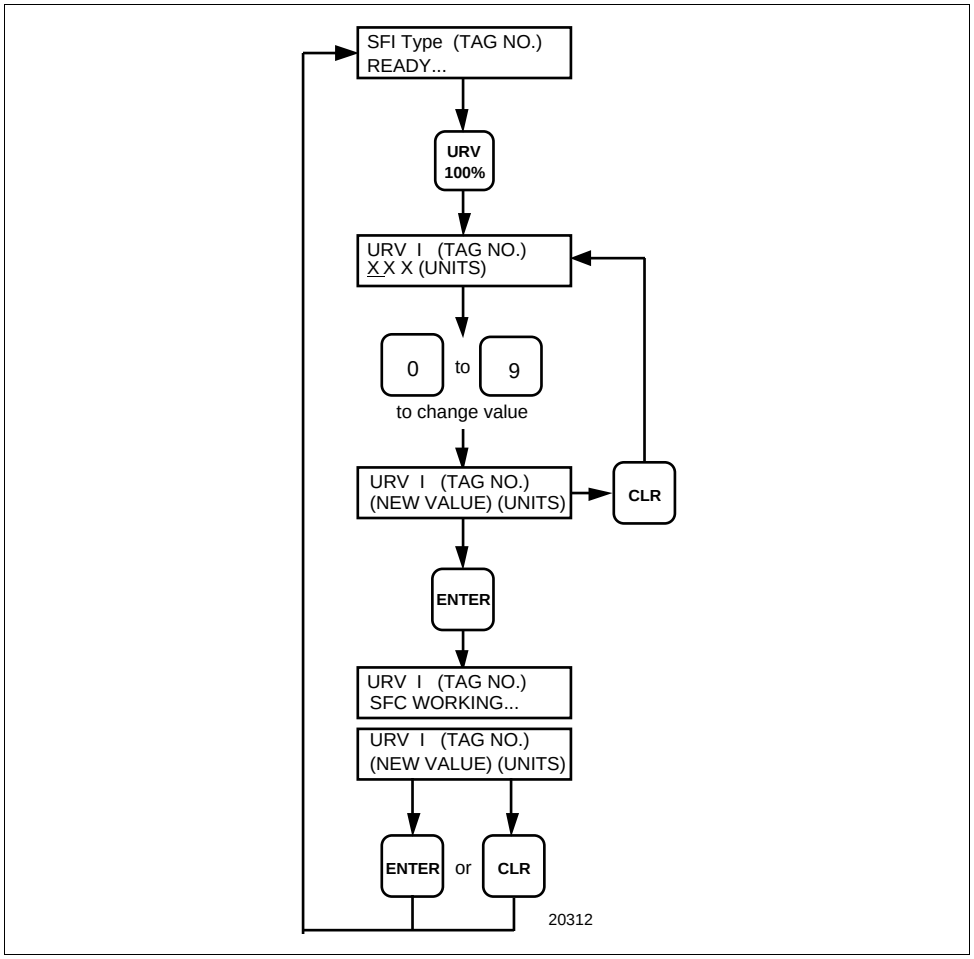
Keying-in the upper range value (URV)

Change the URV - Upper Range Value of a transmitter as follows:

Locate the URV key on the keyboard and press. Figure 4-7 is a graphic view of the key presses required to change the Upper Range Value (URV).

Figure 4-7 Changing the ST 3000 Upper Range Value (URV)



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Setting the lower and upper range values of the transmitter using an applied pressure

On some applications there may be two unknown pressures (for example: liquid level) that represent a full and empty tank that you would want to use.
The ST 3000 can set the lower and upper range values to these pressures. Follow the procedures given to set the LRV and URV using applied pressure.
If you are working on a transmitter in a process, use the actual pressure from the process. If you are working on a set up with a pressure source, simulate the pressure.

Set the lower range value

Table 4-4 is the procedure for setting the lower range value using applied pressure.

Table 4-4 Setting the ST 3000 Lower Range Value Using Applied Pressure

Step	Press	SFC Display will Read	Result
1			Apply to the transmitter the pressure that will be used as the lower range value (LRV).
2	SHIFT (^) then INPUT OUT-PUT (J)	INPUT 1 (tag no.) XX.XXX (UNITS)	This reads the input pressure. The reading will change or blink since the SFC updates it every 6 seconds. DO NOT PRESS THE NEXT KEY until the display changes so you are not trying to communicate with the transmitter when it's updating the SFC reading.
3	LRV 0% (E) then SET (G)	LRV 1 (tag no.) XX.XXX (UNITS) LRV 1 (tag no.) SET LRV?	Displays the Lower Range Value (LRV). The SFC asks if you want to set the Lower Range Value (LRV) to this input.
4	NON-VOL ENTER (YES) OR	LRV 1 (tag no.) SFC WORKING . . . then LRV 1 (tag no.) XX.XXX (UNITS)	Answers Yes. The SFC displays SFC WORKING while it sets the LRV to that reading. Next set the Upper Range Value (URV).
	CLR (NO)	LRV 1 (tag no.) XX.XXX (UNITS)	Answers No. SFC displays updated pressure value. Repeat the procedure until you enter the LRV you want.
5	SHIFT (^) then NON-VOL ENTER (YES)	LRV 1 (tag no.) SFC WORKING . . . then LRV 1 (tag no.) DATA NONVOLATILE then (SFI Type) TAG No. READY	The LRV data is entered into non-volatile memory.

Set the upper range value

Table 4-5 is the procedure for setting the upper range value using applied pressure.

Table 4-5 Setting the ST 3000 Upper Range Value Using Applied Pressure

Step	Press	SFC Display will Read	Result
1			Apply to the transmitter the pressure that will be used as the upper range value (URV).
2	^ SHIFT then INPUT J OUT-PUT	INPUT 1 (tag no.) XX.XXX (UNITS)	This reads the input pressure. The reading will change or blink since the SFC updates it every 6 seconds. DO NOT PRESS THE NEXT KEY until the display changes so you are not trying to communicate with the transmitter when it's updating the SFC reading.
3	F URV 100% then G SET	URV 1 (tag no.) XX.XXX (UNITS) URV 1 (tag no.) SET URV?	Displays the Upper Range Value (URV). The SFC asks if you want to set the Upper Range Value (URV) to this input.
4	NON-VOL ENTER (YES)	URV 1 (tag no.) SFC WORKING . . . then URV 1 (tag no.) XX.XXX (UNITS)	Answers Yes. The SFC displays SFC WORKING while it sets the URV to that reading.
	OR CLR (NO)	URV 1 (tag no.) XX.XXX (UNITS)	Answers No. SFC displays updated pressure value. Repeat the procedure until you enter the URV you want.
5	^ SHIFT then NON-VOL ENTER (YES)	URV 1 (tag no.) SFC WORKING . . . then URV 1 (tag no.) DATA NONVOLATILE then (SFI Type) TAG No. READY	The URV data is entered into non-volatile memory.

4.4 Configuration

Overview

Configuration of the ST 3000 transmitter lets you:

- Under configuration prompt “CONFORMITY?”, select the Output form for the transmitter
  – Linear or Square Root.
- Read the Sensor temperature and change the unit of measurement to
  – °F, °C, °K, or °C.
- Read the PROM serial number.
- Save data to the SFC or Restore data to the transmitter.

Selecting a parameter

Table 4-6 shows you what key to press in order to scroll through the configuration groups and select a parameter.

Table 4-6 Scrolling through the ST 3000 Parameters

Press	Result
H ▲ NEXT	Display goes to next parameter.
L ▼ PREV	Display goes to previous parameter.
NON-VOL ENTER (YES)	Enters that particular configuration parameter and allows menu selections. See figure that follows. Also enters menu item selection into SFC memory. NOTE: Under CONFORMITY group there is an element entitled “DOWNLOAD DATA?”. No newly selected menu item will be entered into ST 3000 memory until the ENTER key is pressed while “DOWNLOAD DATA?” is being displayed.
DE CONF I MENU ITEM OR A <–> DE O M → OR ←	Scrolls through the values or selections available for a particular parameter. Press ENTER key after selection is made to enter information into the SFC memory.
^ SHIFT CLR (NO)	Exits the Configuration mode and puts the SFC into a “READY” mode.
CLR (NO)	Clears from parameter to beginning of group.

Exit configuration

You can exit configuration at any time.

Press CLR until this display appears:

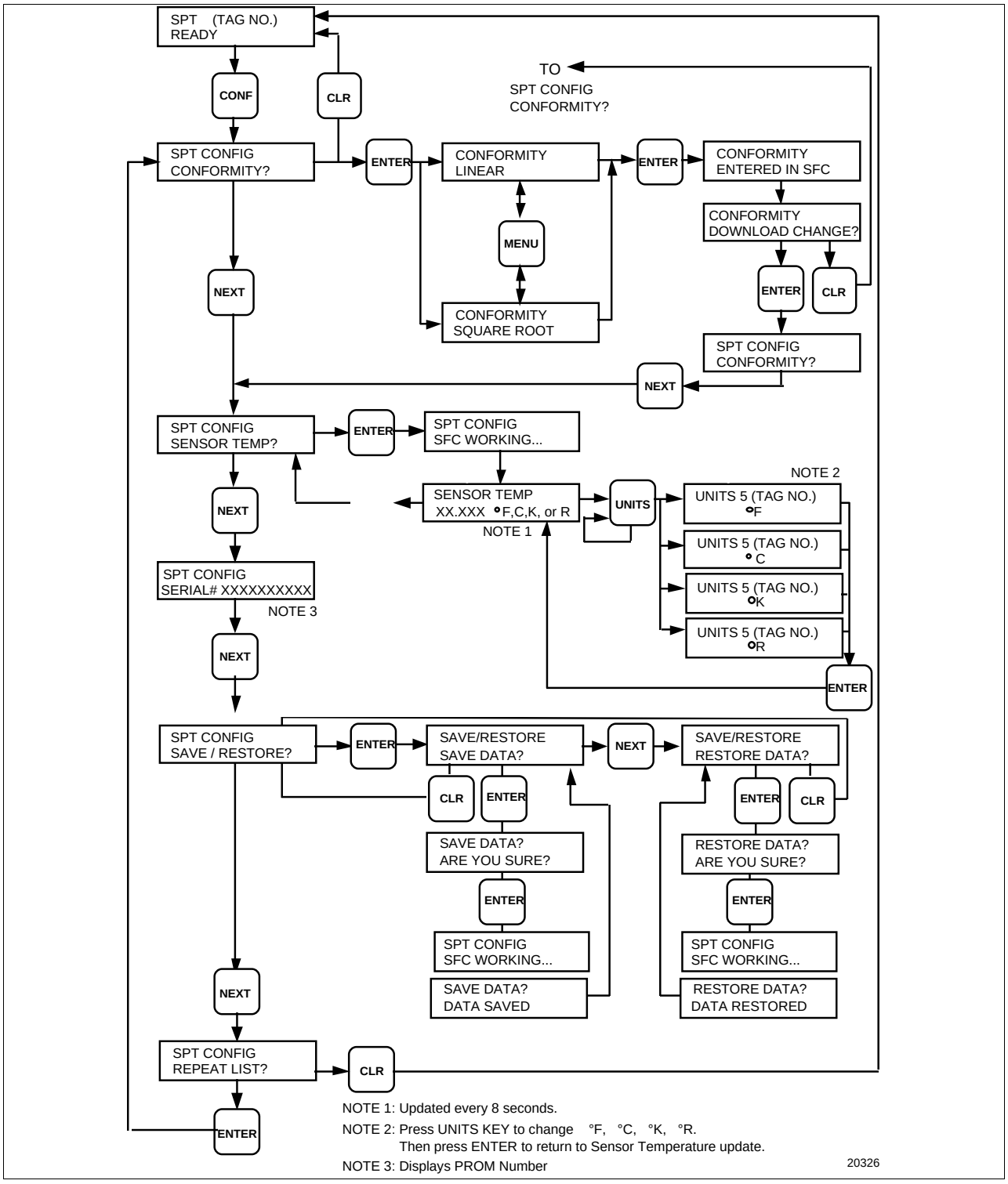
(SFI Type) TAG No.
READY

or press SHIFT CLR .

Configuration procedure

Figure 4-8 is a graphic view of the key presses required to configure the ST 3000 transmitter. Follow this procedure referring to the notes that accompany it.

Figure 4-8 Configuring the ST 3000 Transmitter



4.5 Output Calibration

Introduction

To calibrate the output of an Analog transmitter, connect a precision volt– or ammeter at the appropriate connection point on your system or use the control room display to monitor the output signal.

If the 0 or 100% output is not correct, you can do a Digital to Analog Current Output Signal Calibration.

Do a DAC calibration

With this procedure you can calibrate the digital to analog current output zero and span.

Use the procedure in Table 4-7 to enter the Output mode, check the 0% and 100% output value and if necessary, do a digital to analog current output signal calibration.

Table 4-7 ST 3000 Digital to Analog Current Output Signal Calibration

Step	Press	SFC Display will Read	Result
1			Connect a precision volt– or ammeter at the appropriate connection point on your system or use the control room display to monitor the output signal.
2	INPUT J OUT-PUT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) # 10.000 %	The SFC is ready to calibrate 0% output or 100% output.
3	Z 0	OUTP 1 (tag no.) 0 %	To select 0% output
4	NON-VOL ENTER (YES)	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) 0.0 00 %	# in display indicates the transmitter is in the Output mode.
5			Check the DVM. If the value on the DVM is 4 mA (1.00 volt), go to step 9 (100% calibration). If the value on the DVM is *not* 4 mA (1.00 volt), go to step 6 to correct DAC zero.

Table continued on next page

Do a DAC calibration,
continued

Table 4-7 ST 3000 Digital to Analog Current Output Signal Calibration (continued)

Step	Press	SFC Display will Read	Result
6	RESET K COR-RECT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) CORRECT DAC ZERO	Allows correction of DAC zero.
7	H ▲ NEXT or L ▼ PREV	OUTP 1 (tag no.) INC 1 COUNTS or OUTP 1 (tag no.) DEC 1 COUNTS then OUTP 1 (tag no.) CORRECT DAC ZERO	Repeat increments or decrements to adjust the value on the DVM to 4 mA (1.00 volt). When 4 mA(1.00 volt) is shown on the DVM, go to step 8.
8	INPUT J OUT-PUT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) 0.0 00 %	0% output calibrated, go to step 9, 100% calibration.
9	V 1 Z 0 Z 0	OUTP 1 (tag no.) 100__ %	This selects 100% output. # in display indicates the transmitter is in the Output mode.
10	NON-VOL ENTER (YES)	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) 100.0 %	Check the DVM: If the value on the DVM is 20 mA (5.000 volts), go to step 13. If the value on the DVM is *not* 20 mA (5.000 volts), go to step 11 to correct DAC span.
11	RESET K COR-RECT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) CORRECT DAC ZERO	Allows correction of DAC span.

Table continued on next page

Do a DAC calibration,
continued

Table 4-7 ST 3000 Digital to Analog Current Output Signal Calibration (continued)

Step	Press	SFC Display will Read	Result
12	H ▲ NEXT or L ▼ PREV	OUTP 1 (tag no.) INC 1 COUNTS or OUTP 1 (tag no.) DEC 1 COUNTS then OUTP 1 (tag no.) CORRECT DAC ZERO	Repeat increments or decrements to adjust the value on the DVM to 20 mA (5.00 volts). When 20 mA (5.000 volts) is shown on the DVM, go to step 13.
13	INPUT J OUT-PUT then CLR (NO)	(SFI Type) TAG No. READY	Exits DAC calibration mode. Exits OUTPUT mode.

4.6 Operation

Overview

The STS103 displays all the operating data for the ST 3000 Pressure Transmitter. This data includes:

- Transmitter I.D.
- Damping value
- Lower range value
- Upper range value (span)
- Configuration elements for Digital Communications mode
- Input value
- Output Value
- Span value
- Upper range limit
- Engineering units
- Operation Status
- Software Version Number
- Failsafe Direction
- Zero Point adjustment
- Display and Keyboard Test
- Read Scratch Pad messages

Refer to Table 4-5 for Operating Data access instructions.

Continued on next page

Operating data

Table 4-8 shows you what key to press and what the associated displays will be when you access each of the operating data.

Table 4-8 ST 3000 Operating Data

Operating Data	Press	Displays (Displays are examples)	Result
Transmitter I.D (ANALOG)	DE READ ID (A) NON-VOL ENTER (YES)	(SFI Type) TAG No. TRIPS SECURED? YYYY XX TAG NO. 12345678	**Analog Communications Mode** YYYY = Output Form LIN – Linear SQRT – Square Root XX = Type of Transmitter DP - Differential Pressure AP – Absolute Pressure GP – Gauge Pressure
	or	or	
(DIGITAL)	DE READ ID (A)	DE XMTR TAG NO. 12345678	**Digital Communications Mode** Lower Display is the device I.D
Damping Value	DAMP (C)	DAMP 1 (tag no.) X.X SECONDS	Damping Time is displayed in seconds.
Upper Range Value	URV 100% (F)	URV 1 (tag no.) (value) (Units)	Upper Range Value (span) The value of Input which will generate 100% Output.
Lower Range Value	LRV 0% (E)	LRV 1 (tag no.) (value) (Units)	Lower Range Value (zero) The value of Input which will generate 0% Output.
Digital Communications Mode Configuration Elements	SHIFT (^) then DE CONF MENU ITEM (I)	DE CONF (tag no.) SINGLE RANGE	Type of Transmitter operation.
	NEXT (H)	DE CONF (tag no.) w/o DB (4byte)	Broadcast Message Format
	NEXT (H)	DE CONF (tag no.) F/S=B/O Lo	Burnout Mode
Input Value	SHIFT (^) then INPUT OUT-PUT (J)	INPUT 1 (tag no.) 0.0000 PSI	Indicates the pressure (in an engineering unit of measure)

Table continued on next page

Operating Data,
continued

Table 4-8 ST 3000 Operating Data (continued)

Operating Data	Press	Displays (Displays are examples)	Result
Output Value	INPUT J OUT-PUT	OUTP 1 (tag no.) 0.000%	Indicates the percent(%) output The value is displayed and updated every 5 seconds.
Currently Running Span	URL Y SPAN	SPAN 1 (tag no.) 100.00 PSI	Span is the URV-LRV or the range of input corresponding to a full range (0-100%) of output.
Upper Range Limit	^ SHIFT then URL Y SPAN	URL 1 (tag no.) 100.00 PSI	The highest value of the measured variable that a device can be adjusted to measure.
Engineering Units	D UNITS	UNITS 1 (tag no.) PSI	The present selection of engineering units.
Operation Status	F/S DIR U STAT	STATUS (tag no.) STATUS CHECK=OK	Momentary Display. Indicates the status of operation at the present time.
Failsafe Direction	^ SHIFT then F/S DIR U STAT	F/S DIR (tag no.) SFC WORKING – XX% then F/S DIR (tag no.) F/SAFE DOWNSCALE	Displays the Failsafe Burnout direction , upscale or downscale, for analog devices.
Software Version	^ SHIFT then SW VER X 3 then H ▲ NEXT	S/W No. (tag no.) SFC=X.X XMTR=X.X S/W No. (tag no.) DD-MM-YY HH:MM	Displays the STS103 and ST 3000 software version numbers, date and time stamp.

Table continued on next page

Operating Data,
continued

Table 4-8 ST 3000 Operating Data (continued)

Operating Data	Press	Displays (Displays are examples)	Result
Zero Point Adjustment	SHIFT (^) then INPUT OUT-PUT (J) RESET COR-RECT (K) NON-VOL ENTER (YES)	INPUT 1 (tag no.) 0.0000 PSI INPUT 1 (tag no.) ZERO INPUT? INPUT 1 (tag no.) INPUT ZEROED	Request to Zero Input. Press CLR to Exit. A physical input equivalent to 0% must be applied before pressing the ENTER key Zero adjustment is automatically done within approximately 20 seconds after pressing the ENTER key.
Display and Keyboard Test	SHIFT (^) then 2 (W) CLR (NO)	DISPLAY TEST **DISPLAY OK** then KEYBOARD TEST ROW * COLUMN *	Display test indication. You can test each key on the keyboard For example: If you press INPUT OUT-PUT (J) the display will read KEYBOARD TEST ROW 3 COLUMN 2 to clear
Access the scratch pad message	SHIFT (^) then SCR PAD ■	SCR PAD (tag no.) SFC WORKING . . . then SCRATCH PAD 1 XXXXXXXXXXXXXXX	Displays the scratch pad message. Press the NEXT key to switch from SCRATCH PAD 1 to SCRATCH PAD 2

4.7 Diagnostics and SFC Messages

Introduction

The ST 3000 and the STS103 both run continuous self-diagnostics. This means that they are constantly testing the communications, the loop, and themselves.

Any time you want results of these diagnostics, press the STAT key.

The SFC displays its report, in the form of messages, which identify diagnostic conditions.
Diagnostic conditions are broken down into three categories:

- OK status
- critical status
- a non-critical condition

OK Status

An OK condition means no problem exists, and the display looks like this:

```
STATUS  (tag no.)
STATUS CHECK=OK
```

Critical status

A critical condition means that the transmitter is not functioning properly. When this occurs, the transmitter goes into upscale burnout and maintains an output of 21.8 mA, or into downscale burnout and maintains an output of less than 3.9 mA. The message CRITICAL STATUS interrupts your operation and is followed by the message PRESS STATUS.

After the PRESS STATUS message, you press the STAT key to find out what problem exists. You will receive one or more messages. Take whatever corrective action necessary to solve the problem. Remember that the transmitter will stay in upscale or down scale burnout until the condition is corrected.
If the transmitter sends more than one message, each message will be displayed in the order of importance for about 5 seconds. If you need to see them again, press the STAT key again.

Non-critical status

A non-critical condition means that although a problem exists, the transmitter is still operating. When a non-critical condition occurs a "#" character appears on the right side of the display, along with whatever you're displaying at the time.

This character means press the STAT key because some type of a problem exists. Again, one or more messages will appear on the display for about five seconds each.

Low battery voltage

When the battery voltage becomes low, a colon "**:**" will appear in the middle of the display. It stays on the display until you either charge or replace the batteries.

Continued on next page

4.7 Diagnostics and SFC Messages, Continued

Diagnostic messages

Table 4-9 is a list of all the diagnostic messages that can appear when using the STS103 with a ST 3000 Pressure Transmitter.
They are listed in alphabetical order along with the problem associated with the message and the corrective action to take when the message appears.

Table 4-9 Diagnostic Messages for SFC and ST 3000

Message	Problem	Corrective Action
SFC FAULT or **FAILURE**	SFC communication is not possible due to a detected SFC problem.	• Press [STAT] key to obtain other messages. • Replace the SFC.
CHAR PROM FAULT	The characterization PROM is not functioning correctly.	• Replace the characterization PROM with an identical PROM, or if needed, replace the entire meter body and PROM with a matching spare unit. Press [CONF] and [NEXT] twice to display the PROM serial number.
CORRECTS RESET	Recalibration is required to obtain the required accuracy.	• Calibrate the upper range value.
ELECTRONIC FAULT	A component of the transmitter electronics module is not functioning properly.	• Replace the electronics module in the transmitter. Do not SAVE the data in the transmitter memory since it may not be correct.
ENTRY>SENS RNG	The number entered is beyond 1.5 times the upper range limit of the sensor.	• Press the [CLR] key, check the parameter, and start again.
EXCESS ZERO CORR	The ZERO correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value. • Check the meter body on the pressure transmitter.
EXCESS SPAN CORR	The SPAN correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value. • Check the meter body on the pressure transmitter.
EXCESSIVE OUTPUT	The requested output percent in the output mode is too high or too low. The limits are –1.25% to +105%.	• Press the [CLR] key, check the parameter, and start again.
FAILED COMM CHK	The SFC failed a communication diagnostic check. This could be a SFC electronics problem or a faulty or dead communication loop.	• Try communicating again. • Press the [STAT] key. If a loop fault message appears, do the corrective action and try again. • If the Comm error continues, replace the SFC.

Table continued on next page

Diagnostic Messages,
continued

Table 4-9 Diagnostic Messages for SFC and ST 3000 (continued)

Message	Problem	Corrective Action
HI RES/LOW VOLT	Either there is too much resistance in the loop (open circuit), the voltage is too low, or both.	• Check the wiring connections and the power supply. There must be 11 Volts minimum at the transmitter to permit operation.
H.W. MISMATCH	Hardware mismatch. Part of Save/Restore function.	• None - SFC tried to restore as much of the database as possible.
ILLEGAL RESPONSE	SFC received an illegal response from the SFI.	• Try communicating again.
INVALID DATABASE	The database of the transmitter was not correct at power up.	• Try communicating again. • Verify the database, re-calibrate the transmitter and then manually update the non-volatile memory.
INVALID REQUEST	• The transmitter is being asked to correct or set its URV to a value that results in too low a span, or being asked to correct its LRV or URV while in the output mode. • The given key function is not valid for the associated transmitter.	• Check that the proper calibrated URV input is being applied to the transmitter, or that the transmitter is not in the output mode. • Check that the key function is applicable for a pressure transmitter.
IN OUTPUT MODE	The transmitter is operating as a current source.	• Press the OUTPUT and CLR keys if you want to exit the output mode.
LOW LOOP RES	Not enough resistance in series with the communication loop.	• Check the sensing resistor and verify at least 250 Ohms resistance in the loop.
M B OVERLOAD or **METERBODY FAULT**	The pressure input is greater than two times the upper range limit of the transmitter.	• Check the process value to determine if the appropriate transmitter model is installed. • The meterbody may have been damaged. • Do a complete performance check.
NACK RESPONSE	The SFI sent a negative acknowledgment because one or more of the commands could not be processed by the SFI.	• Check the configuration and try again.
NO DAC TEMP COMP	R-250 electronics board has been used in a series 600 transmitter and subsequently in a series 100 transmitter. Coefficients for a special temperature compensation algorithm unique to series 100/R-250 have been wiped from memory.	No corrective action possible. Effect will be a minor degradation of ambient temperature influence specifications.

Table continued on next page

Diagnostic Messages,
continued

Table 4-9 Diagnostic Messages for SFC and ST 3000 (continued)

Message	Problem	Corrective Action
NO H W FAILSAFE	Connected transmitter does not support a hardware jumper.	
NO XMTR RESPONSE	No response from the transmitter. It may be a transmitter or loop problem.	• Try communicating again. • Press the [STAT] key and do any corrective action required. • Check that the transmitter's loop integrity has been maintained and that the SFC is connected.
NVM FAULT	Non-volatile memory fault.	• Replace the transmitter.
NVM ON SEE MAN	The SFC's CPU is misconfigured	• Replace the SFC.
OPTION MISMATCH	On a database restore, one or more options do not match.	• None - SFC tried to restore as much of the database as possible.
>RANGE	The value to be displayed is over the range of the display.	• Press the [CLR] key and start again.
RESTORE FAILED	Part of the Save/Restore function.	• Check the transmitter and try again.
SENSOR OVER TEMP	The meter body temperature is too high. Accuracy and life-span may decrease if it remains too high.	• See the pressure transmitter Installation section of the Product Manual for temperature limits and suggested protections against over-temperature.
SENSOR TEMP FAIL	The ST 3000 temperature sensor has failed.	• Replace the transmitter.
SFC FAULT	A component of the SFC is not operating properly.	• Try communicating again. If the condition still exists, replace the SFC.
SUSPECT INPUT	The input process data seems to be wrong. This could be a process problem, but it could also be a meterbody, or pressure transmitter, or electronics problem.	• Put the transmitter into the output mode and press the [STAT] key. The message will identify where the problem is. In the absence of any other diagnostic messages, the condition is most likely meterbody related. • Check the installation, and if the condition persists, replace the meter body.
TYPE MISMATCH	On a database restore, the transmitter types are not the same.	• None - SFC tried to restore as much of the database as possible.
UNKNOWN	Selection is unknown.	Have the software in your SFC updated.

4.8 Troubleshooting

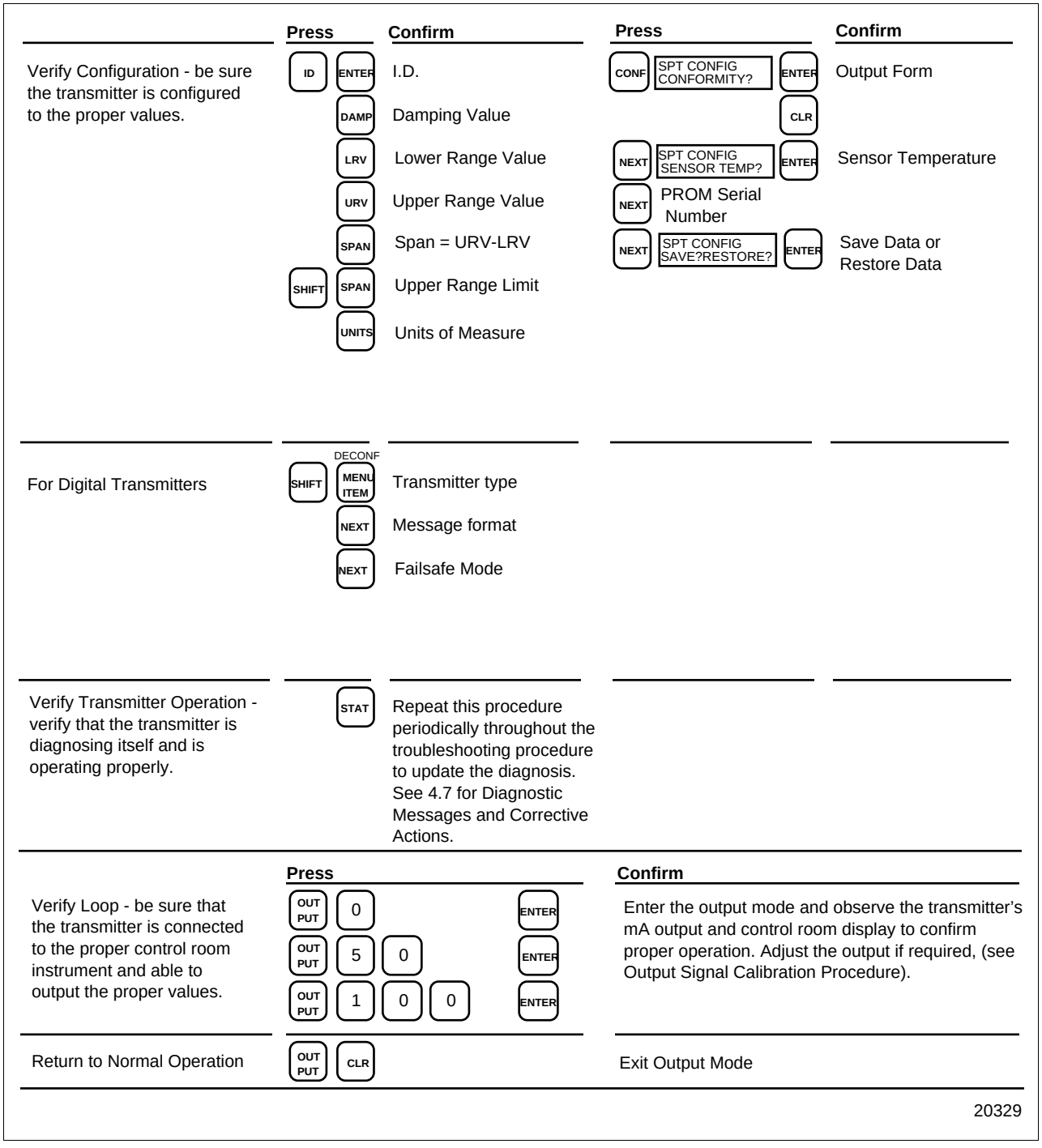
Introduction

If you suspect a problem in the transmitter, check the transmitter configuration, operation, and output. Use the procedure shown in Figure 4-9. Refer to Section 4.7 for diagnostic messages and corrective action.

Troubleshooting procedure

Check the parameters listed in Figure 4-9 to confirm proper configuration, operation, and output.

Figure 4-9 ST 3000 Troubleshooting Procedure



Section 5 —STT 3000 Temperature Transmitter

5.1 Overview

Introduction

This section contains all the information you will need to know in order to wire, set-up, configure, operate, troubleshoot, and calibrate STT 3000 Smart Temperature Transmitters using the STS103 Smart Field Communicator.

Refer to the STT 3000 transmitter user's manual for operating and installation information.

Make sure you have become familiar with the STS103 operations that are more or less the same for every transmitter.

This section gives you the keystrokes and displays that are specific for SFC communications with the following STT 3000 Smart Temperature Transmitter models:

- STT350
- STT302
- STT300
- STT25D
- STT25M

What's in this section?

This section contains the following topics:

5.2 Wiring

Overview

Establish communications with the STT 3000 by connecting the SFC leads to the 4–20 mA line of the Transmitter.

Your choices are either at a junction box somewhere along the 4–20 mA line, on the field side of the intrinsic safety barrier panel in the control room, or at the transmitter itself.

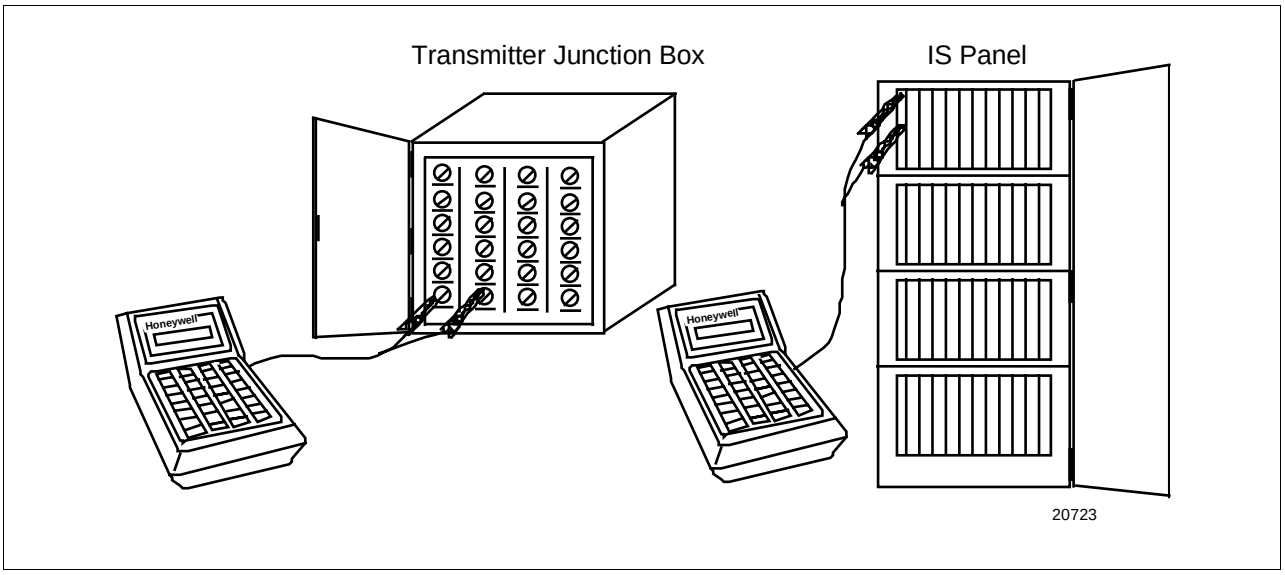
Following are examples for connecting to all these places. Use the one you need.

Connecting the STS103 to junction boxes and IS panels

The STS103 connects to STT 3000 transmitters, IS Panels, and junction boxes through a pair of wires with alligator clips on the ends. The STS103 communications terminal end of the wires has a stereo phone jack connection that is inserted into the communications terminal. The other end of the wires are clipped onto terminals in the junction box or IS barrier panel, or directly to the transmitter. The red SFC lead connects to the junction box or SFI positive terminal, the black lead to the negative terminal.

Figure 5-1 shows the STS103 connected to a junction box or an IS barrier panel.

Figure 5-1 STS103 – Junction Box and IS Connection



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STS103 - STT 3000 connection

Figures 5-2, 5-3 and 5-4 show the STS103 connected directly to the positive and negative terminals of various STT 3000 transmitters. The STS103 can connect to only one STT 3000 at a time.

Figure 5-2 STS103 Connections to Model STT350 Transmitter

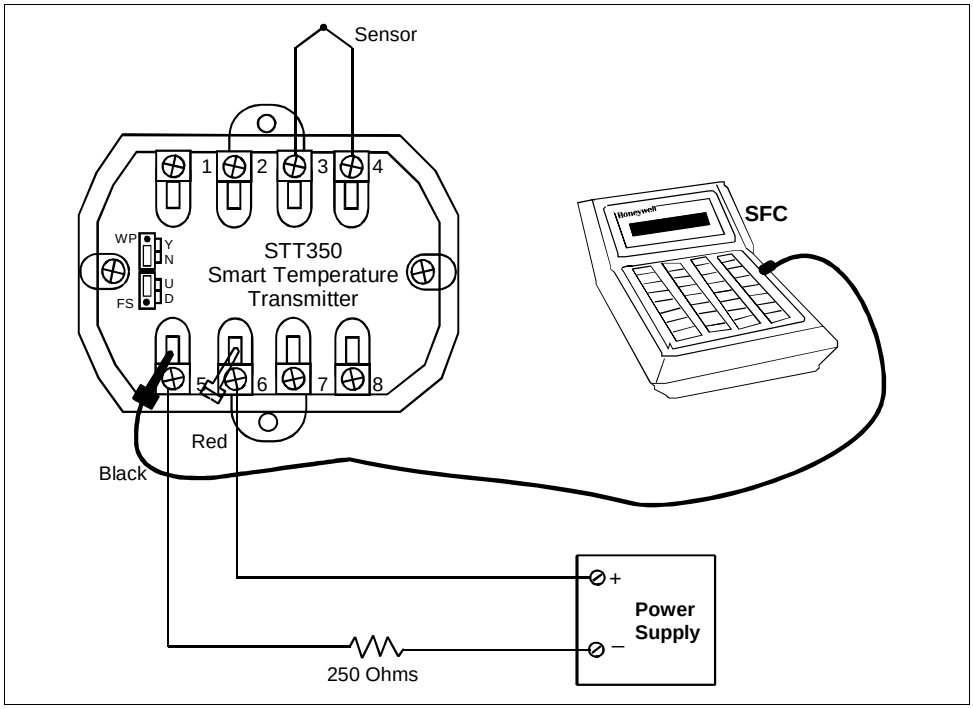
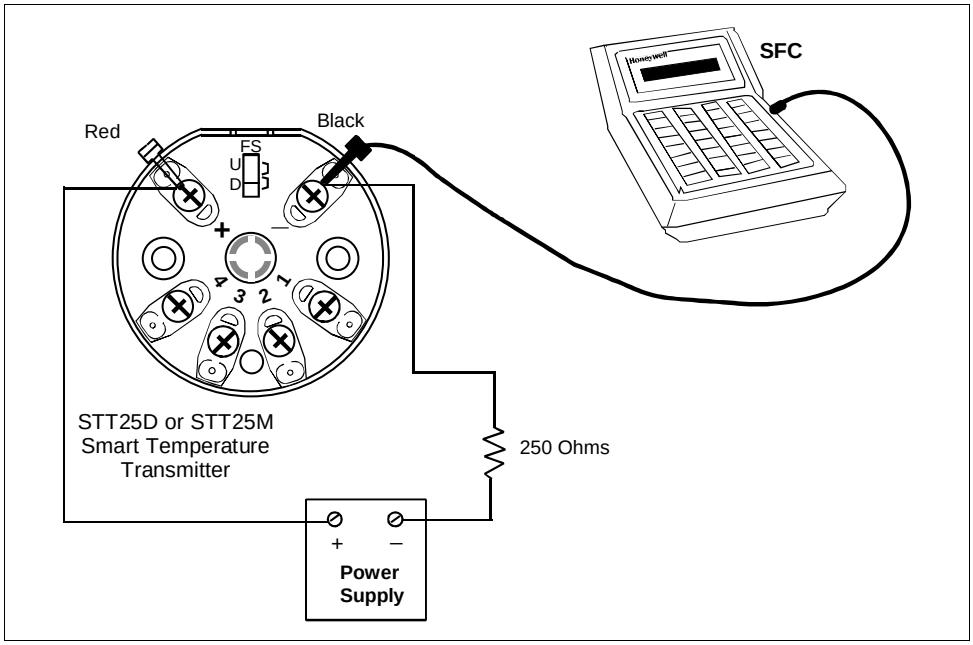


Figure 5-3 STS103 Connections to Model STT25D or STT25M Transmitters



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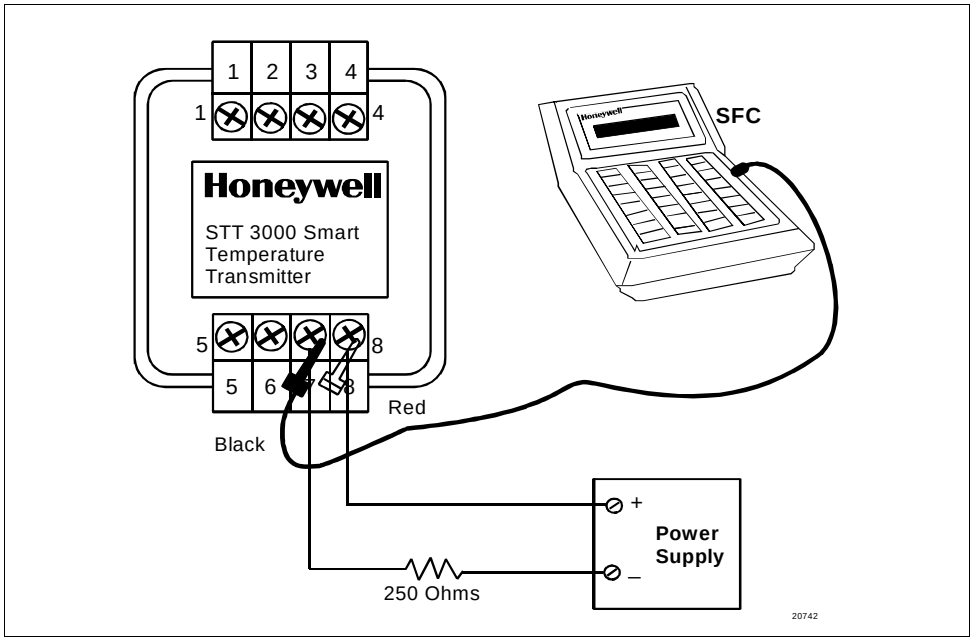
STS103 - STT 3000 connection, continued

Figure 5-4 STS103 Connections to Model STT300 and STT302 Transmitters



WARNING

When the junction box cover on the transmitter is removed, the housing is NOT explosion-proof.

STS103 charging terminal

The NiCd battery pack is charged through a battery charger that plugs into the charging terminal. The charger inputs 110 or 220 Vac 50/60 Hz and outputs 7 Vdc 180 mA to the NiCd battery pack.

The connector of the battery charger is inserted into the charging terminal on left side of the STS103 near the ON/OFF switch.

5.3 Set-up

Overview

Setting up the STT 3000 Temperature Transmitter consists of:

- Keying-in the I.D. and Uploading the Database
- Adjusting the Damping time
- Selecting the units in which to display values
- Selecting the STT 3000's communication mode.
- Selecting the type of configuration for the transmitter in the Digital Communications Mode.
- Keying-in the Lower Range value and Upper Range value (Span) using the keyboard.
- Keying-in the Lower Range value and Upper Range value (Span) using applied Temperature

Keying-in the I.D. and uploading the database

The procedure listed in Table 5-1 gives you the steps required to key–in an ID and upload the database for the STT 3000.

ATTENTION

You will note in the procedure that:

- The database for an *Analog* transmitter is automatically read or uploaded to the SFC when you press [ENTER] in response to the "TRIPS SECURED" prompt.
- The database for a *Digital* transmitter is read or uploaded when you press the [SHIFT] [I D] keys.

Table 5-1 Keying–in the STT 3000 ID and Database Procedure

Step	Press	SFC Display will Read	Result
ANALOG TRANSMITTERS (For Digital Transmitters - see step 4)			
1	**DE READ** **ID** (A)	TAG NO. TRIPS SECURED?.	
	NON-VOL **ENTER** (YES)	TAG NO. SFC WORKING . . . Then STT TAG NO. XXXXXXXX	The database is loaded into the SFC at this point for analog transmitters. **STT** on the top line identifies that it is a Temperature Transmitter. Notice the line under the first character of the ID on the bottom line. This is the cursor and indicates where you can key–in an ID. Alpha/numeric entries of up to 8 characters are permitted. If the STT 3000 was not given an ID, the line will be blank with a cursor.

Table continued on next page

Keying–in the ID and uploading the database, continued

Table 5-1 Keying–in the STT 3000 ID and Uploading the Database Procedure (continued)

Step	Press	SFC Display will Read	Result
2	NUM / ALPHA until you see	STT TAG NO. * or STT TAG NO. ▮	An * indicates that the prompt is looking for an alpha character. The letters are located in the upper right corner of the keys. A ▮ indicates the prompt is looking for a number. The numbers are on the yellow keys. Press NUM/ALPHA key to change from Alpha to Numeric mode or vice versa. One of the symbols appears on the display and in place of the first character of the old ID. The rest of the old ID disappears. Key–in your ID using the NUM/ALPHA key and the letters and numbers on the keys.
3	NON-VOL ENTER (YES)	STT TAG NO. SFC WORKING . . . then STT TAG NO. (New ID)	The ID and database are loaded.
DIGITAL TRANSMITTERS			
4	DE READ A ID	TAG NO. SFC WORKING . . . Then DE-XMTR TAG No. XXXXXXXX	The top line indicates that the transmitter is configured for **DE Communications mode**. Notice the line under the first character of the ID on the bottom line. This is the cursor and indicates where you can key–in an ID. Alpha/numeric entries of up to 8 characters are permitted. If the STT 3000 was not given an ID, the line will be blank with a cursor.
5	NUM / ALPHA until you see	STT TAG NO. * or STT TAG NO. ▮	An * indicates that the prompt is looking for an alpha character. The letters are located in the upper right corner of the keys. A ▮ indicates the prompt is looking for a number. The numbers are on the yellow keys. Press NUM/ALPHA key to change from Alpha to Numeric mode or vice versa. One of the symbols appears on the display and in place of the first character of the old ID. The rest of the old ID disappears. Key–in your ID using the NUM/ALPHA key and the letters and numbers on the keys.

Keying–in the ID and uploading the database, continued

Table 5-1 Keying–in the STT 3000 ID and Uploading the Database Procedure (continued)

Step	Press	SFC Display will Read	Result
DIGITAL TRANSMITTERS, continued			
6	NON-VOL ENTER (YES)	STT TAG No. SFC WORKING . . . then STT TAG NO. (New ID)	The ID is loaded into the transmitter.
7	^ SHIFT then DE READ A ID	STT TAG NO. SFC WORKING – XX% then STT TAG NO. (New ID)	This loads the Digital Transmitter database to the SFC. The display indicates the percent of the database being loaded until it reaches 100%.

Copying data into non-volatile memory

When setting-up or configuring a ST 3000, whether you are changing one element or a full database, you must copy all configuration data into the transmitter's non-volatile memory. This is the transmitter's permanent memory. If the transmitter were to lose power, the values for the database will be saved here.
The transmitter also contains a working memory that loses its contents if the power goes off; and when power is restored, the transmitter copies the contents of the non-volatile memory into the working memory.

