FLUID COMPONENTS INTERNATIONAL LLC

FOUNDATION™ Fieldbus Manual

ST100A Series
Thermal Mass Flow Meter

FOUNDATION

Table of Contents

INTENTIONALLY LEFT BLANK

Introduction

General

This manual describes the ST100 family products' (of which ST100A Series is a member) FOUNDATION™ Fieldbus features, its operation, and configuration. The ST100A Series can provide up to four different process variables. It provides Flow, Temperature, Flow Totalizer, and Pressure as outputs. The flow output can be selected as volumetric, mass or velocity units. There is built-in support for multi-sensor input.

FOUNDATION Fieldbus is different from other communication protocols because it is designed to resolve process control applications instead of just transfer data in a digital mode.

The software description in this document is applicable to all members of the ST100 family product line configured with FOUNDATION Fieldbus digital communication protocol.

FOUNDATION Fieldbus functionality is provided by an optional add-on card that plugs into the ST100A Series main board.

Definition

AI Block: Analog Input Block. This block receives the ST100 family product process data variables from the Process Data Transducer Block and makes the process data available for the function blocks.

There are four AI blocks in the ST100 product family: Flow AI Block, Temperature AI Block, Totalizer AI Block, and Pressure AI Block.

TB Block: Transducer Block. This block makes the connection to the ST100 family product signal processing hardware, presents the process variables and eases instrument setup through FOUNDATION Fieldbus.

PID Block: The Proportional, Integral, Derivative, control function block offers a number of control algorithms that use the Proportional, Integral, and Derivative Terms. The algorithm of the ST100 family product PID is the non-iterative, ISA version.

RS Block: The Resource block contains basic FOUNDATION Fieldbus information about the ST100 family product and some configuration data.

FF Configurator: A software tool used to access data and configure FOUNDATION Fieldbus devices.

DD Files: The Device Description Files are used by configuration software, like the NI configurator or handheld configurators like the Emerson 475, or other FOUNDATION Fieldbus hosts. The DD files describe the FOUNDATION Fieldbus device. They also allow for custom manufacturer-specific features to be added to a FOUNDATION Fieldbus device, and provide the means for the host to access the instrument's custom features.

FCI Configurator: A Windows-based PC application for accessing ST100A Series functions and features. The application, supplied with the instrument, is used for basic instrument setup and configuration, as well as provide access to advanced functions. The FCI configurator/host PC communicates to the instrument through the instrument's USB service port.

Installation

General

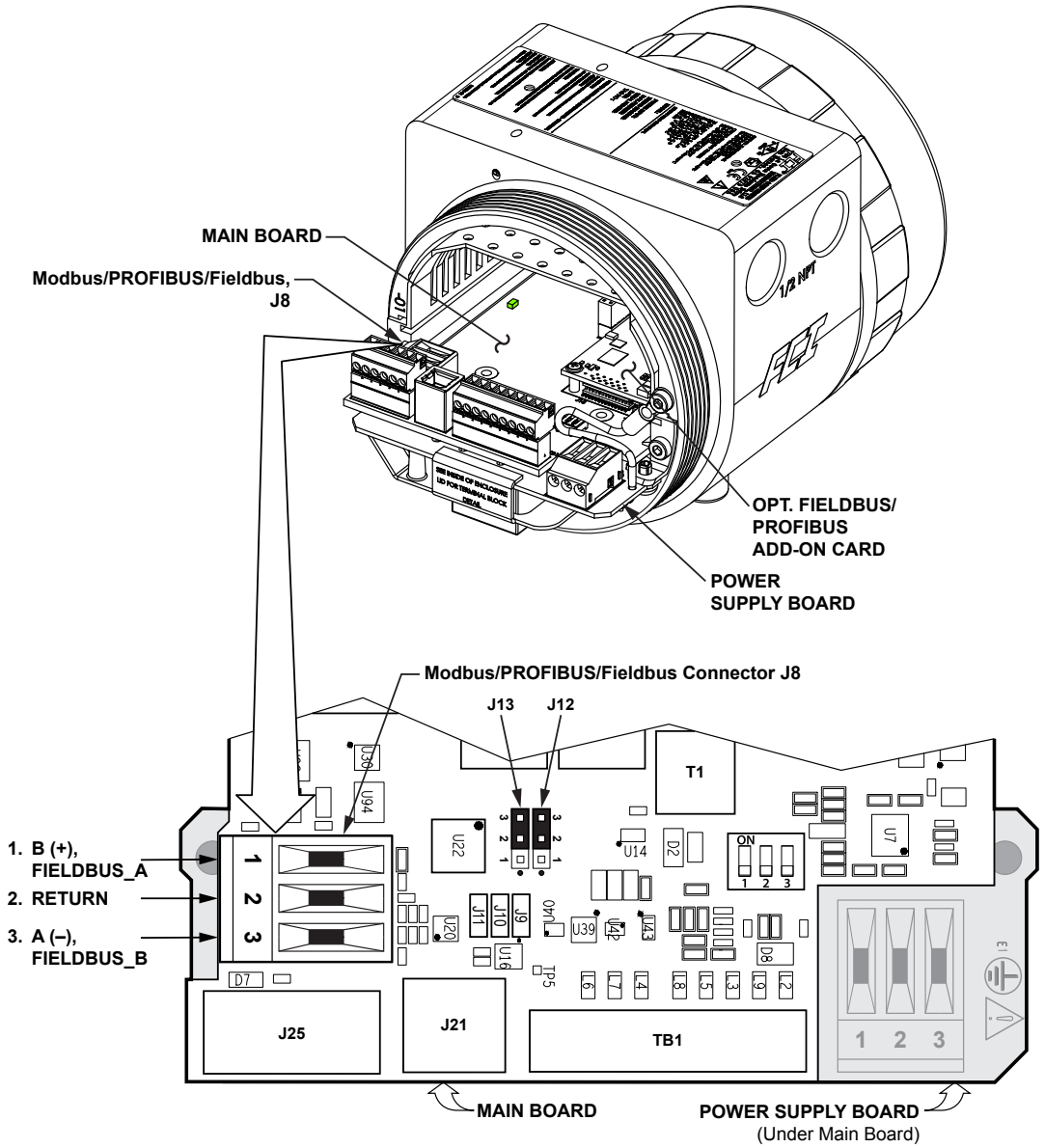
For details on installation and installation options refer to the ST100A Series main manual **06EN003480**.