There is a failsafe procedure. Thirty seconds after a value is changed, the transmitter automatically copies it into the non-volatile memory. But, if you change an element and power goes down before this runs, you will still lose the data in the working memory. Therefore, whenever you make any changes in the transmitter, always end your procedure as follows:

Press	Displays will Read	Result
^ SHIFT then NON-VOL ENTER (YES)	STT TAG NO. SFC WORKING . . . then STT TAG NO. DATA NONVOLATILE then STT TAG NO. READY	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.

Continued on next page

Adjusting the damping time

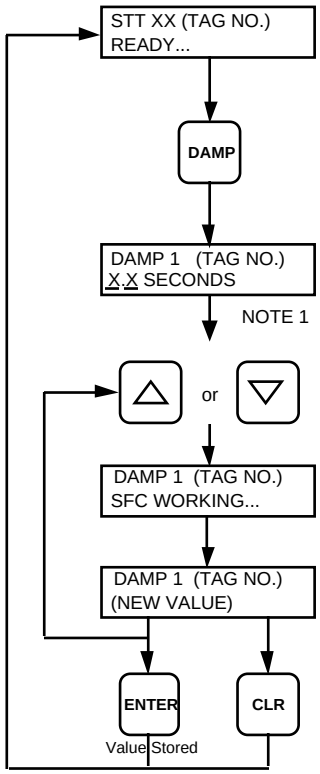
Damping time sets the unit of time for the damping constant which establishes the upper limit of frequency response and the response time characteristics of the transmitter. This is used to reduce the electrical noise effect on the output signal.

Using the SFC, you can adjust the damping by selecting a value on the SFC and send that value to the transmitter.

- The minimum value is 0.0 seconds (no damping).
- The maximum value is 102.3 seconds.

Figure 5-5 is a graphic view of the key presses required to adjust the damping time value and also gives you the selections available.

Figure 5-5 Adjusting the STT 3000 Damping Time Value



NOTE 1: Available Damping Settings are: 0.0, 0.3, 0.7, 1.5, 3.1, 6.3, 12.7, 25.5, 51.1, 102.3 seconds.

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Setting the units in which to display values

Upon power up, the SFC always displays units in degrees C for any STT 3000 transmitter. You may want temperature shown in another unit.

The SFC can display the values for LRV, URV, SPAN, URL, LRL, +Hi/Lo PV, and INPUT in one of several pre-programmed units. These are:

- °F degrees Fahrenheit
- °C degrees Celsius
- °R degrees Rankine
- °K degrees Kelvin

In the case of non-linear inputs
(Configuration selection O/P=NON_LINEAR - See Section 5.4)

- MV Millivolts
- Ω Ohms

When a unit is changed, the SFC automatically performs a calculation for the new value and displays the new value in whichever unit you have selected.

Table 5-2 shows you what keys to press to select a particular unit.

Table 5-2 Selecting the STT 3000 Units

Step	Press	SFC Display will Read	Result
1	D UNITS	UNITS 1 (TAG NO) °F	Display shows the currently selected unit. The example display shows degrees Fahrenheit.
2	H ▲ NEXT or D UNITS	UNITS 1 (TAG NO) °C	Press this key until you see the required unit in the lower display. The available selections are shown above. The SFC will now display the values in the unit selected.

ATTENTION

You can also separately select units for the ECJT (External Cold Junction Temperature) by pressing the Units key while in “Probe Config” display showing ECJT. See Section 5.4 “Configuration” for details.

Continued on next page

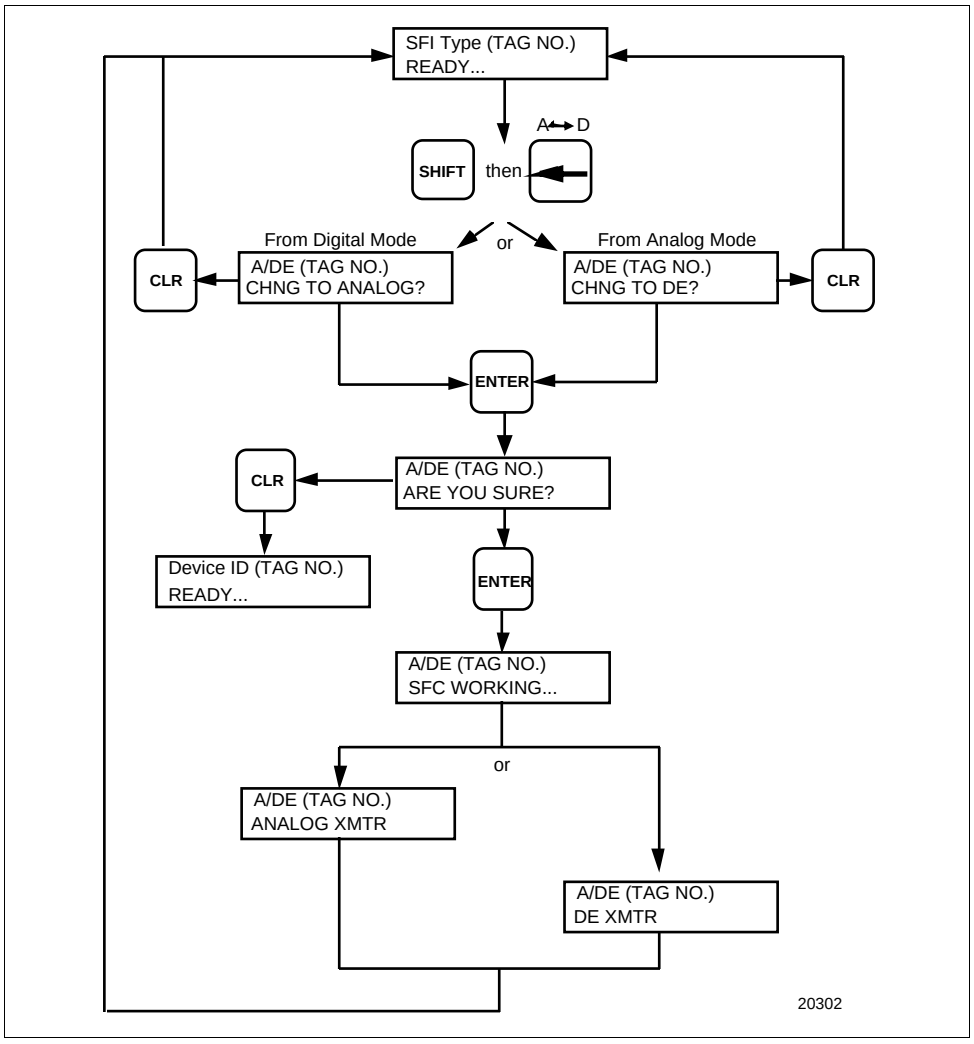
Changing the communications mode

The STT 3000 transmitter operates in either an Analog mode or a Digital mode (DE communications mode). (Model STT25M operates in analog mode only). You can quickly change from one mode to another using the SFC.

See Section 1.4 “STS103/SFI Communication” for format descriptions.

Figure 5-6 is a graphic view of the key presses required to change the communication mode.

Figure 5-6 Changing the STT 3000 Communications Mode



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Selecting configuration data for the digital (DE) communications mode

You determine how the Digital PV data is handled by configuring the DE configuration elements shown in Table 5-3.

Table 5-3 STT 3000 DE Configuration Elements

Element	Selections And Definitions
Type of Transmitter	This element selects the type of transmitter operation. The selections are: • **Single Range** Working range PV (PVw) for STDC card or STI module. • **Single Range W/SV** Working Range PV(PVw) with sensor temperature for STDC card or STI Module. • **Dual Range (STDC)** Full range PV (PVt) and Working range PV (PVw) (For STDC only).
Message Format	This element is the message format. The selections are: • **w/o DB (4 Byte)** 4 Byte message format (PV or SV only), without database information. • **W/DB (6 Byte)** 6 Byte message format (PV or SV with database information).
Failsafe Mode for Digital Control System	This element is the Failsafe mode. You configure the transmitter to tell the control system, via the ST/DC card, which failsafe mode to assume when the card detects a critical failure condition. A critical fault can be due to a critical status indication from the transmitter or an extended loss of PV data. The selections are: • **F/S=B/O Lo** Burnout low (drives the PV value to the downscale limit). • **F/S=B/O Hi** Burnout high (drives the PV value to the upscale limit). • **LKG** Last known good PV value. • **F/S=FSO,B/O Lo** Freeze slot output and burnout low (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller downscale to trip alarms). • **F/S=FSO, B/O Hi** Freeze slot output and burnout high (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller upscale to trip alarms). • **F/S=LKG** Freeze slot output and last known good PV (ST/DC tells the controller to hold the memory block output at the present value and provides the last known good PV value as the input to the controller).

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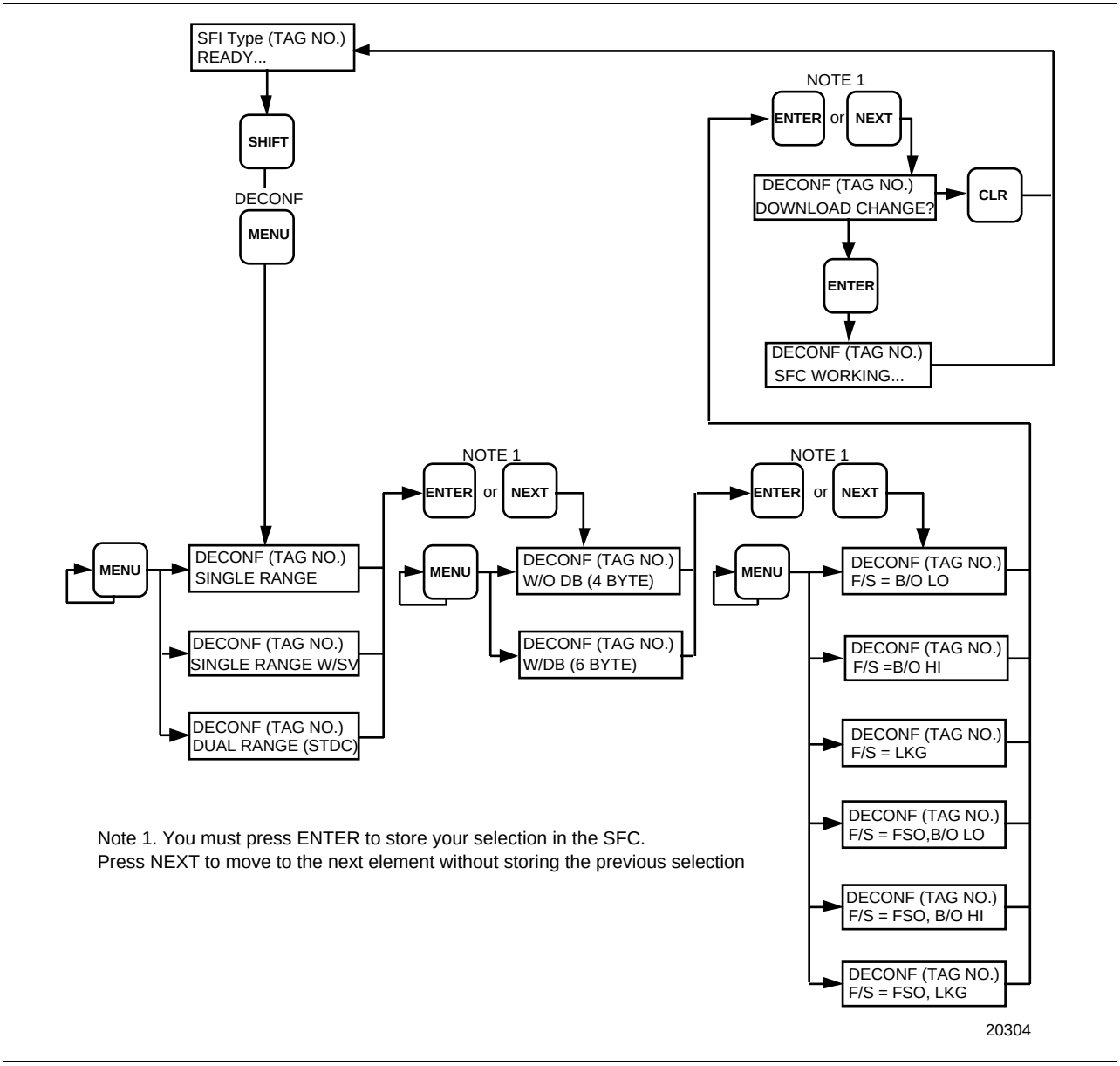
Selecting configuration data for the digital (DE) communications mode, continued

Figure 5-7 is a graphic view of the key presses required to configure the elements for DE communications mode.

Figure 5-7 Configuring the STT 3000 DE Communications Mode



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Keying-in the lower and upper range values

You can re-range a transmitter by changing the transmitter's Lower Range Value (LRV) and Upper Range Value (URV). You can re-range the transmitter to whatever values you require within the Lower Range Limit (LRL) and the Upper Range Limit (URL). Use the procedures listed in the figures that follow.

ATTENTION

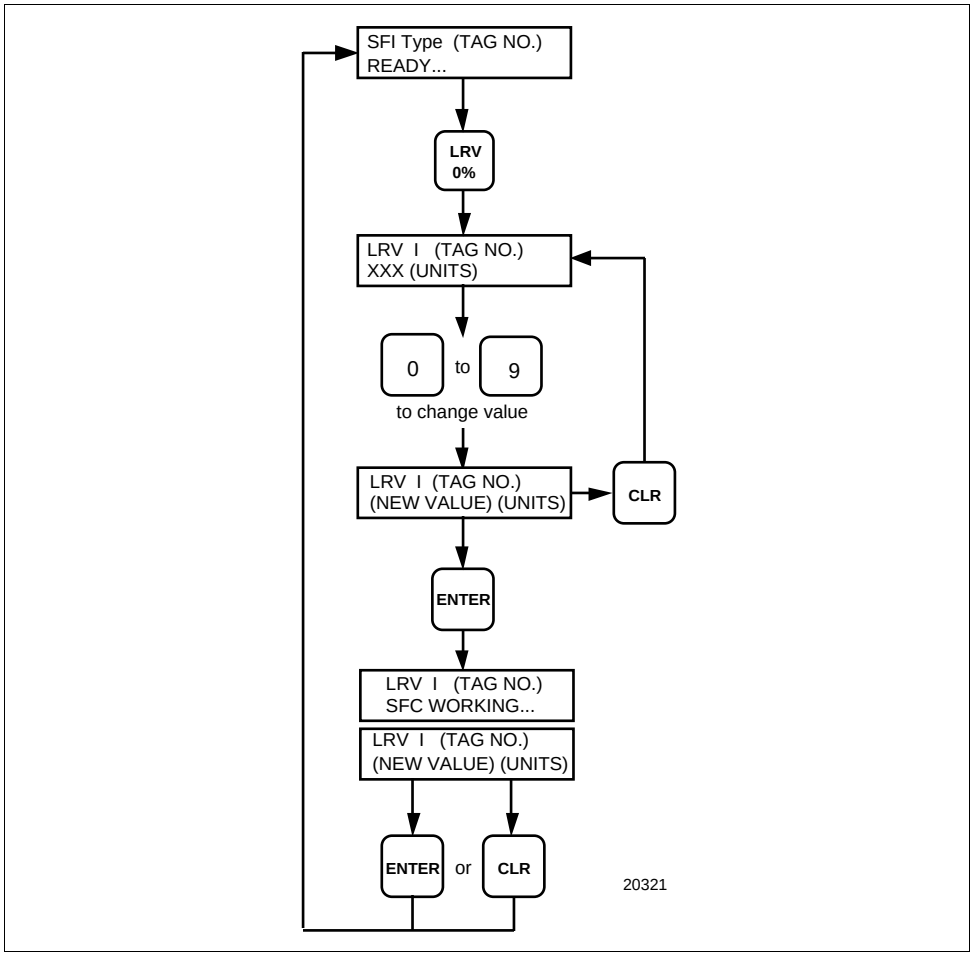
ALWAYS KEY-IN THE LOWER RANGE VALUE FIRST

Keying-in the lower range value (LRV)

Change the LRV - Lower Range Value of a transmitter as follows:

Locate the LRV key on the keyboard and press. Figure 5-8 is a graphic view of the key presses required to change the Lower Range Value (LRV).

Figure 5-8 Changing the STT 3000 Lower Range Value (LRV)



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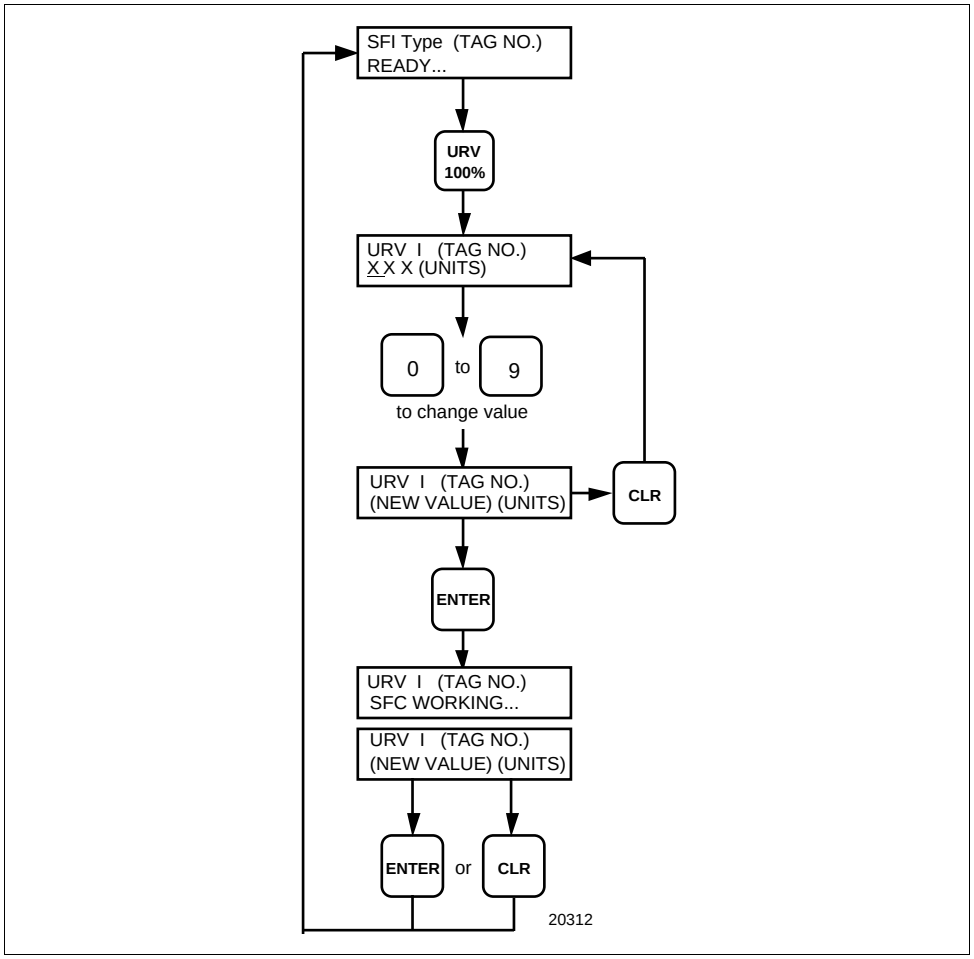
Keying-in the upper range value (URV)

Change the URV - Upper Range Value of a transmitter as follows:

Locate the URV key on the keyboard and press. Figure 5-9 is a graphic view of the key presses required to change the Upper Range Value (URV).

Figure 5-9 Changing the STT 3000 Upper Range Value (URV)



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Setting the upper and lower range values of the transmitter using an applied temperature

On some applications, you may want to set the lower and upper range values to the actual corresponding process values.

The STT 3000 can set the lower and upper range values to these values.

Follow the procedures given to set the LRV and URV using applied temperature.

If you are working on a transmitter in a process, use the actual temperature/value from the process. If you are working on a set up with a input source, simulate the temperatures/values.

Setting the lower range value using an applied temperature

Table 5-4 is the procedure for setting the lower range value using applied temperature.

Table 5-4 Setting the STT 3000 Lower Range Value Using Applied Temperature

Step	Press	SFC Display will Read (displays are examples)	Result
1			Apply the input to the transmitter that will be used as the lower range value (LRV).
2	SHIFT (^) then INPUT OUT-PUT (J)	INPUT 1 (tag no.) XX.XXX (UNITS)	This reads the input temperature. The reading will change or blink since the SFC updates it every 6 seconds. DO NOT PRESS THE NEXT KEY until the display changes so you are not trying to communicate with the transmitter when it's updating the SFC reading.
3	LRV 0% (E) then SET (G)	LRV 1 (tag no.) XX.XXX (UNITS) LRV 1 (tag no.) SET LRV?	Displays the Lower Range Value (LRV). The SFC asks if you want to set the Lower Range Value (LRV) to this input.
4	NON-VOL ENTER (YES)	LRV 1 (tag no.) SFC WORKING . . . then LRV 1 (tag no.) XX.XXX (UNITS)	Answers Yes. The SFC displays SFC WORKING while it sets the LRV to that reading. Next set the Upper Range Value (URV).
	OR CLR (NO)	LRV 1 (tag no.) XX.XXX (UNITS)	Answers No. SFC displays updated temperature value. Repeat the procedure until you enter the LRV you want.
5	SHIFT (^) then NON-VOL ENTER (YES)	LRV 1 (tag no.) SFC WORKING . . . then LRV 1 (tag no.) DATA NONVOLATILE	The LRV data is entered into non-volatile memory.

Continued on next page

Setting the upper range value using an applied temperature

Table 5-5 is the procedure for setting the upper range value using applied temperature.

Table 5-5 Setting the STT 3000 Upper Range Value Using Applied Temperature

Step	Press	SFC Display will Read	Result
1			Apply the input to the transmitter that will be used as the upper range value (URV).
2	^ SHIFT then INPUT J OUT-PUT	INPUT 1 (tag no.) XX.XXX (UNITS)	This reads the input temperature. The reading will change or blink since the SFC updates it every 6 seconds. DO NOT PRESS THE NEXT KEY until the display changes so you are not trying to communicate with the transmitter when it's updating the SFC reading.
3	F URV 100% then G SET	URV 1 (tag no.) XX.XXX (UNITS) URV 1 (tag no.) SETURV?	Displays the Upper Range Value(URV). The SFC asks if you want to set the Upper Range Value (URV) to this input.
4	NON-VOL ENTER (YES)	URV 1 (tag no.) SFC WORKING . . . then URV 1 (tag no.) XX.XXX (UNITS)	Answers Yes. The SFC displays SFC WORKING while it sets the URV to that reading.
	CLR (NO)	URV 1 (tag no.) XX.XXX (UNITS)	Answers No. SFC displays updated temperature value. Repeat the procedure until you enter the URV you want.
5	^ SHIFT then NON-VOL ENTER (YES)	URV 1 (tag no.) SFC WORKING . . . then URV 1 (tag no.) DATA NONVOLATILE then STT (TAG NO.) READY	The URV data is entered into non-volatile memory.

5.4 Configuration

Overview

The STT 3000 Temperature configuration mode lets you:

- Change the probe configuration
  - select the probe type
  - select internal or external Cold Junction (C/J) and set the external C/J value when selected
  - select the input filter frequency
  - enable or disable fault detection
  - select linear or non-linear operation.
- View the lower range limit (LRL) and change the engineering units used to display values.
- Read the actual C/J temperature.
- Read the high and low PV values.
- Read the PROM serial number.

Selecting a parameter

Table 5-6 shows you what key to press in order to scroll through the configuration groups and select a parameter.

Table 5-6 Scrolling through the STT 3000 Parameters

Press	Result
H ▲ NEXT	Display goes to next parameter.
L ▼ PREV	Display goes to previous parameter.
NON-VOL ENTER (YES)	Enters that particular configuration parameter and allows menu selections. See figure that follows. Also enters menu item selection into SFC memory. NOTE: Under PROBE CONFIG? group there is an element entitled “DOWNLOAD DATA?”. No newly selected menu item will be entered into STT 3000 memory until the ENTER key is pressed while “DOWNLOAD DATA?” is being displayed.
DE CONF MENU ITEM OR → OR ←	Scrolls through the values or selections available for a particular parameter. Press ENTER key after selection is made to enter information into the SFC memory.
^ SHIFT CLR (NO)	Exits the Configuration mode and puts the SFC into a “READY” mode.
CLR (NO)	Clears from parameter to beginning of group.

Exit configuration

You can exit configuration at any time.

Press CLR until this display appears:

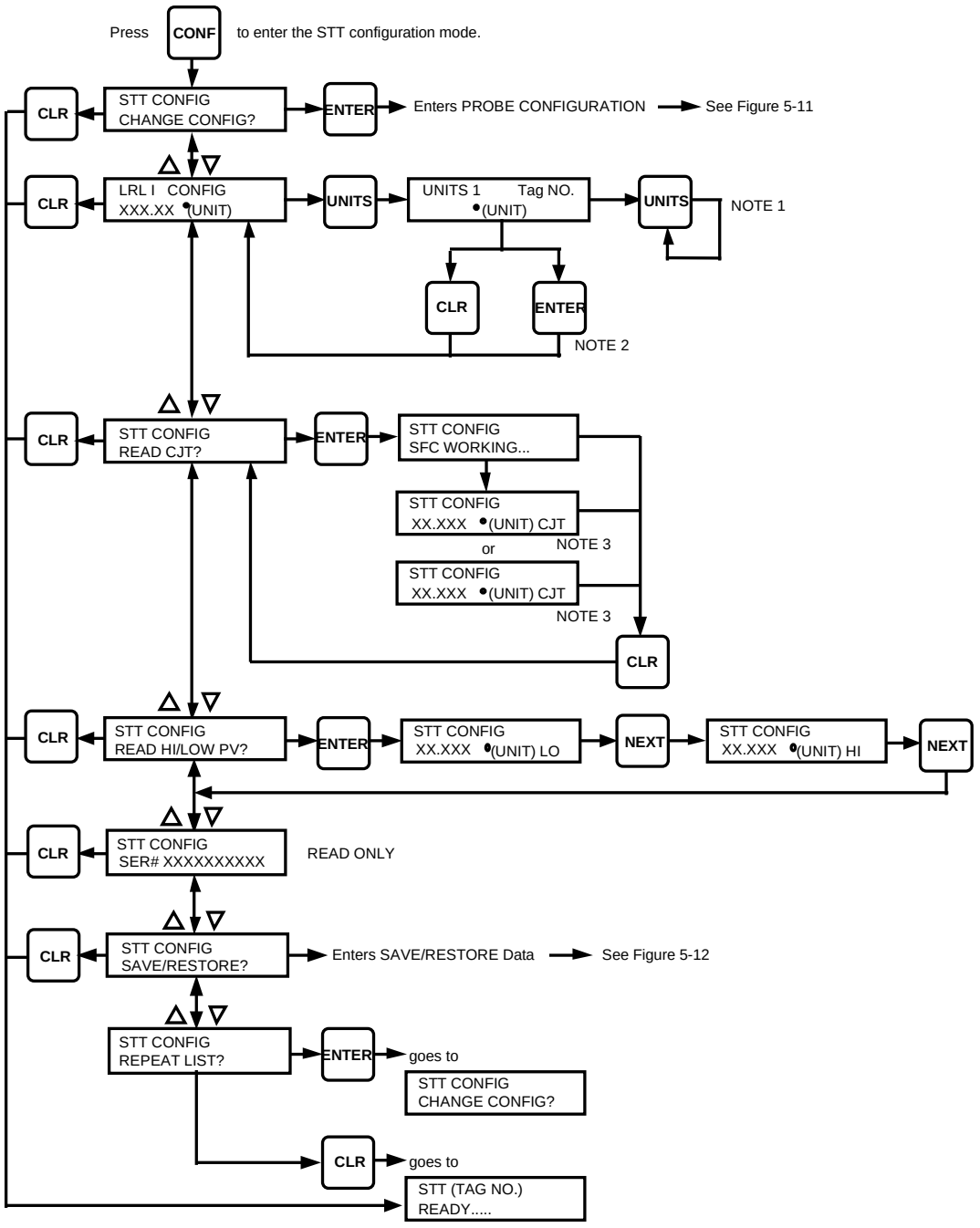
```
STT     TAG NO.
READY
```

or press SHIFT CLR .

Configuration procedure

Figure 5-10 is a graphic view of the key presses required to configure the STT 3000 transmitter. Follow this procedure referring to the notes that accompany it.

Figure 5-10 STT 3000 Temperature Transmitter Configuration



NOTE 1: Changes UNITS selection each time it is pressed.

NOTE 2: Returns LRL display with new unit and associated value displayed.

NOTE 3: CJT = internal C/J ECJT = external C/J at an isotherm block. Display is determined by selecting Internal or External C/J in PROBE CONFIG? - See Figure 5-11.

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Continued on next page

Probe config

This configuration subgroup of parameters lets you select the Probe function elements.

Probe config elements

The elements of Probe Config are listed in Table 5-7.

Table 5-7 STT 3000 Probe Configuration Elements

Element	Definition
PROBE=	This selects the probe or actuation type to be accepted as input to the transmitter. There are 21 selections from which to choose. Refer to Table 5-8 for selections and applicable range and span data for each probe type.
CJ =	This selects the source of the cold junction temperature for thermocouple inputs. **INTERNAL** The C/J temperature is sensed internally which sets the value to the temperature of the terminal block. **EXTERNAL** The C/J temperature is sensed externally at an isothermal block You can enter the ECJT value when you select CJ=EXTERNAL
FILTER =	This selects the frequency of the input filter. Make sure you select the value that matches the power line frequency. **50Hz** 50 Hertz **60Hz** 60 Hertz
TC FAULT DET =	This selection enables or disables the thermocouple fault detection for open circuit inputs. **ON** Enable T/C fault detection **OFF** Disable T/C fault detection

Continued on next page

Probe config elements, continued

Table 5-7 STT 3000 Probe Configuration Elements, (continued)

Element	Definition
OP =	This selects linear or non-linear operation. Note: This selection has no effect on millivolt ranges. **LINEAR** The output will always read in °C, °F, °R, or °K and selected by the UNITS key. **NON LINEAR** The output will read in millivolts for the thermocouple inputs and in Ohms for RTD inputs. When configured for NON-LINEAR, you can only select MV or Ω through the UNITS key.
LATCHING =	This selects latching method of open input. **OFF** Critical status message will automatically clear when sensor is fixed. **ON** Critical status message appears until verify that sensor wires fixed.
WRITE PROTECT =	This selects secure configuration changes. **OFF** Configuration changes can be made. **ON** Unable to change configuration without jumper (STT350) or password (STT25D, STT25M).

Probe types

Table 5-8 lists all the probe types and applicable range data that are available under selection “PROBE =“.

Table 5-8 STT 3000 Probe Types and Ranges

Input Type		Range	
		° C	**° F**
T/C	B	200 to 1820	392 to 3308
	C (W_5W_{26}) *	0 to 2300	32 to 4172
	D (W_3W_{25}) *	0 to 2300	32 to 4172
	E	– 200 to 1000	– 328 to 1832
	J	– 200 to 1200	– 328 to 2192
	K	– 200 to 1370	– 328 to 2498
	N (Nicrosil/Nisil)	– 200 to 1300	– 328 to 2372
	R	– 50 to 1760	– 58 to 3200
	S	– 50 to 1760	– 58 to 3200
	T	– 250 to 400	– 418 to 752
	NiNiMoly *	0 to 1300	32 to 2372
	RH Radiamatic *	420 to 1800	788 to 3272
RTD	Pt100 J	– 200 to 640	– 328 to 1184
	Pt100 D	– 200 to 850	– 328 to 1562
	PT200	– 200 to 850	– 328 to 1562
	Pt500 *	– 200 to 850	– 328 to 1562
	Cu10 *	– 20 to 250	– 4 to 482
	Cu25 *	– 20 to 250	– 4 to 482
	Ni500 *	– 80 to 150	– 112 to 302
Millivolts		– 1000 to 1000 mV	
Ohms (3 wire)		0 to 4000Ω	

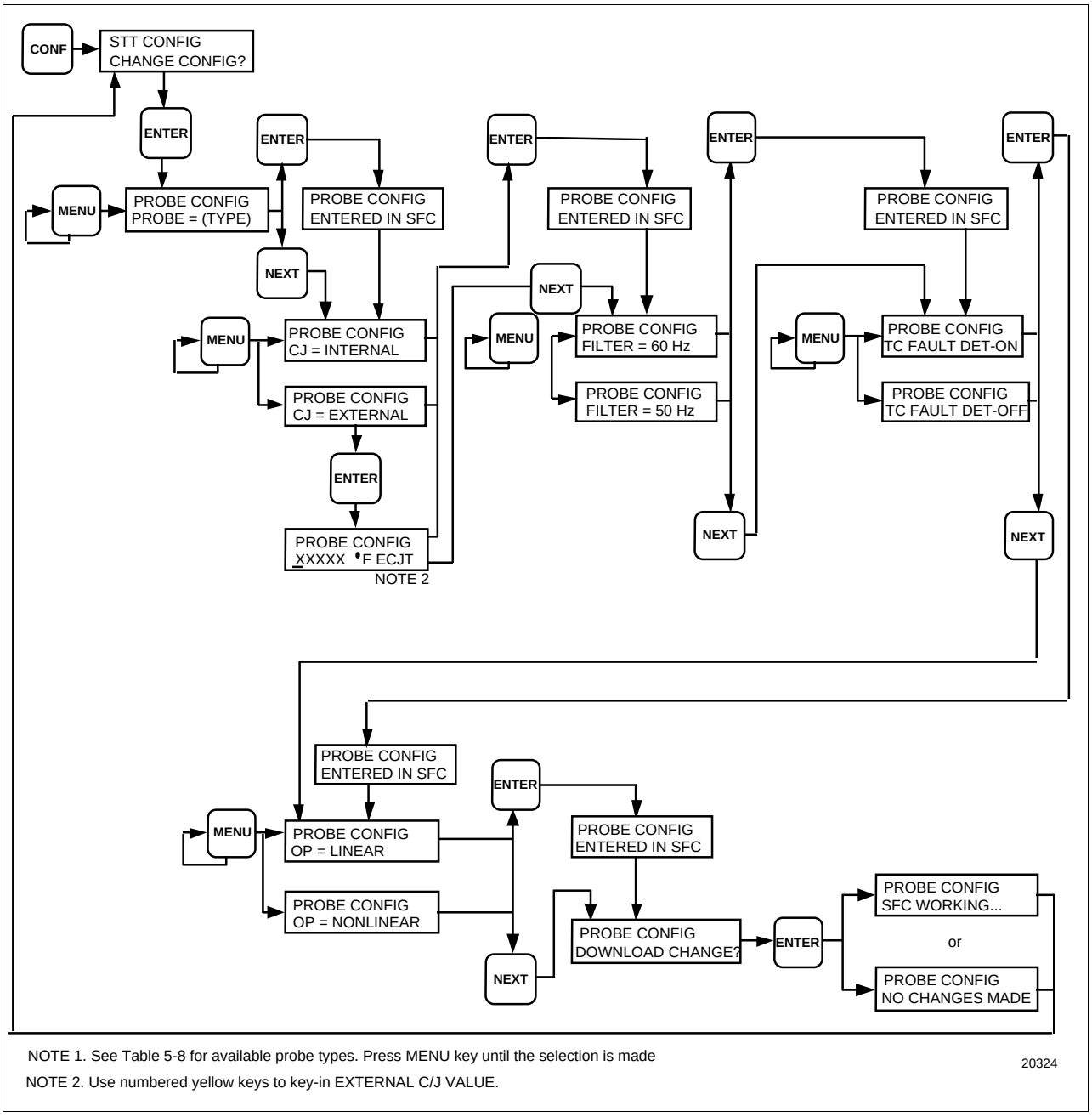
* Not available with Models STT25D or STT25M.

Continued on next page

Probe Config # configuration graphic

Figure 5-11 is a graphic view of the key presses required to configure the Function elements.

Figure 5-11 STT 3000 Probe Configuration



NOTE 1. See Table 5-8 for available probe types. Press MENU key until the selection is made

NOTE 2. Use numbered yellow keys to key-in EXTERNAL C/J VALUE.

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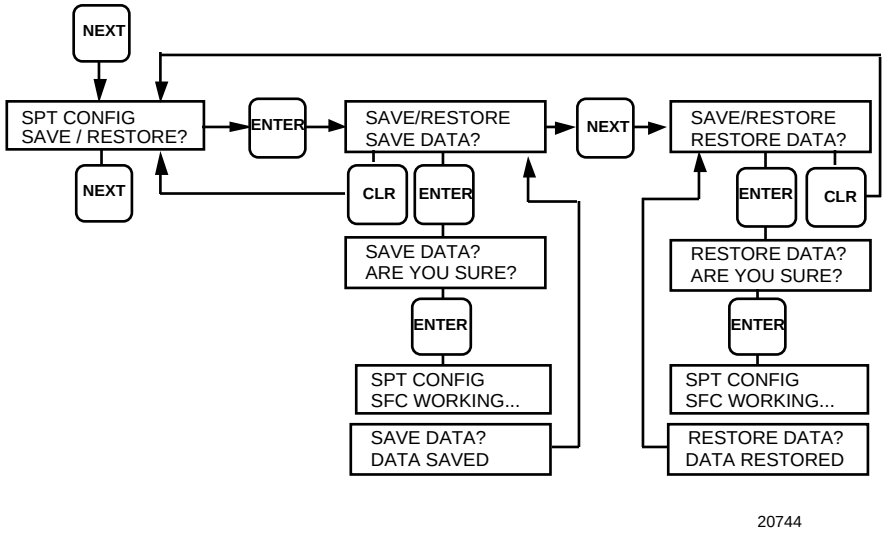
Continued on next page

Save/Restore data

Figure 5-12 is a graphic view of the key presses required to Save data from the transmitter to the SFC or Restore data from the SFC to the transmitter.

Figure 5-12 Save/Restore Data



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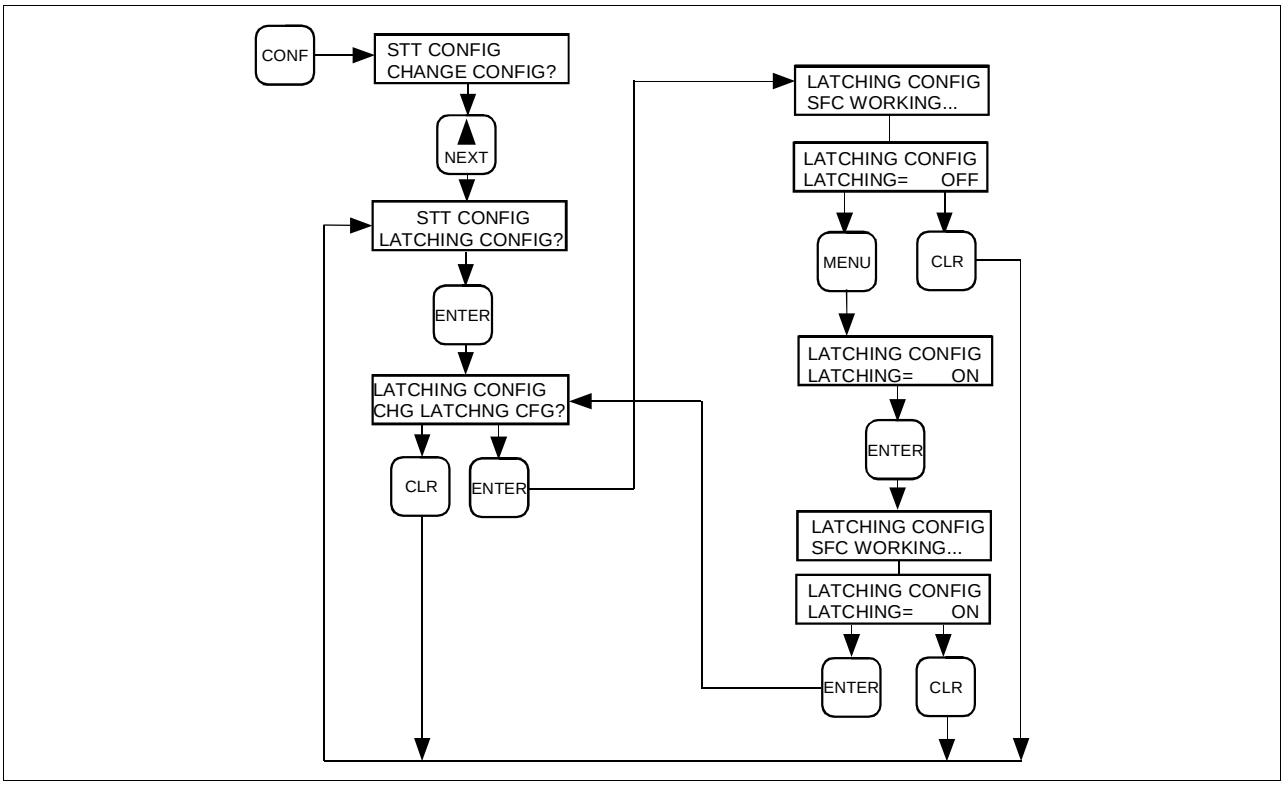
Alarm Latching/ Open Input Failsafe

Models STT350, STT25D and STT25M can be configured with an alarm latching mode. When the latching mode is on, a critical status open input message is displayed when the transmitter detects an open input or high impedance. The message will clear only after the sensor wires are fixed and the status flag is cleared using the SFC. When latching mode is off, the open input message clears when the sensor wires are fixed. Figure 5-13 is a graphic view of the key presses required to configure the latching mode feature. SFC software version 5.3 is needed to access this feature.

Figure 5-13 Alarm Latching/Open Input Failsafe



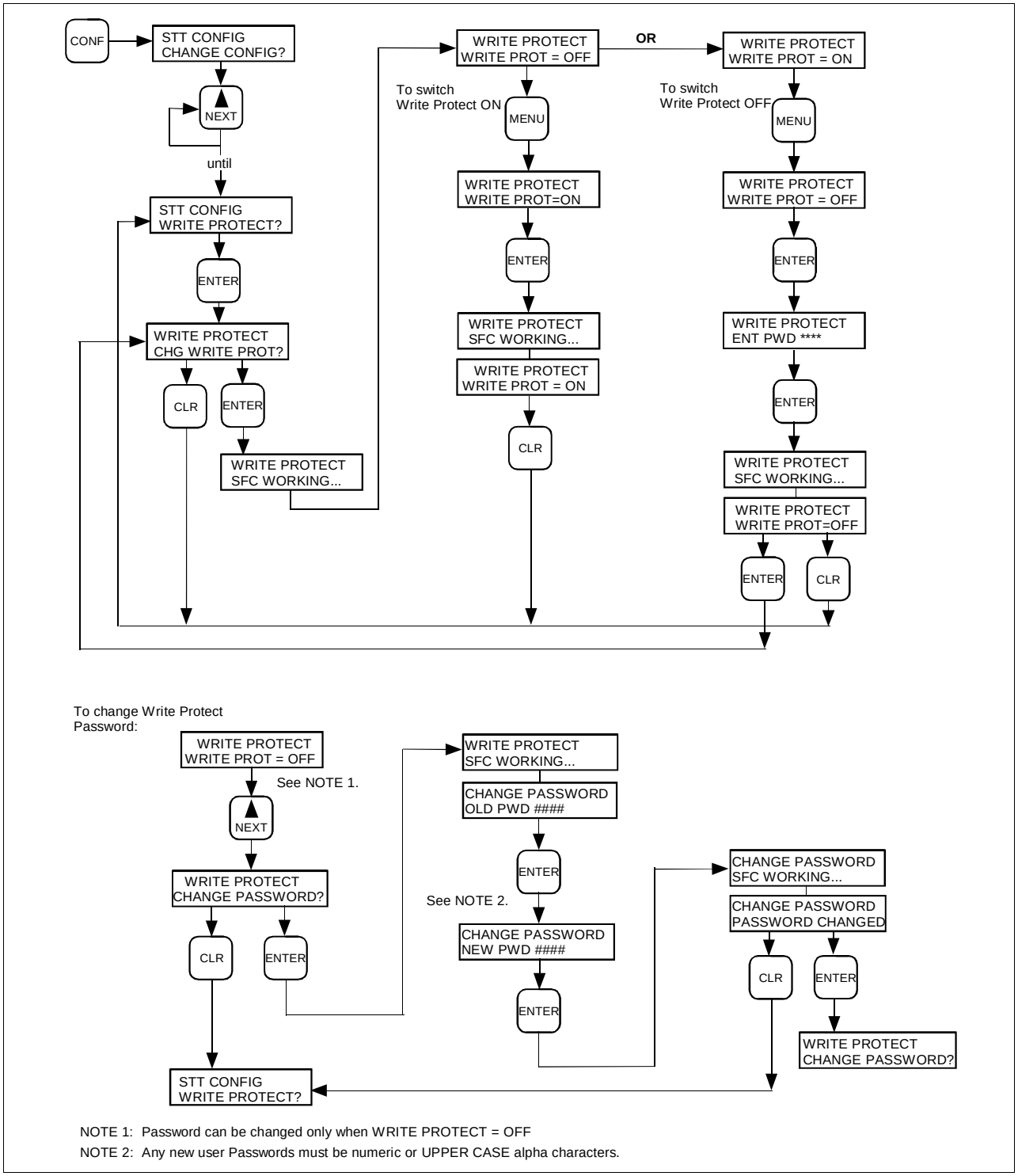
Write Protect

Models STT25D and STT25M have a Write Protect feature which is software configurable and accessible through a four-digit password. Figure 5-14 is a graphic view of the key presses required to access Write Protect. SFC software version 5.3 is needed to access this feature.

Continued on next page

Write Protect,
continued

Figure 5-14 Write Protect and Password



NOTE: Any new user passwords must be numeric or upper case alpha characters. The fallback password is an algorithm based on the units's serial number. If the password is lost, contact your regional Technical Assistance Center (TAC) with the unit serial number.

5.5 Output Calibration

Introduction

To calibrate the output of an Analog transmitter, connect a precision volt– or ammeter at the appropriate connection point on your system or use the control room display to monitor the output signal.

If the 0 or 100% output is not correct, you can do a Digital to Analog Current Output Signal Calibration.

Do a DAC calibration

With this procedure you can calibrate the digital to analog current output zero and span.

Use the procedure in Table 5-9 to enter the Output mode, check the 0% and 100% output values and if necessary, do a digital to analog current output signal calibration.

Table 5-9 STT 3000 Digital to Analog Current Output Signal Calibration

Step	Press	SFC Display will Read	Result
1			Connect a precision volt– or ammeter at the appropriate connection point on your system or use the control room display to monitor the output signal.
2	INPUT J OUT-PUT	OUTP1 (TAG No.) SFC WORKING . . . then OUTP1 (TAG No.) 0.00 %	The SFC is ready to calibrate 0% output or 100% output.
3	Z 0	OUTP1 (TAG No.) 0__ %	To select 0% output
4	NON-VOL ENTER (YES)	OUTP1 (TAG No.) SFC WORKING then OUTP1 (TAG No.) 0.00 % RNG1	# in display indicates the transmitter is in the Output mode.
5			Check the DVM. If the value on the DVM is 4 mA (1.00 volt), go to step 9 (100% calibration). If the value on the DVM is *not* 4 mA (1.00 volt), go to step 6 to correct DAC zero.