Electrical Wiring

Open the instrument's blind lid to access the wiring terminal blocks. FCI recommends the use of FOUNDATION Fieldbus H1 cable compliant with the *H1 Cable Test Specification FF-844*.

Wire the ST100A Series FOUNDATION Fieldbus cable to the **J8** FIELDBUS_A and FIELDBUS_B connector terminals as shown in Figure 1 below. Connector **J8** accepts 24–12 AWG (0.2 mm^2 – 1.5 mm^2) wire. Check that the mode select jumpers J12 and J13 are set for FOUNDATION Fieldbus operation (both jumpers installed over pins 2 and 3). Refer to the ST100A Series main manual **06EN003480** for further wiring details.

Note: FOUNDATION Fieldbus operation requires that the optional Fieldbus/PROFIBUS add-on card be installed on the main board as shown in Figure 1 below. This card is installed at the factory when the instrument is ordered with the Fieldbus/PROFIBUS option.



C01479-1-1

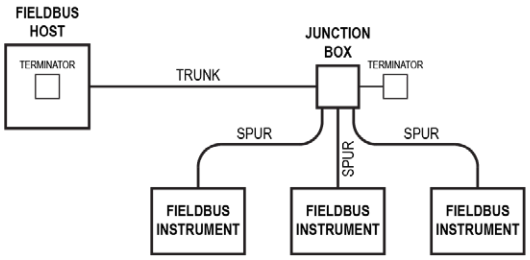
Figure 1 – ST100A Series Foundation Fieldbus Connections (Aux. Board Not Shown For Clarity)

Topology and Network Configuration

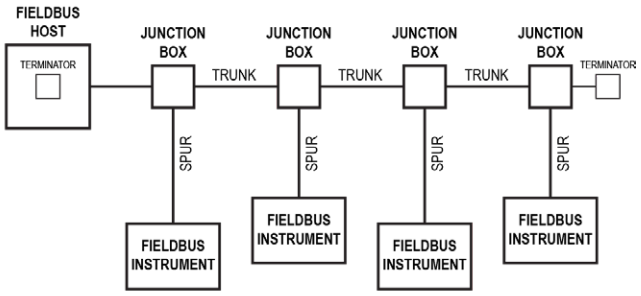
The ST100 product family supports both Bus topology and Tree topology. Both types have a trunk cable with two terminations. The devices are connected to the trunk via spurs. The spurs can be integrated in the device for a spur length of zero. A spur may connect more than one device, depending on the length. Spur lengths are extendable via the use of active couplers.

Active repeaters may be used to extend the trunk length.

The total cable length, including spurs, between any two devices in the FOUNDATION Fieldbus network must not exceed 1900 m. Limit the connection of couplers to less than 15 per 250 m.



(a) Tree Topology



(b) Bus Topology

General Operation

Functional Description

The ST100A Series is a flow meter with three flow classifications: volumetric flow, mass flow, and velocity flow. In addition, the ST100A Series offers process temperature and process pressure.

The FOUNDATION Fieldbus functionality is organized into two modes; an Instrument Process Data mode, and an Instrument Setup mode. To support these two modes, two transducer blocks were designed, one for process data and one for basic setup data.

Support is provided for multi-sensor input that is averaged at the output.

Function Transducer Blocks

The ST100A Series provides the following FOUNDATION Fieldbus blocks to present its process data and setup features: Resource Block, Process Data Transducer Block, Service Transducer Block, Flow Analog Input Block, Temperature Analog Input, Totalizer Analog Input Block, and Pressure Analog Input Block.

Data Types Definitions

DS-64 *Data Type*

E	Element Name	Data Type	Size
1	Block Tag	VisibleString	32
2	DD MemberId	Unsigned32	4
3	DD ItemId	Unsigned32	4
4	DD Revision	Unsigned16	2
5	Profile	Unsigned16	2
6	Profile Revision	Unsigned16	2
7	Execution Time	Unsigned32	4
8	Period of Execution	Unsigned32	4
9	Number of Parameters	Unsigned16	2
10	Next FB to Execute	Unsigned16	2
11	Starting Index of Views	Unsigned16	2
12	NumberofVIEW_3	Unsigned8	1
13	NumberofVIEW_4	Unsigned8	1

DS-65 *Floating Point Value & Status*

E	Element Name	Data Type	Size
1	Status	Unsigned8	1
2	Value	Float	4

DS-69 *Mode Structure*

E	Element Name	Data Type	Size
1	Target	Bitstring	1
2	Actual	Bitstring	1
3	Permitted	Bitstring	1
4	Normal	Bitstring	1

DS-72 *Alarm Discrete Structure*

E	Element Name	Data Type	Size
1	Unacknowledged	Unsigned8	1
2	Alarm State	Unsigned8	1
3	Time Stamp	Time Value	8
4	Subcode	Unsigned16	2
5	Value	Unsigned8	1

DS-73 *Event Update Structure*

E	Element Name	Data Type	Size
1	Unacknowledged	Unsigned8	1
2	Update State	Unsigned8	1
3	Time Stamp	Time Value	8
4	Static Revision	Unsigned16	2
5	Relative Index	Unsigned16	2

DS-74 *Alarm Summary Structure*

E	Element Name	Data Type	Size
1	Current	Bit String	2
2	Unacknowledged	Bit String	2
3	Unreported	Bit String	2
4	Disabled	Bit String	2

DS-85 *Test Structure*

E	ElementName	DataType	Size
1	Value1	Boolean	1
2	Value2	Integer8	1
3	Value3	Integer16	2
4	Value4	Integer32	4
5	Value5	Unsigned8	1
6	Value6	Unsigned16	2
7	Value7	Unsigned32	4
8	Value8	FloatingPoint	4
9	Value9	VisibleString	32
10	Value10	OctetString	32
11	Value11	Date	7
12	Value12	Time of Day	6
13	Value13	Time Difference	6
14	Value14	Bitstring	2
15	Value15	Time Value	8

Other Data Types used in the ST100A Series:

- Unsigned 16- and 32-bit integers
- Floating Point (Single Precision)

Resource Block

This block contains data that is specific to the ST100A Series hardware that is associated with the resource. All data is modeled as contained, so there are no links in the Block.

ITK_VER parameter – Provides the ITK version to which the device is certified. The ST100 Series is certified to Version 5.

FD_VER parameter – Provides the device Field Diagnostic Specification. The ST100A Series uses Version 1.

MANUFAC_ID parameter – Provides the manufacturer identification number. An interface device to locate the DD file uses the MANUFAC_ID parameter. The manufacturer ID for Fluid Components International is 0x01FC49.

DEV_TYPE parameter – Provides the manufacturer's model number associated with the resource. The Fluid Components model number is FCI ST100.

DEV_REV parameter – Provides the manufacturer's revision number associated with the resource. Fluid Components revision number is 1.

DD_REV parameter – Provides the DD file revision of the associated resource. Fluid Components DD file revision number is 1.

Resource Block Parameter List

The table below summarizes the ST100A Series Resource Block.