Table continued on next page

Do a DAC calibration,
continued

Table 5-9 STT 3000 Digital to Analog Current Output Signal Calibration (continued)

Step	Press	SFC Display will Read	Result
6	RESET K COR-RECT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) CORRECT DAC ZERO	Allows correction of DAC zero.
7	H ▲ NEXT or L ▼ PREV	OUTP 1 (tag no.) INC 1 COUNTS or OUTP 1 (tag no.) DEC 1 COUNTS then OUTP 1 (tag no.) CORRECT DAC ZERO	Repeat increments or decrements to adjust the value on the DVM to 4 mA (1.00 volt). When 4 mA (1.00 volt) is shown on the DVM, go to step 8.
8	INPUT J OUT-PUT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) 0.0 00 %	0% output calibrated, go to step 9, 100% calibration.
9	V 1 Z 0 Z 0	OUTP 1 (tag no.) 100__ %	This selects 100% output. # in display indicates the transmitter is in the Output mode.
10	NON-VOL ENTER (YES)	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) 100.0 %	Check the DVM: If the value on the DVM is 20 mA (5.000 volts), go to step 13. If the value on the DVM is *not* 20 mA (5.000 volts), go to step 11 to correct DAC span.
11	RESET K COR-RECT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) CORRECT DAC ZERO	Allows correction of DAC span.

Table continued on next page

Do a DAC calibration,
continued

Table 5-9 STT 3000 Digital to Analog Current Output Signal Calibration (continued)

Step	Press	SFC Display will Read	Result
12	H ▲ NEXT or L ▼ PREV	OUTP 1 (tag no.) INC 1 COUNTS or OUTP 1 (tag no.) DEC 1 COUNTS then OUTP 1 (tag no.) CORRECT DAC ZERO	Repeat increments or decrements to adjust the value on the DVM to 20 mA (5.00 volts). When 20 mA (5.000 volts) is shown on the DVM, go to step 13.
13	INPUT J OUT-PUT then CLR (NO)	(SFI Type) TAG No. READY	Exits DAC calibration mode. Exits OUTPUT mode.

5.6 Operation

Overview

The STS103 displays all the operating data for the STT 3000 Temperature. This data includes:

- Transmitter I.D.
- Damping value
- Lower range value
- Upper range value (span)
- Configuration elements for Digital Communications mode
- Input value
- Output Value
- Span value
- Upper Range limit
- Engineering units
- Operation Status
- Software Version Number
- Failsafe Direction
- Zero Point adjustment
- Display and Keyboard Test
- Read Scratch Pad messages
- Write Protection
- Alarm Latching

Refer to Table 5-5 for Operating Data access instructions.

Continued on next page

Operating data

Table 5-10 shows you what key to press and what the associated displays will be when you access each of the operating data.

Table 5-10 STT 3000 Operating Data

Operating Data	Press	Displays (Displays are examples)	Result
Transmitter I.D (ANALOG)	DE READ [A ID]	(SFI Type) TAG No. TRIPS SECURED?	**Analog Communications Mode**
	NON-VOL [ENTER (YES)]	STT TAG NO. 12345678	
	or	or	
(DIGITAL)	DE READ [A ID]	DE XMTR TAG NO. 12345678	**Digital Communications (DE) Mode** Lower Display is the device I.D or Tag No.
Damping Value	[C DAMP]	DAMP 1 (tag no.) X.X SECONDS	Damping Time is displayed in seconds.
Upper Range Value	[F URV 100%]	URV 1 (tag no.) (value) (Units)	Upper Range Value (span) The value of Input which will generate 100% Output.
Lower Range Value	[E LRV 0%]	LRV 1 (tag no.) (value) (Units)	Lower Range Value (zero) The value of Input which will generate 0% Output.
Digital Communications Mode Configuration Elements	[^ SHIFT] then DE CONF [I MENU ITEM]	DE CONF (tag no.) SINGLE RANGE	Type of Transmitter operation.
	[H ▲ NEXT]	DE CONF (tag no.) w/o DB (4byte)	Broadcast Message Format
	[H ▲ NEXT]	DE CONF (tag no.) F/S=B/O Lo	Burnout Mode
Input Value	[^ SHIFT] then INPUT [J OUT-PUT]	INPUT 1 (tag no.) 0.0000 °C or °F	Indicates the temperature (in an engineering unit of measure).

Table continued on next page

Operating data,
continued

Table 5-10 STT 3000 Operating Data (continued)

Operating Data	Press	Displays (Displays are examples)	Result
Output Value	INPUT J OUT-PUT	OUTP 1 (tag no.) 0.000%	Indicates the percent(%) output.
Currently Running Span	URL Y SPAN	SPAN 1 (tag no.) 100.00 °F	Span is the URV-LRV or the range of input corresponding to a full range (0-100%) of output.
Upper Range Limit	^ SHIFT then URL Y SPAN	URL 1 (tag no.) 100.00 °F	The URL is the maximum measuring range of the selected Thermocouple as per the Table in section 5.8.
Engineering Units	D UNITS	UNITS X TAG NO. °F	The present selection of engineering units.
Operation Status	F/S DIR U STAT	STATUS (tag no.) STATUS CHECK=OK	Momentary Display. Indicates the status of operation at the present time. See section 5.7.
Failsafe Direction	^ SHIFT then F/S DIR U STAT	F/S DIR (tag no.) SFC WORKING – XX% then F/S DIR (tag no.) F/SAFE DOWNSCALE	Displays the Failsafe Burnout direction, upscale or downscale, for analog devices. (Based on the position of the hardware jumper.)
Software Version	^ SHIFT then SW VER X 3 then H ▲ NEXT	S/W No. (tag no.) SFC=X.X XMTR=X.X S/W No. (tag no.) DD-MM-YY HH:MM	Displays the STS103 and STT 3000 software version numbers, date and time stamp.

Table continued on next page

Operating data,
continued

Table 5-10 STT 3000 Operating Data (continued)

Operating Data	Press	Displays (Displays are examples)	Result
Display and Keyboard Test	SHIFT (^) then 2 (W) CLR (NO)	DISPLAY TEST **DISPLAY OK** then KEYBOARD TEST ROW * COLUMN *	Display test indication. You can test each key on the keyboard. For example: If you press INPUT OUT-PUT (J) the display will read KEYBOARD TEST ROW 3 COLUMN 2 to clear.
Access the scratch pad message	SHIFT (^) then SCR PAD ■	SCR PAD (tag no.) SFC WORKING . . . then SCRATCH PAD 1 XXXXXXXXXXXXXXX	Displays the scratch pad message. Press the NEXT key to switch from SCRATCH PAD 1 to SCRATCH PAD 2
Alarm Latching Status	CONF then ▲ NEXT (H)	STT CONFIG CHANGE CONFIG? then STT CONFIG LATCHING CONFIG?	Displays the change configuration message. Press the ENTER key to change the Alarm Latching mode.
Write Protect	CONF then ▲ NEXT (H)	STT CONFIG CHANGE CONFIG? then STT CONFIG WRITE PROTECT?	Displays the change configuration message. Press the ENTER key to change the Write Protect switch.
Write Protect Password	NON-VOL ENTER (YES) ▲ NEXT (H)	WRITE PROTECT CHG WRITE PROT? WRITE PROTECT CHANGE PASSWORD?	A password is needed to change the write protect switch to OFF. Press the NEXT key to access the display to change the password. Press the ENTER key to change the password for the write protect switch.

5.7 Diagnostics and SFC Messages

Introduction

The STT 3000 and the STS103 both run continuous self-diagnostics. This means that they are constantly testing the communications, the loop, and themselves.

Any time you want results of these diagnostics, press the STAT key.

The SFC displays its report, in the form of messages, which identify diagnostic conditions.
Diagnostic conditions are broken down into three categories:

- an OK condition
- a critical condition
- a non-critical condition

OK Status

An OK condition means no problem exists, and the display looks like this:

```
STATUS  (tag no.)
STATUS CHECK=OK
```

Critical status

A critical condition means that the transmitter is not functioning properly. When this occurs, the transmitter goes into upscale burnout and maintains an output of 21.8 mA, or into downscale burnout and maintains an output of less than 3.9 mA. The message CRITICAL STATUS interrupts your operation and is followed by the message PRESS STATUS.

After the PRESS STATUS message, you press the STAT key to find out what problem exists. You will receive one or more messages. Take whatever corrective action necessary to solve the problem. Remember that the transmitter will stay in upscale or down scale burnout until the condition is corrected.
If the transmitter sends more than one message, each message will be displayed in the order of importance for about 5 seconds. If you need to see them again, press the STAT key again.

Non-critical status

A non-critical condition means that although a problem exists, the transmitter is still operating. When a non-critical condition occurs a "#" character appears on the right side of the display, along with whatever you're displaying at the time.

This character means press the STAT key because some type of a problem exists. Again, one or more messages will appear on the display for about five seconds each.

Low battery voltage

When the battery voltage becomes low, a colon "**:**" will appear in the middle of the display. It stays on the display until you either charge or replace the batteries.

Continued on next page

5.7 Diagnostics and SFC Messages, Continued

Diagnostic messages

Table 5-11 is a list of all the diagnostic messages that can appear when using the STS103 with a STT 3000 Temperature Transmitter.
They are listed in alphabetical order along with the problem associated with the message and the corrective action to take when the message appears.

Table 5-11 Diagnostic Messages for SFC and STT 3000

Message	Problem	Corrective Action
SFC FAULT or **SFC FAILURE**	SFC communication is not possible due to a detected SFC problem.	• Press STAT key to obtain other messages. • Replace the SFC.
AMB TEMP HI/LO	Transmitter internal temperature is beyond specified limits of –40 to +85°C.	• Possible process of transmitter mounting problem. Condition will cause inaccuracies or potential failure if not corrected.
COMM ABORTED	Communication aborted by user.	
ENTRY>SENS RNG	The number entered is beyond 2 times the upper range limit of the sensor.	• Press the CLR key, check the parameter, and start again.
EXCESS ZERO CORR	The ZERO correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value.
EXCESS SPAN CORR	The SPAN correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value.
EXCESSIVE OUTPUT	The requested output percent in the output mode is too high or too low. The limits are –1.25% to +105%.	• Press the CLR key, check the parameter, and start again.
FAILED COMM CHK	The SFC failed a communication diagnostic check. This could be a SFC electronics problem or a faulty or dead communication loop.	• Try communicating again. • Press the STAT key. If a loop fault message appears, do the corrective action and try again. • If the Comm error continues, replace the SFC.
HI RES/LOW VOLT	Either there is too much resistance in the loop (open circuit), the voltage is too low, or both.	• Check the wiring connections and the power supply. There must be 11 Volts minimum at the transmitter to permit operation.
H.W. MISMATCH	Hardware mismatch. Part of Save/Restore function.	• None - SFC tried to restore as much of the database as possible.

Table continued on next page

Diagnostic Messages,
continued

Table 5-11 Diagnostic Messages for SFC and STT 3000 (continued)

Message	Problem	Corrective Action
ILLEGAL RESPONSE	SFC received an illegal response from the SFI.	• Try communicating again.
IN OUTPUT MODE	The transmitter is operating as a current source.	• Press the [OUTPUT] and [CLR] keys if you want to exit the output mode.
INPUT OPEN	Open input or high impedance.	• Check the input terminals. Remove one input lead and check sensor for continuity.
INVAL CAL DATA	Factory calibration database is corrupted.	• Data not user accessible. Return to factory for re-calibration.
INVALID DATABASE	The database of the SFI was not correct at power up.	• Try communicating again. • Verify the database, recalibrate the SFI and then manually update non-volatile memory.
INVALID REQUEST	• The transmitter is being asked to correct or set its URV to a value that results in too low a span, or being asked to correct its LRV or URV while in the output mode. • The given key function is not valid for the associated transmitter.	• Check that the proper calibrated URV input is being applied to the transmitter, or that the transmitter is not in the output mode. • Check that the key function is applicable for a temperature transmitter.
INVAL USER DATA	User database is corrupted.	• Reconfigure and re-calibrate the transmitter. If the transmitter does not require calibration. Press [SHIFT] [CORRECT] to restore factory calibration.
I/P OUT OF SPEC	Input is lower than LRL or higher than URL.	• Check the input sensor, T/C type, etc. If the process requires broader limits, change sensor type and reconfigure.
LOW LOOP RES	Not enough resistance in series with the communication loop.	• Check the sensing resistor and verify at least 250 Ohms resistance in the loop.
MEASURE HW FAIL	Electronic component failure on isolated input side of the transmitter.	• Replace the transmitter.
MODE SWITCH FAILED	Failure to change the write protect mode.	• Enter the correct write protect password when prompted to do so.

Table continued on next page

Diagnostic Messages,
continued

Table 5-11 Diagnostic Messages for SFC and STT 3000 (continued)

Message	Problem	Corrective Action
NACK RESPONSE	The SFI sent a negative acknowledgment because one or more of the commands could not be processed by the SFI.	• Check the configuration and try again.
NO HW FAILURE	Connected transmitter does not support a hardware jumper for failsafe direction.	
NO XMTR RESPONSE	No response from the transmitter. It may be a transmitter or loop problem.	• Try communicating again. • Press the [STAT] key and do any corrective action required. • Check that the flowmeter's loop integrity has been maintained and that the SFC is connected.
NVM FAULT	Non-volatile memory fault.	• Replace the transmitter.
NVM ON SEE MAN	The SFC's CPU is misconfigured	• Replace the SFC.
NVM WRITE FAIL	Last configuration/calibration item written to was not correctly stored.	• Repeat last configuration/calibration command. Press [SHIFT] [ENTER] . • Replace the transmitter.
OPTION MISMATCH	On a database restore, one or more options do not match.	• None - SFC tried to restore as much of the database as possible.
>RANGE	The value to be displayed is over the range of the display.	• Press the [CLR] key and start again.
RESTORE FAILED	Part of the Save/Restore function.	• Check the transmitter and try again.
SELF TEST FAIL	Power up self test failed.	• Replace the transmitter.
SENSOR TEMP FAIL	The STT 3000 temperature sensor has failed.	• Replace the transmitter.
TYPE MISMATCH	On a database restore, the transmitter types are not the same.	• None - SFC tried to restore as much of the database as possible.
UNCERTAIN CJC	Low quality reading of CJ inconsistent input. Possible internal communications failure.	• Check input for noise, intermittent connection.

Table continued on next page

Diagnostic Messages,
continued

Table 5-11 Diagnostic Messages for SFC and STT 3000 (continued)

Message	Problem	Corrective Action
UNCERTAIN RDING	The unit has an uncertain or inconsistent input reading	• Check the transmitter input. • Replace the transmitter.
UNKNOWN	Selection is unknown action.	Have the software in your SFC updated.
USER CORR ACTIVE	Inconsistent or step input. Possible internal communications failure.	• Check input for noise, intermittent connection, etc. Ignore if transmitter recovers quickly and message does not repeat.
USER CORR ACTIVE	User has implemented “LRV CORRECT”, “URV CORRECT”, “LRV SET”, or “URV SET”.	• None required unless to correct unintended re-calibration. A “#” sign will be displayed continuously and “USER CORR ACTIVE” will be displayed when the STAT key is pressed unless user returns to factory calibration via the SHIFT/CORRECTS (Reset) procedure.
WRITE PROTECTED	The transmitter configuration and calibration data is write protected. The write protect mode is ON.	Change the write protect mode.
WRONG PASSWORD	The password entered was incorrect.	Enter the correct password when prompted to do so.

5.8 Troubleshooting

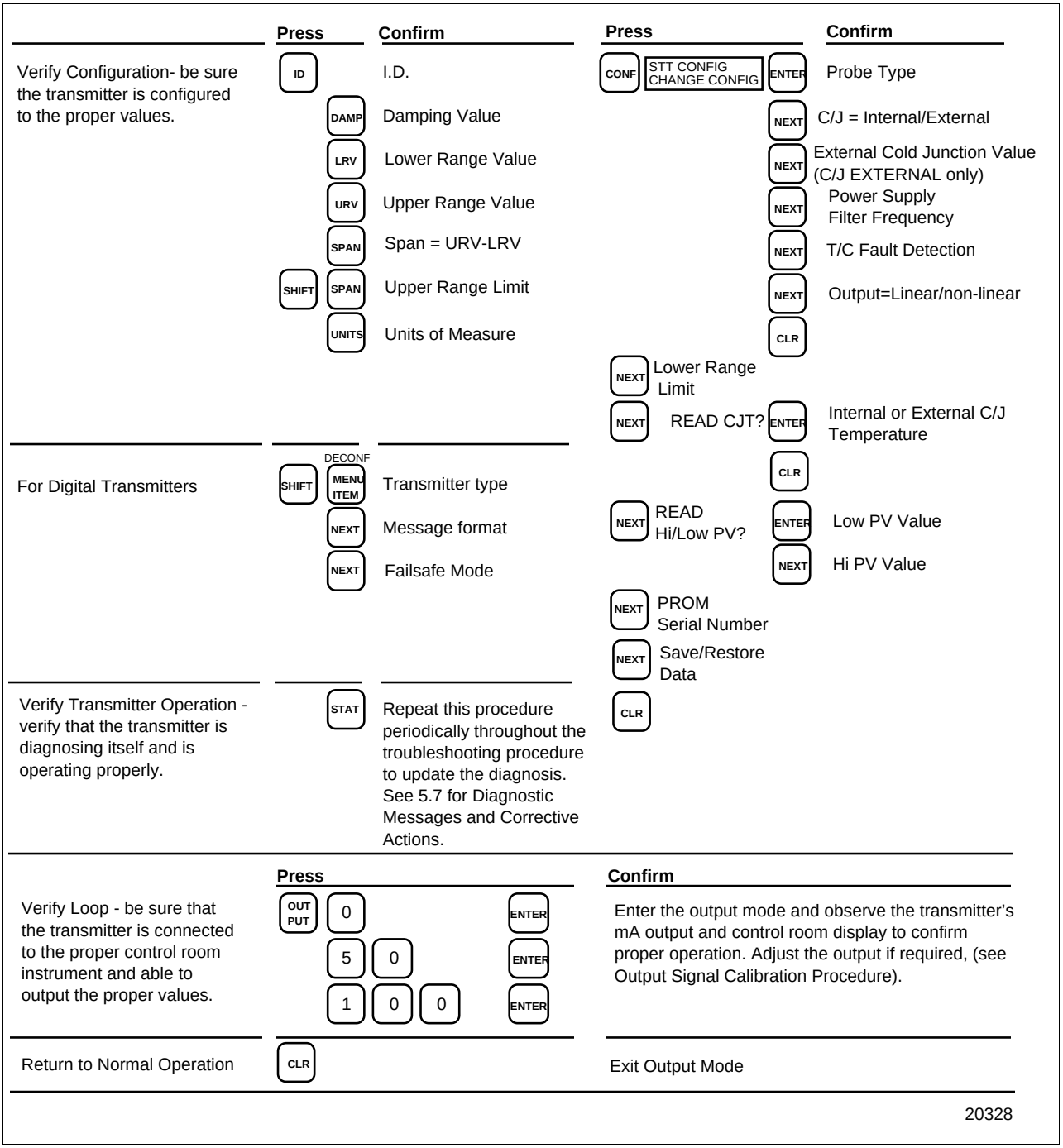
Introduction

If you suspect a problem in the transmitter, check the transmitter configuration, operation, and output. Use the procedure shown in Figure 5-15. Refer to Section 5.7 for diagnostic messages and corrective action.

Troubleshooting procedure

Check the parameters listed in Figure 5-11 to confirm proper configuration, operation, and output.

Figure 5-15 STT 3000 Troubleshooting Procedure



Section 6 —MagneW 3000 Electromagnetic Flowmeter

6.1 Overview

Introduction

This section contains all the information you will need to know in order to wire, set-up, configure, operate, and calibrate the MagneW 3000 Magnetic Flowmeter using the STS103 Smart Field Communicator.

Refer to the MagneW 3000 User's Manual for Flowmeter operating and installation information.

Make sure you have become familiar with the STS103 operations that are more or less the same for every transmitter.

This section gives you the keystrokes and displays that are specific for SFC communications with the MagneW 3000 Flowmeter.

What's in this section?

This section contains the following topics:

6.2 Wiring

Overview

Establish communications with the MagneW 3000 by connecting the SFC leads to the 4–20 mA line of the flowmeter.

Your choices are either at a junction box somewhere along the 4–20 mA line, on the field side of the intrinsic safety barrier panel in the control room, or at the flowmeter itself.

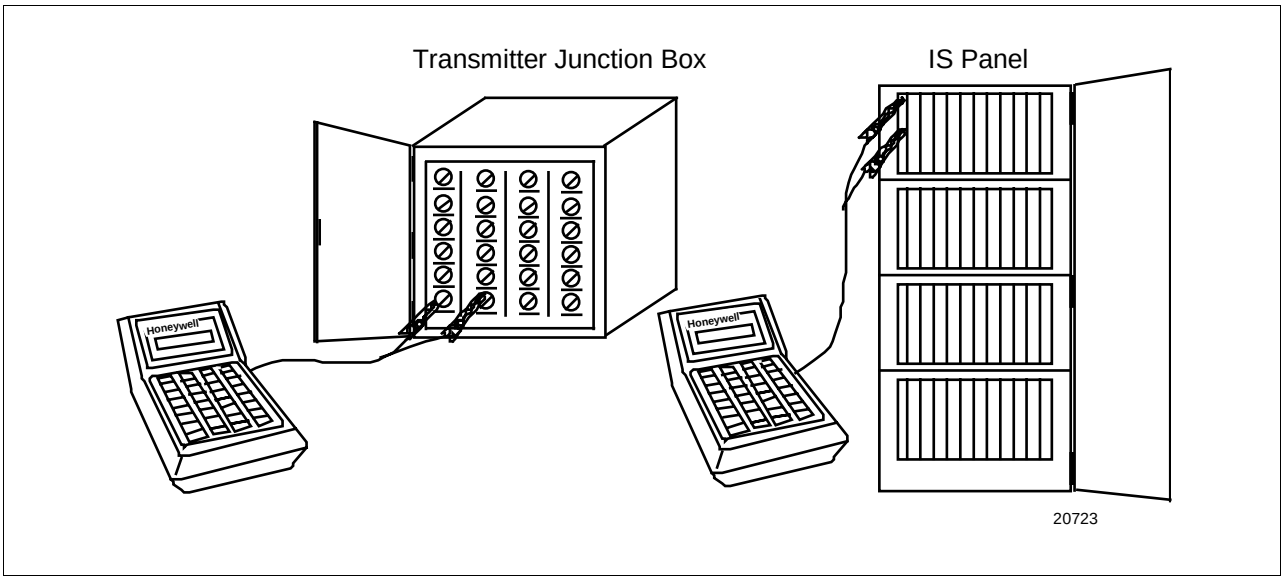
Following are examples for connecting to all these places. Use the one you need.

Connecting the STS103 to junction boxes and IS panels

The STS103 connects to MagneW flowmeters, IS Panels, and junction boxes through a pair of wires with alligator clips on the ends. The STS103 communications terminal end of the wires has a stereo phone jack connection that is inserted into the communications terminal. The other end of the wires are clipped onto terminals in the junction box or IS barrier panel, or directly to the flowmeter. The red SFC lead connects to the junction box or SFI positive terminal, the black lead to the negative terminal.

Figure 6-1 shows the STS103 connected to a junction box or an IS barrier panel.

Figure 6-1 STS103 – Junction Box and IS Connection



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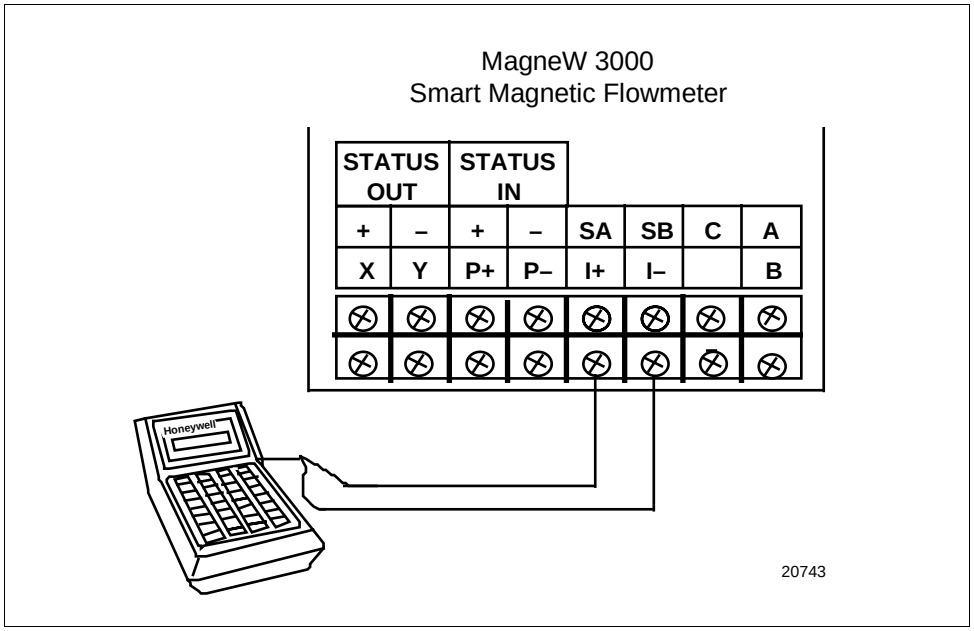
STS103 - MagneW connections

Figure 6-2 shows the STS103 connected directly to the positive and negative terminals on the MagneW. The STS103 can connect to only one MagneW at a time.

Figure 6-2 STS103–MagneW Connections



WARNING

When the junction box cover on the transmitter is removed, the housing is NOT explosion-proof.

STS103 charging terminal

The NiCd battery pack is charged through a battery charger that plugs into the charging terminal. The charger inputs 110 or 220 Vac 50/60 Hz and outputs 7 Vdc 180mA to the NiCd battery pack.

The connector of the battery charger is inserted into the charging terminal on left side of the STS103 near the ON/OFF switch.

6.3 Set-up

Overview

Setting up the MagneW 3000 Flowmeter consists of:

- Keying-in the I.D. and Uploading the Database
- Adjusting the Damping time
- Selecting the units in which to display values
- Selecting the MagneW's communication mode
- Selecting the type of configuration for the flowmeter in the Digital Communications Mode
- Keying-in the Upper Range value (Span)

Keying-in the I.D. and uploading the database

The procedure listed in Table 6-1 gives you the steps required to key–in an ID and upload the database for the MagneW.

ATTENTION

You will note in the procedure that:

- The database for an *Analog* transmitter is automatically read or uploaded to the SFC when you press [ENTER] in response to the "TRIPS SECURED" prompt.
- The database for a *Digital* transmitter is read or uploaded when you press the [SHIFT] [I D] keys.

Table 6-1 Keying–in the MagneW 3000 ID and Upload Database Procedure

Step	Press	SFC Display will Read	Result
ANALOG FLOWMETERS		*(For Digital Flowmeters - see step 4)*	
1	**DE READ** [A ID]	TAG NO. TRIPS SECURED?.	
	NON-VOL [ENTER (YES)]	TAG NO. SFC WORKING . . . Then MAG XX TAG NO. X—	The database is loaded into the SFC at this point for analog transmitters. **MAG XX** on the top line identifies that it is a MagneW Flowmeter. XX = SR - Single Range DR - Dual Range Notice the line under the first character of the ID on the bottom line. This is the cursor and indicates where you can key–in an ID. Alpha/numeric entries of up to 8 characters are permitted. If the MagneW was not given an ID, the line will be blank with a cursor.

Table continued on next page

Keying–in the ID and uploading the database, continued

Table 6-1 Keying–in the MagneW 3000 ID and Database Procedure (continued)

Step	Press	SFC Display will Read	Result
ANALOG FLOWMETERS, continued			
2	NUM / ALPHA until you see	MAG XX TAG NO. * or MAG XX TAG NO. ▮	An * indicates that the prompt is looking for an alpha character. The letters are located in the upper right corner of the keys. A ▮ indicates the prompt is looking for a number. The numbers are on the yellow keys. Press NUM/ALPHA key to change from Alpha to Numeric mode or vice versa. One of the symbols appears on the display and in place of the first character of the old ID. The rest of the old ID disappears. Key–in your ID using the NUM/ALPHA key and the letters and numbers on the keys.
3	NON-VOL ENTER (YES)	MAG XX TAG NO. SFC WORKING . . . then MAG XX TAG NO. (New ID)	The ID and database are loaded.
DIGITAL FLOWMETERS			
4	DE READ A ID	TAG NO. SFC WORKING . . . Then DE-XMTR TAG No. XXXXXXXX	The top line indicates that the flowmeter is configured for **DE Communications mode**. Notice the line under the first character of the ID on the bottom line. This is the cursor and indicates where you can key–in an ID. Alpha/numeric entries of up to 8 characters are permitted. If the MagneW was not given an ID, the line will be blank with a cursor.

Table continued on next page

Keying–in the ID and uploading the database, continued

Table 6-1 Keying–in the MagneW 3000 ID and Uploading Database Procedure (continued)

Step	Press	SFC Display will Read	Result
DIGITAL FLOWMETERS, continued			
5	NUM / ALPHA until you see	MAG XX TAG NO. * or MAG XX TAG NO. ▀	An * indicates that the prompt is looking for an alpha character. The letters are located in the upper right corner of the keys. A ▀ indicates the prompt is looking for a number. The numbers are on the yellow keys. Press NUM/ALPHA key to change from Alpha to Numeric mode or vice versa. One of the symbols appears on the display and in place of the first character of the old ID. The rest of the old ID disappears. Key–in your ID using the NUM/ALPHA key and the letters and numbers on the keys.
6	NON-VOL ENTER (YES)	MAG XX TAG NO. SFC WORKING . . . then MAG XX TAG NO. (New ID)	The ID is loaded into the flowmeter.
7	SHIFT ^ then DE READ ID A	MAG XX TAG NO. SFC WORKING – XX% then MAG XX TAG NO. (New ID)	This loads the Digital flowmeter database into the SFC. The display indicates the percent of the database being loaded until it reaches 100%.

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Copying data into non-volatile memory

When setting-up or configuring a MagneW 3000, whether you are changing one element or a full database, you must copy all configuration data into the flowmeter's Non-Volatile Memory. This is the flowmeter's permanent memory. If the flowmeter were to lose power, the values for the database will be saved here.

The flowmeter also contains a working memory that loses its contents if the power goes off; and when power is restored, the flowmeter copies the contents of the non-volatile memory into the working memory.

There is a failsafe procedure. Thirty seconds after a value is changed, the flowmeter automatically copies it into the non-volatile memory. But, if you change an element and power goes down before this runs, you will still lose the data in the working memory. Therefore, whenever you make any changes in the flowmeter, always end your procedure as follows:

Press	Displays will Read	Result
SHIFT ^ then NON-VOL ENTER (YES)	MAG XX TAG NO. SFC WORKING . . . then MAG XX TAG NO. DATA NONVOLATILE then MAG XX TAG NO. READY	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.

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Adjusting the damping time

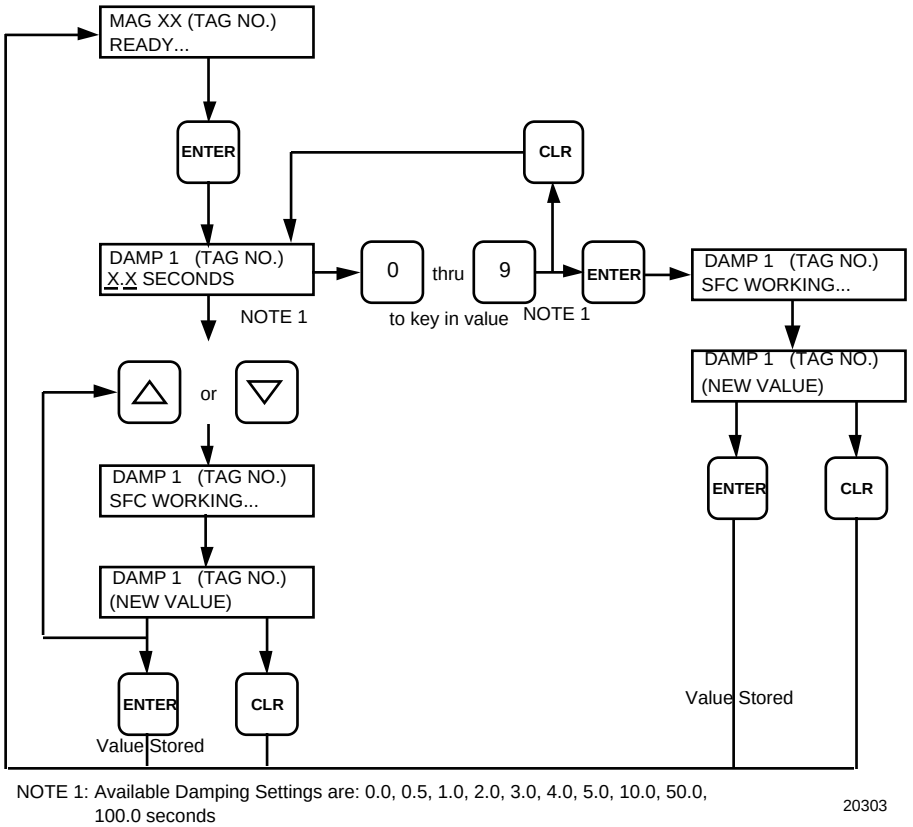
Damping time sets the unit of time for the damping constant which establishes the upper limit of frequency response and the response time characteristics of the flowmeter. This is used to reduce the electrical noise effect on the output signal.

Using the SFC, you can adjust the damping by selecting a value on the SFC and send that value to the flowmeter.

- The minimum value is 0.0 seconds (no damping).
- The maximum value is 100.0 seconds.

Figure 6-3 is a graphic view of the key presses required to adjust the damping time value and also gives you the selections available. You can also key–in a value using the numbered yellow keys.

Figure 6-3 Adjusting the MagneW 3000 Damping Time Value



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Selecting the units in which to display values

There are three groups of units that can be displayed on the SFC for the MagneW.

The group that will be displayed depends on the application that you select when you configure the UNITS KEY display.
See "CONFIGURATION" - "UNITS KEY?" - Section 6.4.

Table 6-2 is a list of units in which you can display the values for LRV, URV, SPAN, URL, and INPUT.

Table 6-2 List of the MagneW 3000 Units by Application

VELOCITY	VOLUME FLOW	MASS FLOW
m/sec	m^3/h	Kg/min
ft/sec	gal/h	lb/min
	l/h	Kg/h
	cc/h	lb/h
	m^3/min	Kg/sec
	gal/min	lb/sec
	l/min	t/h
	cc/min	t/min
	m^3/day	t/sec
	gal/day	g/h
	Kgal/day	g/min
	bbl/day	g/sec
	m^3/sec	ton/h
		ton/min
		ton/sec

Continued on next page

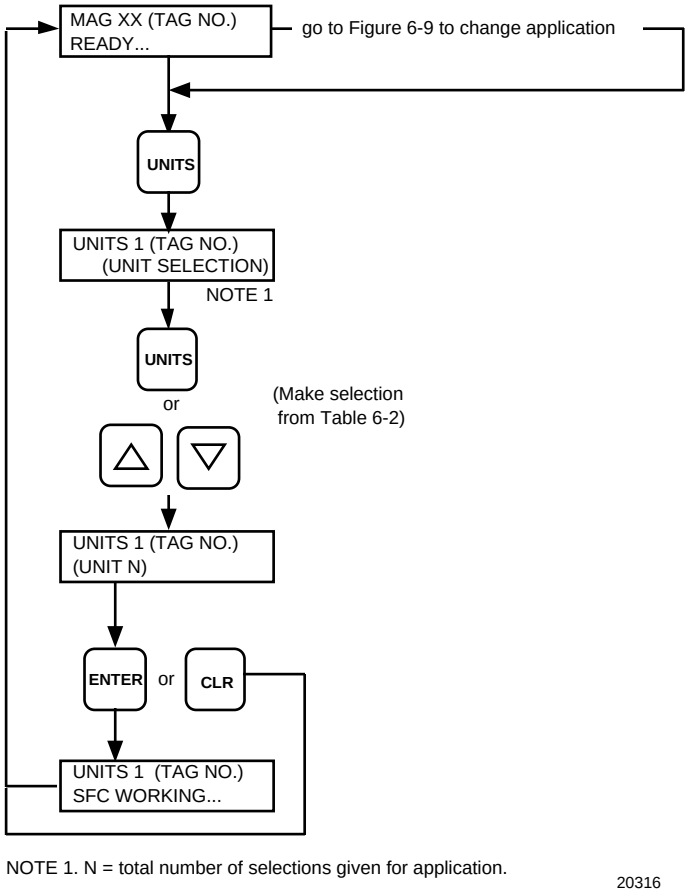
Selecting the units in which to display values, continued

Figure 6-4 is a graphic view of the key presses required to select the desired units in which to display values.

When a Unit is selected it is saved in the MagneW as “user preferred” and is automatically recalled and displayed whenever the SFC is connected.

Press the UNITS key and use ▲▼ to change selection.

Figure 6-4 Selecting the MagneW 3000 Units in which to Display Values



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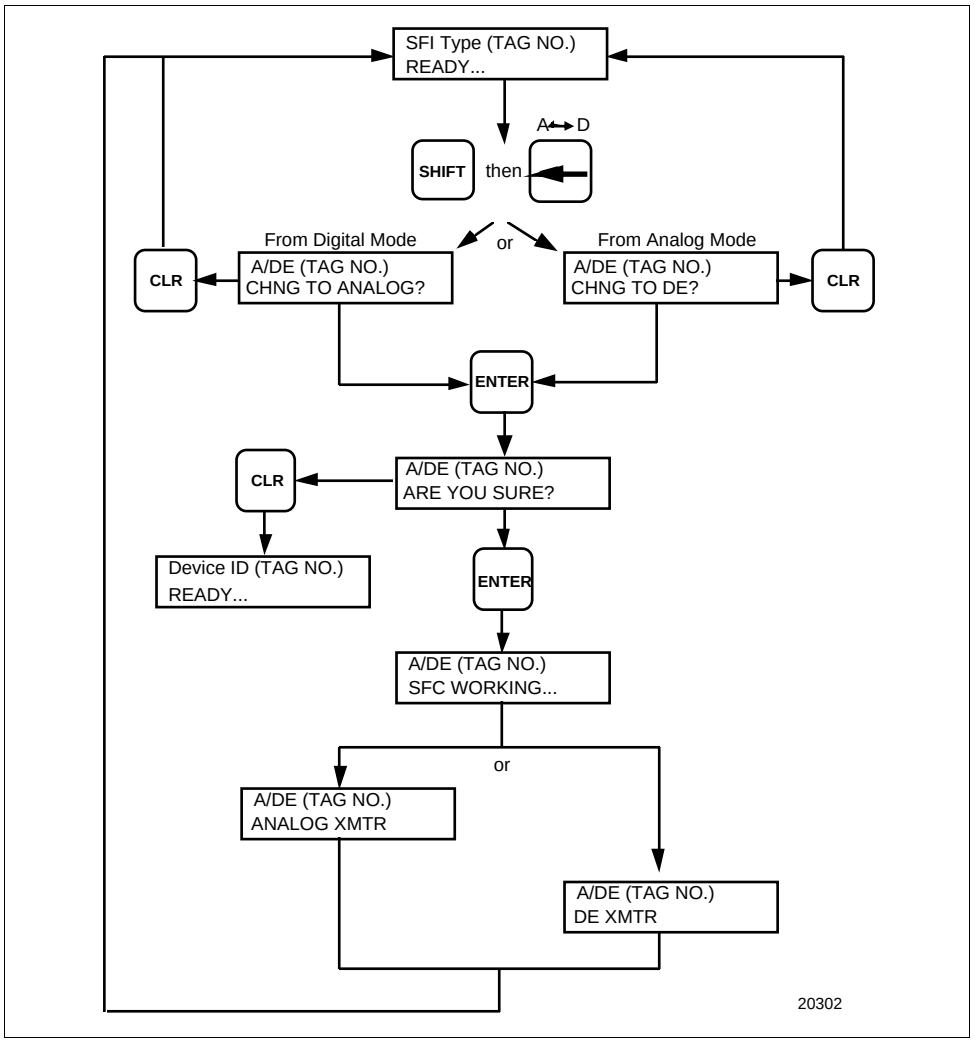
Changing the communications mode

The MagneW 3000 flowmeter operates in either an Analog mode or a Digital mode (DE communications mode) You can quickly change from one mode to another using the SFC.

See Section 1.4 “STS103/SFI Communication” for format descriptions.

Figure 6-5 is a graphic view of the key presses required to change the communication mode.

Figure 6-5 Changing Communications Mode



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Selecting configuration data for the digital (DE) communications mode

You determine how the Digital PV data is handled by configuring the DE configuration elements shown in Table 6-3.

Table 6-3 MagneW 3000 DE Configuration Elements

Element	Selections And Definitions
Type of Transmitter	This element selects the type of transmitter operation. The selections are: • **Single Range** Working range PV (PVw) for STDC card or STI module. • **Single Range W/SV** Working Range PV(PVw) with sensor temperature for STDC card or STI Module. • **Dual Range (STDC)** Full range PV (PVt) and Working range PV (PVw) (For STDC only).
Message Format	This element is the message format. The selections are: • **w/o DB (4 Byte)** 4 Byte message format (PV or SV only), without database information. • **W/DB (6 Byte)** 6 Byte message format (PV or SV with database information).
Failsafe Mode for Digital Control System	This element is the Failsafe mode. You configure the flowmeter to tell the control system, via the ST/DC card, which failsafe mode to assume when the card detects a critical failure condition. A critical fault can be due to a critical status indication from the flowmeter or an extended loss of PV data. The selections are: • **F/S=B/O Lo** Burnout low (drives the PV value to the downscale limit). • **F/S=B/O Hi** Burnout high (drives the PV value to the upscale limit). • **LKG** Last known good PV value. • **F/S=FSO,B/O Lo** Freeze slot output and burnout low (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller downscale to trip alarms). • **F/S=FSO, B/O Hi** Freeze slot output and burnout high (ST/DC card tells the controller to hold the memory block output at the preset value and drives input to the controller upscale to trip alarms). • **F/S=LKG** Freeze slot output and last known good PV (ST/DC tells the controller to hold the memory block output at the present value and provides the last known good PV value as the input to the controller).

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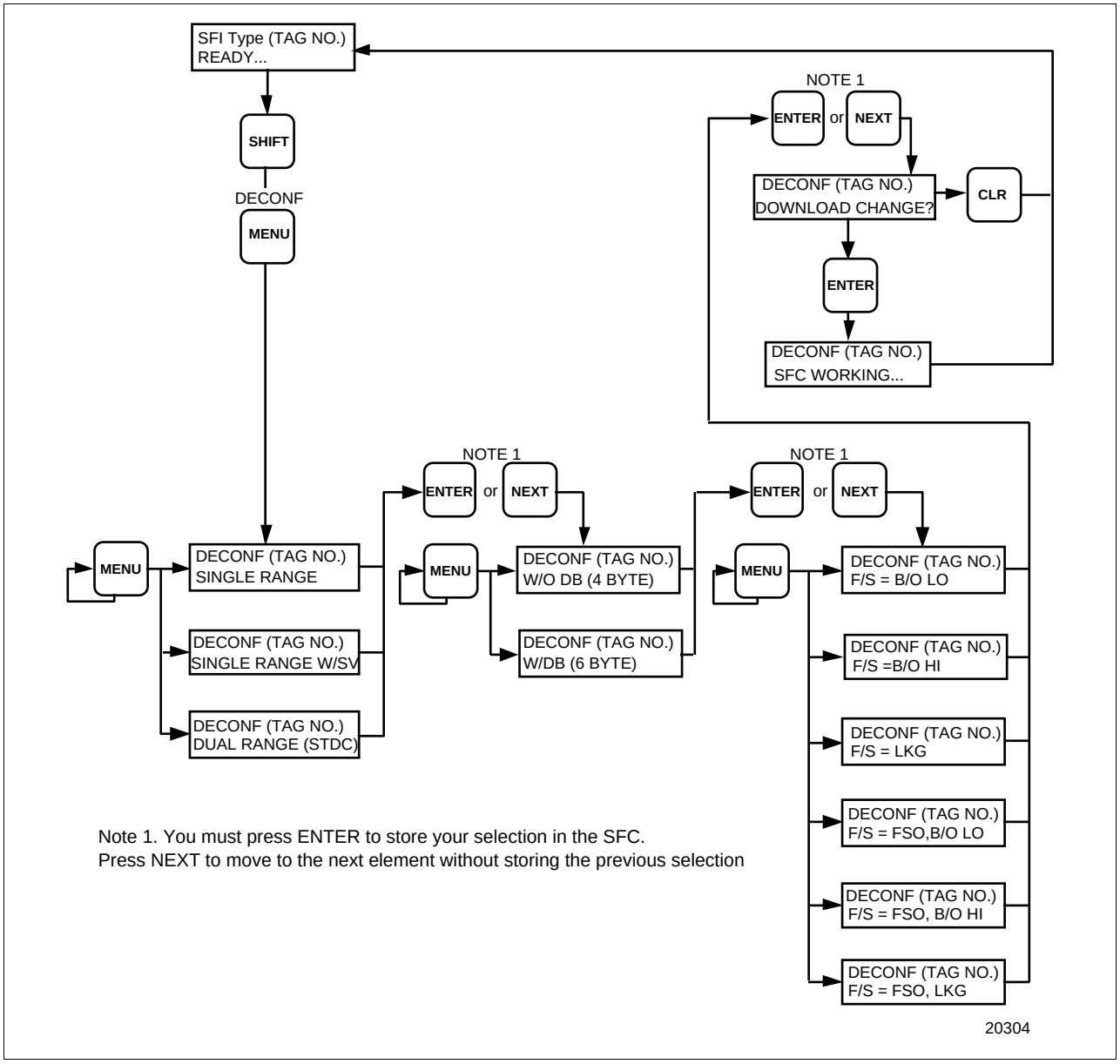
Selecting configuration data for the digital (DE) communications mode, continued

Figure 6-6 is a graphic view of the key presses required to configure the elements for DE communications mode.

Figure 6-6 Configuring the MagneW 3000 DE Communications Mode



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Keying-in the upper range value (Span)

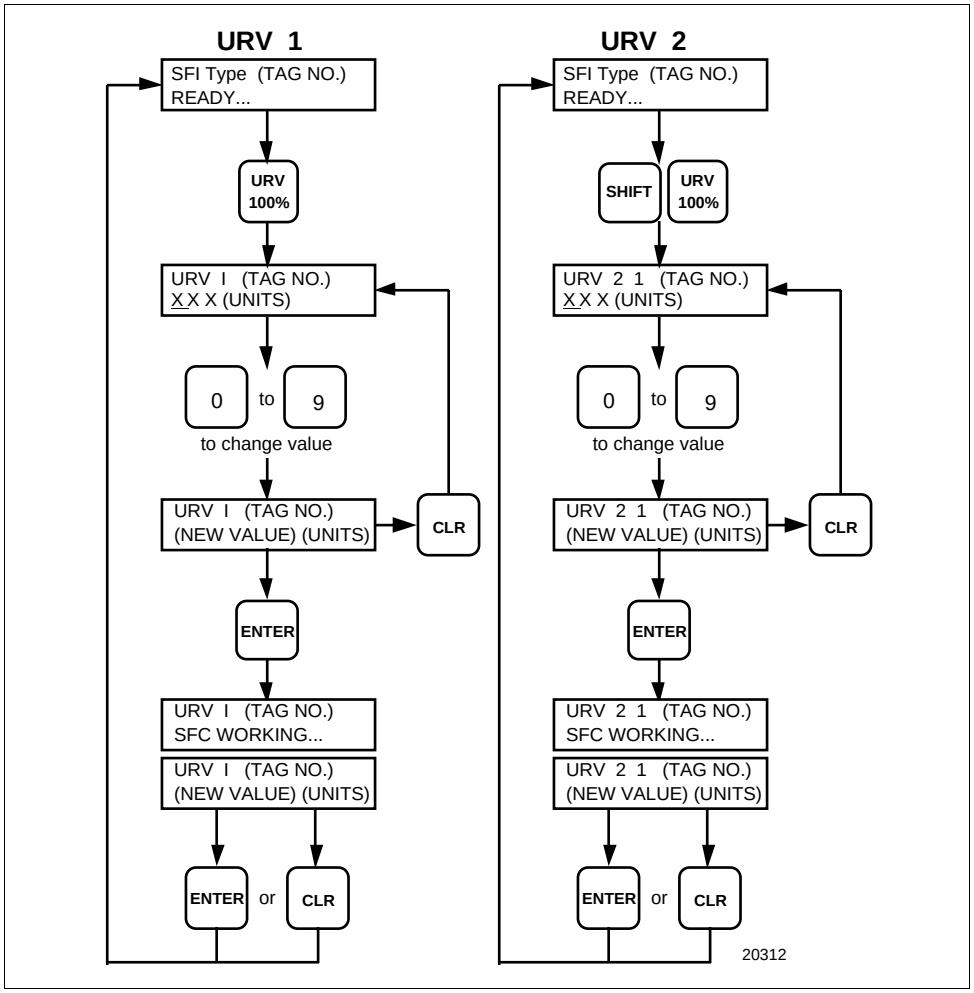
You can change the URV - Upper Range Value (Span) of a single or dual range flowmeter.
URV 1 is Range 1 of a single or dual range flowmeter.
URV 2 1 is used for +/– and Dual range applications. Press SHIFT then URV keys to get the displays. URV 2 1 means Upper Range Value (or Span) for the second range of PV1.
For +/– ranges, it would be the negative range.
For Dual ranges, it would be the second range.
Refer to Section 6.4, Table 6-5 for setting up ranging.

ATTENTION

On the Magnetic Flowmeter, the 0% output point (LRV) (4 mA point) cannot be changed. The 0% output point means that the measured process fluid is stationary.

Locate the URV key on the keyboard and press. Figure 6-7 is a graphic view of the key presses required to change the Upper Range Value (Span).

Figure 6-7 Changing the MagneW 3000 Upper Range Value (Span)



6.4 Configuration

Overview

Configuration is a dedicated operation where you use straightforward keystroke sequences to select and establish (configure) pertinent flowmeter data best suited for your application.

Prompts

To assist you in this process, there are prompts that appear in the SFC's display that let you know what group of configuration data you are working with and also, the specific parameters associated with each group.

Restrictions

Before you start your configuration, be aware that all of the parameters do not appear all the time. The prompt hierarchy that appears in Figure 6-8 gives you an overall view of the configuration parameter groups that can appear. Their appearance is sometimes restricted due to other selections particularly in the "Menu Items" selections.

Those that are restricted will be referenced in the individual graphic presentations that are given for entering those configuration parameter groups.

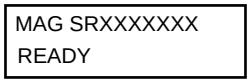
Prompt hierarchy

The Prompt Hierarchy in Figure 6-8 gives you an overall view of the configuration parameters that will appear. It will help you to get to where you want to go more quickly. Refer to each parameter and accompanying figure indicated for specific settings and menu selections for each element of the configuration parameters.

Exit configuration

You can exit configuration at any time.

Press CLR until this display appears:



or press SHIFT CLR .

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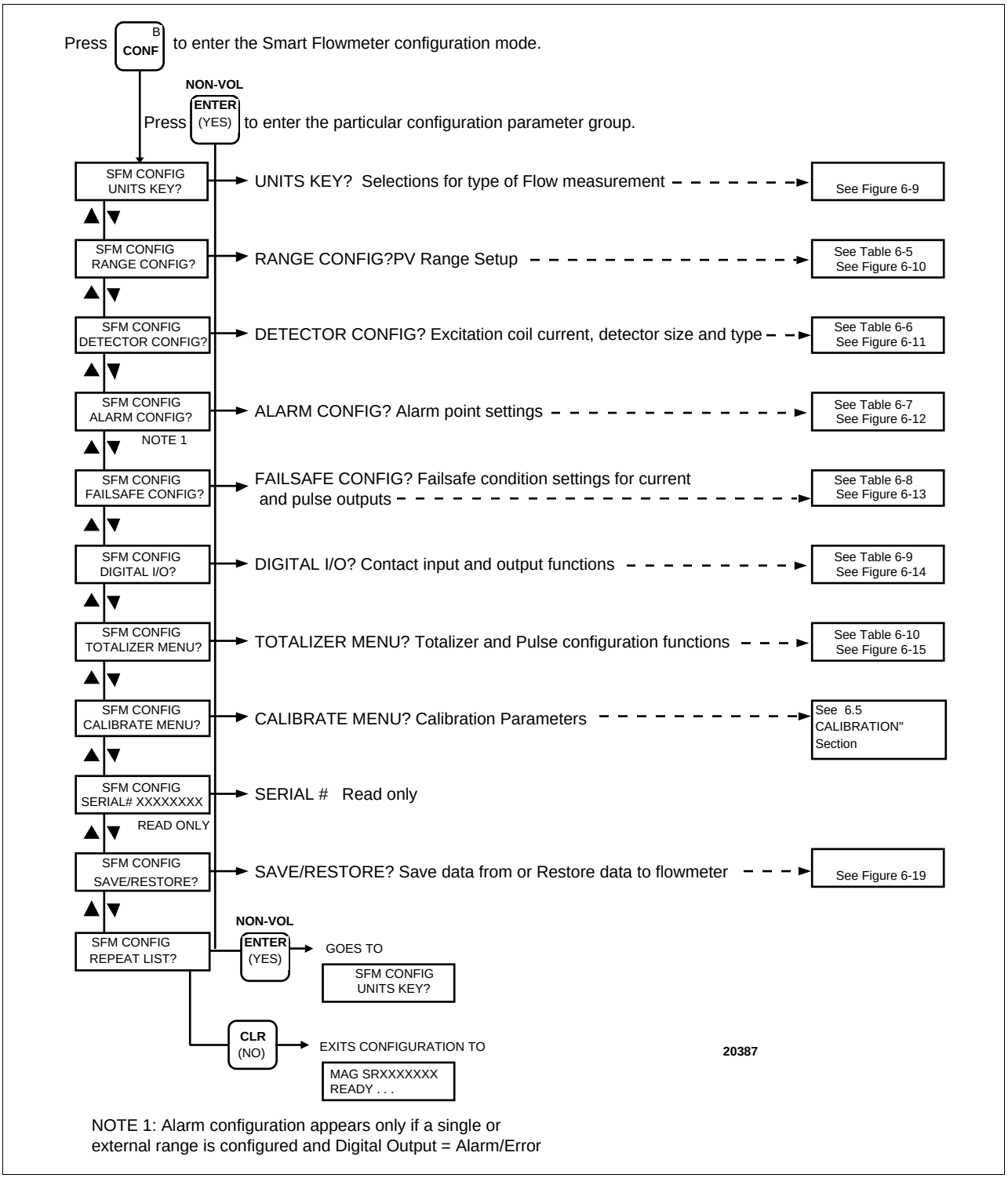
Prompt hierarchy

Figure 6-8 MagneW 3000 Prompt hierarchy



NOTE 1: Alarm configuration appears only if a single or external range is configured and Digital Output = Alarm/Error

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Selecting a parameter

Table 6-4 shows you what key to press in order to scroll through the configuration groups and select a parameter.

Table 6-4 Scrolling through the MagneW 3000 Parameters

Press	Result
H ▲ NEXT	Display goes to next parameter.
L ▼ PREV	Display goes to previous parameter.
NON-VOL ENTER (YES)	Enters that particular configuration parameter and allows menu selections. See figures that follow. Also enters menu item selection into SFC memory. NOTE: Under each parameter group there is an element entitled “DOWNLOAD DATA?”. No newly selected menu item will be entered into MagneW memory until the ENTER key is pressed while “DOWNLOAD DATA?” is being displayed.
DE CONF I MENU ITEM OR → OR ←	Scrolls through the values or selections available for a particular parameter. Press ENTER key after selection is made to enter information into the SFC memory.
^ SHIFT + CLR (NO)	Exits the Configuration mode and puts the SFC into a “READY” mode.
CLR (NO)	Clears from parameter to beginning of group.

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Units key?

This configuration parameter lets you select the type of Flow measurement for your application. Available flow measurement applications are:

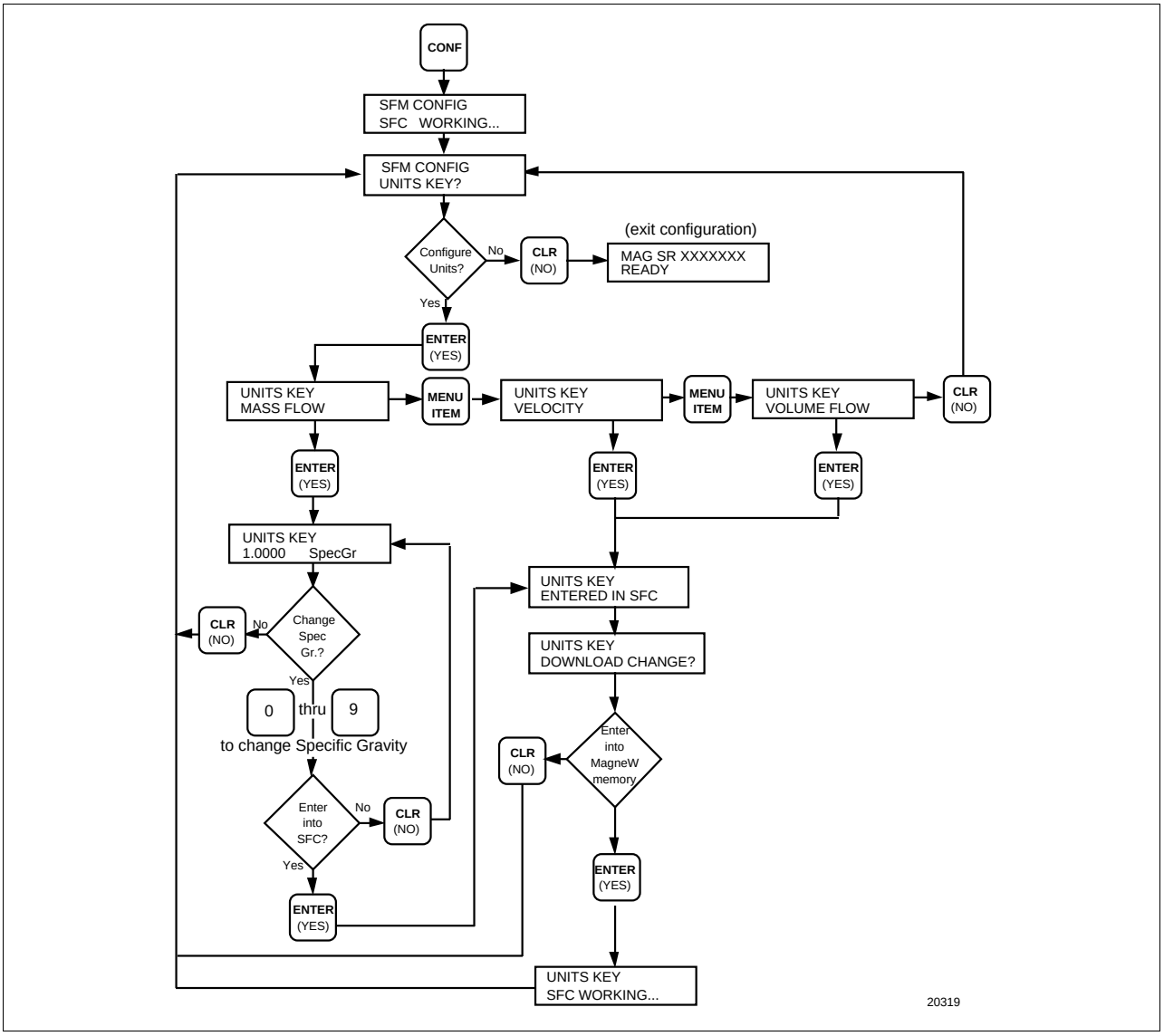
- VELOCITY
- VOLUME FLOW
- MASS FLOW

The choice of application determines the Units selections (available when the UNITS key is pressed) for LRV, URV, Input, Span, and URL.

If you select the Mass Flow application, a selection for specific gravity automatically appears.

Figure 6-9 is a graphic view of the key presses required to configure the UNITS key.

Figure 6-9 MagneW 3000 Units Key Configuration



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Range Config?

This configuration group of parameters lets you select the range function elements.

Table 6-5 lists the Range Configuration Elements.
Table 6-6 explains the Ranging Functions.
Table 6-7 is a list of possible Function Selection Combinations.

Range Config? configuration elements

The elements of Range Config? are listed in Table 6-5.

Table 6-5 MagneW 3000 Range Config? Elements

Element	Definition
RANGE=	The type of range required. See Table 6-6 for ranging function definitions **SINGLE** Single range **AUTO DUAL** Forward flow direction, automatic selection, dual range **EXT. DUAL** Forward flow direction, externally set, dual range **AUTO +/–** Forward/reverse, automatic range selection **EXT +/–** Forward/reverse, externally set
HYSTERESIS=	The transfer between ranges can be with hysteresis. Range is from 0 to 20%. The amount of overlap desired between the two ranges when “RANGE=“ is configured. For AUTO DUAL or AUTO +/– only.
CUT-OFF=	Low flow cutoff point locks the output signal to 0% when PV decreases below cut-off percentage of active span. Range is from 0 to 10%.
DISP=	Local flow display mode of the MagneW meter. **NO DISPLAY** Without local display card **DISP=%** Percent display of instantaneous flow rate **DISP=FLOWRATE** Engineering units display of instantaneous flow rate **DISP=TOTAL** Integrated amount of flow

Continued on next page

Ranging function

Table 6-6 lists the definitions of the ranging functions that are available under Range Config? Element "RANGE=".

Table 6-6 Ranging Function Definitions

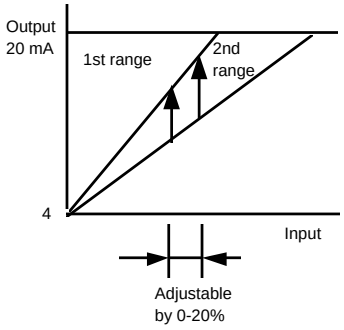
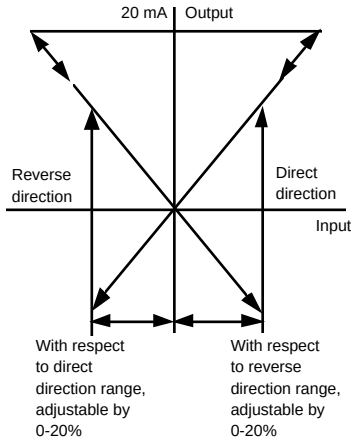
Function	Definition
SINGLE (Single Range)	For Flow measurement in the direct direction with a single range. When the flow direction is reverse, the outputs are as follows: Analog Output: Down to approximately –22.5% (0.4 mA) Pulse Output: Not delivered Display: Minus sign (–) is displayed
AUTODUAL (Direct Direction, Dual Range, Auto Selection)	Measurement is with two ranges (1st range and 2nd range). When the measured value has exceeded 100% of the low range, measurement is automatically transferred to the high range. Transfer between the two ranges can be with hysteresis as illustrated in the figure below. The flow signal must always be accompanied by the range status signal. Analog Output 1st range: 4 to 20 mAdc 2nd range: 4 to 20 mAdc When pulse output is provided The pulse weight of both 1st and 2nd ranges are the same. Contact output Range status signal The instrument comes from the factory with its range status signal set as follows: 1st range: Open 2nd range: Closed Setting reverse of the above is also possible.  Direct Direction, Automatic double range transfer hysteresis
EXT DUAL (Direct Direction, Dual Range, External Selection)	The ranges can be changed from an external range select command signal (contact signal). It is also possible to deliver a range status signal in synchronization to the range select signal. Analog Output 1st range: 4 to 20 mAdc 2nd range: 4 to 20 mAdc When pulse output is provided The pulse weight of both 1st and 2nd ranges are the same. Contact output Range select command signal 1st range: Open 2nd range: Closed Contact Output (optional) The instrument comes from the factory with its range status signal set as follows: 1st range: Open 2nd range: Closed Setting in reverse of the above is also possible.

Table continued on next page

Ranging function,
continued

Table 6-6 Ranging Function Definitions, continued

Function	Definition
AUTO +/– (Direct/Reverse Direction, Dual Range, Auto Selection)	As the flow directions change, the measuring ranges are automatically changed. The transfer section of the two ranges can be overlapped to provide a hysteresis feature as illustrated in the figure shown below. Analog Output Direct direction: 4 to 20 mAdc Reverse direction: 4 to 20 mAdc When pulse output is provided The signal is delivered regardless of the flow direction. The pulse weight remains the same regardless of the flow direction When display is provided For the flow in the reverse direction, a minus sign(–) appears on the readout. When the pulse output is provided, the direct /reverse differential flow totalization function is also available. Contact output Direct/Reverse flow direction status signal. The instrument comes from the factory with its status signal set as follows: Direct direction: Open Reverse direction: Closed Setting reverse of the above is also possible.  **Direct/Reverse transfer hysteresis**
EXT +/– (Direct/Reverse Direction, Dual Range, External Selection)	The Direct/Reverse ranges can be selected by means of an external direct/ reverse range select command signal. It is also possible to deliver a direct/reverse range status signal (contact signal) in synchronization to the select command signal. Analog Output Direct direction: 4 to 20 mAdc Reverse direction: 4 to 20 mAdc When pulse output is provided The signal is delivered regardless of the flow direction. The pulse weight remains the same regardless of the flow direction When display is provided For the flow in the reverse direction, a minus sign(–) appears on the readout. When the pulse output is provided, the direct /reverse differential flow totalization function is also available. Contact output Direct/Reverse flow direction status signal. The instrument comes from the factory with its status signal set as follows: Direct direction: Open Reverse direction: Closed Setting reverse of the above is also possible.

Continued on next page

Ranging function, continued

Table 6-7 is a list of possible Function Selection Combinations. Refer to this table when making your range function selection for possible restrictions.

Table 6-7 Function Selection Combinations

Configuration Parameter	**Range Config?**	**Pulse Config?**	**Digital I/O?**	**Digital I/O?**
Parameter Element	**Range Function**	**Pulse Out**	**DI =**	**DO =**
Selection Code Restrictions	**SINGLE**	X A B	X,1,2 X,1,2,4 X,1,2,4	X,1 X,1 3
	AUTODUAL	X A	X,1,2 X,1,2,4	2 2
	EXT DUAL	X A B	3 3 3	X,1 X,1,2 3
	AUTO +/–	X A C	X,1,2 X,1,2,4 X,1,2,4	2 2 2
	EXT +/–	X A B C	3 3 3 3	X,1,2 X,1,2 3 X,1,2
Selection Codes		X=Pulse not installed A=Normal Add B=Preset Match C=Dir/Rev differ	X=Not Used 1=0% Lock 2=Ext Auto Zero 3=Ext Range 4=Counter Reset	X=Not Used 1=Alarm 2=Range ID 3=Preset Match

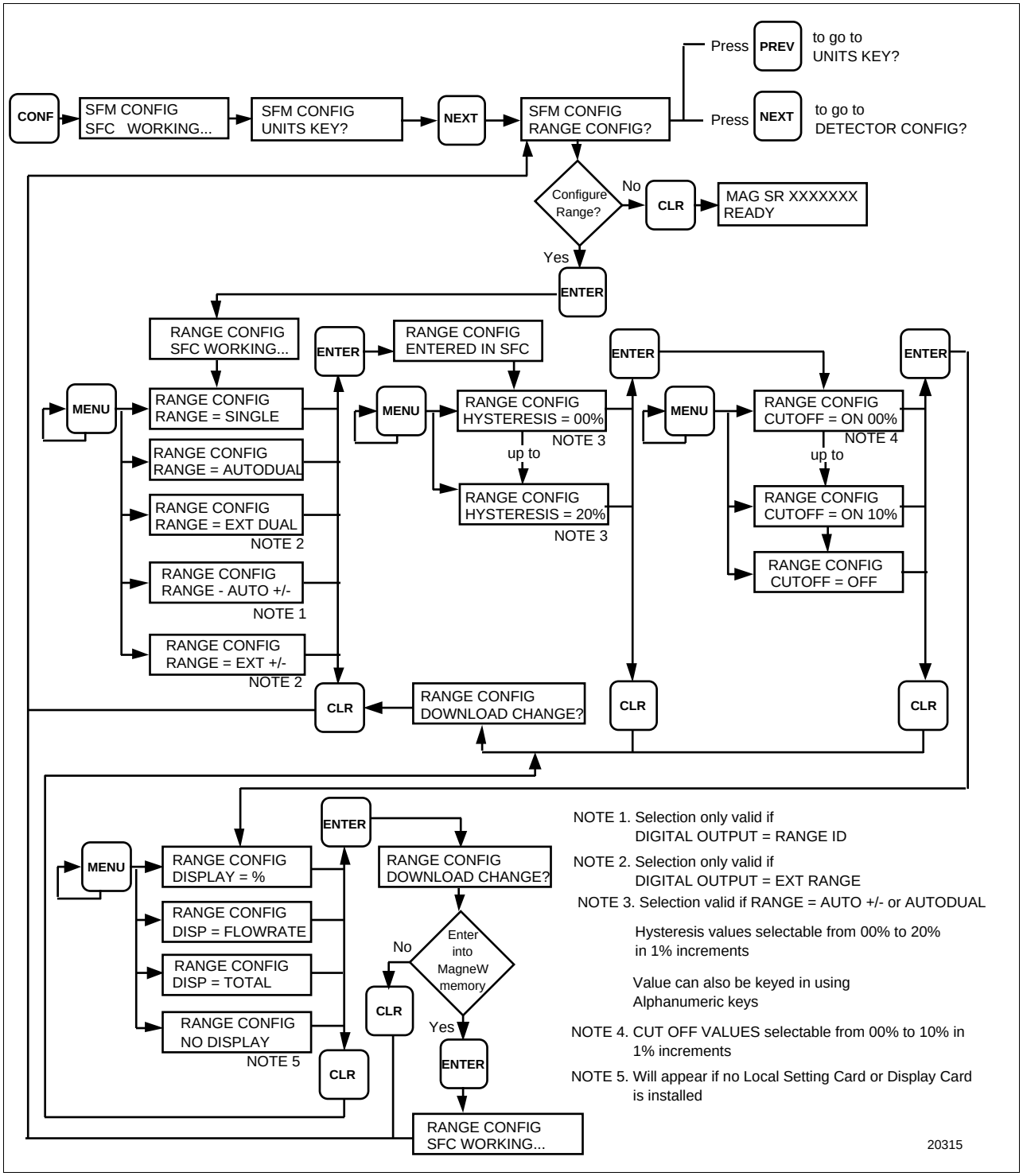
Note: Totalizing functions and pulse settings are unavailable for functionality selection without pulse board

Continued on next page

Range Config? configuration graphic

Figure 6-10 is a graphic view of the key presses required to configure the range configuration function elements.

Figure 6-10 MagneW 3000 Range Configuration Graphic



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Detector Config?

This configuration group of parameters let you select the Detector Data elements.

Detector Config? configuration elements

The elements of Detector Config? are listed in Table 6-8. See Figure 6-11 for key presses.

Table 6-8 MagneW 3000 Detector Config? Elements

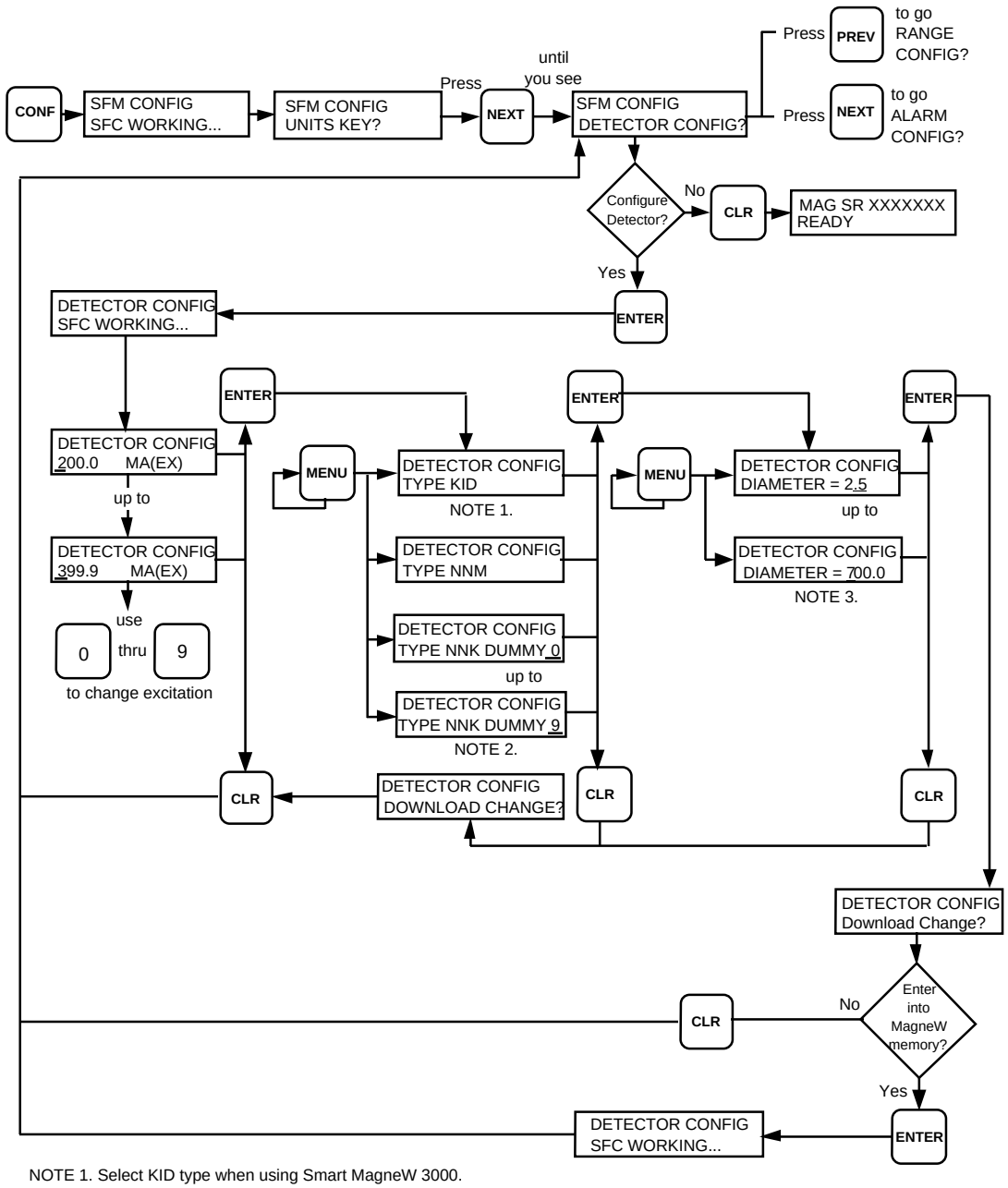
Element	Definition
EXCITATION CURRENT	The excitation coil current setting should be set to match the value stamped on the nameplate of the detector connected to the transmitter.
DETECTOR TYPE	Always select KID type when using Smart MagneW 3000.
DETECTOR SIZE	Selects the diameter of the detector you are using. See Figure 6-11 for a list of available diameters.

Continued on next page

Detector Config? configuration graphic

Figure 6-11 is a graphic view of the key presses required to configure the Detector Data elements.

Figure 6-11 MagneW 3000 Detector Data Configuration



NOTE 1. Select KID type when using Smart MagneW 3000.

NOTE 2. NUMBER OF DUMMIES = integer values 0 to 9

NOTE 3. Diameter list = 2.5MM, 5MM, 10MM, 15 MM, 25MM, 40MM, 50MM, 80MM, 100MM, 150MM, 200MM, 250MM, 300MM, 350MM, 400MM, 500MM, 600MM, 700MM.

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Continued on next page

Alarm Config?

This configuration group of parameters lets you set high and low alarm point settings based on the detected flowrate percentage.

Selections may be limited. Refer to Table 6-7 for restrictions.

The MagneW alarm occurs when the output dry contact closure is activated. There is no internal audible alarm, but an independently powered loop may be connected to provide an external alarm.

Alarm Config? configuration elements

The elements of Alarm Config? are listed in Table 6-9. See Figure 6-12 for key presses.

Table 6-9 MagneW 3000 Alarm Config? Elements

Element	Definition
■■■ % HI ALM	High alarm setpoint Range is –125 to +125% Output Flowrate
■■■ % LO ALM	Low alarm setpoint Range is –125 to +125% Output Flowrate

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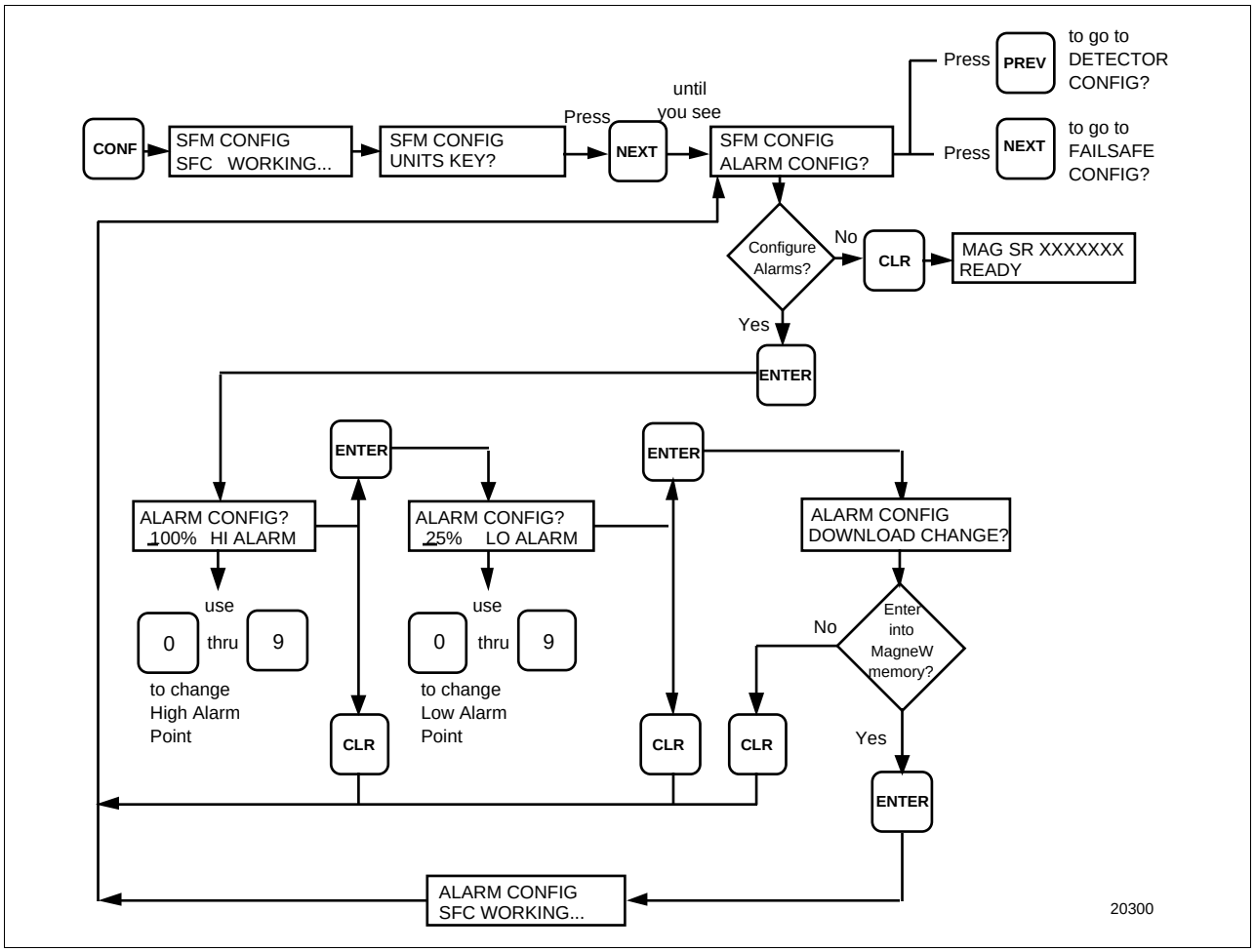
Alarm Config? configuration graphic

Figure 6-12 is a graphic view of the key presses required to configure the high and low alarm setpoints.

Figure 6-12 MagneW 3000 Alarm Setting Configuration



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Failsafe Config?

This configuration group of parameters lets you select Failsafe condition settings.

Failsafe Config? configuration elements

The elements of Failsafe configuration are listed in Table 6-10. See Figure 6-13 for key presses.

Table 6-10 MagneW 3000 Failsafe Config? Elements

Element	Definition
4-20 mA F/S=	The 4-20 mA output status **HIGH** Upscale burnout **LOW** Downscale burnout **HOLD** Hold at existing value
PULSE OUT	Pulse output status **LOW** Pulse output clamped at low state **HOLD** Pulse output held in last good value

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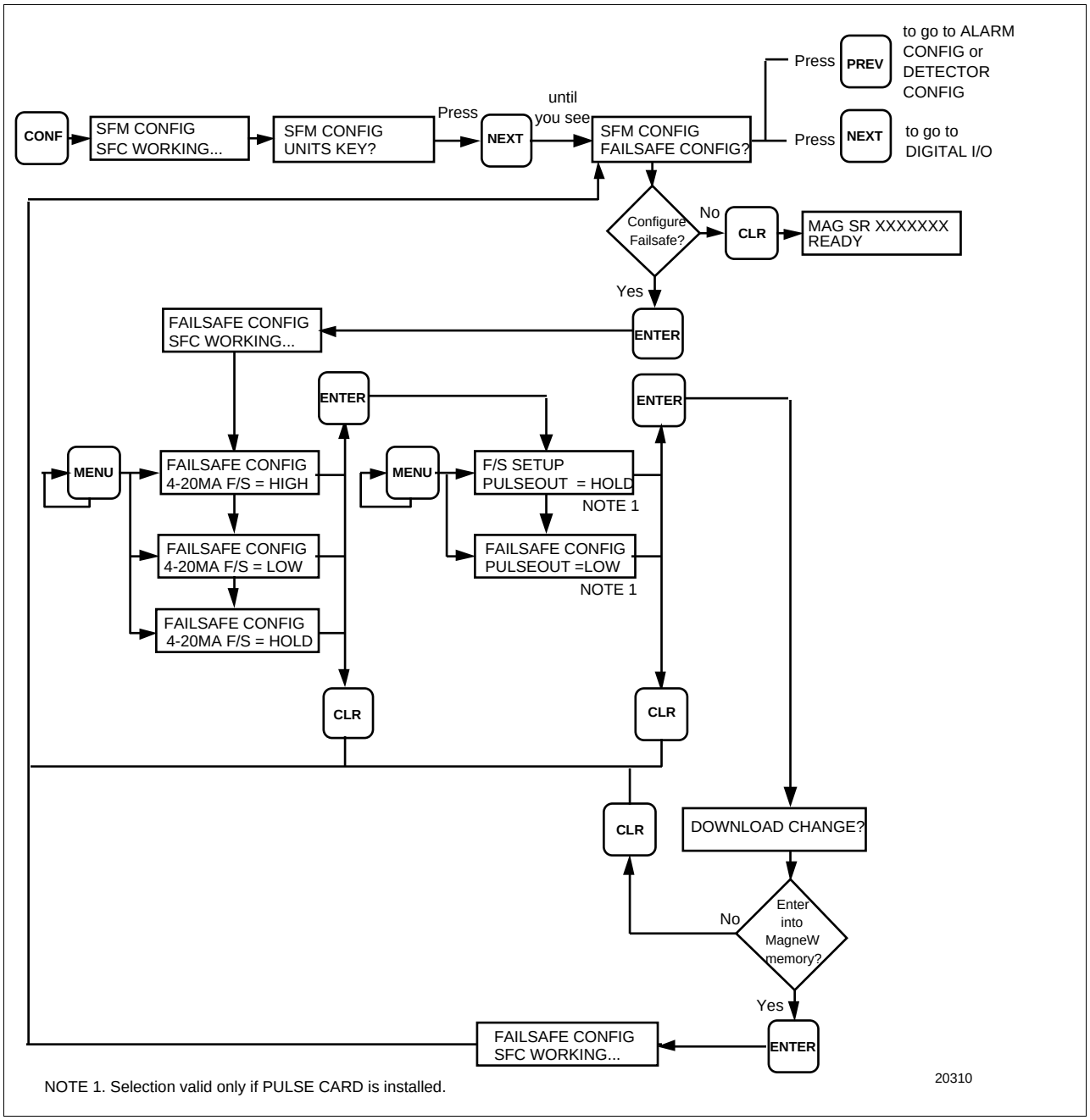
Failsafe Config? graphic

Figure 6-13 is a graphic view of the key presses required to configure the Failsafe condition settings.

Figure 6-13 MagneW 3000 Failsafe Condition Configuration



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Digital I/O?

This configuration group of parameters lets you select Digital Input/Output functions.

Dry contact input allows an independently powered loop to be connected for remote activation of database options with a switch or pushbutton.

Dry contact output allows an independently powered loop to be connected for activation of other devices when predetermined conditions occur. For example, the activation of a solenoid to close a control valve when the preset total value on the built-in counter is reached.

Digital I/O? configuration elements

The elements of Digital I/O? configuration are listed in Table 6-11. See Figure 6-14 for key presses. Selection may be limited. Refer to Table 6-7 for restrictions.

Table 6-11 MagneW 3000 Digital I/O? Elements

Element	Definition
DI=	Dry contact input functions **= NOT USED** Without the function **= 0% LOCK** External 0% lock **= AUTO ZERO** External automatic zero activation **= CNTR RESET** External counter reset **= EXT RANGE** External range selection
DO=	Dry contact output functions **= NOT USED** Without the function **= ALARM** Hi/Lo alarm contact **= RANGE ID** Range identification contact **= PRESET MTCH** Totalize counter reset reached
DO NORM=	Contact output status **= CLOS** normally closed **= OPEN** normally open

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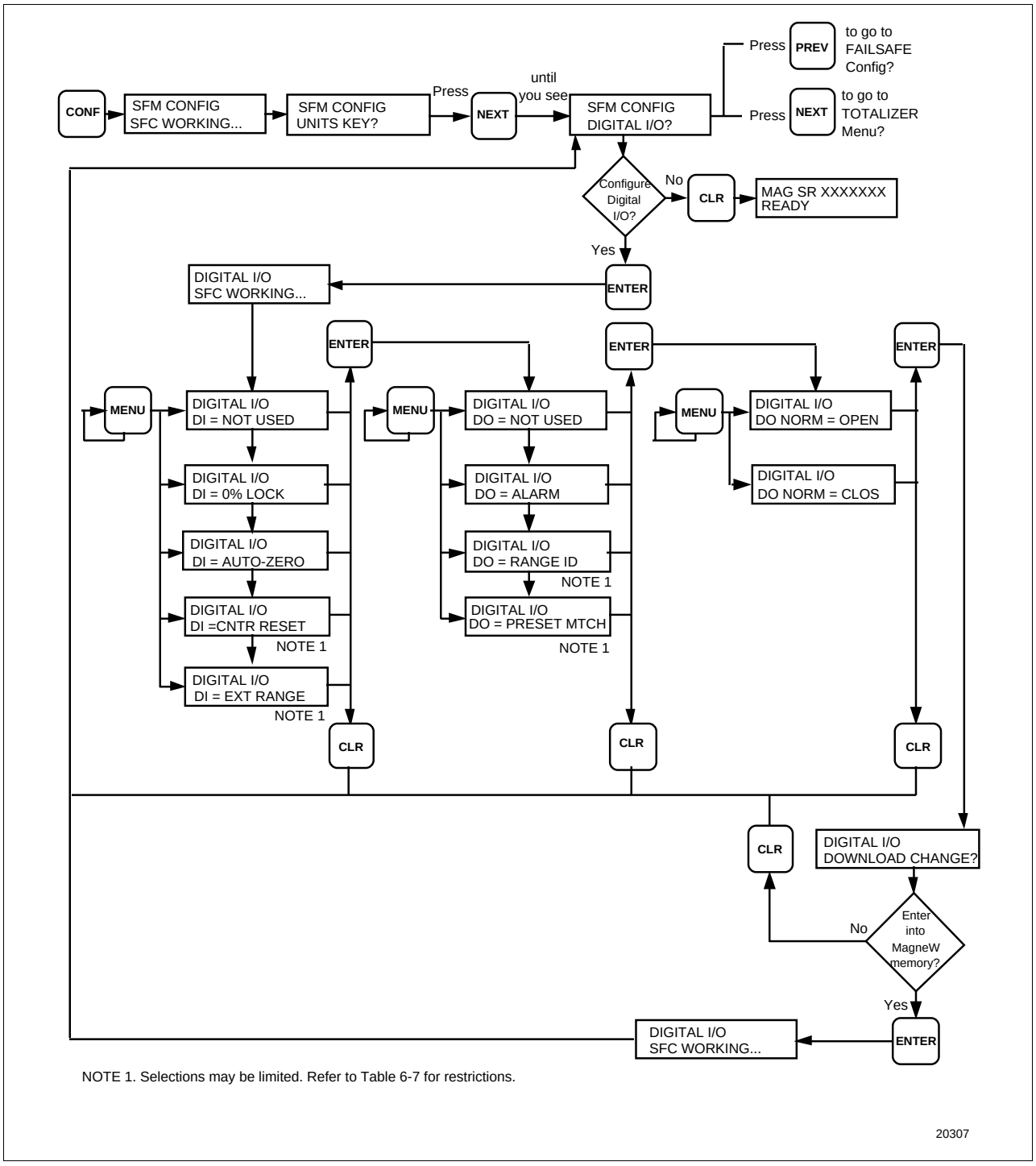
Digital I/O? configuration graphic

Figure 6-14 is a graphic view of the key presses required to configure the Digital Input/Output contact functions.

Figure 6-14 MagneW 3000 Digital Input/Output Configuration



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Totalizer Menu?

This configuration group and subset groups of parameters let you select Pulse configuration functions and Totalizer functions.

Before starting your configuration, be aware that all of the parameters do not appear all the time and that some are READ ONLY.

Totalizer Menu? elements

The elements of Totalizer Menu are listed in Table 6-12. Selections may be limited. Refer to Table 6-7 for restrictions.

Table 6-12 MagneW 3000 Totalizer Menu Elements

Element	Definition	
NO PULSE CARD	This is displayed if pulse card is not installed. All other selections are not valid.	
READ TOTAL?	Used to check the accumulated output pulse count which is calculated from the total flow.	
PULSE OUTPUT	Pulse output is read every 4 seconds.	
PULSE CONFIG?	Pulse configure elements:	
	PULSE=	Built-in counter function
	TYPE OF PULSE	Read only—determined by the pulse card installed
	PULSE UNIT	Pulse weight unit of measure
	PULSE WEIGHT	Pulse weight numerical value
	P-WIDTH	Usually selected to match requirements of external totalizer. Measured in MS.
	P-DROPOUT	When the Pulse Output rate decreases below the pulse dropout setting, the pulse output will drop to 0%.
SET TRIP VALUE	This parameter lets you change the preset value of the counter.	
RESET TOTALIZER	This is used to reset the built-in counter to zero.	

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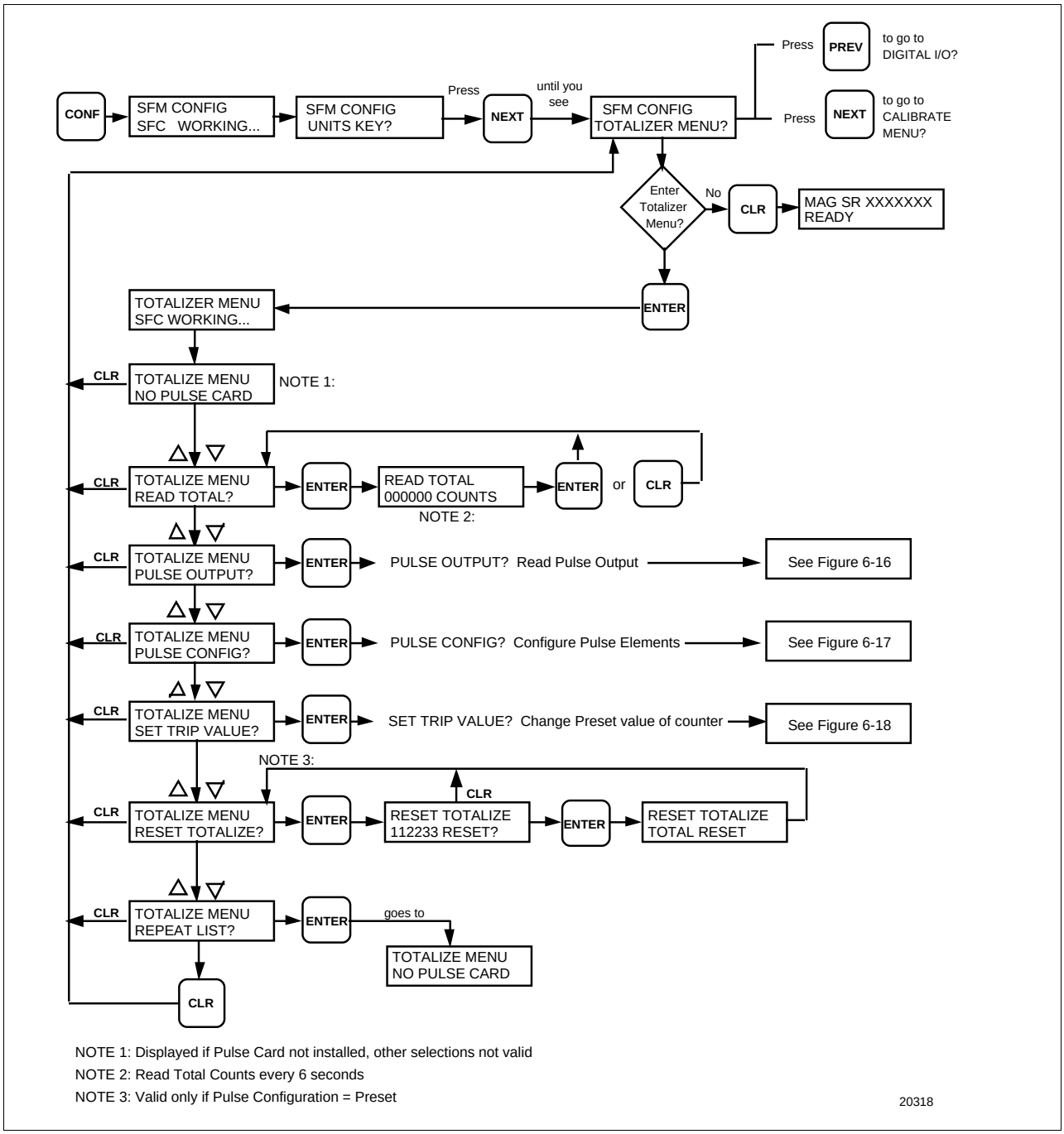
Totalizer Menu hierarchy

The prompt hierarchy listed in Figure 6-15 gives you an overall view of the Pulse configuration parameters that will appear. It will help you get to where you want to go more quickly.
Refer to the tables and figures indicated for specific settings and menu selections for each element of the configuration parameters.