Table 1 – Resource Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
0	BLOCK OBJECT	DS-64		
1	ST_REV	Unsigned16	0	
2	TAG_DESC	Octet String	spaces	
3	STRATEGY	Unsigned16	0	
4	ALERT_KEY	Unsigned8	0	
5	MODE_BLK	DS-69	O/S	
6	BLOCK_ERR	Bit String		
7	RS_STATE	Unsigned8		
8	TEST_RW	DS-85		
9	DD_RESOURCE	Visible String	null	
10	MANUFAC_ID	Unsigned32		
11	DEV_TYPE	Unsigned16		
12	DEV_REV	Unsigned8	0x01	
13	DD_REV	Unsigned8	0x01	
14	GRANT_DENY	DS-70		
15	HARD_TYPES	Bit String	0xC000	
16	RESTART	Unsigned8		
17	FEATURES	Bit String	0111.0100.0010.0000	
18	FEATURE_SEL	Bit String	0111.0100.0000.0000	
19	CYCLE_TYPE	Bit String		
20	CYCLE_SEL	Bit String	0	
21	MIN_CYCLE_T	Unsigned32		
22	MEMORY_SIZE	Unsigned16		
23	NV_CYCLE_T	Unsigned32		
24	FREE_SPACE	Float		
25	FREE_TIME	Float		
26	SHED_RCAS	Unsigned32	640000	
27	SHED_ROUT	Unsigned32	640000	
28	FAULT_STATE	Unsigned8		
29	SET_FSTATE	Unsigned8	1	
30	CLR_FSTATE	Unsigned8	1	
31	MAX_NOTIFY	Unsigned8		
32	LIM_NOTIFY	Unsigned8	MAX_NOTIFY	
33	CONFIRM_TIME	Unsigned32	640000	

Table 1 – Resource Block (continued)

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
34	WRITE_LOCK	Unsigned8	1	
35	UPDATE_EVT	DS-73		
36	BLOCK_ALM	DS-72		
37	ALARM_SUM	DS-74		
38	ACK_OPTION	Bit String	0	
39	WRITE_PRI	Unsigned8	0	
40	WRITE_ALM	DS-72		
41	ITK_VER	Unsigned16		
42	FD_VER	Unsigned16	1	
43	FD_FAIL_ACTIVE	Bit String	0	
44	FD_OFFSPEC_ACTIVE	Bit String	0	
45	FD_MAINT_ACTIVE	Bit String	0	
46	FD_CHECK_ACTIVE	Bit String	0	
47	FD_FAIL_MAP	Bit String		
48	FD_OFFSPEC_MAP	Bit String		
49	FD_MAINT_MAP	Bit String		
50	FD_CHECK_MAP	Bit String		
51	FD_FAIL_MASK	Bit String		
52	FD_OFFSPEC_MASK	Bit String		
53	FD_MAINT_MASK	Bit String		
54	FD_CHECK_MASK	Bit String		
55	FD_FAIL_ALM	DS-87	0;0;0,0;0;0;0;15;0;0	
56	FD_OFFSPEC_ALM	DS-87	0;0;0,0;0;0;0;16;0;0	
57	FD_MAINT_ALM	DS-87	0;0;0,0;0;0;0;17;0;0	
59	FD_FAIL_PRI	Unsigned8	0	
60	FD_OFFSPEC_PRI	Unsigned8	0	
61	FD_MAINT_PRI	Unsigned8	0	
62	FD_CHECK_PRI	Unsigned8	0	
63	FD_SIMULATE	SIMULATE_FD	0;0;1	
64	FD_RECOMMEN_ACT	Unsigned16	0	

Process Data Transducer Block

This block connects the ST100A Series sensor process variable values and engineering units to the block's output channels. The ST100A Series process variables are Flow, Temperature, Totalizer, and Pressure.

PRIMARY_VALUE parameter – This parameter makes available to the AI block the flow value of the ST100A Series. Flow is organized into three classes; volumetric, mass, and velocity. Each class has its associated valid engineering units. Verify that units match the flow class.

SECONDARY_VALUE parameter – This parameter makes available to the AI block the temperature value of the ST100A Series. There are two valid engineering units associated with this parameter, °C and °F.

TERTIARY_VALUE parameter – This parameter makes available to the AI block the Totalizer value of the ST100A Series. This is an optional parameter that can be turned ON or OFF. It is associated with the volumetric flow and the mass flow. The units are set by the flow units selected.

QUATERNARY_VALUE parameter – This parameter makes available to the AI block the pressure value of the ST100A Series. This is an optional parameter that can be activated when a pressure sensor is connected to the instrument. The engineering units associated with this variable are PSIG, in H2Og, bar (g), Kpa(g), cm H2O g, in Hg, KpaA, mm Hg.