Figure 6-15 MagneW 3000 Totalizer Menu Hierarchy



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Pulse Output?

Pulse output can be for a Single or Dual Range selection.

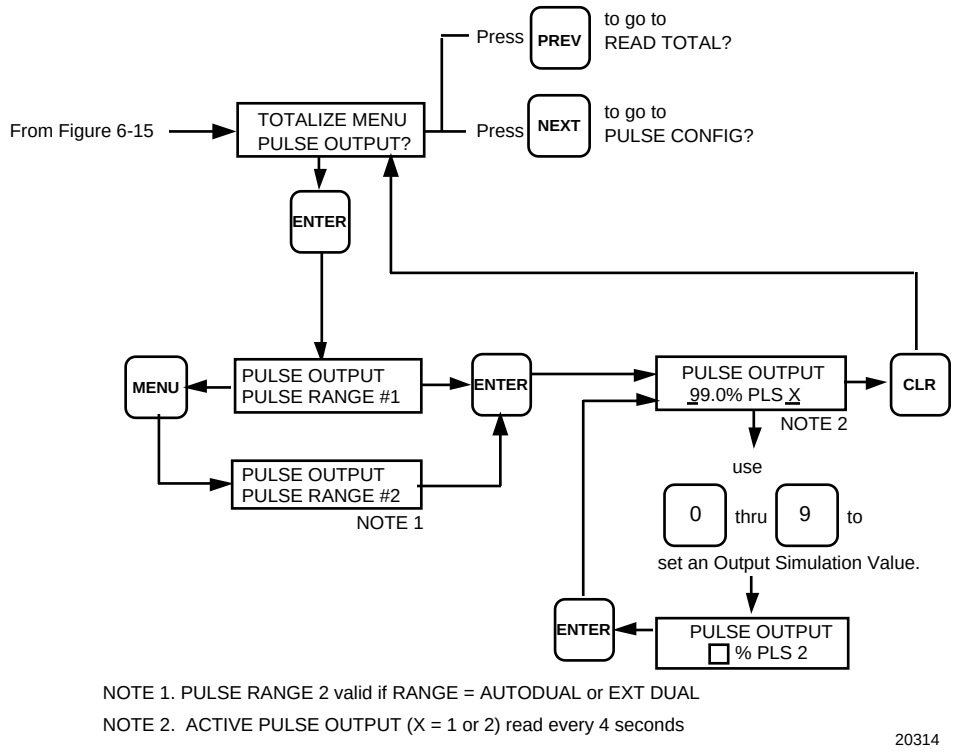
The active pulse output (#1 or #2) is read every four seconds.

You can simulate an output value on range #1 or #2 if RANGE=AUTO DUAL or EXT DUAL has been selected, by selecting a value using the 0 through 9 keys.

Pulse Output? configuration graphic

Figure 6-16 is a graphic view of the key presses required to read the Pulse Output Range percent.

Figure 6-16 MagneW 3000 Pulse Output Configuration



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Pulse Configure?

This configuration sub-group of parameters are the elements required to configure the parameters for the type of pulse card that is installed in your MagneW.

Pulse Configure? configuration elements

The elements of Pulse Configure? configuration are listed in Table 6-13. Selections may be limited. Refer to Table 6-7 for restrictions.

Table 6-13 MagneW 3000 Pulse Configure? Elements

Element	Definition
PULSE=	Selects a built-in counter function. **ADD** Simple addition **PRESET** Simple addition with preset **+/– DIFF** Algebraic addition that uses negative values for reverse flow
(Type of pulse)	This is a “READ ONLY”. The type of pulse is determined by the pulse card installed.
(Pulse unit)	Pulse weight unit of measure—The available selections are: **l/p** Liters per pulse **cc/p** Cubic centimeters per pulse **BRL/p** Barrels per pulse **Kgal/p** Kilogallons per pulse **Gal/p** Gallons per pulse **mGal/p** 10^{-3} gallons per pulse **m^3/p** Cubic meters per pulse
(Pulse weight)	Pulse weight numerical value—One output pulse is generated each time the selected amount of process material (pulse weight) passes through the detector. Use the numbered yellow keys to select the pulse weight numerical value you want.
P-WIDTH=	Pulse Width—The actual pulse duration in milliseconds. Usually selected to match requirements of external totalizer. The pulse width range of setting is from 0.3 milliseconds to 100.0 milliseconds. See Figure 6-17 for list of available Pulse Widths.
P-DROPOUT=	Pulse Dropout—Pulse output will drop to 0% when pulse output rate falls below the pulse dropout setting. The pulse dropout range of setting is from 2% up to 10%. Use the numbered yellow keys to select the Pulse Dropout value you require.

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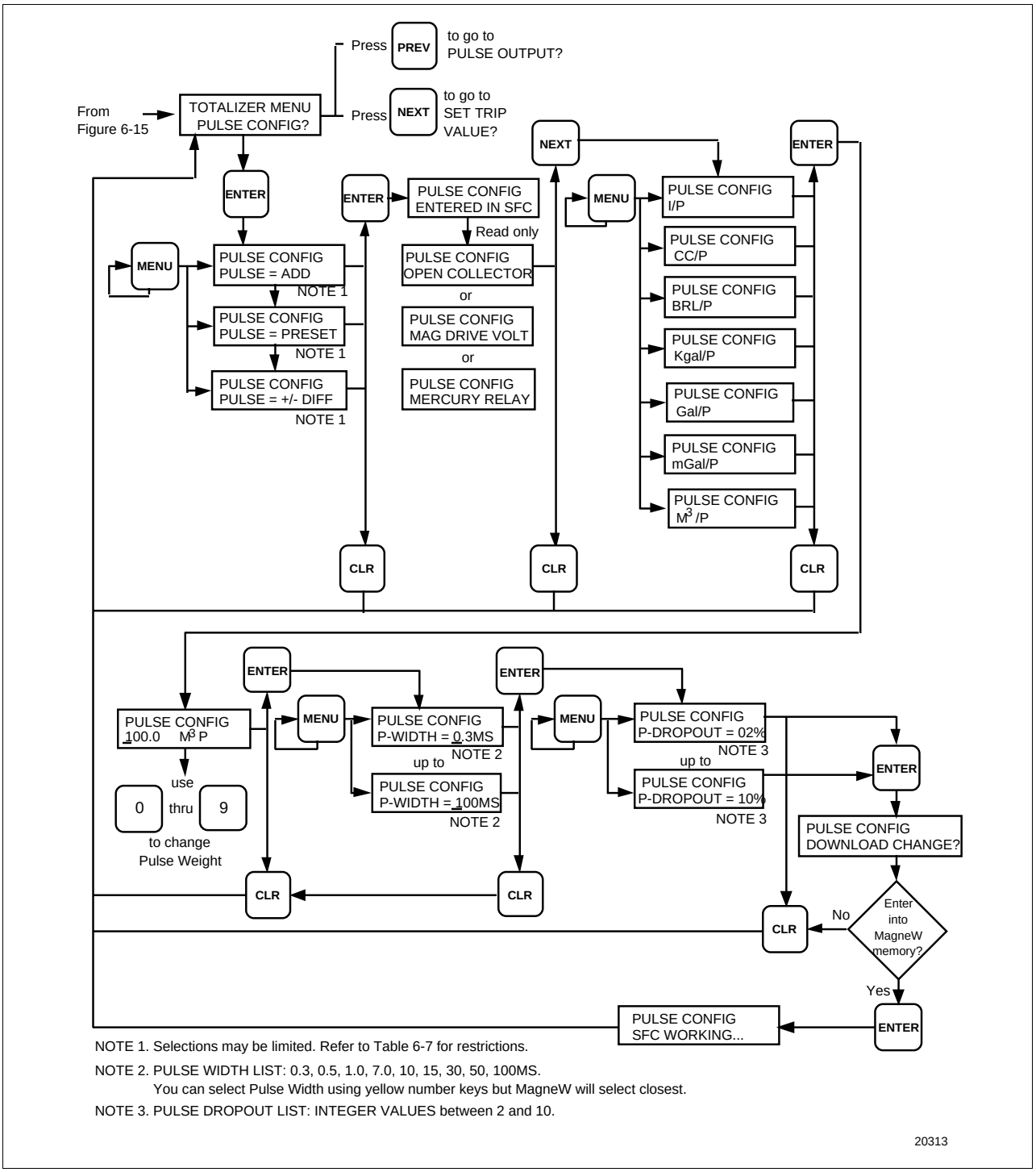
Pulse Config? configuration graphic

Figure 6-17 is a graphic view of the key presses required to configure the Pulse Config elements.

Figure 6-17 MagneW 3000 Pulse Config?



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Set Trip Value?

This parameter allows you to change the preset value of the counter. When the counter reaches trip value, Dig Out is toggled.

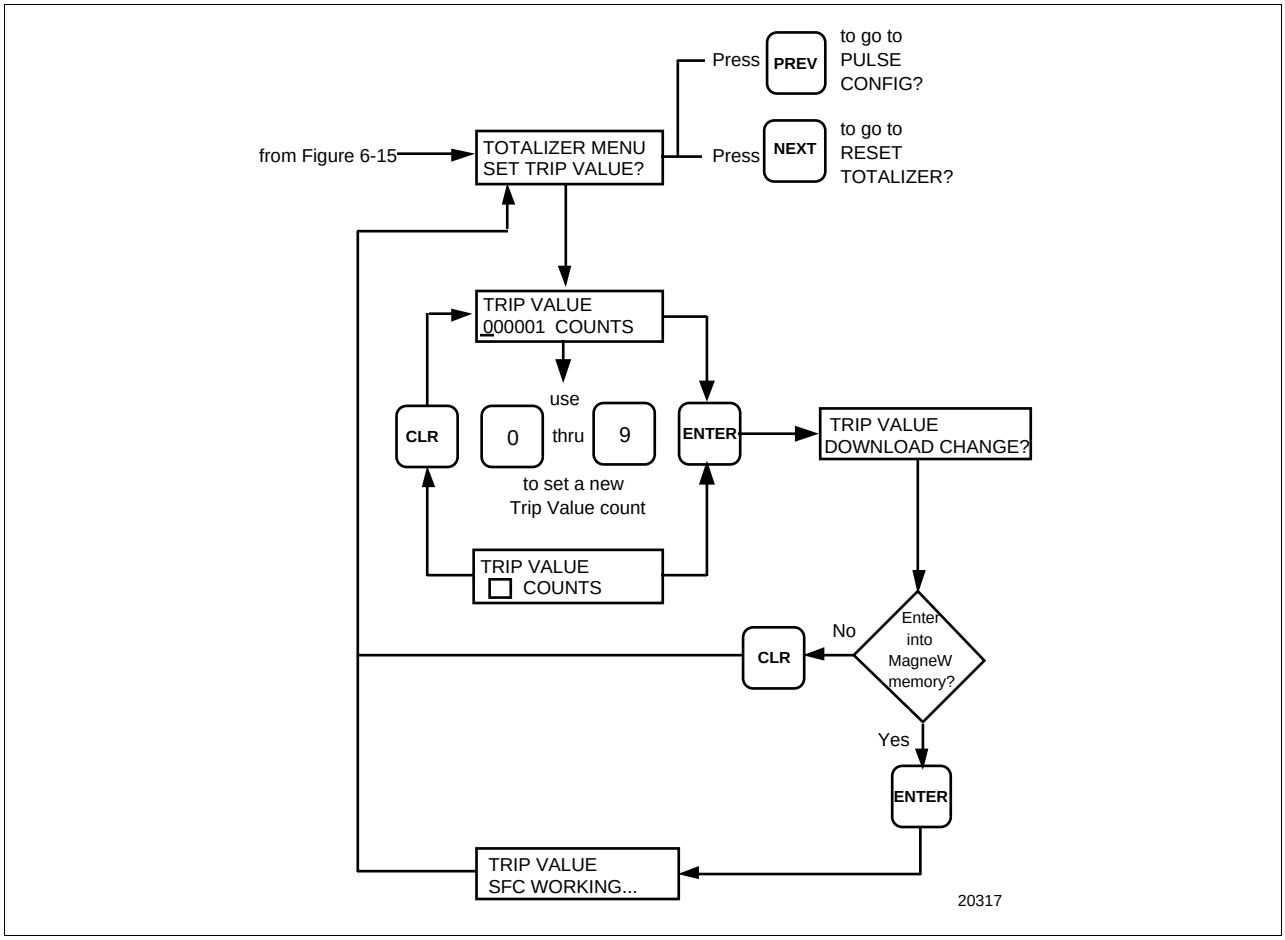
This will only appear if parameter
RANGE FUNCTION=SINGLE, EXT DUAL, or EXT +/– and
PULSE=PRESET

The display shows the existing preset counter value. Notice the cursor under the first number. Use the numbered yellow keys to select a new value.

Set Trip Value? Configuration graphic

Figure 6-18 is a graphic view of the key presses required to set the Trip value.

Figure 6-18 MagneW 3000 Set Trip Value



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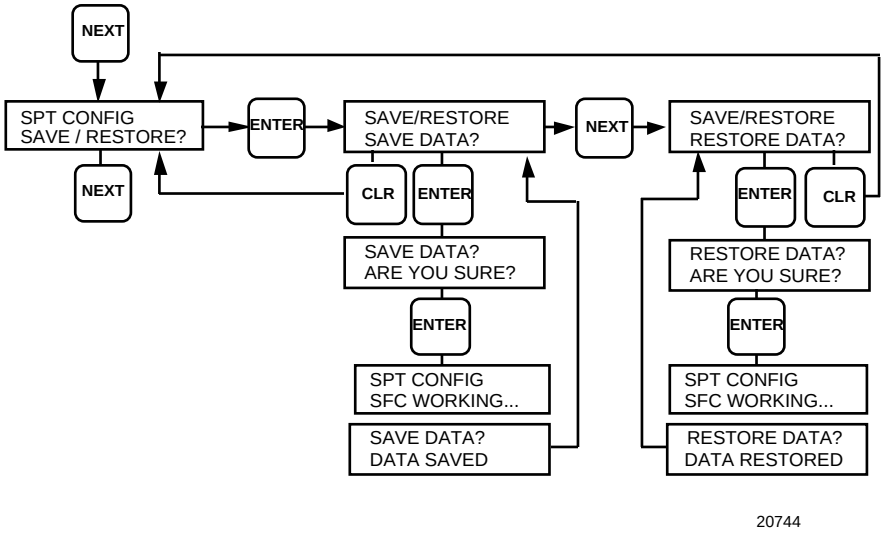
Save/Restore data?

Figure 6-19 is a graphic view of the key presses required to Save data from the flowmeter to the SFC or Restore data from the SFC to the flowmeter.

Figure 6-19 Save/Restore Data



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Copying data into non-volatile memory

The last step when configuring a MagneW 3000, whether you are changing one element or a full database, is to copy all that data into the flowmeter's Non-Volatile Memory.

This is the flowmeter's permanent memory. If the flowmeter were to lose power, the values for the database will be saved here.
The working memory loses its contents if the power goes off; and when power is restored, the flowmeter copies the contents of the non-volatile memory into the working memory.

There is a failsafe procedure. Thirty seconds after a value is changed, the flowmeter automatically copies it into the non-volatile memory. But, if you change an element and power goes down before this runs, you will still lose the data in the working memory. Therefore, whenever you make any changes in the flowmeter, always end your procedure as follows:

Press	Displays will Read	Result
 then NON-VOL 	MAG XX (tag no) SFC WORKING . . . then MAG XX (tag no) DATA NONVOLATILE then MAG XX (tag no) READY . . .	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.

6.5 Calibration

Introduction

The calibration prompts that you will use to calibrate the MagneW are a subset of prompts under the Calibrate Menu?

There are some set-up instructions and preliminary procedures to follow before going into the CALIBRATE MENU. These are given at the beginning of this section.

Calibration topics

The following topics are covered under “CALIBRATION”.

Equipment needed

In order to calibrate a MagneW 3000 Magnetic Flowmeter using an STS103 Smart Field Communicator, you will need the following equipment:

- STS103 Smart Field Communicator
- A digital voltmeter (DVM)
- 24 Vdc power supply
- Model KIZ006 MagneW Calibrator

This calibrator is designed for the precise calibration of all models of MagneW flowmeters. The calibrator generates a simulated flow velocity signal which is synchronized with the excitation current of the flowmeter. The simulated signal is applied to the converter to be calibrated. This signal is adjustable for a flow velocity equivalent range of 0-10.00 m/sec (0-30 ft/sec) in 0.01 m/sec steps for highly accurate calibration of individual flow spans.

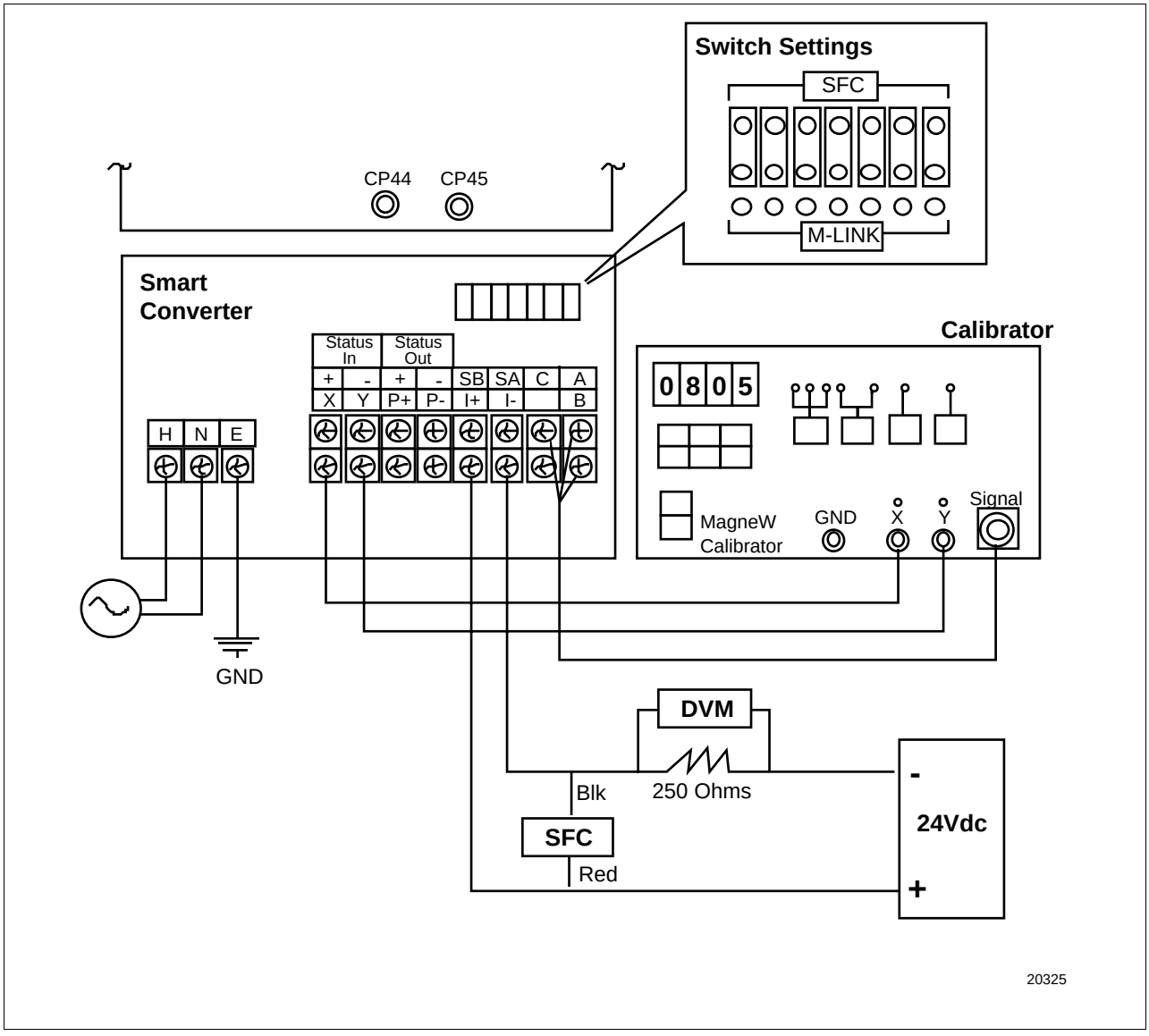
Continued on next page

Calibration setup

Figure 6-20 is the calibration set-up for KIX model using the SFC.

Refer to this figure and follow the procedure in Table 6-12 to set up for calibration.

Figure 6-20 MagneW 3000 Calibration Set-up



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Calibration set-up procedure

Table 6-14 is the procedure to set up to calibrate the MagneW using the Smart Field Communicator. Refer to Figure 6-20 for terminal locations.

WARNING

Be sure the converter power is turned OFF before making electrical connections for calibration.

Table 6-14 MagneW 3000 Calibration Set-up Procedure

Step	Action
1	Connect one end of the output signal cable to the signal output terminal of the calibrator and the other end to terminals A, B, and C of the converter (RED: A, WHITE: B, BLACK: C).
2	Connect one end of the excitation current cable to the EXCITATION CURRENT INPUT terminal of the calibrator and the other end to the X and Y terminals of the converter (RED: X, BLUE: Y).
3	Connect the GND (Ground) terminal of the calibrator to that of the converter and ground the GND terminal.
4	Make sure the switches on the converter are set.
5	Connect the Smart Field Communicator terminals (1+) RED and (1–) BLACK of the converter.
6	Connect a digital voltmeter (DVM) across the 250 ohm resistor or terminals CP44 (–) and CP45 (+).

Continued on next page

Set units to m/sec (meters per second)

Use the procedure in Table 6-15 to set the Units key for a velocity application, then select m/sec on the Units key.

Table 6-15 Set the MagneW 3000 Units to m/sec

Step	Press	SFC Display will Read	Result
1	B CONF	SFM CONFIG SFC WORKING then SFM CONFIG UNITS KEY?	The SFC enters Configuration mode and shows the first configuration parameter which is "UNITS KEY?"
2	NON-VOL ENTER (YES)	UNITS KEY MASS FLOW	Enters into UNITS KEY configuration.
3	DE CONF MENU ITEM until you see	UNITS KEY VELOCITY	The flow measurement selections are shown in this step.
4	NON-VOL ENTER (YES)	UNITS KEY ENTERED IN SFC then UNITS KEY DOWNLOAD CHANGE?	Velocity measurement is selected and entered into the SFC . The SFC then prompts you to download this change to the MagneW.
5	NON-VOL ENTER (YES)	UNITS KEY SFC WORKING then SFM CONFIG UNITS KEY?	Data is downloaded and the SFC returns to the initial display.
6	CLR (NO)	MAG SR (tag no) READY . . .	Exits configuration mode.
7	D UNITS	UNITS 1 (tag no) m/sec	If display does not read m/sec, press NEXT key until it does.
8	NON-VOL ENTER (YES)	UNITS 1 (tag no) SFC WORKING then MAG SR(tag no) READY . . .	m/sec entered into MagneW memory.

Continued on next page

Set span to 10.001 m/sec (meters per second)

Use the procedure in Table 6-16 to set the span to 10.001 m/sec (meters per second).

Table 6-16 Set the MagneW 3000 Span to 10.001 m/sec

Step	Press	SFC Display will Read	Result
1	F URV 100%	URV1 (tag no) SFC WORKING . . . then URV1 (tag no) X.XXXX M/SEC	The display will show the current value in "m/sec". The cursor will be under the first digit.
2	V 1 Z 0 ■ Z 0 Z 0 V 1 on yellow keys	URV1 (tag no) 10.001 M/SEC	You have selected 10.001 meters per second.
3	NON-VOL ENTER (YES)	URV1 (tag no) SFC WORKING . . . then URV1 (tag no) 10.001 M/SEC	The span is now set at 10 meters per second. **ATTENTION** LRV (zero) will always read 0. The SFC will not allow change.
4	CLR (NO)	MAG XX (tag no) READY	

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Do a DAC calibration

With this procedure you can calibrate the digital to analog current output zero and span. (ANALOG FLOWMETERS ONLY)

Use the procedure in Table 6-17 to do a digital to analog current output signal calibration.

Table 6-17 MagneW 3000 Digital to Analog Current Output Signal Calibration

Step	Press	SFC Display will Read	Result
1			Connect a DVM across the 250 ohm resistor as shown in Figure 6-20 — Calibration Set-up.
2	INPUT / J OUT-PUT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP 1 (tag no.) # 10.000 % RNG 1	The SFC is ready to calibrate 0% output or 100% output.
3	Z 0	OUTP1 (tag no) 0___ % RNG1	To select 0% output
4	NON-VOL / ENTER (YES)	OUTP 1 (tag no.) SFC WORKING . . . then OUTP1 (tag no) # 0.00 % RNG1	# in display indicates the transmitter is in the Output mode.
5			Check the DVM. If the value on the DVM is 1.00 volt, go to step 9 (100% calibration). If the value on the DVM is *not* 1.00 volt, go to step 6 to correct DAC zero.
6	RESET / K COR-RECT	OUTP 1 (tag no.) SFC WORKING . . . then OUTP1 (tag no) # CORRECT DAC ZERO	Allows correction of DAC zero.
7	H ▲ NEXT or L ▼ PREV	OUTP1 (tag no) # INCREASED 4 MA or OUTP1 (tag no) # DECREASED 4 MA then OUTP1 (tag no) # CORRECT DAC ZERO	To adjust the value on the DVM to 1.00 volt. When 1.00 volt is shown on the DVM, go to step 8.

Table continued on next page

Do a DAC calibration,
continued

Table 6-17 MagneW 3000 Digital to Analog Current Output Signal Calibration (continued)

Step	Press	SFC Display will Read	Result
8	CLR (NO)	OUTP1 (tag no) # 0.00 % RNG 1	0% output calibrated, go to step 9, 100% calibration.
9	1 V, 0 Z, 0 Z, ■, 0 Z, 0 Z	OUTP1 (tag no) # 100.00 % RNG 1	This selects 100% output. \# in display indicates the transmitter is in the Output mode.
10	NON-VOL ENTER (YES)	OUTP 1 (tag no.) SFC WORKING . . . then OUTP1 (tag no) # 100.00 % RNG 1	Check the DVM: If the value on the DVM is 5.000 volts, go to step 13. If the value on the DVM is *not* 5.000 volts, go to step 11 to correct DAC span.
11	RESET COR- RECT K	OUTP 1 (tag no.) SFC WORKING . . . then OUTP1 (tag no) # CORRECT DAC SPAN	Allows correction of DAC span.
12	▲ NEXT H or ▼ PREV L	OUTP1 (tag no) # INCREASED 20 MA or OUTP1 (tag no) # DECREASED 20 MA then OUTP1 (tag no) # CORRECT DAC SPAN	To adjust the value on the DVM to 5.00 volts. When 5.000 volts is shown on the DVM, go to step 13.
13	INPUT OUT- PUT J then CLR (NO)	OUTP1 (tag no) # 100.00 % RNG 1 MAG SR (tag no) READY	Exits DAC calibration mode. Exits current output mode.

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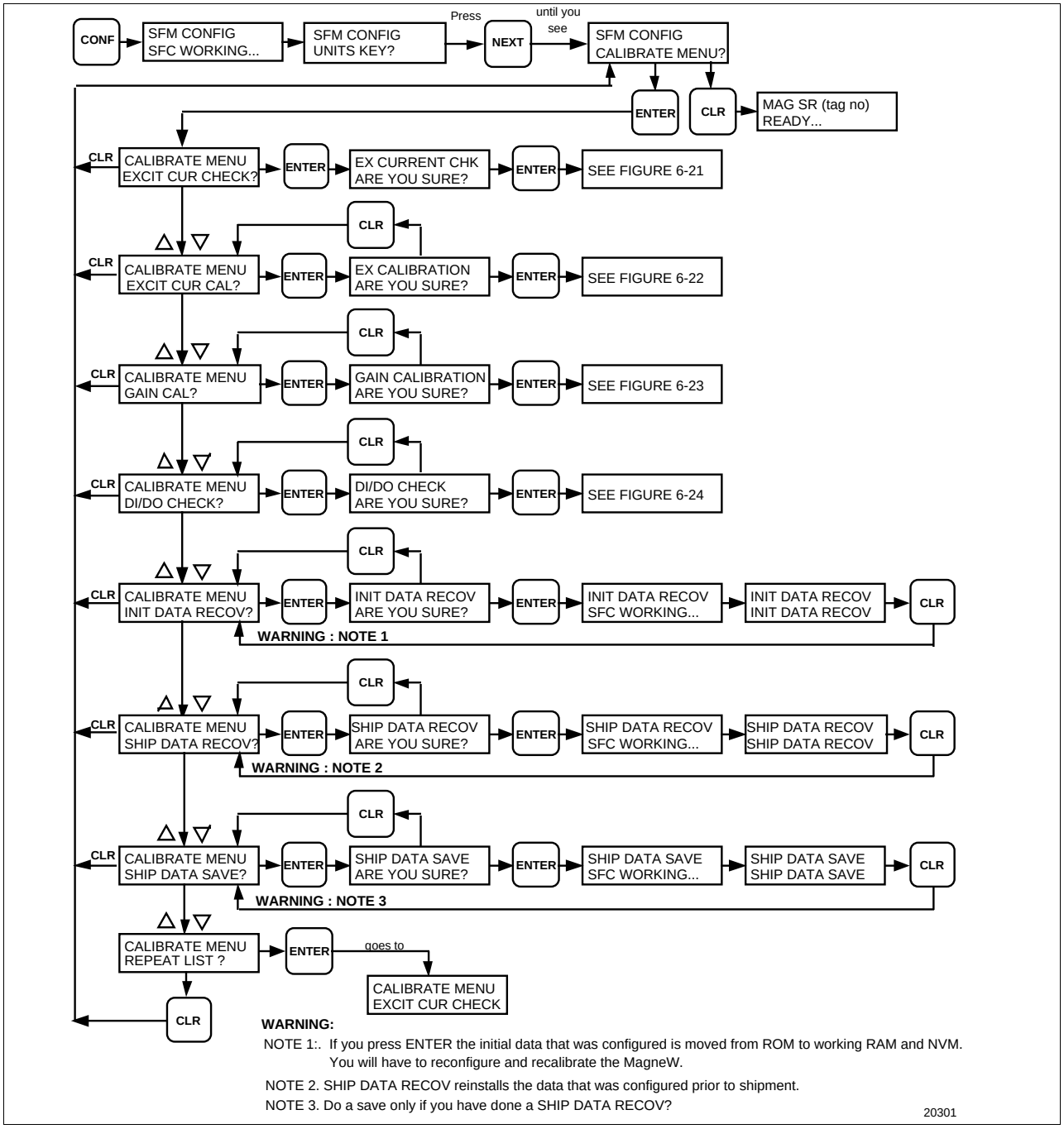
Calibration menu hierarchy

The Calibrate Menu? prompts are reached on the SFC through the CONF key. Figure 6-21 shows you how to get to the Calibrate Menu? and the hierarchy of the prompts required to calibrate the MagneW.
The hierarchy will lead you to the specific procedures required to do the calibration.

Figure 6-21 MagneW 3000 Calibration Menu Hierarchy



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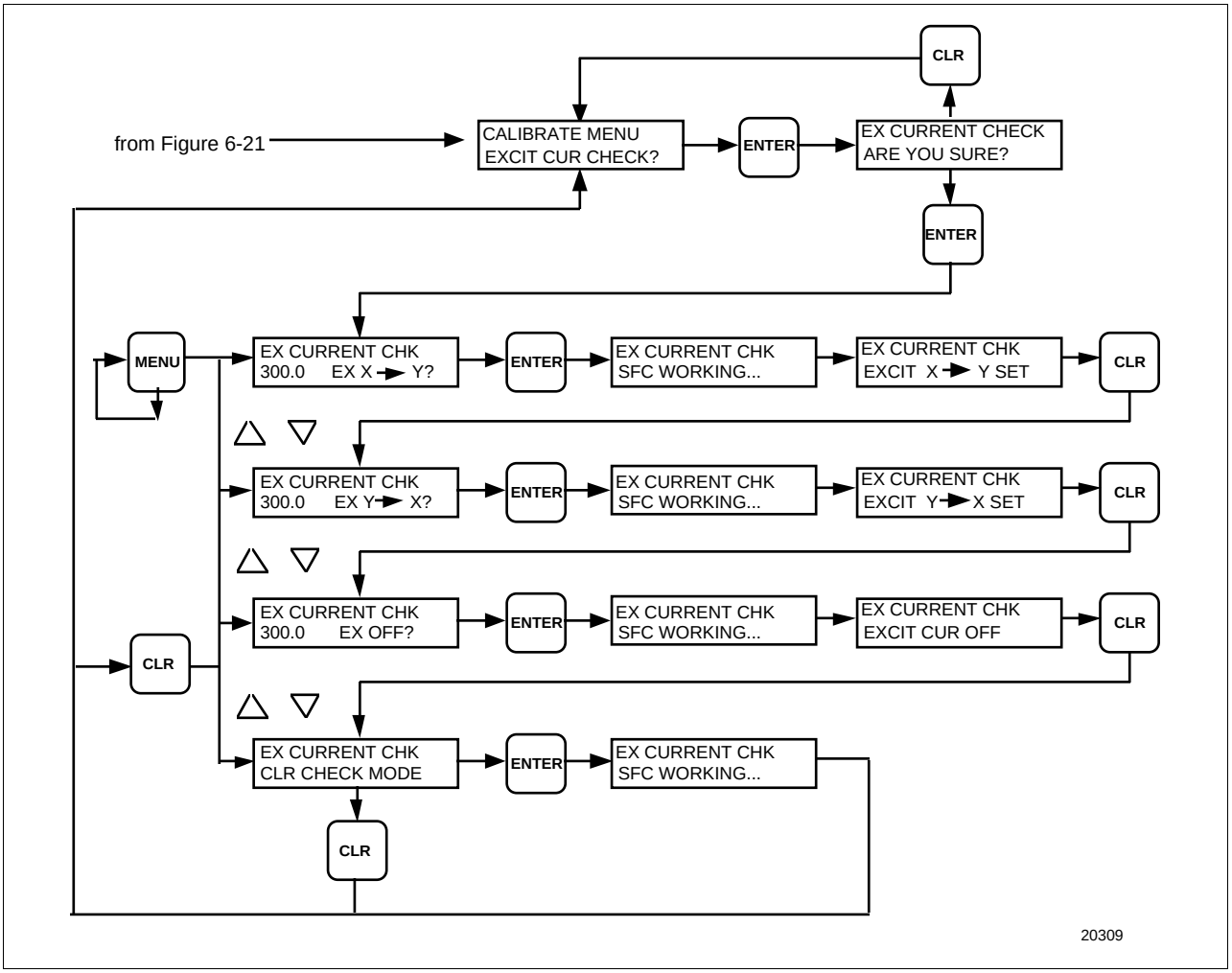
Excitation current check

Make sure the excitation current agrees with what is on the nameplate.

Figure 6-22 gives you the key presses, displays, and rules (notes) required to do an excitation current check or turn the excitation current off.

Figure 6-22 MagneW 3000 Excitation Current Check



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Excitation current calibration

The low excitation current should read 250 mA and the high excitation current should read 350 mA.

If the excitation current needs calibrating, you can select an increment or decrement value of 0.03, 0.10, 0.50, 1.00, or 5.00 mA to use during calibration that will bring the excitation current to the proper value more quickly.

For example: If the high excitation current value reads 340, you can select "INC/DEC 5.00 mA" and the DVM will increase 5 mA each time you press the ▲ key. Press ▲ twice to increase to 350.

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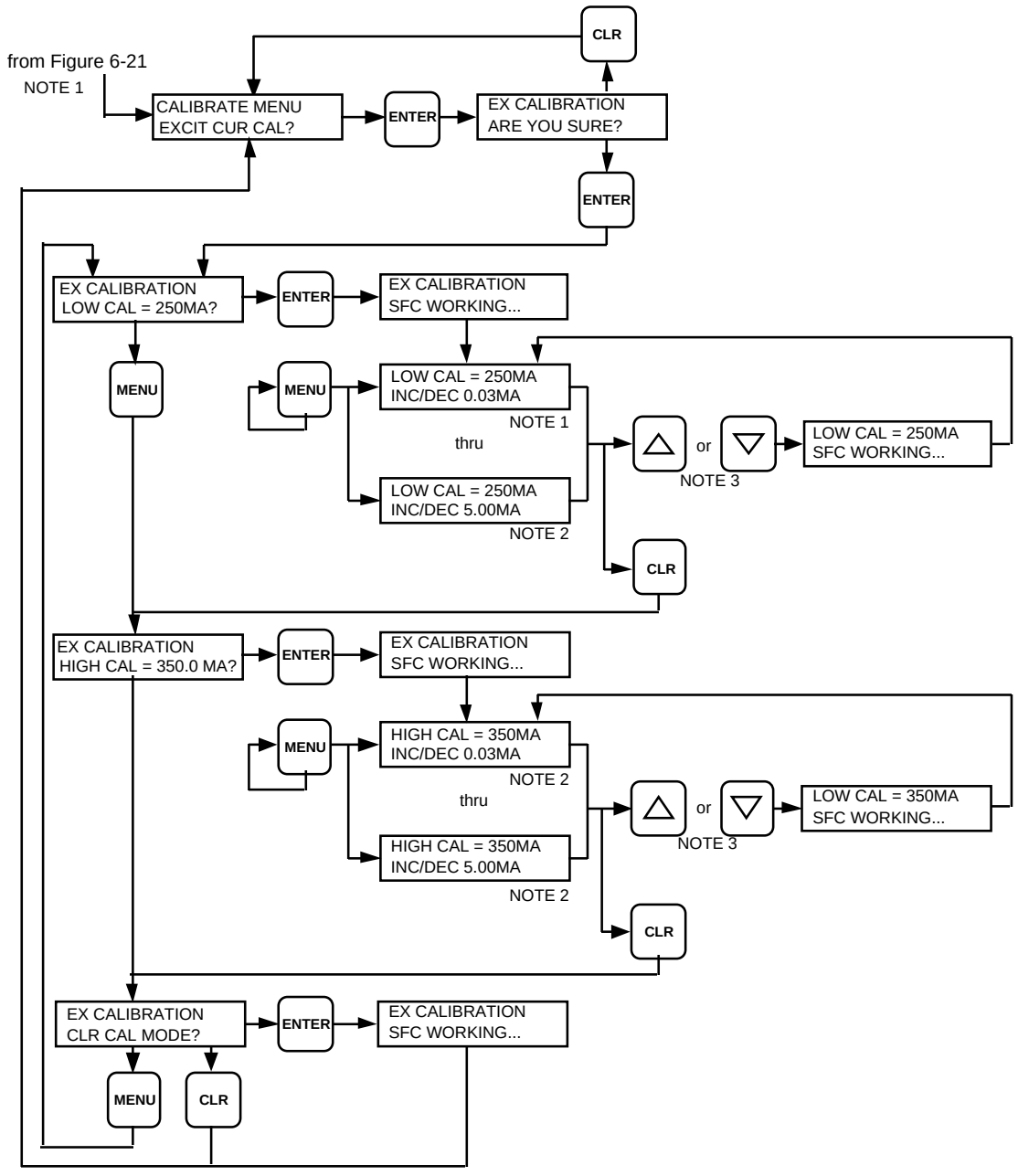
Excitation current calibration procedure

Figure 6-23 gives you the key presses, displays, and rules (notes) required to calibrate the excitation current.

Figure 6-23 MagneW 3000 Excitation Current Calibration



NOTE 1. Connect a DVM across terminals CP44(-) and CP45(+) on the main Printed Circuit Board. See Figure 6-20 for location.

NOTE 2. INCREMENT/DECREMENT LIST = 0.03, 0.10, 0.50, 1.00, 5.00 MA. Select one.

NOTE 3. DVM Reading will be increased or decreased by INC/DEC value selected. Repeat until DVM Reading is correct.

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Gain calibration

Gain calibration consists of calibrating the internal gain coefficients-zero point 0.0 m/s, 0.4 m/s, 1.2 m/s, 2.6 m/s, and 10 m/s.

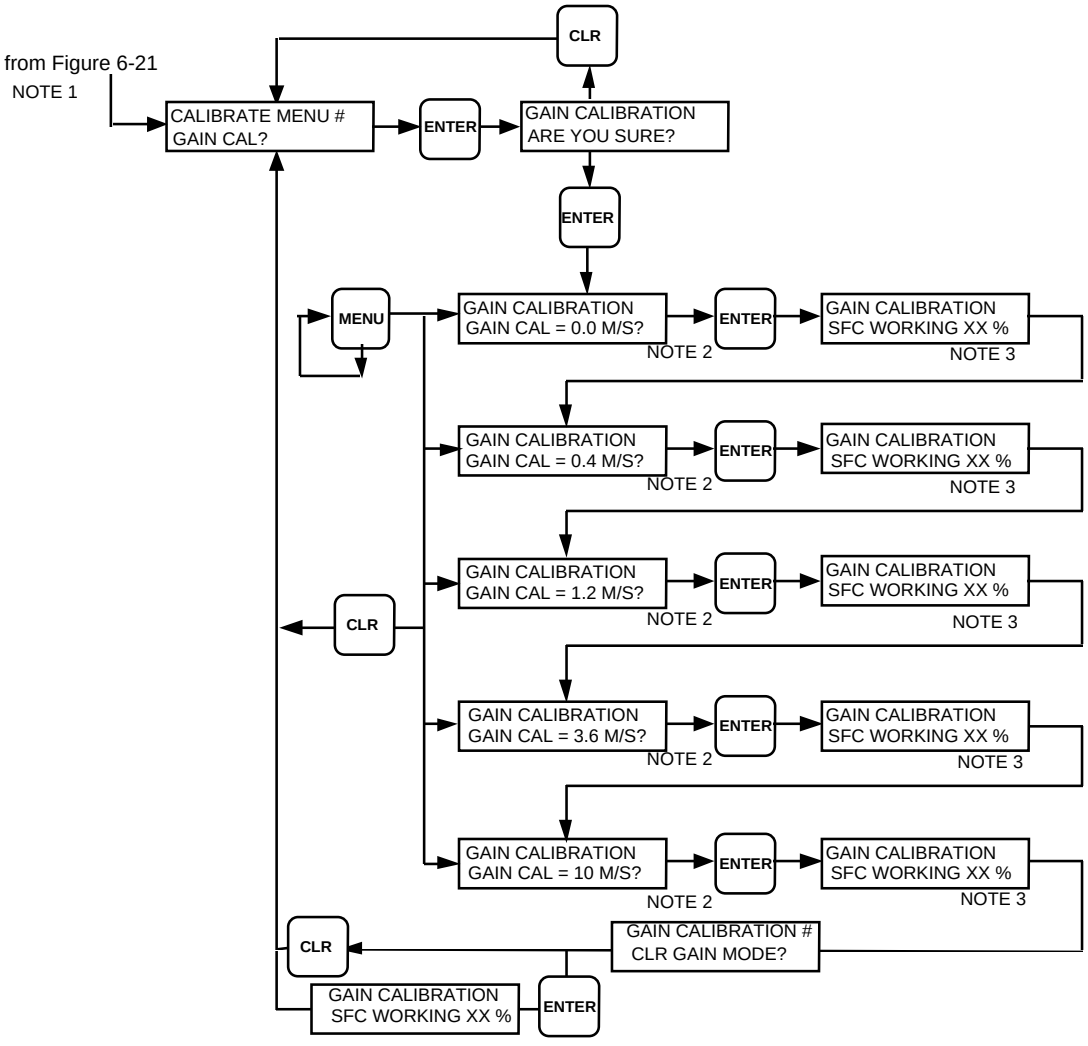
Gain calibration procedure

Connect a digital voltmeter across the 250 ohm resistor as shown in Figure 6-20 and set the DVM to volts mode.

Press URV and verify span is set to 10.00 m/sec. Refer to Table 6-16 if the value is incorrect.

Figure 6-24 gives you the key presses, displays, and rules (notes) required to calibrate the internal gain coefficients.

Figure 6-24 MagneW 3000 Gain Calibration



NOTE 1. Connect a DVM across the 250 ohm resistor and set the DVM to the volts mode (See Figure 6-20).

NOTE 2. Apply an input from the MagneW calibrator to match the value on the SFC display and wait until the DVM value stabilizes

NOTE 3. Gain calibration for each value takes approximately 35 seconds
"XX%" indicates percent of gain process complete for example: "SFC WORKING 52%"

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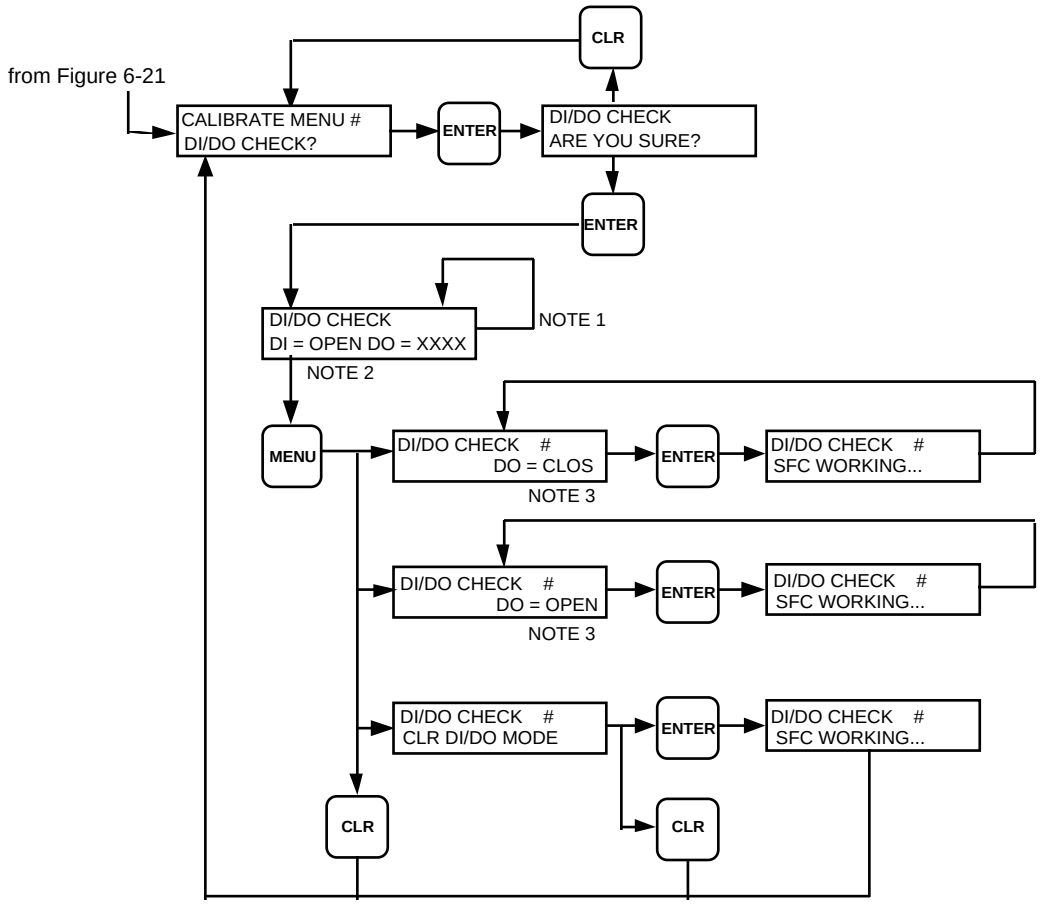
DI/DO check

DI/DO (Digital Input/Digital Output) check lets you verify the OPEN or CLOSED state of the digital input and output and physically switch the DO state.

Figure 6-25 gives you the key presses, displays, and rules (notes) required to do a DI/DO check.

Figure 6-25 MagneW 3000 DI/DO Check



NOTE 1. Reads the actual ststus of the DIGITAL INPUT / DIGITAL OUTPUT displays every 6 seconds

NOTE 2. XXXX can read DO = OPEN or DO = CLOS - change selection next display. DI can also be open or closed.

NOTE 3. Pressing [ENTER] forces DO into identified state.

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6.6 Operation

Overview

The STS103 displays all the operating data for the MagneW 3000. This data includes:

- Flowmeter I.D.
- Damping value
- Upper range value (span)
- Configuration elements for Digital Communications (DE) mode
- Input value
- Output Value
- Span value
- Upper range limit
- Engineering units
- Operation Status
- Software Version Number
- Failsafe Direction
- Zero Point adjustment
- Display and Keyboard Test
- Read Scratch Pad messages

Refer to Table 6-16 for Operating Data access instructions.

Continued on next page

Operating data

Table 6-18 shows you what key to press and what the associated displays will be when you access each of the operating data.

Table 6-18 MagneW 3000 Operating Data

Operating Data	Press	Displays (Displays are examples)	Result
Flowmeter I.D **(ANALOG)**	DE READ A ID NON-VOL ENTER (YES) or DE READ A ID	(SFI Type) TAG No. TRIPS SECURED? MAG XX TAG NO. 12345678 or DE XMTR TAG NO. 12345678	**Analog Communications Mode** Mag SR = Single Range Mag DR = Dual Range **Digital Communications Mode** Lower Display is the device I.D or tag no.
(DIGITAL)			
Damping Value	C DAMP	DAMP 1 (tag no.) X.X SECONDS	Damping Time is displayed in seconds.
Upper Range Value Range #1	F URV 100%	URV 1 (tag no.) (value) (Units)	Range #1 - The value of Input which will generate 100% Output.
Upper Range Value Range #2	^ SHIFT then F URV 100%	URV 2 (tag no.) (value) (Units)	URV 2 1 is the value for range 2 of PV1. URV 2 1 is the value of input which corresponds to 100% output when MagneW is measuring flow based on the second range of a dual range setup.
Digital Communications Mode Configuration Elements	^ SHIFT then DE CONF I MENU ITEM	DE CONF (tag no.) SINGLE RANGE	Type of Flowmeter operation.
	H ▲ NEXT	DE CONF (tag no.) w/o DB (4byte)	Broadcast Message Format
	H ▲ NEXT	DE CONF (tag no.) F/S=B/O Lo	Burnout Mode
Input Value	^ SHIFT then INPUT J OUT-PUT	INPUT 1 (tag no.) 0.0000 Kg/h	Indicates the instantaneous flow rate (in a user selected engineering unit of measure)

Table continued on next page

Operating Data,
continued

Table 6-18 MagneW 3000 Operating Data (continued)

Operating Data	Press	Displays (Displays are examples)	Result
Output Value	INPUT J OUT-PUT	OUTP 1 (tag no.) 0.000% RNG X	Indicates in percent(%) the instantaneous flow rate represented by the 4–20 mA signal and the range number. RNG 1 = Range 1 RNG 2 = Range 2
Currently Running Span	URL Y SPAN	SPAN 1 (tag no.) 0.0000 Kg/h	Span is the URV-LRV or the range of input corresponding to a full range (0-100%) of output.
Upper Range Limit	^ SHIFT then URL Y SPAN	URL 1 (tag no.) 0.0000 Kg/h	The highest value of the measured variable that a device can be adjusted to measure.
Engineering Units	D UNITS	UNITS 1 (tag no.) Kg/h	The present selection of engineering units.
Operation Status	F/S DIR U STAT	STATUS (tag no.) STATUS CHECK=OK	Momentary Display. Indicates the status of operation at the present time.
Failsafe Direction	^ SHIFT then F/S DIR U STAT	F/S DIR (tag no.) SFC WORKING – XX% then F/S DIR (tag no.) F/SAFE DOWNSCALE	Displays the Failsafe Burnout direction, upscale or downscale, for analog devices.
Software Version	^ SHIFT then SW VER X 3	S/W No. (tag no.) SFC=X.XXMTR=X.X	Displays the STS103 and MagneW software version numbers.

Table continued on next page

Operating Data,
continued

Table 6-18 MagneW 3000 Operating Data (continued)

Operating Data	Press	Displays (Displays are examples)	Result
Zero Point Adjustment	SHIFT (^) then INPUT OUT-PUT (J) RESET COR-RECT (K) NON-VOL ENTER (YES)	INPUT 1 (tag no.) 0.0000 Kg/h INPUT 1 (tag no.) ZERO INPUT? INPUT 1 (tag no.) INPUT ZEROED	The detector must be filled with stationary fluid (flow velocity is not faster than 0.2 m/s) Request to Zero Input. Press CLR to Exit. Zero adjustment is automatically done within approximately 20 seconds after pressing the ENTER key.
Display and Keyboard Test	SHIFT (^) then 2 (W) CLR (NO)	DISPLAY TEST **DISPLAY OK** then KEYBOARD TEST ROW * COLUMN *	Display test indication. You can test each key on the keyboard For example: If you press INPUT OUT-PUT (J) the display will read KEYBOARD TEST ROW 3 COLUMN 2 to clear
Access the scratch pad message	SHIFT (^) then SCR PAD ■	SCR PAD XXXX SFC WORKING . . . then SCRATCH PAD 1 XXXXXXXXXXXXXXXX	Displays the scratch pad message. Press the NEXT key to switch from SCRATCH PAD 1 to SCRATCH PAD 2

6.7 Diagnostics and SFC Messages

Introduction

The MagneW 3000 and the STS103 both run continuous self-diagnostics. This means that they are constantly testing the communications, the loop, and themselves.

Any time you want results of these diagnostics, press the STAT key.

The SFC displays its report, in the form of messages, which identify diagnostic conditions.
Diagnostic conditions are broken down into three categories:

- an OK condition
- a critical condition
- a non-critical condition

OK Status

An OK condition means no problem exists, and the display looks like this:

```
STATUS  (tag no.)
STATUS CHECK=OK
```

Critical status

A critical condition means that the flowmeter is not functioning properly. When this occurs, the flowmeter goes into upscale burnout and maintains an output of 21.8 mA, or into downscale burnout and maintains an output of less than 3.9 mA. This message CRITICAL STATUS interrupts your operation and is followed by the message PRESS STATUS.

After the PRESS STATUS message, you press the STAT key to find out what problem exists. You will receive one or more messages. Take whatever corrective action necessary to solve the problem. Remember that the flowmeter will stay in upscale or down scale burnout until the condition is corrected.
If the flowmeter sends more than one message, each message will be displayed in the order of importance for about 5 seconds. If you need to see them again, press the STAT key again.

Non-critical status

A non-critical condition means that although a problem exists, the flowmeter is still operating. When a non-critical condition occurs a "#" character appears on the right side of the display, along with whatever you're displaying at the time.

This character means press the STAT key because some type of a problem exists. Again, one or more messages will appear on the display for about five seconds each.

Low battery voltage

When the battery voltage becomes low, a colon "**:**" will appear in the middle of the display. It stays on the display until you either charge or replace the batteries.

Continued on next page

6.7 Diagnostics and SFC Messages, Continued

Diagnostic Messages

Table 6-19 is a list of all the diagnostic messages that can appear when using the STS103 with a MagneW 3000 Magnetic Flowmeter. They are listed in alphabetical order along with the problem associated with the message and the corrective action to take when the message appears.

Table 6-19 Diagnostic Messages for SFC and MagneW 3000

Message	Problem	Corrective Action
SFC FAULT or **SFC FAILURE**	SFC communication is not possible due to a detected SFC problem.	• Press [STAT] key to obtain other messages. • Replace the SFC.
AC POWER LOSS	Displayed briefly when the MagneW loses AC power.	
A/D FAULT	Analog / Digital converter of converter is abnormal.	• Turn the converter power OFF then ON. • Replace the main printed circuit board if message still appears.
BAD CONFIG DATA	Configuration data is incorrect.	• Check for a wrong setting. Step through the MagneW configuration and check values and selections.
COMM ABORTED	Communication aborted by user.	
CORRECT RESET	Re-calibration is necessary to obtain the required accuracy.	• Calibrate the Upper Range Value (span).
DO OUTPUT MODE	Checking the contact input/output status.	None
EMPTY PIPE	Detector is empty.	None
ENTRY>SENS RNG	The number entered is beyond 1.125 times the upper range limit of the sensor.	• Press the [CLR] key, check the parameter, and start again.
EXCESS ZERO CORR	The ZERO correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value.
EXCESS SPAN CORR	The SPAN correction factor is outside the acceptable limits for accurate operation.	• Check the input and be sure it matches the calibrated range value.
EXCESSIVE OUTPUT	The requested output percent in the output mode is too high or too low. The limits are –1.25% to +105%.	• Press the [CLR] key, check the parameter, and start again.
EXCIT CHECK MODE	Excitation current is being checked	None
EXCIT COIL FAULT	Electrical discontinuity of the Detector Coil circuit.	• Check the connections. • Measure the CAL resistance. • Check the converter.
EXT. ZERO ACTIVE	In “External Zero Percent Lock” mode.	None

Table continued on next page

Diagnostic Messages,
continued

Table 6-19 Diagnostic Messages for SFC and MagneW 3000 (continued)

Message	Problem	Corrective Action
FAILED COMM CHK	The SFC failed a communication diagnostic check. This could be a SFC electronics problem or a faulty or dead communication loop.	• Try communicating again. • Press the STAT key. If a loop fault message appears, do the corrective action and try again. • If the Comm error continues, replace SFC
FIXED PULSE MODE	In “Pulse Output Check” mode.	None
GAIN CORRECT MODE	Checking and calibrating the MagneW input gain constant.	
HIGH<LOW ERROR	High setting is less than low setting.	• Change setting to high greater than low.
HI RES/LOW VOLT	Either there is too much resistance in the loop (open circuit), the voltage is too low, or both.	• Check the wiring connections and the power supply. There must be 11 Volts minimum at the flowmeter to permit operation.
HYSTERESIS ERROR	Hysteresis is too large.	• Reset to lower value of Hysteresis.
H.W. MISMATCH	Hardware mismatch. Part of Save/Restore function.	• None - SFC tried to restore as much of the database as possible.
ILLEGAL RESPONSE	Failure of communication between the SFC and the flowmeter.	• Check the wiring, load resistance, etc.
IN LOCAL MODE	Converter (model KIX) is operating in the Local mode.	None
INVALID DATABASE	The database of the flowmeter was not correct at power up.	• Try communicating again. Verify the database, re-calibrate the flowmeter and then manually update non-volatile memory.
INVALID REQUEST	• The flowmeter is being asked to correct or set its URV to a value that results in too low a span, or being asked to correct its URV while in the output mode.	• Check that the proper calibrated URV input is being applied to the flowmeter, or that the flowmeter is not in the output mode.
4-20MA OUTPUT MODE	The transmitter is operating as a current source.	• Press the OUTPUT and CLR keys if you want to exit the output mode.
LOW LOOP RES	Not enough resistance in series with the communication loop.	• Check the sensing resistor and verify at least 250 Ohms resistance in the loop.
NACK RESPONSE	The SFI sent a negative acknowledgment because one or more of the commands could not be processed by the SFI.	• Check the configuration and try again.

Table continued on next page

Diagnostic Messages,
continued

Table 6-19 Diagnostic Messages for SFC and MagneW 3000 (continued)

Message	Problem	Corrective Action
NO HW FAILSAFE	Connected transmitter does not support a hardware jumper for failsafe direction.	
NO XMTR RESPONSE	No response from the flowmeter. It may be a flowmeter or loop problem.	• Try communicating again. • Press the [STAT] key and do any corrective action required. • Check that the flowmeter's loop integrity has been maintained and that the SFC is connected.
NVM FAULT	The non-volatile memory of the converter is corrupted.	• Turn the converter OFF then ON. • Replace the main printed circuit board, if necessary.
NVM ON SEE MAN	The SFC's CPU is misconfigured	• Replace the SFC.
OPTION MISMATCH	On a database restore, one or more options do not match.	• None - SFC tried to restore as much of the database as possible.
PLS WEIGHT ERROR	Pulse frequency is too high or low.	• Check the pulse weight, span, and type of pulse.
PLS WIDTH > 70%	Pulse width is too large. Duty ratio is 70% or more.	• Check the pulse weight, pulse width, and span.
>RANGE	The value to be displayed is over the range of the display.	• Press the [CLR] key and start again.
RAM FAULT	RAM of converter is not normal.	• Turn the converter OFF then ON. • Replace the main printed circuit board, if necessary.
RESTORE FAILED	Part of the Save/Restore function.	• Check the transmitter and try again.
ROM FAULT	ROM of converter is not normal.	• Turn the converter OFF then ON. • Replace the main printed circuit board, if necessary.
SENSOR TEMP FAIL	The ST3000 temperature sensor has failed.	• Replace the transmitter.
SPAN OVER ERROR	Span setting is 12 m/s or more.	Check the span, size, and type of detector.
TYPE DIA ERROR	Mismatching between size and type of detector.	Check the size and type of detector.
TYPE MISMATCH	On a database restore, the transmitter types are not the same.	• None - SFC tried to restore as much of the database as possible.
UNKNOWN	Selection is unknown.	Have the software in the SFC updated.

6.8 Troubleshooting

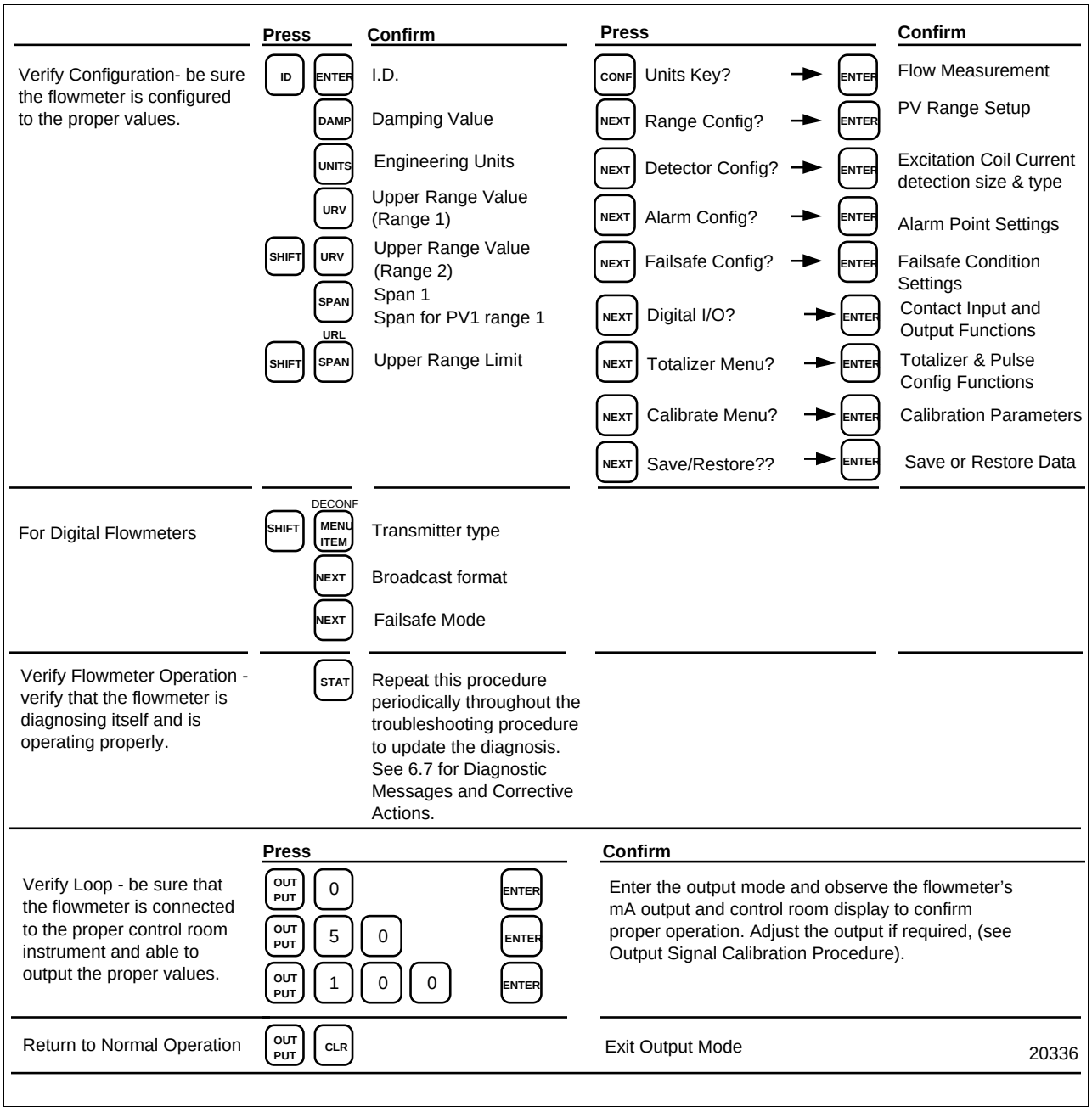
Introduction

If you suspect a problem in the flowmeter, check the flowmeter configuration, operation, and output. Use the procedure shown in Figure 6-26. Refer to Section 6.7 for diagnostic messages and corrective action.

Troubleshooting procedure

Check the parameters listed in Figure 6-26 to confirm proper configuration, operation, and output.

Figure 6-26 MagneW 3000 Troubleshooting Procedure



Section 7 —SMV 3000 Multivariable Transmitter

7.1 Overview

Introduction

This section contains all the information you will need to know in order to wire, set-up, configure, operate, calibrate, and troubleshoot the SMV 3000 Multivariable Transmitter using the STS103 Smart Field Communicator.*

Refer to the *SMV 3000 User's Manual* (34-SM-25-02) for transmitter installation and additional operating information.

Make sure you have become familiar with the STS103 operations that are more or less the same for every transmitter.

This section gives you the keystrokes and displays that are specific for SFC communications with the SMV 3000 Multivariable Transmitter.

* **ATTENTION**

IMPORTANT: If your SMV contains Release 250 firmware or greater and you are using the SMV 3000 for flow measurement with dynamic compensation**, you must use the SCT 3000** (software Release 150 or greater) instead of an SFC to configure the transmitter. The SFC does not support the advanced configuration parameters for the SMV 3000 dynamic compensation flow equations. Refer to the *SMV 3000 User's Manual*, document # 34-SM-25-02 for more details and also follow the SCT 3000 on-line help and on-line documentation to configure the transmitter's database.

What's in this section?

This section contains the following topics:

7.2 Wiring

Overview

Establish communications with the SMV 3000 by connecting the SFC leads to the 4–20 mA line of the transmitter.

Your choices are either at a junction box somewhere along the 4–20 mA line, on the field side of the intrinsic safety barrier panel in the control room, or at the transmitter itself.

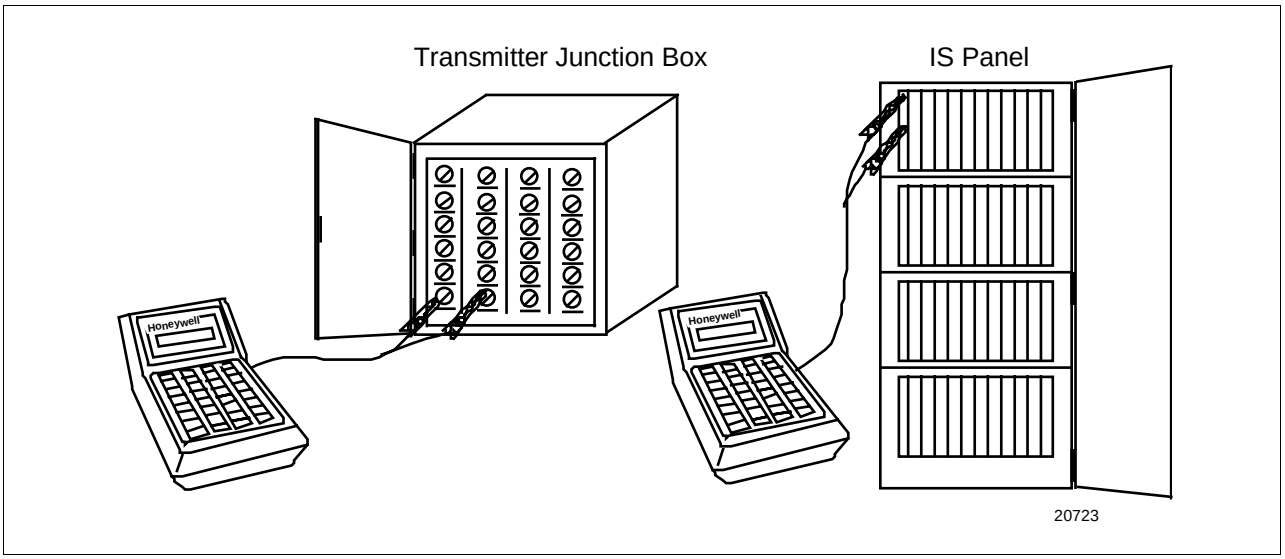
Following are examples for connecting to all these places. Use the one you need.

Connecting the STS103 to junction boxes and IS panels

The STS103 connects to SMV 3000 transmitters, IS Panels, and junction boxes through a pair of wires with alligator clips on the ends. The STS103 communications terminal end of the wires has a stereo phone jack connection that is inserted into the communications terminal. The other end of the wires are clipped onto terminals in the junction box or IS barrier panel, or directly to the transmitter. The red SFC lead connects to the junction box or SFI positive terminal, the black lead to the negative terminal.

Figure 7-1 shows the STS103 connected to a junction box or an IS barrier panel.

Figure 7-1 STS103 – Junction Box and IS Connection



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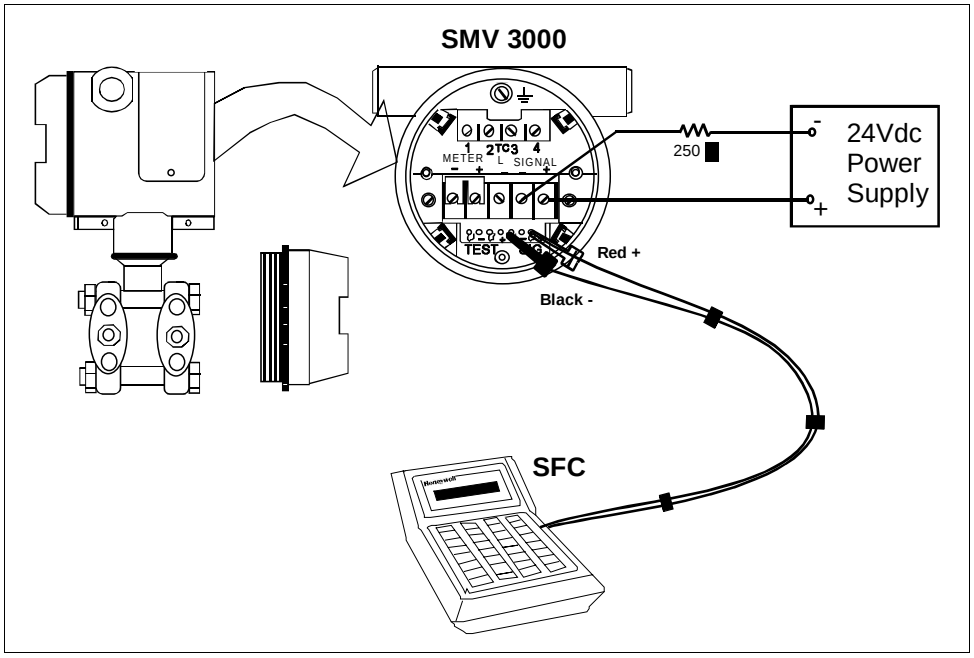
STS103 - SMV 3000 connection

Figure 7-2 shows the STS103 connected directly to the positive and negative signal terminals on a typical SMV 3000 transmitter. The STS103 can connect to only one transmitter at a time.

Figure 7-2 STS103–SMV 3000 Connections



WARNING

When the end cap on the transmitter is removed, the housing is NOT explosion-proof.

STS103 charging terminal

The NiCd battery pack is charged through a battery charger that plugs into the charging terminal. The charger inputs 110 or 220 Vac 50/60 Hz and outputs 7 Vdc 180 mA to the NiCd battery pack.
The connector of the battery charger is inserted into the charging terminal on left side of the STS103 near the ON/OFF switch.

7.3 Configuration

Uploading the SMV 3000 database

If your SMV 3000 transmitter is already configured, follow the steps below to upload the database.

Please note that:

- The database for a transmitter in the *Analog mode* is automatically read or uploaded to the SFC when you press ENTER in response to the "TRIPS SECURED" prompt.
- The database for a transmitter in the *Digital mode* is read or uploaded when you press the SHIFT I D keys.

After the database is loaded into the SFC memory, you can view the database, check transmitter status, make changes to the configuration parameters (if desired) and then download the changes to the transmitter.

Configuration Overview

If you need to configure the SMV 3000 transmitter, the tables in the following pages provide procedures to set up the transmitter database that contains the configuration parameters.

Setting up the SMV 3000 Multivariable Transmitter consists of:

- Keying-in the I.D. and loading the Database.
- Selecting output conformity
- Adjusting the Damping time.
- Selecting the units in which to display values.
- Select PV3 probe type and other parameters for temperature measurement
- Define PV4 flow measurement equation
- Select PV4 flow equation parameters.
- Set low flow cutoff limits for PV4 output
- Select PV output for transmitter operating in analog mode.
- Keying-in the Lower Range value and Upper Range value (Span) using the keyboard.
- Keying-in the Lower Range value and Upper Range value (Span) using applied pressure.
- Selecting the SMV 3000's communication mode.
- Selecting the PVs for broadcast and message format for a transmitter in the Digital Communications (DE) Mode.

ATTENTION

Since the SFC is compatible with other Honeywell Smartline™ transmitters, be sure all configuration data applies to a multivariable transmitter.

Continued on next page

Copying data into non-volatile memory

When setting-up or configuring a ST 3000, whether you are changing one element or a full database, you must copy all configuration data into the transmitter's non-volatile memory. This is the transmitter's permanent memory. If the transmitter were to lose power, the values for the database will be saved here.
The transmitter also contains a working memory that loses its contents if the power goes off; and when power is restored, the transmitter copies the contents of the non-volatile memory into the working memory.

There is a failsafe procedure. Thirty seconds after a value is changed, the transmitter automatically copies it into the non-volatile memory. But, if you change an element and power goes down before this runs, you will still lose the data in the working memory. Therefore, whenever you make any changes in the transmitter, always end your procedure as follows:

Press	Displays will Read	Result
^ SHIFT then NON-VOL ENTER (YES)	(SFI Type) TAG No. SFC WORKING . . . then (SFI Type) TAG No. DATA NONVOLATILE then (SFI Type) TAG No. READY	"SFC WORKING" will be displayed as long as eight seconds. The data is copied from the Working memory into the Non-Volatile memory.

Continued on next page

Entering Transmitter Tag Number (and Broadcast Priority)

The procedure in Table 7-1 shows how to enter a sample tag number of FT 3011 into the transmitter's configuration database and set PV1 as the number 1 priority in the DE broadcast transmission.

- Up to eight characters for tag number.
- Enter "/"" slash as eighth character in tag number to set PV1 as "priority" PV in DE (digital) data broadcast, if all four PVs are turned ON.
- Note that the transmission rate for the various PVs depends on the number of PVs that are turned ON. When more than one PV is turned ON, the "priority" PV is sent every other broadcast cycle. Normally, PV1 has the number 1 priority unless all four PVs are turned ON. Then, PV4 has the number 1 priority, PV1 is second, PV2 is third, and PV3 is fourth. However, you can set PV1 to have the top priority and PV4 to be second by entering a "/" as the eighth character in the Tag number.

Table 7-1 Keying-in Tag Number

Step	Press Key	Read Display or Action	Description
1	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off. This prompt only appears for transmitters in analog mode
2	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING...	Confirm that "TRIPS" are secured and establish transmitter communications **ATTENTION** This procedure also applies for transmitters in DE mode. The prompt may show DE - XMTR instead of output form and transmitter type in top row if you have not established communications as previously described in this manual.
		SMV TAG NO. _	
3	NUM/ ALPHA	SMV TAG NO. *	Put SFC keyboard into alpha mode. Activates alphabetic characters in upper right hand corner of keys.

Continued on next page

Entering Transmitter Tag Number (and Broadcast Priority), continued

Table 7-1 Keying-in Tag Number,

Step	Press Key	Read Display or Action	Description
4	F URV 100% T 6 SCR PAD ■	SMV TAG NO. F * SMV TAG NO. FT * SMV TAG NO. FT *	Key in F T, and space as first characters in tag number.
5	NUM/ ALPHA	SMV TAG NO. FT _	Take SFC keyboard out of alpha mode and put it into numeric mode.
6	SW VER X 3 Z 0 V 1 V 1	SMV TAG NO. FT 3Ø11_	Key in “3011” as numbers in Tag number.
7		**Do you want to set PV1 priority…** / **Then…** Yes / go to Step 8. No / go to Step 9.	This is only applicable for transmitters operating in the DE mode.
8	NUM/ ALPHA +/–	SMV TAG NO. FT 3Ø11 * SMV TAG NO. FT 3Ø11 /	Activate Alpha mode. Key in slash “/” in eighth character position to set PV1 as number 1 priority in DE broadcast transmission if all PVs are turned ON. Otherwise, PV4 is priority 1 and PV1 is second.
9	NON-VOL ENTER (Yes)	SMV TAG NO. SFC WORKING... SMV TAG NO. FT 3Ø11	Message exchange is working. Loads tag number into transmitter’s working memory.

Continued on next page

Output Conformity

The PV1 output is normally set for a straight linear calculation since square root is performed for PV4. However, You can select the transmitter's PV1 output to represent a square root calculation for flow measurement. Thus, we refer to the linear or the square root selection as the output conformity or the output form for PV1.

Selecting Output Conformity

The procedure in Table 7-2 shows how to select the desired output conformity

NOTE: For differential pressure (PV1) variable, you can configure output form to represent one of these selections. Note that calculated flow rate (PV4) process variable includes a square root operation that is not affected by this selection.

Table 7-2 Selecting Output Conformity

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG PV1 CONFORMITY?	Prompt asks if you want to access configuration parameter called conformity. If you want to access it, go to Step 2. If you do not want to access it, press [**CLR**] key to exit function or [s **NEXT**] key to call up next configuration parameter.
2	NON-VOL ENTER (Yes)	PV1 CONFORMITY LINEAR OR PV1 CONFORMITY SQUARE ROOT	Present output conformity for PV1 is linear Present output conformity for PV1 is square root.
3	DE CONF I MENU ITEM	CONFORMITY SQUARE ROOT OR PV1 CONFORMITY LINEAR	Change output conformity to square root. Change output conformity to linear.
4	NON-VOL ENTER (Yes)	PV1 CONFORMITY SQUARE ROOT CONFORMITY DOWNLOAD CHANGE?	Conformity change is entered in SFC. Prompt asks if you want to download change to transmitter. If you want to download change, go to Step 5. If you do not want to download change, press [**CLR**] key to return to initial prompt in Step 1.
5	NON-VOL ENTER (Yes)	CONFORMITY SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Message exchange is working. Output conformity is changed in transmitter. Press [s **NEXT**] key to call up next parameter or [**CLR**] key to exit function.

Adjusting Damping Time

You can adjust the damping time individually for these process variables to reduce the output noise.

- Differential Pressure (PV1) and Static Pressure (PV2)
- Process Temperature (PV3)
- Calculated Flow Rate (PV4)

We suggest that you set the damping to the smallest value that is reasonable for the process. Damping values are displayed in seconds. The procedure in Table 7-3 outlines the keystrokes used to adjust the damping time to two seconds for PV1 and PV2, one and a half seconds for PV3, and four seconds for PV4 as an example.

Table 7-3 Adjusting Damping Time

Step	Press Key	Read Display or Action	Description
1	C DAMP	DAMP 1 FT 3011 Ø.16 SECONDS	Present damping time in seconds for PV1.
2		**If display in Step 1 is…** / **Then…** for desired PV / go to Step 4. not for desired PV / go to Step 3.	
3	DE CONF I MENU ITEM DE CONF I MENU ITEM DE CONF I MENU ITEM DE CONF I MENU ITEM NON-VOL ENTER (Yes)	PV NUM FT 3011 CURRENT PV: 1 PV NUM FT 3011 CURRENT PV: 2 PV NUM FT 3011 CURRENT PV: 3 PV NUM FT 3011 CURRENT PV: 4 DAMP 3 FT 3011 Ø.3 SECONDS	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when desired PV number is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections. Returns to previous display which is updated to reflect current PV number selection. PV number 3 is shown for example purposes only. PV number 1 is correct for initial pass through this procedure.

Continued on next page

Procedure, continued

Table 7-3 Adjusting Damping Time, continued

Step	Press Key	Read Display or Action	Description
4	H ▲ NEXT	DAMP 1 FT 3011 SFC WORKING...	Message exchange is working.
		DAMP 1 FT 3011 Ø.32 SECONDS	Next highest damping time value in seconds. **ATTENTION** The [s **NEXT**] key raises the setting while the [t **PREV**] key lowers the setting. Or, you can key in a number that will be converted to closest valid damping value.
5		Repeat Step 4 until display shows DAMP 1 FT 3011 2.Ø SECONDS	Transmitter's damping time is now set to two seconds for PV1. **ATTENTION** You do not need to press the [**ENTER**] key to store the damping time in the transmitter's memory.
6		Return to Step 3, select PV2 as current PV number, and repeat Steps 4 and 5 to set damping value for PV2. Then, repeat this Step for PV3 and PV4 damping value settings.	

Continued on next page

Selecting Units of Measurement

You can choose to have the measurements for the selected process variable displayed in one of the preprogrammed engineering units in the SFC.

You can also choose preprogrammed engineering units for display of design density value entered in equation parameters configuration. See Selecting Density Units in this section.

Table 7-4, Table 7-5, and Table 7-6 list the preprogrammed units for the selected process variable and show how to select them. Be sure desired PV number is currently selected for display when selecting applicable units. Press [**MENU ITEM**] to display the current PV.

IF Current PV in the SFC display …	THEN …
is for the desired PV,	• go to Table 7-4 to select measurement units for PV1 and PV2, • go to Table 7-5 to select measurement units for PV3, or • go to Table 7-6 to select measurement units for PV4.
is not for the desired PV,	press [**MENU ITEM**] key to call up PV NUM display and press [**MENU ITEM**] key to change current PV selection to match desired PV number. Then, go to Table 7-4 , 7-5, or 7-6 as applicable.

ATTENTION

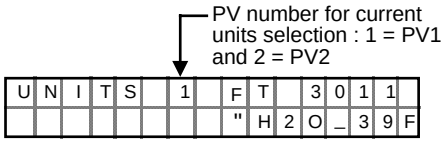
The engineering units shown in Table 7-4 for PV1 and PV2 are only available in an SFC with software version 4.2 or greater The selections are similar in earlier software versions but may not include temperature references and additional engineering units of inches of water at 60 ºF (15.6 ºC) and 68ºF (20 ºC), and atmospheres. Be sure number of PV in units display matches PV number for which units are to be selected.

Note that inches of water ranges for differential pressure input are factory calibrated using pressure referenced to a temperature of 39.2 ºF (4 ºC).

Continued on next page

Selecting Units of Measurement, continued

Table 7-4 Selecting Engineering Units for PV1 and PV2.

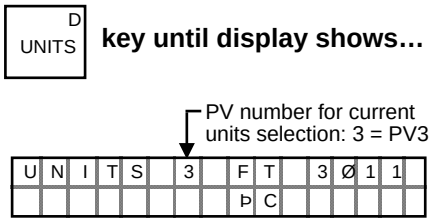
IF you want URV, LRV, etc. for PV1 or PV2 displayed in …	**THEN call up desired parameter display and sequentially press** D UNITS **key until display shows…** 
inches of water at 39.2 ºF (4 ºC)	“H2O _39F
inches of water at 68 ºF (20 ºC)	“H2O _68F
millimeters of mercury at 0 ºC (32 ºF)	mmHg _0C
pounds per square inch	PSI
kilopascals	Kpa
megapascals	Mpa
millibar	mBAR
bar	BAR
grams per square centimeter	g/cm^2
kilograms per square centimeter	Kg/cm^2
inches of mercury at 32 ºF (0 ºC)	inHg/32F
millimeters of water at 4 ºC (39.2 ºF)	mmH2O _4C
meters of water at 4 ºC (39.2 ºF)	mH2O _4C
normal atmospheres	ATM
inches of water at 60 ºF (15.6 ºC)	H2O _60F

Continued on next page

Selecting Units of Measurement, continued

You can choose to have the PV3 measurements displayed in one of the preprogrammed engineering unitsshown in Table 7-5 in the SFC depending upon output characterization configuration. You can also choose to have cold junction temperature readings displayed in one of the preprogrammed temperature engineering units independent of the other sensor measurements.

Table 7-5 Selecting Engineering Units for PV3, etc. .

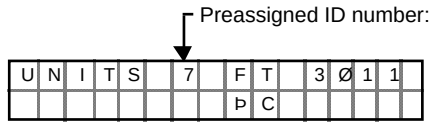
IF you want URV, LRV, etc. for PV3 displayed in …	**And Output Characterization * configuration is**	**THEN call up desired parameter display and sequentially press** 
degrees Celsius	LINEAR	°C
degrees Fahrenheit	LINEAR	°F
Kelvin	LINEAR	°K
degrees Rankine	LINEAR	°R
ohms (RTD sensor)	NON-LINEAR	Ω
volts (Thermocouple sensor)	NON-LINEAR	V
millivolts (Thermocouple sensor)	NON-LINEAR	MV

* When Output Characterization configuration for PV3 is NON-LINEAR, PV3 input readings can only be displayed in millivolts (mV) or volts (V) for thermocouple (T/C) inputs or in ohms (Ω) for RTD inputs.

Continued on next page

Selecting Units of Measurement, continued

Table 7-5 Selecting Engineering Units for PV3, etc., continued

IF you want cold junction temperature* displayed in...	**And Output Characterization configuration is**	**THEN call up CJT or ECJT display and sequentially press D UNITS key until display shows…** 
degrees Celsius	ECJT or CJT	°C and press [**CONF**] key to return to ECJT or CJT display.
degrees Fahrenheit	ECJT or CJT	°F and press [**CONF**] key to return to ECJT or CJT display.
Kelvin	ECJT or CJT	°K and press [**CONF**] key to return to ECJT or CJT display.
degrees Rankine	ECJT or CJT	°R and press [**CONF**] key to return to ECJT or CJT display.

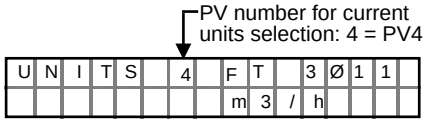
*See Table 7-9 for details about selecting cold junction temperature source.

Continued on next page

Selecting Units of Measurement, continued

You can choose to have the PV4 calculated flow rate measurements displayed in one of the preprogrammed engineering units shown in Table 7-6 in the SFC depending upon type of flow measurement configuration.

Table 7-6 Selecting Engineering Units for PV4

IF you want URV, LRV, etc. displayed in …	**And type of flow measurement (UNITSMODE) configuration is . . .**	**THEN call up desired parameter display and sequentially press**  **key until display shows…** 
cubic meters per hour	VOLUME FLOW	m3/h
gallons per hour	VOLUME FLOW	gal/h
liters per hour	VOLUME FLOW	l/h
cubic centimeters per hour	VOLUME FLOW	cc/h
cubic meters per minute	VOLUME FLOW	m3/min
gallons per minute	VOLUME FLOW	gal/min
liters per minute	VOLUME FLOW	l/min
cubic centimeters per minute	VOLUME FLOW	cc/min
cubic meters per day	VOLUME FLOW	m3/day
gallons per day	VOLUME FLOW	gal/day
kilogallons per day	VOLUME FLOW	Kgal/day
barrels per day	VOLUME FLOW	bbl/day
cubic meters per second	VOLUME FLOW	m3/sec
cubic feet per minute	VOLUME FLOW	CFM
kilograms per minute	MASS FLOW	kg/min
pounds per minute	MASS FLOW	lb/min
kilograms per hour	MASS FLOW	kg/h
pounds per hour	MASS FLOW	lb/h
kilograms per second	MASS FLOW	kg/sec
pounds per second	MASS FLOW	lb/sec
tonnes per hour	MASS FLOW	t/h
tonnes per minute	MASS FLOW	t/min
tonnes per second	MASS FLOW	t/sec

Continued on next page

Selecting Units of Measurement, continued

Table 7-6 Selecting Engineering Units for PV4, continued

IF you want URV, LRV, etc. displayed in …	And type of flow measurement (UNITS MODE) configuration is . . .	THEN call up desired parameter display and sequentially press D UNITS key until display shows…
grams per hour	MASS FLOW	g/h
grams per minute	MASS FLOW	g/min
grams per second	MASS FLOW	g/sec
tons per hour	MASS FLOW	ton/h
tons per minute	MASS FLOW	ton/min
tons per seconds	MASS FLOW	ton/sec
user selected units	CUSTOM (Units are entered as part of PV4 equation configuration)	CUSTOM

Selecting density units.

Preprogrammed engineering units for displaying design density value can be selected when you enter at the ALGPARM dDensity configuration prompt. With `ALGPARM dDensity` prompt on display, press [**UNITS**] key to select desired engineering unit, then press [**ENTER**] key to return to the configuration prompt. The available density prompts are listed in Table 7-7 below.

Table 7-7 Selecting Engineering Units for Design Density for PV4

IF you want density displayed in …	THEN call up ALGPARM dDensity display and sequentially press D UNITS key until display shows…
pound per cubic foot	lb/ft3
pound per gallon	lb/gal
specific gravity at 4 °C	SG 4 °C
specific gravity at 60 °F	SG 60 °F
specific gravity at 68 °F	SG 68 °F
specific gravity at 59 °F	SG 59 °F
grams per cubic centimeter	gm/cm3
kilograms per liter	Kg/l
kilograms per cubic meter	Kg/m3

Specify Probe Type for PV3

You must identify the type of probe that is connected to the transmitter as its input for process temperature PV3. This sets the appropriate LRL and URL data in the transmitter.

Table 7-8 gives the procedure for identifying the probe type as part of the transmitter's configuration function.

ATTENTION

Whenever you connect a different probe as the transmitter's input, you must also change the probe typeconfiguration to agree. Otherwise, range setting errors may result.

ATTENTION
Configuration Note

While this procedure covers how to configure the probe type parameter individually, you can access all SMV Configuration parameters serially without exiting the function once you call up the SMV CONFIG function. Just use the [H ▲ NEXT] and [L ▼ PREV] keys to step through the parameter selections.

Table 7-8 Identifying PV3 Probe Type

Step	Press Key	Read Display or Action	Description
1	[B CONF]	SMV CONFIG PV1 CONFORMITY?	Call up configuration function.
2	[H ▲ NEXT]	SMV CONFIG READ MB. TEMP?	Calls up next configuration menu item.
3	[H ▲ NEXT]	SMV CONFIG PV3 CONFIG?	Calls up next configuration menu item.
4	NON-VOL [ENTER (Yes)]	PV3 CONFIG PROBE = PT1ØØ D	Access Probe Configuration selections. If selection is correct, press [**NEXT**] key to call up next parameter or [**CLR**] key to return to Step 3 prompt.
5	DE_CONF [I MENU ITEM] DE_CONF [I MENU ITEM]	PV3 CONFIG PROBE = TYPE J PV3 CONFIG PROBE = TYPE K PV3 CONFIG PROBE = TYPE T PV3 CONFIG PROBE = TYPE E	Calls up next probe type selection. Repeatedly press [**MENU ITEM**] key to step through all probe selections listed in sequence. Stop when desired probe is on display.

Continued on next page

Procedure, continued

Table 7-8 Identifying PV3 Probe Type, continued

Step	Press Key	Read Display or Action	Description
6	NON-VOL ENTER (Yes)	PV3 CONFIG ENTERED IN SFC PV3 CONFIG CJ = INTERNAL	Enters change in SFC and calls up next PROBE CONFIG parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function or [s **NEXT**] key to call up next parameter.
7	CLR (No)	PV3 CONFIG DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 8. If you do not want to download change, press [**CLR**] key to exit function. This action only applies when Step 6 is valid. Otherwise, this keystroke returns you to Step 3 prompt.
8	NON-VOL ENTER (Yes)	PV3 CONFIG SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Message exchange is working. Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Selecting CJ Source

If a thermocouple is used for process temperature PV3 input, you must select if the cold junction (CJ) compensation will be supplied internally by the transmitter or externally from a user-supplied isothermal block.

If you configure CJ source as external, you must tell the transmitter what cold junction temperature to reference by keying in the temperature as a configuration value. For internal cold junction configuration, the transmitter measures the cold junction temperature internally.
The procedure in Table 7-9 outlines the steps for selecting the source of the cold junction compensation.

Continued on next page

Selecting CJ Source,
continued

Table 7-9 Selecting Source of CJ Compensation

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action that may require a database update.
2	H ▲ NEXT	Until display reads SMV CONFIG PV3 CONFIG?	Calls up next configuration menu item.
3	NON-VOL ENTER (Yes)	PV3 CONFIG PROBE = PT100D	Access Probe Configuration selections.
4	H ▲ NEXT	PV3 CONFIG CJ = INTERNAL	Calls up next configuration parameter.
5	DE CONF I MENU ITEM	PV3 CONFIG CJ = EXTERNAL	Calls up next CJ source selection. Repeatedly press [**MENU ITEM**] key to toggle between two selections. Stop when desired selection is on display.
6		**If CJ Source is …** / **Then…** INTERNAL / go to Step 9. EXTERNAL / go to Step 7.	
7	NON-VOL ENTER (Yes)	PV3 CONFIG ENTERED IN SFC PV3 CONFIG Ø.ØØØØ ÞC ECJT	Enters change in SFC and calls up next parameter.
8	W 2 SCR PAD → ■ S 5	PV3 CONFIG 2_ ÞC ECJT PV3 CONFIG 2._ ÞC ECJT PV3 CONFIG 2.5_ ÞC ECJT	Key in 2.5 °C as external cold junction temperature for example purposes only. **ATTENTION** If you want to change engineering units for ECJT, repeatedly press [**UNITS**] key until desired unit (°C, °F, °K, or °R) is displayed and press [**CONF**] key to return to this display with ECJT displayed in selected unit.

Continued on next page

Selecting CJ Source, continued

Table 7-9 Selecting Source of CJ Compensation, continued

Step	Press Key	Read Display or Action	Description
9	NON-VOL ENTER (Yes)	PV3 CONFIG ENTERED IN SFC PV3 CONFIG FILTER = 60Hz	Enters change in SFC and calls up next parameter.
10	CLR (No)	PV3 CONFIG DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 11. If you do not want to download change, press [**CLR**] key to exit function. This action only applies when parameter in Step 5 and/or Step 8 is changed. Otherwise, this keystroke returns you to Step 1 prompt.
11	NON-VOL ENTER (Yes)	PV3 CONFIG SFC WORKING... SMV CONFIG PV3 CONFIG?	Message exchange is working. Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Selecting Input Filter Frequency for PV3

You must the frequency of the input filter for PV3 so it matches the frequency of the power line for the power supply. Table 7-10 gives the steps for selecting the input filter frequency.

Table 7-10 Selecting Input Filter Frequency

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action that may require a database update.
2	H ▲ NEXT	Until display reads SMV CONFIG PV3 CONFIG?	Calls up next configuration menu item.
3	NON-VOL ENTER (Yes)	PV3 CONFIG PROBE = PT100 D	Access Probe Configuration selections.

Continued on next page

Selecting Input Filter Frequency for PV3, continued

Table 7-10 Selecting Input Filter Frequency, Continued

Step	Press Key	Read Display or Action	Description
4	H ▲ NEXT	PV3 CONFIG CJ = EXTERNAL	Calls up next configuration parameter.
5	H ▲ NEXT	PV3 CONFIG 2.5ØØØ ÞC ECJT	Calls up next configuration parameter - ECJT only appears when CJ = EXTERNAL.
6	H ▲ NEXT	PV3 CONFIG FILTER = 6ØHz	Calls up next configuration parameter.
7	DE CONF I MENU ITEM	PV3 CONFIG FILTER = 5ØHz	Calls up next frequency selection. Repeatedly press [**MENU ITEM**] key to toggle between two selections. Stop when desired selection is on display.
8	NON-VOL ENTER (Yes)	PV3 CONFIG ENTERED IN SFC PV3 CONFIG TC FAULT DET=ON	Enters change in SFC and calls up next parameter.
9	CLR (No)	PV3 CONFIG DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 10. If you do not want to download change, press [**CLR**] key to exit function. This action only applies when parameter in Step 6 is changed. Otherwise, this keystroke returns you to Step 2 prompt.
10	NON-VOL ENTER (Yes)	PV3 CONFIG SFC WORKING... SMV CONFIG PV3 CONFIG?	Message exchange is working. Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Continued on next page

Activating Sensor Fault Detection

You can turn the transmitter's temperature sensor fault detection function ON or OFF through configuration. With the detection ON, the transmitter will drive its output upscale or downscale as determined by the failsafe jumper on the PCB in the event of an open RTD or T/C lead condition. These same conditions will result for an open RTD **sensing** lead or any T/C lead in a transmitter with the detection OFF. But, an open RTD **compensation** lead will automatically be reconfigured to operate without the compensation lead that avoids a critical status condition. This means a 4-wire RTD would be reconfigured as 3-wire RTD, if possible. The procedure in Table 7-11 outlines the steps for activating the sensor fault detection function.

Table 7-11 Activating Sensor Fault Detection

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action which may require a database update.
2	H ▲ NEXT	SMV CONFIG READ M.B. TEMP?	Calls up next configuration menu item.
3	H ▲ NEXT	SMV CONFIG PV3 CONFIG?	Calls up next configuration menu item.
4	NON-VOL ENTER (Yes)	PV3 CONFIG PROBE = PT1ØØ D	Access Probe Configuration selections.
5	H ▲ NEXT	PV3 CONFIG CJ = EXTERNAL	Calls up next configuration parameter.
6	H ▲ NEXT	PV3 CONFIG 2.5ØØØ ÞC ECJT	Calls up next configuration parameter - ECJT only appears when CJ = EXTERNAL.
7	H ▲ NEXT	PV3 CONFIG FILTER = 6ØHz	Calls up next configuration parameter.
8	H ▲ NEXT	PV3 CONFIG TC FAULT DET=ON	Calls up next configuration parameter.
9	DE_CONF I MENU ITEM	PV3 CONFIG TC FAULT DET=OFF	Calls up next sensor fault detection selection. Repeatedly press [**MENU ITEM**] key to toggle between ON/OFF selections. Stop when "ON" is on display.

Continued on next page

Activating Sensor Fault Detection, continued

Table 7-11 Activating Thermocouple (Sensor) Fault Detection, continued

Step	Press Key	Read Display or Action	Description
10	NON-VOL ENTER (Yes)	PV3 CONFIG ENTERED IN SFC PV3 CONFIG O/P= LINEAR	Enters change in SFC and calls up next parameter.
11	CLR (No)	PV3 CONFIG DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 12. If you do not want to download change, press [**CLR**] key to exit function. This action only applies when parameter in Step 8 is changed. Otherwise, this keystroke returns you to Step 3 prompt.
12	NON-VOL ENTER (Yes)	PV3 CONFIG SFC WORKING... SMV CONFIG PV3 CONFIG?	Message exchange is working. Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Selecting Output Characterization

You can have the transmitter provide a linear output which is linearized to temperature for PV3 input or a nonlinear output which is proportional to resistance for an RTD input or millivolt or volt input for T/C input. Also, if you do switch from linear to non-linear or vice versa, be sure you verify the LRV and URV settings after you enter the configuration data. Table 7-12 gives the steps for selecting the output characterization for the process temperature PV3 input.

Table 7-12 Selecting Output Characterization

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action which may require a database update.

Continued on next page

Selecting Output Characterization, continued

Table 7-12 Selecting Output Characterization, continued

Step	Press Key	Read Display or Action	Description

2	H ▲ NEXT	Until display reads:
		`SMV CONFIG`
		`PV3 CONFIG?`
			Calls up next configuration menu item.

3	NON-VOL ENTER (Yes)	`PV3 CONFIG` `PROBE = PT100 D`	Access Probe Configuration selections.

4	H ▲ NEXT	Until display reads:
		`PV3 CONFIG`
		`O/P = LINEAR`
			Calls up next configuration parameter.

5	DE_CONF I MENU ITEM	`PV3 CONFIG` `O/P = NON-LINEAR`	Calls up next output characterization selection. Repeatedly press [**MENU ITEM**] key to toggle between two selections. Stop when “LINEAR” is on display.

6	NON-VOL ENTER (Yes)	`PV3 CONFIG`
		`ENTERED IN SFC`
		`PV3 CONFIG`
		`DOWNLOAD CHANGE?`
			Enters change in SFC and prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 7. If you do not want to download change, press [**CLR**] key to return to Step 2 prompt.

7	NON-VOL ENTER (Yes)	`PV3 CONFIG`
		`SFC WORKING...`
		`SMV CONFIG`
		`PV3 CONFIG?`
			Message exchange is working. This action only applies when a configuration parameter is changed. Otherwise, the message NO CHANGES MADE appears.
			
			Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Continued on next page

Defining equation for PV4 calculation

Using the SFC, you can define simple equations for measuring the flow rate of a gas or superheated steam. However, if you are using the SMV 3000 for flow measurement with dynamic compensation**, you must use the SCT 3000** (software Release 150 or greater) instead of an SFC to configure the transmitter.

About flow calculation

The SMV 3000 includes configurable simple equations for measuring the flow rate of a gas or superheated steam as it flows through an orifice plate in a pipe line. It bases the gas flow rate calculation on Bernoulli's theorem and the ideal gas law. The superheated steam equation uses the measurements of steam pressure and temperature to determine the actual specific volume of the flowing steam. (Note that the superheated steam equation also works for saturated steam applications.) The actual specific volume is the reciprocal of the fluid density in steam flow calculations.

The gas flow rate can be expressed as a volumetric flow rate in fluid volume per unit time, or as a mass flow rate in fluid mass per unit of time.

ATTENTION

The mass flow rate also applies for a volumetric flow rate at standard conditions such as Standard Cubic Feet per Minute (SCFM). The steam flow rate is expressed as a mass flow rate in fluid mass per unit of time.

Dynamic compensation flow equations

Additional configurable equations are available that provide flow measurement with dynamic compensation for changes due to temperature and pressure. These equations use density, viscosity, Reynolds number, discharge coefficient, thermal expansion factor and gas expansion factor to calculate mass and volume flowrate.

ATTENTION

However, due to the complexity of these flow equations, you must use the Smart Configuration Toolkit (SCT 3000) software program to configure the SMV 3000 for dynamic compensated flow measurement

Continued on next page

Basic gas flow equation

The SMV 3000 uses this basic gas flow equation to calculate PV4 flow rate.

$$Q_{flow} = K_{user} \sqrt{P_{comp} \bullet T_{comp} \bullet P_{dp}}$$

Where:

Q_{flow} = Gas Flow Rate. You select Ideal Gas Volume or Mass Flow type as a configuration entry. The default selection is for Ideal Gas Volume Flow.

K_{user} = A scaling factor you determine based on the dynamics of your process. (Note that the SCT 3000 software includes an easy to use K_{user} calculation function.)

P_{comp} = $\frac{Pref}{Pa}$ pressure compensation for Volume Flow, Or

$\frac{Pa}{Pref}$ pressure compensation for Mass Flow or Volume Flow adjusted to Standard Temperature and Pressure

P_{ref} = Absolute pressure of the process at design conditions. You enter design pressure as a configuration value. The default configuration value is actually not-a-number (NaN) which forces the PV4 output to a failsafe condition until a value is entered.

P_a = Measured absolute pressure of the process = Transmitter's PV2 input.

T_{comp} = $\frac{Ta}{Tref}$ Temperature compensation for Volume Flow, Or

$\frac{Tref}{Ta}$ Temperature compensation for Mass Flow or Volume Flow adjusted to Standard Temperature and Pressure

T_a = Measured absolute temperature of the process = Transmitter's PV3 input.

T_{ref} = Absolute temperature of the process at design conditions. You enter nominal operating temperature as a configuration value. The default configuration value is actually not-a-number (NaN) which forces the PV4 output to a failsafe condition until a value is entered

P_{dp} = Measured Differential pressure of process = Transmitter's PV1 input.

Gas K_{user} quick calculation

The quickest way to calculate the Gas K_{user} value is to solve the gas flow equation for K_{user} in terms of P_{dp}, Q_{flow}, P_{comp} and T_{comp}. To do this calculation, you only need to obtain the process design data that lists the differential pressure (P_{dp}) corresponding to the maximum flow (Q_{flow}) along with the flowing pressure and temperature.

ATTENTION

If you use a standard mass flow or volume flow engineering unit, be sure you convert the Q_{flow} value to the base engineering unit of tonnes per hour for mass flow or cubic meters per hour for volume flow before solving for K_{user}. However, this is **not** required when you use a **custom** engineering unit; in this case, you must use the custom unit. See CUSTOM units below.

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Superheated steam flow equation

The SMV 3000 uses this superheated steam flow equation to calculate PV4 flow rate.

$$Q_{flow} = K_{user} \sqrt{DP_{act}} \bullet \sqrt{\frac{\rho_{act}}{\rho_{des}}}$$

Where:

Q_{flow} = Superheated Steam Mass Flow Rate. You select this equation as a configuration entry. The default equation selection is for Ideal Gas Volume Flow.

K_{user} = A scaling factor you determine based on the dynamics of your process. (Note that the SCT 3000 software includes an easy to use K_{user} calculation function.)

Dp_{act} = Measured Differential pressure of process at actual density = Transmitter's PV1 input.

ρ_{act} = Actual density based on measured absolute pressure and temperature of the process = Transmitter's PV2 and PV3 inputs, respectively.

ρ_{des} = Design density based on absolute pressure and temperature of the process at design conditions. You must enter the design density value for your process as a configuration value, since the default is NaN. (Note that most engineering handbooks include tables showing properties of saturated and superheated steam at given pressure and temperature from which you can derive the density value.)

Steam K_{user} quick calculation

The quickest way to calculate the Steam K_{user} value is to solve the steam flow equation for steam K_{user} in terms of DP_{act}, Q_{flow}, ρ_{act} and ρ_{des}. To do this calculation, you only need to obtain the process design data that lists the differential pressure (DP_{act}) corresponding to the maximum flow (Q_{flow}) along with the actual density based on the operating pressure and temperature, and the design density based on the design pressure and temperature.

ATTENTION

If you use a standard mass flow or volume flow engineering unit, be sure you convert the Q_{flow} value to the base engineering unit of tonnes per hour for mass flow or cubic meters per hour for volume flow before solving for K_{user}. However, this is **not** required when you use a **custom** engineering unit; in this case, you must use the custom unit. See CUSTOM units below.

Continued on next page

About using CUSTOM units

If you want the PV4 calculation to represent an engineering unit that is not one of the preprogrammed units stored in the SFC, you must substitute values with matching engineering units into the K_{user} scaling factor equation as well as compatible units for temperature and pressure in the derived volume or mass flow equation.

Example: If volumetric flow rate was to represent cubic feet per hour, we would substitute pounds per cubic feet for the density measurement and feet for the pipe and orifice I.D. measurements in the scaling factor equation as well as substituting psi for pressure measurements and degrees Fahrenheit for temperature measurements in the derived volume flow equation. Note that differential pressure measurement is always in SI units of Pascals.

CAUTION

It is absolutely critical that you use units that match your custom one when calculating the scaling factor.

Calculated flow rate PV4 simple equation configuration

Before you enter the values to define the equation for PV4 flow calculation, you should have already determined the equation parameters for your flow application. The following list provides the parameters that should be entered under the PV4 ALG CONFIG prompt.

CAUTION

If this transmitter has been previously configured at the factory or by you and is providing a calculated PV4 output, changing the equation type selection and downloading it to the transmitter will trigger a PV4 failsafe condition and critical status message until you enter configuration values for the applicable PV4 equation parameters identified in the next row of this Table. This also applies for new transmitters that have not yet been configured.

PV4 CONFIG ALG	SFC Prompt	Selections
Equation type	PV4 CONFIG ALG Idl Gas Vol Flow	Idl Gas Vol Flow[d] Idl Gas Mass Flow Cmp SupHStm MFlo
Equation compensation*	PV4 CONFIG ALG No Compensation	No Compensation Full Compensatn AP Comp Only PT Comp Only
Absolute pressure PV2 failsafe interaction (PV4 AP Comp)	PV4 AP COMP. FAILSAFE = OFF	ON OFF[d]

Continued on next page

Calculated flow rate PV4 simple equation configuration, continued

PV4 CONFIG ALG	SFC Prompt	Selections
Process temperature PV3 failsafe interaction (PV4 PT Comp)	PV4 PT COMP. FAILSAFE = OFF	ON OFF[d]
Engineering Units Mode for Measurement Display	PV4 UNITSMODE VOLUME FLOW	Volume Flow[d] Mass Flow CUSTOM
CUSTOM Units	PV4 CUSTOM UNIT xxxxxxxx	Up to eight character units tag

* If equation type is Cmp SupHStm MFlo, Full Compensation is only valid selection

Setting selections for PV4 equation definition

Table 7-13 gives the steps for setting the PV4 equation selections that define the flow calculation to represent the PV4 output. Note that values used in this procedure are for reference purposes only.

Table 7-13 Setting selections for PV4 Equation Definition

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG SFC WORKING... SMV CONFIG PV1 CONFORMITY?	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action which may require a database update.
2	H ▲ NEXT	Until display reads: SMV CONFIG PV4 ALG CONFIG?	Calls up next configuration menu item.
3	NON-VOL ENTER (Yes)	SMV CONFIG SFC WORKING... PV4 CONFIG ALG Idl Gas Vol Flo	Access PV4 equation configuration selections.
4	DE CONF I MENU ITEM	PV4 CONFIG ALG Idl Gas Mass Flo PV4 CONFIG ALG Cmp SupHStm MFlo	Calls up next PV4 equation selection. Repeatedly press [**MENU ITEM**] key to step through equation selections for calculation as gas volumetric flow “Idl Gas Vol Flo”, gas mass flow “Idl Gas Mass Flo”, or compensated superheated steam mass flow “Cmp SupHStm MFlo” as well as “Algorithm 4” to “Algorithm 8” which are not valid selections at this time - they are for future use only. Stop when desired equation selection is on display.

Continued on next page

Setting selections for PV4 equation definition, continued

Table 7-13 Setting Selections for PV4 Equation Definition, continued

Step	Press Key	Read Display or Action	Description
5	NON-VOL ENTER (Yes)	PV4 CONFIG ALG ENTERED IN SFC PV4 CONFIG COMP. No Compensation	Enters PV4 equation selection into SFC memory and calls up equation compensation configuration selections. **ATTENTION** The Full Compensatn selection is the only one available when the equation selection is for compensated superheated steam mass flow.
6	DE CONF I MENU ITEM	PV4 CONFIG COMP. Full Compensatn PV4 CONFIG COMP. AP Comp Only PV4 CONFIG COMP. PT Comp Only	Calls up next compensation selection. Repeatedly press [**MENU ITEM**] key to step through these four compensation selections: “No Compensation” “Full Compensatn “AP Comp Only” “PT Comp Only” “No Compensation” means that PV4 equation calculations include neither pressure nor temperature compensation. “Full Compensatn” means that calculations include both pressure and temperature compensation. “AP Comp Only” means that calculations include pressure compensation only. “PT Comp Only” means that calculations include temperature compensation only. Stop when desired compensation selection is on display.
7	NON-VOL ENTER (Yes)	PV4 CONFIG COMP ENTERED IN SFC	Enters compensation selection into SFC memory and calls up next configuration selection.

If PV4 CONFIG COMP is…	**Then…**
No Compensation (Gas flow only)	go to Step 13
Full Compensatn	go to Step 8
AP Comp Only (Gas flow only)	go to Step 8 and skip Steps 11 and 12.
PT Comp Only (Gas flow only)	go to Step 11.

Continued on next page

Setting selections for PV4 equation definition, continued

Table 7-13 Setting Selections for PV4 Equation Definition, continued

Step	Press Key	Read Display or Action	Description
8		PV4 AP COMP. FAILSAFE = OFF	Present absolute pressure (PV2) failsafe configuration selection.
9	DE CONF I MENU ITEM	PV4 AP COMP. FAILSAFE = ON **ATTENTION** For steam flow, the Failsafe action selection for PV2 and PV3 must be the same. If PV2 Failsafe is ON, then PV3 Failsafe must be ON. Likewise, if PV2 Failsafe is OFF, then PV3 must be OFF also. If they are not configured alike, you will get an INVALID REQUEST message when you try to download the configuration selections.	Calls up next absolute pressure failsafe selection. Repeatedly press [**MENU ITEM**] key to toggle between selections “OFF” and “ON”. An “OFF” selection means that PV4 output would be flagged for non-critical status when transmitter detects critical status for PV2 input and pressure term (P_r/P_a or P_a/P_r) is set equal to one in derived gas flow equation. An “ON” selection means that PV4 output would be flagged for critical status when transmitter detects critical status for PV2 input and PV4 output will be driven upscale or downscale per failsafe direction configuration.
10	NON-VOL ENTER (Yes)	PV4 AP COMP. ENTERED IN SFC	Enters absolute pressure failsafe selection into SFC memory and calls up next configuration selection. Go to Step 11 or 13 as applicable.
11	DE CONF I MENU ITEM	PV4 PT COMP. FAILSAFE = OFF PV4 PT COMP. FAILSAFE = ON	Present process temperature(PV3) failsafe configuration selection. Calls up next process temperature failsafe selection. Repeatedly press [**MENU ITEM**] key to toggle between selections “OFF” and “ON”. An “OFF” selection means that PV4 output would be flagged for non-critical status when transmitter detects critical status for PV3 input and temperature term (T_{ref}/T_a or T_a/T_{ref}) is set equal to one in derived gas flow equation. An “ON” selection means that PV4 output would be flagged for critical status when transmitter detects critical status for PV3 input and PV4 output will be driven upscale or downscale per failsafe direction configuration.

Continued on next page

Setting selections for PV4 equation definition, continued

Table 7-13 Setting Selections for PV4 Equation Definition, continued

Step	Press Key	Read Display or Action	Description
12	NON-VOL ENTER (Yes)	PV4 PT COMP. ENTERED IN SFC	Enters compensation selection into SFC memory and calls up next configuration selection.
13	DE CONF MENU ITEM	PV4 UNITSMODE CUSTOM PV4 UNITSMODE VOLUME FLOW OR PV4 UNITSMODE MASS FLOW	Present units mode configuration selection. Calls up next units mode selection. Repeatedly press [**MENU ITEM**] key to toggle between mode selections "CUSTOM" and "VOLUME FLOW" or "MASS FLOW" depending on PV4 equation selection of volume or mass, respectively. This determines engineering units that are selectable for displaying PV4 related values. (Note that volume flow selection is only available for gas volume flow equation.) Note that CUSTOM means you have chosen an engineering unit that is not one of the preprogrammed units stored in the SFC. In this case, you must use comparable units in the scaling factor equation to solve for K_{user}. See the About CUSTOM units paragraph in this section for details.
14	NON-VOL ENTER (Yes)	PV4 UNITSMODE ENTERED IN SFC **If UNITSMODE is…** / **Then…** CUSTOM / go to Step 15. VOLUME or MASS FLOW / go to Step 18.	Enters units mode selection into SFC memory.
15		PV4 CUSTOM UNIT X X X X X X X X	You can key in desired custom unit name consisting of up to eight characters.

Continued on next page

Setting selections for PV4 equation definition, continued

Table 7-13 Setting Selections for PV4 Equation Definition, continued

Step	Press Key	Read Display or Action	Description
16	NUM/ ALPHA F URV 100% T 6 NUM/ ALPHA X 3 NUM/ ALPHA +/− H ▲ NEXT R 4	PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT PV4 CUSTOM UNIT	Keying in cubic feet per hour as desired custom unit name for example purposes only.
17	NON-VOL ENTER (Yes)	PV4 CUSTOM UNIT ENTERED IN SFC	Enters custom unit name in SFC memory.
18		PV4 CONFIG DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to transmitter. This is only valid if you made a configuration change in previous Steps. Otherwise, must press [s **NEXT**] key to call up next selection (DOWNLOAD CHANGE?). If you want to download change, go to Step 19. If you do not want to download change, press [**CLR**] key to exit function.

CAUTION If you are downloading an equation type change or this is the initial configuration for a new transmtiter, PV4 output will be forced into failsafe condition and critical status `ALGPARM INVALID` will appear until PV4 parameters are configured for the selected equation.

Continued on next page

Setting selections for PV4 equation definition, continued

Table 7-13 Setting Selections for PV4 Equation Definition, continued

Step	Press Key	Read Display or Action	Description
19	NON-VOL ENTER (Yes)	PV4 CONFIG SFC WORKING...	Message exchange is working. This action only applies when a configuration parameter is changed. Otherwise, the message NO CHANGES MADE appears.
		SMV CONFIG PV4 ALG CONFIG?	Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Calculated flow rate PV4 simple equation parameters

Once you define the PV4 equation, you must enter the reference pressure, reference temperature, reference design density, and scaling factor parameter values to match your process requirements, as applicable.

PV4 CONFIG ALG	SFC Prompt	Selections
Pressure reference value (Pref)	`ALGPARAM Pref` `≥RANGE Kpa`	User must enter value (For gas flow only)
Temperature reference value (Tref)	`ALGPARAM Tref` `≥RANGE °K`	User must enter value (For gas flow only)
Design density value for equation (ρ_{des})	`ALGPARAM dDensity` `≥RANGE lb/ft3`	User must enter value (For steam flow only)
Scaling factor for eqaution (Kuser)	`ALGPARAM Kuser` `≥RANGE`	User must enter value

ATTENTION

To ensure the accuracy of the PV4 calculated output, the default values for the following PV4 equation parameters are actually set as "not-a-number" (NaN). This forces the PV4 output into a failsafe condition and initiates the critical status message `ALGPARM INVALID` whenever you change the equation type configuration. This also applies for new transmitters without factory entered PV4 parameter configuration. You must enter your configuration values for the applicable PV4 parameters and download them to the transmitter to clear the `ALGPARM INVALID` critical status and return the PV4 output to a calculated value.

Setting parameters for PV4 equation

Table 7-14 gives the steps for setting the PV4 equation parameters that determine the compensation and scaling factor values to be used in the flow calculation to represent the PV4 output. Note that values used in this procedure are for reference purposes only.

Table 7-14 Setting Parameters for PV4 Equation

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>1</td><td>B
CONF</td><td>SMV CONFIG
SFC WORKING...

SMV CONFIG
PV1 CONFORMITY?</td><td>Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action which may require a database update.</td></tr>
<tr><td>2</td><td>H
▲
NEXT</td><td>Until display reads

SMV CONFIG
PV4 ALG PARAMS?</td><td>Calls up next configuration menu item.</td></tr>
<tr><td>3</td><td>NON-VOL
ENTER
(Yes)</td><td>SMV CONFIG
SFC WORKING...

<table><tr><th>If PV4 CONFIG COMP is…</th><th>Then…</th></tr><tr><td>No Compensation (Gas flow only)</td><td>go to Step 10.</td></tr><tr><td>Full Compensatn for gas flow equation</td><td>go to Step 4 and skip Steps 8 & 9.</td></tr><tr><td>Full Compensatn for superheated steam flow equation</td><td>go to Step 8.</td></tr><tr><td>AP Comp Only (Gas flow only)</td><td>go to Step 4 and skip Steps 6, 7, 8 and 9.</td></tr><tr><td>PT Comp Only (Gas flow only)</td><td>go to Step 6. and skip steps 8 and 9.</td></tr></table></td><td>Access PV4 equation parameter selections.</td></tr>
<tr><td>4</td><td></td><td>Example for parameter set to default value of NaN:
ALGPARM Pref
≥RANGE KPa

Example for parameter with entered value:
ALGPARM Pref
1Ø1.33 KPa</td><td>Use number keys to key in desired absolute pressure reference value to be used for parameter P_{ref} in derivation of flow equation for PV4 equation. You can change displayed engineering units by pressing [UNITS] key until desired engineering units is displayed and then press [ENTER] key to return to this display. Only appears with Full Compensation and AP Comp Only selections</td></tr>
</table>

Continued on next page

Setting parameters for PV4 equation, continued

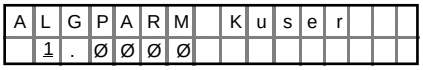
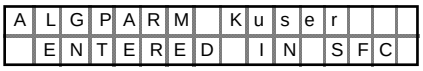
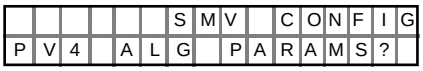
Table 7-14 Setting Parameters for PV4 Equation, continued

Step	Press Key	Read Display or Action	Description
5	NON-VOL ENTER (Yes)	ALG PARM Pref ENTERED IN SFC	Enters pressure reference value into SFC memory. This is only valid if you make a change in Step 4. Otherwise, must press [s **NEXT**] key to call up next selection.
6		Example for parameter set to default value of NaN: ALG PARM Tref ≥ RANGE ÞK Example for parameter with entered value: ALG PARM Tref 288.15 ÞK	Use number keys to key in desired process temperature reference value to be used for parameter T_{ref} in derivation of flow equation for PV4 equation. You can change displayed engineering units by pressing [**UNITS**] key until desired engineering units is displayed and then press [**ENTER**] key to return to this display. Only appears with Full Compensation and PT Comp Only selections
7	NON-VOL ENTER (Yes)	ALG PARM Tref ENTERED IN SFC	Enters temperature reference value into SFC memory. This is only valid if you make a change in Step 6. Otherwise, must press [s **NEXT**] key to call up next selection.
8		Example for parameter set to default value of NaN: ALG PARM dDensity ≥ RANGE lb/ft3 Example for parameter with entered value: ALG PARM dDensity 1.ØØØØ lb/ft3	Use number keys to key in desired design density reference value to be used for parameter ρ_{des} in derivation of steam flow equation for PV4 equation. You can change displayed engineering units by pressing [**UNITS**] key until desired engineering units is displayed and then press [**ENTER**] key to return to this display. Only appears with Cmp SupHStm MFlo equation selection.
9	NON-VOL ENTER (Yes)	ALG PARM dDensity ENTERED IN SFC	Enters design density reference value into SFC memory. This is only valid if you make a change in Step 8. Otherwise, must press [s **NEXT**] key to call up next selection.

Continued on next page

Setting parameters for PV4 equation, continued

Table 7-14 Setting Parameters for PV4 Equation, continued

Step	Press Key	Read Display or Action	Description
10		Example for parameter set to default value of NaN:  Example for parameter with entered value: 	Use number keys to key in desired scaling factor value to be used for parameter K_{user} in derivation of gas or steam flow equation for PV4 equation.
11	NON-VOL ENTER (Yes)	 	Enters change in scaling factor value in SFC and prompt asks if change entered in SFC is to be downloaded to transmitter. This is only valid if you make a change in Step 10. Otherwise, must press [s **NEXT**] key to call up next selection (DOWNLOAD CHANGE?). If you want to download change, go to Step 12. If you do not want to download change, press [**CLR**] key to exit function.
12	NON-VOL ENTER (Yes)	 	Message exchange is working. This action only applies when a configuration parameter is changed. Otherwise, the message NO CHANGES MADE appears. Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

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Setting low flow cutoff limits for PV4

Table 7-15 gives the steps for setting the low and high limits for low flow cutoff for PV4 output. Note that values used in this procedure are for reference purposes only.

Table 7-15 Setting Low and High Limits for Low Flow Cutoff

Step	Press Key	Read Display or Action	Description
1	B CONF	`SMV CONFIG` / `SFC WORKING...` then `SMV CONFIG` / `PV1 CONFORMITY?`	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action which may require a database update.
2	H ▲ NEXT	Until display reads `SMV CONFIG` / `LOW FLOW CUTOFF?`	Calls up next configuration menu item.
3	NON-VOL ENTER (Yes)	`LOFLOW LIMIT LO` / `10.000 l/min`	Access Low Flow Cutoff configuration selections. Value shown is for example purposes only. Default value is 0 (zero). Also, you can use [**UNITS**] key to select other engineering units.
4	S 5 S 5	`LOFLOW LIMIT LO` / `5_ l/min` `LOFLOW LIMIT LO` / `55_ l/min`	Key in 55 l/min as low limit value for low flow cutoff for PV4. Note that it is not necessary to enter zeros for whole numbers.
5	NON-VOL ENTER (Yes)	`LOFLOW LIMIT LO` / `ENTERED IN SFC` `LOFLOW LIMIT HI` / `110.00 l/min`	Enters low limit value into SFC memory and calls up next parameter.

6	V 1
	T 6
	S 5
		`LOFLOW LIMIT HI` / `1_ l/min`
		`LOFLOW LIMIT HI` / `16_ l/min`
		`LOFLOW LIMIT HI` / `165_ l/min`
			Change high limit value for low flow cutoff for PV4 to 165 l/min. Note that it is not necessary to enter zeros for whole numbers.
			ATTENTION Be sure the high limit value is greater than the low limit value.

7	NON-VOL ENTER (Yes)	`LOFLOW LIMIT HI` / `ENTERED IN SFC` `LOW FLOW CUTOFF` / `DOWNLOAD CHANGE?`	Enters change in high limit value in SFC and prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 8. If you do not want to download change, press [**CLR**] key to exit function.

Continued on next page

Setting low flow cutoff limits for PV4, continued

Table 7-15 Setting Low and High Limits for Low Flow Cutoff, continued

Step	Press Key	Read Display or Action	Description
8	NON-VOL ENTER (Yes)	LOW FLOW CUTOFF SFC WORKING...	Message exchange is working. This action only applies when a configuration parameter is changed. Otherwise, the message NO CHANGES MADE appears.
		SMV CONFIG LOW FLOW CUTOFF?	Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Selecting PV to represent analog output

When a transmitter is operating in its analog mode, you can select which PV is to represent the transmitter output. Table 7-16 gives the steps for selecting the PV to represent the analog output.

Table 7-16 Selecting PV to Represent Analog Output

Step	Press Key	Read Display or Action	Description
1	B CONF	SMV CONFIG SFC WORKING...	Call up configuration function. Note that first display may or may not appear depending upon previous keystroke action that may require a database update.
		SMV CONFIG PV1 CONFORMITY?	
2	H ▲ NEXT	Until display reads SMV CONFIG ANALOG OUTPUT?	Calls up next configuration menu item.
3	NON-VOL ENTER (Yes)	SMV CONFIG SFC WORKING...	Access analog output configuration selections.
		ANALOG OUTPUT = PV1 DELTA P	

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Selecting PV to represent analog output, continued

Table 7-16 Selecting PV to Represent Analog Output, continued

Step	Press Key	Read Display or Action	Description
4	DE CONF MENU ITEM	ANALOG OUTPUT = PV2 ABSOLUTE P ANALOG OUTPUT = PV3 PROC. TEMP ANALOG OUTPUT = PV4 CALCULATED	Calls up next analog output selection. Repeatedly press [**MENU ITEM**] key to step through these selections: • = PV1 DELTA P • = PV2 ABSOLUTE P • = PV3 PROC. TEMP • = PV4 CALCULATED Stop when desired PV selection is on display.
5	NON-VOL ENTER (Yes)	ANALOG OUTPUT ENTERED IN SFC ANALOG OUTPUT DOWNLOAD CHANGE?	Enters change in PV selection in SFC and prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 6. If you do not want to download change, press [**CLR**] key to exit function.
6	NON-VOL ENTER (Yes)	ANALOG OUTPUT SFC WORKING... SMV CONFIG ANALOG OUTPUT?	Message exchange is working. This action only applies when a configuration parameter is changed. Otherwise, the message NO CHANGES MADE appears. Parameter change is loaded into transmitter's working memory. Press [s **NEXT**] key to access another configuration function or [**CLR**] key to exit function.

Setting range values for PV1

You can set the Lower Range Value (LRV) and Upper Range Value (URV) for the differential pressure input PV1 by either keying in the desired values through the SFC keyboard or applying the corresponding LRV and URV pressures directly to the transmitter.

Table 7-17 gives the procedure for keying in the range values for a sample 5 to 45 inH_2O at 39.2 ºF (4 ºC) range.

ATTENTION

- We factory calibrate SMV 3000 Smart Multivariable Transmitters with inches of water ranges using inches of water pressure referenced to a temperature of 39.2 ºF (4 ºC).
- For a reverse range, enter the upper range value as the LRV and the lower range value as the URV. For example, to make a 0 to 50 inH^2O range a reverse range, enter 50 as the LRV and 0 as the URV.
- The URV changes automatically to compensate for any changes in the LRV and maintain the present span (URV – LRV).
- If you must change both the LRV and URV, always change the LRV first.

Table 7-17 Keying in LRV and URV for PV1

Step	Press Key	Read Display or Action	Description
1	E LRV 0%	LRV 1 FT 3Ø11 Ø.ØØØØ "H2O_39F	Present LRV setting for PV1. (Pressure for 4 mAdc (0%) output.)
2		**If display in Step 1 is…** / **Then…** for PV1 / go to Step 4. not for PV1 / go to Step 3.	
3	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV:1	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV1 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections.
	NON-VOL ENTER (Yes)	LRV 1 FT 3Ø11 Ø.ØØØØ "H2O_39F	Returns to previous display which is updated to reflect PV1 as current PV number selection.

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Setting range values for PV1, continued

Table 7-17 Keying in LRV and URV for PV1, continued

Step	Press Key	Read Display or Action	Description
4	S 5	LRV 1 FT 3Ø11 5_ "H2O_39F	Key in desired LRV setting. (It is not necessary to key in a decimal point and zeros for a whole number.)
5	NON-VOL ENTER (Yes)	LRV 1 FT 3Ø11 SFC WORKING...	Message exchange is working.
		LRV 1 FT 3Ø11 5.ØØØØ "H2O_39F	New LRV setting for PV1 stored in transmitter's working memory.
6	F URV 100%	URV 1 FT 3Ø11 10Ø5.ØØ "H2O_39F	Present URV setting for PV1 (Pressure for 20 mAdc (100%) output.)
7	R 4	URV 1 FT 3Ø11 4_ "H2O_39F	Key in 45 as desired URV setting.
	S 5	URV 1 FT 3Ø11 45_ "H2O_39F	
8	NON-VOL ENTER (Yes)	URV 1 FT 3Ø11 SFC WORKING...	Message exchange is working.
		URV 1 FT 3Ø11 45.ØØØ "H2O_39F	New URV setting for PV1 stored in transmitter's working memory.

Setting range values for PV1 to applied pressures

Table 7-18 gives the procedure for setting range values to sample applied pressures.

Table 7-18 Setting LRV and URV for PV1 to Applied Pressures

Step	Press Key	Read Display or Action	Description
1		Apply known input pressure to transmitter that represents LRV for PV1 for 0% (4 mAdc) output.	
2	E LRV 0%	LRV 1 FT 3Ø11 5.ØØØØ "H2O_39F	Present LRV setting for PV1. (Pressure for 4 mAdc (0%) output.)
3		**If display in Step 2 is…** / **Then…** for PV1 / go to Step 5. not for PV1 / go to Step 4.	

Continued on next page

Setting range values for PV1 to applied pressures, continued

Table 7-18 Setting LRV and URV for PV1 to Applied Pressures, continued

Step	Press Key	Read Display or Action	Description
4	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 1	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV1 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections.
	NON-VOL ENTER (Yes)	LRV 1 FT 3011 Ø.ØØØØ "H2O 39F	Returns to previous display which is updated to reflect PV1 as current PV number selection.
5	G SET	LRV 1 FT 3011 SET LRV?	Prompt asks if you want to set LRV to applied pressure. If you don’t want to set LRV, press [**CLR**] key to exit function. Otherwise, go to Step 6.
6	NON-VOL ENTER (Yes)	LRV 1 FT 3011 SFC WORKING...	Message exchange is working.
		LRV 1 FT 3011 7.8377 "H2O 39F	Applied LRV setting stored in transmitter’s working memory.
7		Apply known input pressure to transmitter that represents URV for 100% (20 mAdc) output.	
8	F URV 100%	URV 1 FT 3011 47.837 "H2O 39F	Present URV setting. (Pressure for 20 mAdc (100%) output.)
9	G SET	URV 1 FT 3011 SET URV?	Prompt asks if you want to set URV to applied pressure. If you don’t want to set URV, press [**CLR**] key to exit function. Otherwise, go to Step 10.
10	NON-VOL ENTER (Yes)	URV 1 FT 3011 SFC WORKING...	Message exchange is working.
		URV 1 FT 3011 55.482 "H2O 39F	Applied URV setting stored in transmitter’s working memory.

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Setting range values for PV1 to applied pressures, continued

Table 7-18 Setting LRV and URV for PV1 to Applied Pressures, continued

Step	Press Key	Read Display or Action	Description
11	^ SHIFT NON-VOL ENTER (Yes)	URV 1 FT 3Ø11 SHIFT–... URV 1 FT 3Ø11 SFC WORKING... URV 1 FT 3Ø11 DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiates shift key selection. Saves data in transmitter's non-volatile memory. This takes approximately 8 seconds.

Setting range values for PV2

You can set the LRV and URV for the static pressure input PV2 by either keying inthe desired values through the SFC keyboard or applying the corresponding LRV and URV pressures directly to the transmitter.

Table 7-19 gives the procedure for keying inthe range values for a sample 2 to 150 psi range for PV2.

ATTENTION

- The range for PV2 is absolute pressure. The usual reference pressure is 14.696 psia (101.33 KPa) for standard atmospheric pressure at sea level.
- The URV changes automatically to compensate for any changes in the LRV and maintain the present span (URV – LRV).
- If you must change both the LRV and URV, always change the LRV first

Table 7-19 Keying in LRV and URV for PV2

Step	Press Key	Read Display or Action	Description
1	E LRV 0%	LRV 2 FT 3Ø11 Ø.ØØØØØ PSI	Present LRV setting for PV2. (Pressure for 4 mAdc (0%) output.)
2		**If display in Step 1 is…** / **Then…** for PV2 / go to Step 4. not for PV2 / go to Step 3.	

Continued on next page

Setting range values for PV2, continued

Table 7-19 Keying in LRV and URV for PV2, continued

Step	Press Key	Read Display or Action	Description
3	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 1	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV2 is on display.
	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 2	**ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections.
	NON-VOL ENTER (Yes)	LRV 2 FT 3Ø11 Ø.ØØØØ PSI	Returns to previous display which is updated to reflect PV2 as current PV number selection.
4	W 2	LRV 2 FT 3Ø11 2_ PSI	Key in desired LRV setting. (It is not necessary to key in a decimal point and zeros for a whole number.)
5	NON-VOL ENTER (Yes)	LRV 2 FT 3Ø11 SFC WORKING...	Message exchange is working.
		LRV 2 FT 3Ø11 2.ØØØØ PSI	New LRV setting for PV2 stored in transmitter’s working memory.
6	F URV 100%	URV 2 FT 3Ø11 752.ØØ PSI	Present URV setting for PV2 (Pressure for 20 mAdc (100%) output.)
7	V 1	URV 2 FT 3Ø11 1_ PSI	Key in 150 as desired URV setting.
	S 5	URV 2 FT 3Ø11 15_ PSI	
	Z 0	URV 2 FT 3Ø11 150_ PSI	
8	NON-VOL ENTER (Yes)	URV 2 FT 3Ø11 SFC WORKING...	Message exchange is working.
		URV 2 FT 3Ø11 150.ØØ PSI	New URV setting for PV2 stored in transmitter’s working memory.

Continued on next page

Setting range values for PV2 to applied pressures

Table 7-20 gives the procedure for setting LRV and URV to applied static pressures. This procedure assumes that you can safely simulate zero and full scale pressure for a running process.

Table 7-20 Setting LRV and URV for PV2 to Applied Pressures

Step	Press Key	Read Display or Action	Description
1		Apply known static pressure for transmitter that represents LRV for 0% (4 mAdc) output.	
2	E LRV 0%	LRV 2 FT 3011 2.0000 PSI	Present LRV setting for PV2. (Pressure for 4 mAdc (0%) output.)
3		**If display in Step 2 is…** / **Then…** for PV2 / go to Step 5. not for PV2 / go to Step 4.	
4	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 1	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV2 is on display.
	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 2	**ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections.
	NON-VOL ENTER (Yes)	LRV 2 FT 3011 2.0000 PSI	Returns to previous display which is updated to reflect PV2 as current PV number selection.
5	G SET	LRV 2 FT 3011 SET LRV?	Prompt asks if you want to set LRV to applied pressure. If you don’t want to set LRV, press [**CLR**] key to exit function. Otherwise, go to Step 6.
6	NON-VOL ENTER (Yes)	URV 2 FT 3011 SFC WORKING...	Message exchange is working.
		LRV 2 FT 3011 14.701 PSI	Applied LRV setting stored in transmitter’s working memory.
7		Apply known static pressure for transmitter that represents URV for 100% (20 mAdc) output.	
8	F URV 100%	URV 2 FT 3011 164.00 PSI	Present URV setting for PV2 (Pressure for 20 mAdc (100%) output.)

Continued on next page

Setting range values for PV2 to applied pressures, continued

Table 7-20 Setting LRV and URV for PV2 to Applied Pressures, continued

Step	Press Key	Read Display or Action	Description
9	G SET	URV 2 FT 3Ø11 SET URV ?	Prompt asks if you want to set URV to applied pressure. If you don't want to set URV, press [**CLR**] key to exit function. Otherwise, go to Step 10.
10	NON-VOL ENTER (Yes)	URV 2 FT 3Ø11 SFC WORKING... URV 2 FT 3Ø11 149.76 PSI	Message exchange is working. Applied URV setting stored in transmitter's working memory.
11	^ SHIFT NON-VOL ENTER (Yes)	URV 2 FT 3Ø11 SHIFT–... URV 2 FT 3Ø11 SFC WORKING... URV 2 FT 3Ø11 DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiates shift key selection. Saves data in transmitter's non-volatile memory. This takes approximately 8 seconds.

Setting range values for PV3

You can set the LRV and URV for PV3 by either keying in the desired values through the SFC keyboard or applying the corresponding LRV and URV input signals directly to the transmitter.

Table 7-21 gives the procedure for keying in the range values for a sample –100 to 600 ºF range.

ATTENTION

- For a reverse range, enter the upper range value as the LRV and the lower range value as the URV. For example, to make a 0 to 500 ºF range a reverse range, enter 500 as the LRV and 0 as the URV.
- The URV changes automatically to compensate for any changes in the LRV and maintain the present span (URV – LRV).
- If you must change both the LRV and URV, always change the LRV first. However, if the change in the LRV would cause the URV to exceed the URL, you would have to change the URV to narrow the span before you could change the LRV.

Continued on next page

Setting range values for PV3, continued

Table 7-21 Keying in LRV and URV for PV3

Step	Press Key	Read Display or Action	Description
1	E LRV 0%	LRV 3 FT 3011 – . ØØØØ8 ÞF	Present LRV setting for PV3. (Temperature for 4 mAdc (0%) output.)
2		**If display in Step 1 is…** / **Then…** for PV3 / go to Step 4. not for PV3 / go to Step 3.	
3	DE CONF I MENU ITEM DE CONF I MENU ITEM DE CONF I MENU ITEM NON-VOL ENTER (Yes)	PV NUM FT 3011 CURRENT PV: 1 PV NUM FT 3011 CURRENT PV: 2 PV NUM FT 3011 CURRENT PV: 3 LRV 3 FT 3011 – . ØØØØ8 ÞF	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV3 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections. Returns to previous display which is updated to reflect PV3 as current PV number selection.
4	/ + / – V 1 Z 0 Z 0	LRV 3 FT 3011 – _ ÞF LRV 3 FT 3011 –1 _ ÞF LRV 3 FT 3011 –1Ø _ ÞF LRV 3 FT 3011 –1ØØ _ ÞF	Key in –100 as desired LRV setting for PV3. (It is not necessary to key in a decimal point and zeros for a whole number.)
5	NON-VOL ENTER (Yes)	LRV 3 FT 3011 SFC WORKING . . . LRV 3 FT 3011 –1ØØ. ØØ ÞF	Message exchange is working. New LRV setting stored in transmitter’s working memory. Note if change in LRV causes the URV to exceed the URL, you must change the URV to narrow the span before you can change the LRV

Continued on next page

Setting range values for PV3, continued

Table 7-21 Keying in LRV and URV for PV3, continued

Step	Press Key	Read Display or Action	Description
6	F URV 100%	URV 3 FT 3Ø11 74 2.ØØ PF	Present URV setting for PV3. (Temperature for 20 mAdc (100%) output.) Note that this value was automatically compensated for previous change in LRV value.
7	T 6 Z 0 Z 0	URV 3 FT 3Ø11 6_ PF URV 3 FT 3Ø11 6Ø_ PF URV 3 FT 3Ø11 6ØØ_ PF	Key in 600 as desired URV setting for PV3.
8	NON-VOL ENTER (Yes)	URV 3 FT 3Ø11 SFC WORKING... URV 3 FT 3Ø11 6ØØ.ØØ PF	Message exchange is working. New URV setting for PV3 stored in transmitter's working memory.
9	^ SHIFT NON-VOL ENTER (Yes)	URV 3 FT 3Ø11 SHIFT– URV 3 FT 3Ø11 SFC WORKING... URV 3 FT 3Ø11 DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiates shift key selection. Saves data in transmitter's nonvolatile memory. This takes approximately 8 seconds.

Setting range values for PV3 to applied input signals

Table 7-22 gives the procedure for setting LRV and URV to sample applied input signals.

Table 7-22 Setting LRV and URV for PV3 to Applied Input Signals

Step	Press Key	Read Display or Action	Description
1		Apply known input signal to transmitter that represents LRV for PV3 for 0% (4 mAdc) output.	
2	E LRV 0%	LRV 3 FT 3Ø11 –1ØØ.ØØ PF	Present LRV setting for PV3. (Input for 4 mAdc (0%) output.)

Continued on next page

Setting range values for PV3 to applied input signals, continued

Table 7-22 Setting LRV and URV for PV3 to Applied Input Signals, continued

Step	Press Key	Read Display or Action	Description
3		**If display in Step 2 is…** / **Then…** for PV3 — go to Step 5. not for PV3 — go to Step 4.	
4	DE CONF I MENU ITEM DE CONF I MENU ITEM DE CONF I MENU ITEM NON-VOL ENTER (Yes)	PV NUM FT 3011 CURRENT PV: 1 PV NUM FT 3011 CURRENT PV: 2 PV NUM FT 3011 CURRENT PV: 3 LRV 3 FT 3Ø11 −10Ø.ØØ ÞF	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV3 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections. Returns to previous display which is updated to reflect PV3 as current PV number selection.
5	G SET	LRV 3 FT 3Ø11 SET LRV?	Prompt asks if you want to set LRV for PV3 to applied input signal. If you don’t want to set LRV, press [**CLR**] key to exit function. Otherwise, go to Step 6.
6	NON-VOL ENTER (Yes)	LRV 3 FT 3Ø11 SFC WORKING...	Message exchange is working.
		LRV 3 FT 3Ø11 72.ØØ7 ÞF	Applied LRV setting stored in transmitter’s working memory.
7		Apply known input signal to transmitter that represents URV for PV3 for 100% (20 mAdc) output.	
8	F URV 100%	URV 3 FT 3Ø11 7722.ØØ ÞF	Present URV setting for PV3. (Input for 20 mAdc (100%) output.)
9	G SET	URV 3 FT 3Ø11 SET URV?	Prompt asks if you want to set URV to applied pressure. If you don’t want to set URV, press [**CLR**] key to exit function. Otherwise, go to Step 10.

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Setting range values for PV3 to applied input signals, continued

Table 7-22 Setting LRV and URV for PV3 to Applied Input Signals, continued

Step	Press Key	Read Display or Action	Description
10	NON-VOL ENTER (Yes)	URV 3 FT 3Ø11 SFC WORKING... URV 3 FT 3Ø11 6Ø8.47 PF	Message exchange is working. Applied URV setting stored in transmitter's working memory.
11	^ SHIFT NON-VOL ENTER (Yes)	URV 3 FT 3Ø11 SHIFT– URV 3 FT 3Ø11 SFC WORKING... URV 3 FT 3Ø11 DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiates shift key selection. Saves data in transmitter's nonvolatile memory. This takes approximately 8 seconds.

PV4 URL and LRL

The Lower Range Limit (LRL) and Upper Range Limit (URL) identify the minimum and maximum flow rates for the given PV4 calculation. The LRL is fixed at zero to represent a no flow condition. The URL, like the URV, depends on the calculated rate of flow that includes a scaling factor as well as pressure and/or temperature compensation. It is expressed as the maximum flow rate in the selected volumetric or mass flow engineering units. This means you can use the derived volume or mass flow equation to determine the URL by plugging in values for the scaling factor, static pressure, process temperature, and differential pressure for your unique process at design and flow conditions.

Setting URL and range values for PV4

You can set the URL, LRV, and URV for calculated flow rate PV4 output by keying in the desired values through the SFC keyboard.

ATTENTION

If you use CUSTOM units for PV4 calculation, be sure to use appropriate engineering units conversions in flow equations.

Continued on next page

Setting URL for PV4 Table 7-23 gives the steps for setting URL for the PV4 calculation.

Table 7-23 Setting URL for PV4

Step	Press Key	Read Display or Action	Description
1	^ SHIFT URL Y SPAN	SMV FT 3Ø11 SHIFT– URL 4 FT 3Ø11 1ØØØ.Ø m3/h	Initiate shift key selection. Calls up URL display.
2		**If display in Step 1 is…** / **Then…** for PV4 / go to Step 4. not for PV4 / go to Step 3.	
3	DE CONF I MENU ITEM DE CONF I MENU ITEM NON-VOL ENTER (Yes)	PV NUM FT 3011 CURRENT PV:1 PV NUM FT 3011 CURRENT PV:4 URL 4 FT 3Ø11 1ØØØ.Ø m3/h	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV4 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections. Returns to previous display which is updated to reflect PV4 as current PV number selection.
4	N 7 S 5 Z 0	URL 4 FT 3Ø11 7_ 75_ 75Ø_	Key in 750 as desired URL setting for PV4. (It is not necessary to key in a decimal point and zeros for a whole number.)
5	NON-VOL ENTER (Yes)	URL 4 FT 3Ø11 SFC WORKING... URL 4 FT 3Ø11 75Ø.ØØ m3/h	Message exchange is working. New URL setting for PV4 stored in transmitter’s working memory.

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Setting URL for PV4, continued

Table 7-23 Setting URL for PV4, continued

Step	Press Key	Read Display or Action	Description
6	^ SHIFT NON-VOL ENTER (Yes)	URL 4 FT 3Ø11 SHIFT– URL 4 FT 3Ø11 SFC WORKING... URL 4 FT 3Ø11 DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiates shift key selection. Saves data in transmitter's nonvolatile memory. This takes approximately 8 seconds.

Setting range values for PV4

Setting the LRV and URV determine the zero and span points for your calculated flow measurement range. .

ATTENTION

- The default engineering units for volumetric flow rate is cubic meters per hour and tonnes per hour is the default engineering units for mass flow rate.
- The URV changes automatically to compensate for any changes in the LRV and maintain the present span (URV – LRV).
- If you must change both the LRV and URV, always change the LRV first.

Keying in LRV and URV for PV4

Table 7-24 gives the procedure for keying in the LRV and URV for PV4 for a sample volumetric flow measurement range of 170 to 650 cubic meters per hour. Note that LRV is normally set to 0 and we are using an LRV of 170 for example purposes only in this procedure.

ATTENTION

Be sure that you set the PV4 Upper Range Limit (URL) to desired value before you set PV4 range values. We suggest that you set the PV4 URL to equal two times the maximum flow rate.

Table 7-24 Keying in LRV and URV for PV4

Step	Press Key	Read Display or Action	Description
1	E LRV 0%	LRV 4 FT 3Ø11 Ø.ØØØØ m3/h	Present LRV setting for PV4. (Flow rate for 4 mAdc (0%) output.)
2		**If display in Step 1 is…** / **Then…** for PV4 / go to Step 4. not for PV4 / go to Step 3.	

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Keying in LRV and URV for PV4, continued

Table 7-24 Keying in LRV and URV for PV4, Continued

Step	Press Key	Read Display or Action	Description
3	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 1	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV4 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections.
	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 2	
	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 3	
	DE CONF I MENU ITEM	PV NUM FT 3011 CURRENT PV: 4	
	NON-VOL ENTER (Yes)	LRV 4 FT 3Ø11 Ø. ØØØØ m3/h	Returns to previous display which is updated to reflect PV4 as current PV number selection.
4	V 1	LRV 4 FT 3Ø11 1_ m3/h	Key in 170 as desired LRV setting for PV4. (It is not necessary to key in a decimal point and zeros for a whole number.)
	N 7	LRV 4 FT 3Ø11 17_ m3/h	
	Z 0	LRV 4 FT 3Ø11 17Ø_ m3/h	
5	NON-VOL ENTER (Yes)	LRV 4 FT 3Ø11 SFC WORKING...	Message exchange is working.
		LRV 4 FT 3Ø11 17Ø.ØØ m3/h	New LRV setting stored in transmitter’s working memory.
6	F URV 100%	URV 4 FT 3Ø11 17Ø.Ø m3/h	Present URV setting for PV4. (Flow rate for 20 mAdc (100%) output.) Note that this value was automatically compensated for previous change in LRV value.
7	T 6	URV 4 FT 3Ø11 6_ m3/h	Key in 650 as desired URV setting for PV4.
	S 5	URV 4 FT 3Ø11 65_ m3/h	
	Z 0	URV 4 FT 3Ø11 65Ø_ m3/h	

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Keying in LRV and URV for PV4, continued

Table 7-24 Keying in LRV and URV for PV4, continued

Step	Press Key	Read Display or Action	Description
8	NON-VOL ENTER (Yes)	URV 4 FT 3Ø11 SFC WORKING... URV 4 FT 3Ø11 65Ø.ØØ m3/h	Message exchange is working. New URV setting for PV4 stored in transmitter's working memory.
9	^ SHIFT NON-VOL ENTER (Yes)	URV 4 FT 3Ø11 SHIFT– URV 4 FT 3Ø11 SFC WORKING... URV 4 FT 3Ø11 DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiates shift key selection. Saves data in transmitter's nonvolatile memory. This takes approximately 8 seconds.

DE configuration parameters

You must configure these additional parameters for a transmitter in the DE mode of operation.

- PVs for Broadcast
- Message Format

This section and the next cover how to configure these parameters individually. However, once you enter the DE configuration function, you can access all DE configuration parameters serially without exiting the function.

Just use the H NEXT and L PREV keys to step through the parameter selections.

Selecting PVs for broadcast

You can select which transmitter Process Variables (PVs) are to be broadcast as part of the transmitter's digital transmission including PV1 with or without the secondary variable. The procedure in Table 7-25 outlines the steps for selecting PVs for broadcast.

ATTENTION

You can only turn PVs ON in sequence. If you turn ON PV2, you can turn ON PV3. If you turn ON PV2 and PV3, you can turn ON PV4. If you turn OFF PV2, you must turn OFF PV3 and PV4. Likewise, if you turn OFF PV3, you must turn OFF PV4.

Continued on next page

Selecting PVs for broadcast, continued

Table 7-25 Selecting PVs for Broadcast

Step	Press Key	Read Display or Action	Description
1	^ SHIFT DE CONF I MENU ITEM	SMV FT 3Ø11 SHIFT– DE CONFT 3Ø11 SFC WORKING... DE CONFT 3Ø11 PV 1 ON	Initiate shift key selection. Calls up DE CONFIG menu. PV1 selection appears.
2	DE CONF I MENU ITEM	DE CONFT 3Ø11 PV 1 ON W/SV	Calls up next PV1 selection. Repeatedly press [**MENU ITEM**] key to toggle between “PV 1 ON” and PV 1 ON W/SV” selections. For “PV1 ON”, only PV1 value is broadcast; but, secondary variable (meter body temperature) as well as PV1 are broadcast when “PV 1 ON W/SV” is selected. Stop when desired selection is on display.
3	NON-VOL ENTER (Yes)	DE CONFT 3Ø11 ENTERED IN SFC DE CONFT 3Ø11 PV 2 ON	Enters change in SFC and calls up next DE configuration parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function or [s **NEXT**] key to call up next parameter.
4	DE CONF I MENU ITEM	DE CONFT 3Ø11 PV 2 OFF	Calls up next PV2 selection. Repeatedly press [**MENU ITEM**] key to toggle between “PV 2 ON” and PV 2 OFF” selections. Select “PV 2 OFF” if you don’t want PV2 broadcast to control system. Stop when desired selection is on display.
5	NON-VOL ENTER (Yes)	DE CONFT 3Ø11 ENTERED IN SFC DE CONFT 3Ø11 PV 3 ON	Enters change in SFC and calls up next DE configuration parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function or [s **NEXT**] key to call up next parameter.
6	DE CONF I MENU ITEM	DE CONFT 3Ø11 PV 3 OFF	Calls up next PV3 selection. Repeatedly press [**MENU ITEM**] key to toggle between “PV 3 ON” and PV 3 OFF” selections. Select “PV 3 OFF” if you don’t want PV3 broadcast to control system. Stop when desired selection is on display.

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Selecting PVs for broadcast, continued

Table 7-25 Selecting PVs for Broadcast, continued

Step	Press Key	Read Display or Action	Description
7	NON-VOL ENTER (Yes)	DE CONF FT 3Ø11 ENTERED IN SFC DE CONF FT 3Ø11 PV 4 ON	Enters change in SFC and calls up next DE configuration parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function or [s **NEXT**] key to call up next parameter.
8	DE CONF I MENU ITEM	DE CONF FT 3Ø11 PV 4 OFF	Calls up next PV4 selection. Repeatedly press [**MENU ITEM**] key to toggle between “PV 4 ON” and PV 4 OFF” selections. Select “PV 4 OFF” if you don’t want PV4 broadcast to control system. Stop when desired selection is on display.
9	NON-VOL ENTER (Yes)	DE CONF FT 3Ø11 ENTERED IN SFC DE CONF FT 3Ø11 w/DB (6 Byte)	Enters change in SFC and calls up next DE configuration parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function or [s **NEXT**] key to call up next parameter.
10	CLR (NO)	DE CONF FT 3Ø11 DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to transmitter. If you want to download change, go to Step 11. If you do not want to download change, press [**CLR**] key to exit function. This action only applies when change has been entered in SFC. Otherwise, this keystroke exits DE CONF function.
11	NON-VOL ENTER (Yes)	DE CONF FT 3Ø11 SFC WORKING... SMV FT 3Ø11 READY...	Message exchange is working. Parameter change is loaded in transmitter. SFC is ready for next function.

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Message Format for DE Mode

While there are two message format selections, you can only select the 6-Byte type to provide database protection through the control system.

- ~~4-Byte type~~ Invalid Selection for SMV 3000 transmitter
- 6-Byte type

The procedure in Table 7-26 outlines the steps for checking message format selection for example purposes only. The default selection is 6-Byte and you can not change it.

Table 7-26 Selecting Message Format

Step	Press Key	Read Display or Action	Description
1	^ SHIFT	SMV FT 3Ø11 SHIFT–	Initiate shift key selection.
	DE CONF I MENU ITEM	DE CONF FT 3Ø11 SFC WORKING...	Calls up DE CONFIG menu. PV1 selection appears.
		DE CONF FT 3Ø11 PV 1 ON W/SV	
2	H ▲ NEXT	DE CONF FT 3Ø11 PV 2 OFF	Calls up next DE CONFIG menu item - PV2 selection appears.
3	H ▲ NEXT	DE CONF FT 3Ø11 PV 3 OFF	Calls up next DE CONFIG menu item - PV3 selection appears.
4	H ▲ NEXT	DE CONF FT 3Ø11 PV 4 OFF	Calls up next DE CONFIG menu item - PV4 selection appears.
5	H ▲ NEXT	DE CONF FT 3Ø11 w/DB (6 Byte)	Calls up next DE CONFIG menu item - Message format selection appears.
6	DE CONF I MENU ITEM	DE CONF FT 3Ø11 w/oDB (4 Byte)	Calls up next message format selection. While the 4-Byte selection appears, you can not select it. Be sure “w/DB (6 Byte)” selection is on display.
7	CLR (NO)	SMV FT 3Ø11 READY...	Exits function without saving any changes

7.4 Output Calibration

About SMV 3000 calibration

The SMV 3000 Smart Multivariable Transmitter does not require recalibration at periodic intervals to maintain accuracy. In fact, we do not recommend recalibrating the temperature PV3 and calculated rate of flow PV4 measurement ranges in the field. If recalibration of the differential pressure PV1 and/or static pressure PV2 measurement range is required, we recommend that you do a bench calibration with the transmitter removed from the process and located in a controlled environment to get the best accuracy.

If the transmitter will be operating in the analog mode, you must calibrate its output signal before you calibrate the transmitter's measurement ranges using the SFC. While it is not required to calibrate the output signal first for transmitter's operating in the DE mode, you can do it by using another SFC to read the output in percent.

Transmitter analog output calibration

You can calibrate the transmitter's analog output circuit at its 0 and 100% levels by using the transmitter in its constant-current source mode. It is not necessary to remove the transmitter from service.

The procedure in Table 7-27 shows the steps for calibrating the output signal for a transmitter in the analog mode. Note that the procedure is similar for a transmitter in the DE mode, but the SFC must be used to read the output in percent in place of the milliammeter or voltmeter readings.

Table 7-27 Calibrating Output Signal for Transmitter in Analog Mode

Step	Press Key	Read Display or Action	Description
1		Connect SFC across loop wiring and turn it on. Connect a precision milliammeter or voltmeter (0.03% accuracy or better) in loop to check readings.	**ATTENTION** Be sure the accuracy of the resistor is 0.03% or better for current measurements made by voltage drop.
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
3	NON-VOL ENTER (Yes)	SMV TAG NO. FT 3Ø11	Confirm that "TRIPS" are secured and establish communications with sample transmitter FT 3011
4	INPUT J OUT- PUT	OUTP 1 FT 3Ø11 32.4 %	Display shows current transmitter output level and it will update every six seconds - displayed value blinks when value is updated. Be sure to time your next key press with an updated display.

Continued on next page

Procedure, continued

Table 7-27 Calibrating Output Signal for Transmitter in Analog Mode, continued

Step	Press Key	Read Display or Action	Description
5		**If display in Step 4 is…** / **Then…** for PV4 — go to Step 7. not for PV4 — go to Step 6.	You can only calibrate analog output for PV4. So, be sure PV4 is current PV number. We assume that receiver instrument is configured to match PV4 output range.
6	DE CONF I MENU ITEM DE CONF I MENU ITEM DE CONF I MENU ITEM DE CONF I MENU ITEM NON-VOL ENTER (Yes)	PV NUM FT 3011 CURRENT PV: 1 PV NUM FT 3011 CURRENT PV: 2 PV NUM FT 3011 CURRENT PV: 3 PV NUM FT 3011 CURRENT PV: 4 OUTP 4 FT 3Ø11 32.4 %	Calls up current PV number display. Repeatedly press [**MENU ITEM**] key to step through PV number selections “1”, “2”, “3”, and “4”. Stop when PV4 is on display. **ATTENTION** You can also use left [←] and right [→] arrow keys to step forward and backward through PV number selections. Returns to previous display which is updated to reflect PV4 as current PV number selection.
7	Z 0	OUTP 4 FT 3Ø11 Ø_ %	Key in 0 (zero) as desired output signal level in percent.
8	NON-VOL ENTER (Yes)	OUTP 4 FT 3Ø11# Ø.ØØ %	Put transmitter into constant-current source mode as noted by “#” sign in display and set output to 0%.
9	RESET K COR-RECT	OUTP 4 FT 3Ø11# CORRECT DAC ZERO	Calibrate output signal to 0%.
10		Check that milliammeter or voltmeter reading is 4mA or 1V. **If reading is …** / **Then…** **correct** — go to Step 13. **lower** than 4mA or 1V — go to Step 11. **higher** than 4mA or 1V — go to Step 12.	

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7.4 Output Calibration, Continued

Procedure, continued

Table 7-27 Calibrating Output Signal for Transmitter in Analog Mode, continued

Step	Press Key	Read Display or Action	Description
11	H ▲ NEXT	OUTP 4 FT 3Ø11# INC 1 COUNTS OUTP 4 FT 3Ø11# INCREASED 4mA OUTP 4 FT 3Ø11# CORRECT DAC ZERO	Gradually raise output to 4mA or 1V reading. Repeat this Step as required. Note that you can repeatedly press [**NEXT**] key to raise output by more than one count at a time.
12	L ▼ PREV	OUTP 4 FT 3Ø11# DEC 1 COUNTS OUTP 4 FT 3Ø11# DECREASED 4mA OUTP 4 FT 3Ø11# CORRECT DAC ZERO	Gradually decrease output to 4mA or 1V reading. Repeat this Step as required. Note that you can repeatedly press [**NEXT**] key to decrease output by more than one count at a time.
13	INPUT J OUT-PUT	OUTP 4 FT 3Ø11# Ø.ØØ %	Present output signal level in percent.
14	V 1 Z 0 Z 0	OUTP 4 FT 3Ø11# 1_ % OUTP 4 FT 3Ø11# 1Ø_ % OUTP 4 FT 3Ø11# 1ØØ_ %	Key in 100 as desired output level in percent.
15	NON-VOL ENTER (Yes)	OUTP 4 FT 3Ø11# 1ØØ.ØØ %	Set output to 100%.
16	RESET K COR-RECT	OUTP 4 FT 3Ø11# CORRECT DAC SPAN	Calibrate output to 100%.
17		Check that milliammeter or voltmeter reading is 20mA or 5V.	

If reading is …	Then…
correct	go to Step 20.
lower than 20mA or 5V	go to Step 18.
higher than 20mA or 5V	go to Step 19.

Continued on next page

Procedure, continued

Table 7-27 Calibrating Output Signal for Transmitter in Analog Mode, continued

Step	Press Key	Read Display or Action	Description
18	H ▲ NEXT	OUTP 4 FT 3Ø11# INC 1 COUNTS OUTP 4 FT 3Ø11# INCREASED 2ØmA OUTP 4 FT 3Ø11# CORRECT DAC SPAN	Gradually raise output to 20mA or 5V reading. Repeat this Step as required. Note that you can repeatedly press [**NEXT**] key to raise output by more than one count at a time.
19	L ▼ PREV	OUTP 4 FT 3Ø11# DEC 1 COUNTS OUTP 4 FT 3Ø11# DECREASED 2ØmA OUTP 4 FT 3Ø11# CORRECT DAC SPAN	Gradually decrease output to 20mA or 5V reading. Repeat this Step as required. Note that you can repeatedly press [**NEXT**] key to decrease output by more than one count at a time.
20	^ SHIFT NON-VOL ENTER (Yes)	OUTP 4 FT 3Ø11# SHIFT– OUTP 4 FT 3Ø11# SFC WORKING... OUTP 4 FT 3Ø11# DATA NONVOLATILE SMV FT 3Ø11 READY...	Initiate shift key selection Saves data in transmitter's nonvolatile memory. This takes approximately 8 seconds.
21	INPUT J OUT-PUT	OUTP 4 FT 3Ø11# 1ØØ.ØØ %	Present output signal level in percent.
22	CLR (NO)	SMV FT 3Ø11 READY...	Exit constant-current source mode.

7.5 Operation

Overview

The STS103 displays all the operating data for the SMV 3000 Multivariable Transmitter. This data includes:

- Transmitter I.D
- Current PV number selection
- Damping value
- Upper range value (span)
- Configuration elements for Digital (DE) Communications mode
- Input value
- Output Value
- Span value
- Upper range limit
- Engineering units
- Operation Status
- Failsafe Direction
- Sensor (meter body) temperature
- Cold Junction temperature
- High/Low PV
- Lower range limit
- PROM serial number
- Software Version Number
- Zero Point adjustment
- Display and Keyboard Test
- Read Scratch Pad messages

Refer to Table 4-5 for Operating Data access instructions.

Continued on next page

Operating data

Table 7-28 shows you what key to press and what the associated displays will be when you access each of the operating data.

Table 7-28 ST 3000 Operating Data

Operating Data	Press	Displays (Displays are examples)	Result
Transmitter I.D **(ANALOG)**	DE READ A ID NON-VOL ENTER (YES)	(SFI Type) TAG No. TRIPS SECURED? SMV TAG NO. 12345678	**Analog Communications Mode** XXX = Transmitter Type (SMV) Lower Display is the device I.D
(DIGITAL)	or DE READ A ID	or DE XMTR TAG NO. 12345678	**Digital Communications Mode** Transmitter in DE Communication Mode Lower Display is the device I.D
Current PV	DE CONF I MENU ITEM	PV NUM (tag no.) CURRENT PV: 1	The current PV is displayed. Press MENU ITEM key repeatedly to step through PV selections 1, 2, 3, 4.
Damping Value	C DAMP	DAMP 1 (tag no.) X.X SECONDS	Damping Time of current PV, displayed in seconds.
Upper Range Value	F URV 100%	URV 1 (tag no.) (value) (Units)	Upper Range Value (span) of the current PV. This is the value of Input which will generate 100% Output.
Lower Range Value	E LRV 0%	LRV 1 (tag no.) (value) (Units)	Lower Range Value (zero) of the current PV. This is the value of Input which will generate 0% Output.
Zero Point Adjustment	^ SHIFT then INPUT J OUT-PUT RESET K COR-RECT NON-VOL ENTER (YES)	INPUT 1 (tag no.) 0.0000 PSI INPUT 1 (tag no.) ZERO INPUT? INPUT 1 (tag no.) INPUT ZEROED	Procedure to adjust transmitter zero measurement point. Request to Zero Input. Press CLR to Exit. A physical input equivalent to 0% must be applied before pressing the ENTER key Zero adjustment is automatically done within approximately 20 seconds after pressing the ENTER key.

Table Continued on next page

Operating data,
continued

Table 7-28 ST 3000 Operating Data, continued

Operating Data	Press	Displays (Displays are examples)	Result
Input Value	^ SHIFT then INPUT J OUT-PUT	INPUT 1 (tag no.) 0.0000 PSI	Indicates the input value (in an engineering unit of measure) of the current PV.
Output Value	INPUT J OUT-PUT	OUTP 1 (tag no.) 0.000%	Indicates the percent(%) output of the current PV. This value is displayed and updated every 5 seconds.
Currently Running Span	URL Y SPAN	SPAN 1 (tag no.) 100.00 PSI	Span of the current PV. Span is the URV-LRV or the range of input corresponding to a full range (0-100%) of output.
Upper Range Limit	^ SHIFT then URL Y SPAN	URL 1 (tag no.) 100.00 PSI	The highest value of the measured variable of the current PV that a device can be adjusted to measure.
Engineering Units	D UNITS	UNITS 1 (tag no.) PSI	The present selection of engineering units of the current PV.
Operation Status	F/S DIR U STAT	STATUS (tag no.) STATUS CHECK=OK	Momentary Display. Indicates the status of operation at the present time.
Failsafe Direction	^ SHIFT then F/S DIR U STAT	F/S DIR (tag no.) SFC WORKING – XX% then F/S DIR (tag no.) F/SAFE DOWNSCALE	Displays the Failsafe Burnout direction, upscale or downscale, for analog devices.
Read Meter Body Temperature	H ▲ NEXT NON-VOL ENTER (YES)	until display reads SMV CONFIG READ M.B. TEMP? M. B. TEMP. 16.296 °C	Displays temperature of transmitter meter body in the selected engineering units.

Table Continued on next page

Operating data,
continued

Table 7-28 ST 3000 Operating Data, continued

Operating Data	Press	Displays (Displays are examples)	Result
Read Cold Junction Temperature (PV3)	H NEXT NON-VOL ENTER (YES)	until display reads SMV CONFIG READ CJT ? SMV CONFIG 76.160 °F CJT	Displays the temperature of the cold junction reference in selected engineering units.
High/Low PV	H NEXT NON-VOL ENTER (YES) H NEXT	until display reads SMV CONFIG READ Hi/Low PV3? SMV CONFIG 37.564 °F L o SMV CONFIG 428.45 °F H i	Displays the highest and lowest PV3 values (in selected engineering units) since the last time they were displayed by the SFC.
Lower Range Limit	H NEXT	until display reads LRL(PVno.) CONFIG -400.00 "H2O_39F	Displays the lower range limit of the current PV.
PROM Serial Number	H NEXT	until display reads SMV CONFIG SER# 9317304637	Displays the 10-digit serial number assigned to the transmitter PROM.
Digital Communications Mode Configuration Elements	^ SHIFT then DE CONF MENU ITEM H NEXT	DE CONF (tag no.) SINGLE RANGE DE CONF (tag no.) w/o DB (4byte)	Type of Transmitter operation. Broadcast Message Format

Table Continued on next page

Operating data,
continued

Table 7-28 ST 3000 Operating Data, continued

Operating Data	Press	Displays (Displays are examples)	Result
Software Version	SHIFT (^) then SW VER 3 (X) then NEXT (▲, H)	S/W No. (tag no.) SFC=X.X XMTR=X.X S/W No. (tag no.) SFC Version X.XX	Displays the STS103 and SMV 3000 software version numbers. SFC Version X.XX
Display and Keyboard Test	SHIFT (^) then 2 (W) CLR (NO)	DISPLAY TEST **DISPLAY OK** then KEYBOARD TEST ROW * COLUMN *	Display test indication. You can test each key on the keyboard. For example: If you press INPUT OUT-PUT (J) the display will read KEYBOARD TEST ROW 3 COLUMN 2 to clear.
Access the scratch pad message	SHIFT (^) then SCR PAD ■	SCR PAD (tag no.) SFC WORKING . . . then SCRATCH PAD 1 XXXXXXXXXXXXXXXX	Displays the scratch pad message. Press the NEXT key to switch from SCRATCH PAD 1 to SCRATCH PAD 2

7.6 Diagnostics and SFC Messages

Introduction

The ST 3000 and the STS103 both run continuous self-diagnostics. This means that they are constantly testing the communications, the loop, and themselves.

Any time you want results of these diagnostics, press the STAT key.

The SFC displays its report, in the form of messages, which identify diagnostic conditions.
Diagnostic conditions are broken down into three categories:

- OK status
- critical status
- a non-critical condition

OK Status

An OK condition means no problem exists, and the display looks like this:

```
STATUS  (tag no.)
STATUS CHECK=OK
```

Critical status

A critical condition means that the transmitter is not functioning properly. When this occurs, the transmitter goes into upscale failsafe and maintains an output of 21.8 mA, or into downscale failsafe and maintains an output of less than 3.9 mA. The message CRITICAL STATUS interrupts your operation and is followed by the message PRESS STATUS.

After the PRESS STATUS message, you press the STAT key to find out what problem exists. You will receive one or more messages. Take whatever corrective action necessary to solve the problem. Remember that the transmitter will stay in upscale or down scale failsafe until the condition is corrected.
If the transmitter sends more than one message, each message will be displayed in the order of importance for about 5 seconds. If you need to see them again, press the STAT key again.

Non-critical status

A non-critical condition means that although a problem exists, the transmitter is still operating. When a non-critical condition occurs a "#" character appears on the right side of the display, along with whatever you're displaying at the time.

This character means press the STAT key because some type of a problem exists. Again, one or more messages will appear on the display for about five seconds each.

Low battery voltage

When the battery voltage becomes low, a colon "**:**" will appear in the middle of the display. It stays on the display until you either charge or replace the batteries.

Continued on next page

Diagnostic Messages

The diagnostic text messages that can be displayed on the SFC model STS103 are listed in the following tables. A description of the probable cause and suggested action to be taken are listed also to help in troubleshooting error conditions.

The **SMV Status** column provides the location of the SMV status. If you are using an SFC that contains an earlier software version, you may see the diagnostic messages displayed as these SMV Status numbers.

The **SFC Display Message** column shows text that appears when the SFC is connected to the SMV control loop and the STAT key is pressed.

Diagnostic message tables

The diagnostic messages are grouped in tables according to the status message categories:

Table 7-29 lists	Critical status diagnostic messages
Table 7-30 -	Non-critical status messages
Table 7-31 -	Communications status messages
Table 7-32 -	Informational status messages
Table 7-33 -	SFC Diagnostic messages

Table 7-29 Critical Status Diagnostic Message Table

SMV Status	SFC Display Message	Possible Cause	What to Do
7-0	STATUS *TAG NO.#* A/D FAILURE PV3	A/D circuit for PV3 input has failed.	• Cycle transmitter power OFF/ON. • Replace electronics module.
7-1	STATUS *TAG NO.#* CHAR. FAULT PV3	Characterization data for PV3 is bad.	• Cycle transmitter power OFF/ON. • Replace electronics module.
1-1	STATUS *TAG NO.* CHAR PROM FAULT	Characterization data is bad.	Replace PROM with an identical PROM. Verify PROM serial number: Press [CONF] and [▲ NEXT] keys.
1-3	STATUS *TAG NO.#* DAC COMP FAULT	DAC temperature compensation is out of range.	Replace electronics module.
1-4	STATUS *TAG NO.#* NVM FAULT	PV1 nonvolatile memory fault.	Replace electronics module.
1-5	STATUS *TAG NO.* RAM FAULT	RAM has failed	Replace electronics module
1-6	STATUS *TAG NO.* PROM FAULT	PROM has failed.	Replace PROM.
1-7	STATUS *TAG NO.* PAC FAULT	PAC circuit has failed.	Replace electronics module.

Continued on next page

Diagnostic message tables, continued

Table 7-29 Critical Status Diagnostic Message Table, continued

SMV Status	SFC Display Message	Possible Cause	What to Do
2-4 2-5	STATUS *TAG NO.*# M.B. OVERLOAD OR STATUS *TAG NO.*# METERBODY FAULT	Pressure input is two times greater than URL for PV2.	• Wait for PV2 range to return to normal. • Meter body may have been damaged. Check the transmitter for accuracy and linearity. Replace meter body center and recalibrate if needed.
8-3	STATUS *TAG NO.* INPUT OPEN PV3	Temperature input TC or RTD is open.	Replace the thermocouple or RTD.
1-2	OUTP 1 *TAG NO.* SUSPECT INPUT	PV1 and PV2 or sensor temperature input data seems wrong. Could be a process problem, but it could also be a meter body or electronics module problem.	• Cycle transmitter power OFF/ON. • Put transmitter in PV1 output mode check transmitter status. Diagnostic messages should identify where problem is. If no other diagnostic message is given, condition is most likely meter body related. • Check installation and replace meter body center section. If condition persists, replace electronics module.
3-1	OUTP 1 *TAG NO.* SUSPCT INPUT PV2	PV2 Input data seems wrong. Could be a process problem, but it could also be a meter body or electronics module problem.	• Cycle transmitter power OFF/ON. • Put transmitter in PV2 output mode and check transmitter status. Diagnostic messages should identify where problem is. If no other diagnostic message is given, condition is most likely meter body related. • Check installation and replace meter body center section. If condition persists, replace electronics module.
7-2	OUTP 1 *TAG NO.* SUSPCT INPUT PV3	PV3 Input data seems wrong. Sensor reading is extremely erratic. Could be a process problem, but it could also be a temperature sensor or electronics module problem.	• Cycle transmitter power OFF/ON. • Check sensor leads for weak area that may be ready to break or loose connection.
3-0	*TAG NO.* INVALID DATABASE	Transmitter database was incorrect at power-up.	• Try communicating again. • Verify database configuration, and then manually update non-volatile memory.
7-4	STATUS *TAG NO.* NVM FAULT PV3	PV3 nonvolatile memory fault.	Replace electronics module.

Continued on next page

Diagnostic message tables, continued

Table 7-29 Critical Status Diagnostic Message Table, continued

SMV Status	SFC Display Message	Possible Cause	What to Do
8-4	STATUS *TAG NO.* OVERRANGE PV3	Process temperature exceeds PV3 range.	• Check process temperature. Reduce temperature, if required. • Replace temperature sensor, if needed.
9-0	STATUS *TAG NO.#* ALGPARM INVALID	Configuration for selected equation is not complete.	Check the flow configuration using the SCT flow compensation wizard.
3-3	-	An algorithm diagnostic has determined the flow to be invalid.	• Resolve the conditions causing the other diagnostic message. • Check all flow configuration parameters.

Table 7-30 Non-Critical Status Diagnostic Message Table

SMV Status	SFC Display Message	Possible Cause	What to Do
9-3	STATUS *TAG NO.#* BAD AP COMP PV4	Problem with absolute/gauge pressure input PV2 or input processing circuitry for PV2.	• Verify that absolute/gauge pressure input is correct for selected flow equation. • If error persists, replace transmitter.
9-4	STATUS *TAG NO.#* BAD PT COMP PV4	Problem with process temperature input PV3, input processing circuitry for PV3, or PV4 algorithm parameter data.	• Verify that process temperature input is correct. • Verify open/defective temperature sensor. • Correct process temperature measurement. • Check for temperature limits exceeded in viscosity or density configuration. • Check design temperature value for PV4 standard gas algorithm.
2-6	STATUS *TAG NO.#* CORRECTS RST PV1	All calibration “CORRECTS” were deleted and data was reset for PV1 range.	Recalibrate PV1 (DP) range.
4-6	STATUS *TAG NO.#* CORRECTS RST PV2	All calibration “CORRECTS” were deleted and data was reset.	Recalibrate PV2 (SP) range.
8-6	STATUS *TAG NO.#* CORR. ACTIVE PV3	Process temperature PV3 has been calibrated and is now different than factory default (uncalibrated).	Nothing – or do a reset corrects
9-6	STATUS *TAG NO.#* CORR. ACTIVE PV4	Calculated flow rate PV4 has been calibrated.	Nothing – or do a reset corrects.

Continued on next page

Diagnostic message tables, continued

Table 7-30 Non-Critical Status Diagnostic Message Table, continued

SMV Status	SFC Display Message	Possible Cause	What to Do
3-6	-	Either the temperature (PV3) or the pressure (PV2) is not within the boundaries of SMV steam equation. The SMV steam equation is defined for pressures between 8 and 3000 psia, and temperature between saturation and 1500 °F, except above 2000 psia.	Check to see if the PV measurement is correct.
2-2	STATUS *TAG NO.#* EX. SPAN COR PV1	SPAN correction factor is outside acceptable limits for PV1 range. Could be that transmitter was in input or output mode during a CORRECT procedure.	• Verify calibration. • If error persists, call the Solutions Support Center
4-2	STATUS *TAG NO.#* EX. SPAN COR PV2	SPAN correction factor is outside acceptable limits for PV2 range. Could be that transmitter was in input or output mode during a CORRECT procedure.	• Verify calibration. • If error persists, call the Solutions Support Center
8-2	STATUS *TAG NO.#* EX. SPAN COR PV3	SPAN correction factor is outside acceptable limits for PV3 range.	• Verify calibration. • If error persists, call the Solutions Support Center
9-2	STATUS *TAG NO.#* EX. SPAN COR PV4	SPAN correction factor is outside acceptable limits for PV4 range.	• Verify calibration. • If error persists, call the Solutions Support Center
2-1	STATUS *TAG NO.#* EX. ZERO COR PV1	ZERO correction factor is outside acceptable limits for PV1 range. Could be that transmitter was in input or output mode during a CORRECT procedure.	• Verify calibration. • If error persists, call the Solutions Support Center
4-1	STATUS *TAG NO.#* EX. ZERO COR PV2	ZERO correction factor is outside acceptable limits for PV2 range. Could be that transmitter was in input or output mode during a CORRECT procedure.	• Verify calibration. • If error persists, call the Solutions Support Center
8-1	STATUS *TAG NO.#* EX. ZERO COR PV3	ZERO correction factor is outside acceptable limits for PV3 range.	• Verify calibration. • If error persists, call the Solutions Support Center
9-1	STATUS *TAG NO.#* EX. ZERO COR PV4	ZERO correction factor is outside acceptable limits for PV4 range.	• Verify calibration. • If error persists, call the Solutions Support Center
9-5	STATUS *TAG NO.#* IN CUTOFF PV4	Calculated flow rate is within configured low and high limits for PV4 low flow cutoff.	Nothing – wait for flow rate to exceed configured high limit. Verify that flow rate is in cutoff.

Continued on next page

Diagnostic message tables, continued

Table 7-30 Non-Critical Status Diagnostic Message Table, continued

SMV Status	SFC Display Message	Possible Cause	What to Do
5-4	STATUS *TAG NO.#* INPUT MODE PV1	Transmitter is simulating input for PV1.	Exit Input mode: Press [**SHIFT**], [**INPUT**], and [**CLR**] keys.
5-5	STATUS *TAG NO.#* INPUT MODE PV2	Transmitter is simulating input for PV2.	Exit Input mode: Press [**SHIFT**], [**INPUT**], and [**CLR**] keys.
5-6	STATUS *TAG NO.#* INPUT MODE PV3	Transmitter is simulating input for PV3.	Exit Input mode: Press [**SHIFT**], [**INPUT**], and [**CLR**] keys.
5-7	STATUS *TAG NO.#* INPUT MODE PV4	Transmitter is simulating input for PV4.	Exit Input mode: Press [**SHIFT**], [**INPUT**], and [**CLR**] keys.
2-0	STATUS *TAG NO.#* M.B. OVERTEMP	Sensor temperature is too high (>125 °C). Accuracy and life span may decrease if it remains high.	Take steps to insulate meter body from temperature source.
2-7	STATUS *TAG NO.#* NO DAC TEMPCOMP	Failed DAC.	Replace electronics module.
6-4	STATUS *TAG NO.#* OUTPUT MODE PV1	Analog transmitter is operating as a current source for PV1 output.	Exit Output Mode: Press [**OUTPUT**] and [**CLR**] keys.
6-5	STATUS *TAG NO.#* OUTPUT MODE PV2	Analog transmitter is operating as a current source for PV2 output.	Exit Output Mode: Press [**OUTPUT**] and [**CLR**] keys.
6-6	STATUS *TAG NO.#* OUTPUT MODE PV3	Analog transmitter is operating as a current source for PV3 output.	Exit Output Mode: Press [**OUTPUT**] and [**CLR**] keys.
6-7	STATUS *TAG NO.#* OUTPUT MODE PV4	Analog transmitter is operating as a current source for PV4 output.	Exit Output Mode: Press [**OUTPUT**] and [**CLR**] keys.
3-7	-	For R250 Laminar Flow transmitters only. Asserted when a PV is not within the range of a term in the laminar Flow equation.	• Check the value of every PV against the ranges in the Laminar Flow equation. • Redefine the equation, if necessary.
9-7	-	The high or low Reynolds number limit was exceeded.	• Verify high or low Reynolds number limit. • Calculate Reynolds number for flow conditions causing the message.
8-7	SAVE/RESTORE TYPE MISMATCH	Number of wires selected does not match number of sensor wires physically connected to the transmitter.	Check sensor wiring and type.

Continued on next page

Diagnostic message tables, continued

Table 7-31 Communication Status Message Table

SMV Status	SFC Display Message	Possible Cause	What to Do
-	*TAG NO.* COMM ABORTED	Communications aborted. Pressed [CLR] key during communications operation.	Retry aborted operation.
-	*TAG NO.* END AROUND ERR	Communications unsuccessful.	• Check loop wiring and SMV/SFC connections. • If error persists, replace transmitter electronics module.
-	SAVE/RESTORE RESTORE FAILED	Database restore or download function failed due to a problem with the current configuration or a communications error.	Check transmitter and try again.
-	*TAG NO.* ILLEGAL RESPONSE	The transmitter did not respond properly since the response was not recognizable. The message was probably corrupted by external influences. Transmitter sent illegal response to SFC.	Try communicating again.
-	URV 3 . *TAG NO.* INVALID REQUEST	Requesting transmitter to correct or set its URV to a value that results in too small a span, or correct its LRV or URV while in input or output mode. Keystroke is not valid for given transmitter.	• Check that correct URV calibration pressure is being applied to transmitter, or that transmitter is not in input or output mode. • Check that keystroke is applicable for given transmitter.
-	STATUS *TAG NO.* NACK RESPONSE	Transmitter sent a negative response because it could not process one or more commands.	Check configuration and try again.
-	*TAG NO.* FAILED COMM CHK	SFC failed a communications diagnostic check. Could be an SFC electronic problem or a faulty or dead communication loop.	• Check polarity and try again. • Press [stat] key and do any corrective action required and try again. • Check communication loop. • Replace SFC.
-	*TAG NO.* HI RES/LO VOLT	Either there is too much resistance in loop (open circuit), voltage is too low, or both.	• Check polarity, wiring, and power supply. There must be 11 volts minimum at transmitter to permit operation. • Check for defective or misapplied capacitive or inductive devices (filters).

Continued on next page

Diagnostic message tables, continued

Table 7-31 Communication Status Message Table, continued

SMV Status	SFC Display Message	Possible Cause	What to Do
-	*TAG NO.* NO XMTR RESPONSE	No response from transmitter. Could be transmitter or loop failure.	• Try communicating again. • Check that transmitter's loop integrity has been maintained, that SCT or SFC is connected properly, and that loop resistance is at least 250Ω. • Press [ID] key and do any corrective action required and try again.

Table 7-32 Informational Status Message Table

SMV Status	SFC Display Message	Possible Cause	What to Do
6-3	STATUS *TAG NO.* 2 WIRE TC PV3	PV3 input is being provided by 2-wire Thermocouple (T/C) type.	Nothing – Information only. However, this may indicate a problem if sensor type does not match the sensor physically connected to transmitter.
6-0	STATUS *TAG NO.* 2 WIRE RTD PV3	PV3 input is being provided by 2-wire RTD type.	Nothing – Information only. However, this may indicate a problem if number of wires displayed does not match number of RTD leads physically connected to transmitter; or if sensor type should be thermocouple.
6-1	STATUS *TAG NO.* 3 WIRE RTD PV3	PV3 input is being provided by 3-wire RTD type.	Nothing – Information only. However, this may indicate a problem if number of wires displayed does not match number of RTD leads physically connected to transmitter; or if sensor type should be thermocouple.
6-2	STATUS *TAG NO.* 4 WIRE RTD PV3	PV3 input is being provided by 4-wire RTD type.	Nothing – Information only. However, this may indicate a problem if number of wires displayed does not match number of RTD leads physically connected to transmitter; or if sensor type should be thermocouple.
4-3	-	Sensor type for the current SMV is absolute pressure.	Nothing – Information only.
4-4	-	Sensor type for the current SMV is gauge pressure.	Nothing – Information only.
-	URV 1 . TAG NO. WRITE PROTECTED	The value could not be written because the transmitter is write protected.	The hardware jumper within the device must be repositioned in order to permit write operations.

Continued on next page

Diagnostic message tables, continued

Table 7-33 SFC Diagnostic Message Table

SMV Status	SFC Display Message	Possible Cause	What to Do
-	ALGPARM Kuser ≥RANGE	Applicable PV4 algorithm parameter is set to default value of not-a-number (NaN).	Enter and download desired value to transmitter database.
-	SAVE/RESTORE H.W. MISMATCH	Hardware mismatch. Part of Save/Restore function.	None – SFC tried to restore as much of database as possible.
-	STATUS *TAG NO.* NVM ON SEE MAN	SFC's CPU is misconfigured.	Replace SFC.
-	SAVE/RESTORE OPTION MISMATCH	On a database restore, one or more options do not match.	None – SFC tried to restore as much of database as possible.
-	STATUS *TAG NO.* UNKNOWN	Selection is unknown.	Be sure SFC software is latest version.
-	*TAG NO.* LOW LOOP RES	Not enough resistance in series with communication loop.	Check sensing resistor and increase resistance to at least 250Ω.
-	TAG NO. SFC FAULT	SFC is operating incorrectly.	Try communicating again. If error still exists, replace SFC.
-	URV 1 . *TAG NO.* >RANGE "H20_39F	SFC – Value calculation is greater than display range.	Press [clr] key and start again. Be sure special units conversion factor is not greater than display range.

7.7 Troubleshooting

Diagnostics

The SMV 3000 transmitter is constantly running internal diagnostics to monitor sensor and transmitter functions. The SFC, when connected to the SMV control loop, monitors the transmitter functions, the status of the control loop and the communications link.

When a diagnostic failure is detected, a status is generated by the SMV. The SFC will interpret the transmitter status into messages that can be viewed through the SFC display. Corrective actions then can be taken to clear transmitter fault conditions.

Troubleshooting Tools

The SFC can be used to check transmitter status and identify diagnostic messages.

ATTENTION

IMPORTANT: However, the SFC does not support the advanced configuration parameters for the SMV 3000 dynamic compensation flow equations. **You must use the SCT 3000** to fully view the transmitter configuration parameters. Use the SCT also to verify the transmitter's configuration data and check to be sure your process is operating correctly. Refer to the *SMV 3000 User's Manual* 34-SM-25-02 and the SCT 3000 on-line manual and help topics for more information on using the SCT 3000 for troubleshooting.

ATTENTION

When critical status forces PV output into failsafe condition, record the messages before you cycle transmitter power OFF/ON to clear the failsafe condition.

Table 7-34 Accessing SMV 3000 Diagnostic Information using the SFC

Step	Action
1	**Connect the SFC to the SMV** control loop and establish communications.
2	Press **Status** key to display a listing of the Status messages.
3	Refer to the **Status message tables in subsection 7.6** for descriptions of the status messages and corrective actions to clear faults.

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