Engineering units can be viewed through this block.

Process Data Transducer Block Parameter List

The table below summarizes the ST100A Series Process Data Transducer Block.

Table 2 – Process Data Transducer Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
0	BLOCK OBJECT	DS-64		
1	ST_REV	Unsigned16	0	
2	TAG_DESC	Octet String	spaces	
3	STRATEGY	Unsigned16	0	
4	ALERT_KEY	Unsigned8	0	
5	MODE_BLK	DS-69	0	
6	BLOCK_ERR	Bit String	0	
7	UPDATE_EVT	DS-73		
8	BLOCK_ALM	DS-72		
9	TRANSDUCER_DIRECTORY	Unsigned16	0	
10	TRANSDUCER_TYPE	Unsigned16	65534	
11	XD_ERROR	Unsigned8	0	
12	COLLECTION_DIRECTORY	Unsigned32		
13	PRIMARY_VALUE	DS-65	0; 0.0	ST100 Flow Variable
14	PRIMARY_VALUE_UNIT	Unsigned16	0	ST100 Flow Units
15	SECONDARY_VALUE	DS-65	0; 0.0	ST100 Temperature Variable
16	SECONDARY_VALUE_UNIT	Unsigned16	0	ST100 Temperature Variable
17	TERTIARY_VALUE	DS-65	0; 0.0	ST100 Totalizer Variable
18	TERTIARY_VALUE_UNIT	Unsigned16	0	ST100 Totalizer Units
19	QUATERNARY_VALUE	DS-65	0; 0.0	ST100 Pressure Variable*
20	QUATERNARY_VALUE_UNIT	Unsigned16	0	ST100 Pressure Units*

Service Transducer Block

The main function of this block is to set up, configure and diagnose the ST100A Series from a remote location via a FOUNDATION Fieldbus configurator or a system monitor. Variables set or changed by this block affect all sensors when rights are authorized. Write access is authorized through the ST100A Series Configuration Software application (see "Setting the ST100A Series for FOUNDATION Fieldbus Operation" on page 20).

This block provides access to the instrument's basic setup parameters; some are read and write others are read only. This block can be used to review factory set calibration limits and settings of other process variables, such as plenum size, and to read and write the engineering units of the process variables. In addition, this block can be used to view process data from individual sensor elements in a multipoint system.

This block does not have an output, and it does not make any data available to other blocks.

Factory Calibration Limits (Configuration Software Factory/Factory Parameters)

MAX_CAL_FLOW parameter – Provides the value of the maximum calibrated flow limit that was set by the factory for the active flow classification and calibration group.

MIN_CAL_FLOW parameter – Provides the value of the minimum calibrated flow limit that was set by the factory for the active flow classification and calibration group.

MAX_CAL_TEMP parameter – Provides the value of the maximum calibrated temperature limit that was set by the factory during the factory calibration process.

MIN_CAL_TEMP parameter – Provides the value of the minimum calibrated temperature limit that was set by the factory during the calibration process.

MAX_CAL_PRES parameter – Provides the value of the maximum calibrated pressure limit that was set by the factory during the factory calibration process. This parameter applies only to instruments that accept a pressure sensor.

MIN_CAL_PRES parameter – Provides the value of the minimum calibrated pressure limit that was set by the factory. This parameter applies only to instruments that accept a pressure sensor.

Process Engineering Units (Configuration Software Basic Setup/Units & Basic Setup/Pipe Size)

FLOW_ENG_UNITS parameter – Provides the engineering units associated with the process flow variable.

TOTALIZER_ENG_UNITS parameter – Provides the engineering units associated with the process Totalizer variable. The Totalizer applies only to flow units that are volumetric or mass, and it is a parameter that can be turned off.

PLENUM_SIZE_VALUE_DIAMETER parameter – Provides the engineering units associated with the pipe size diameter parameter, or the width parameter of the duct in which the flow meter sensor is installed.

PLENUM_SIZE_VALUE_HEIGHT parameter – Provides the engineering units associated with the duct in which the flow meter sensor is installed.

PRESSURE_ENG_UNITS parameter – Provides the engineering units associated with the process Pressure variable. This parameter applies to instruments that have a pressure sensor, and may not be active in all instruments.

Factory Restore Command (Configuration Software Basic Setup/Groups)

FACTORY_RESTORE parameter – This parameter is a write only command that restores the instrument calibration to the calibration parameters that were set by the factory, for the presently active calibration group.

Individual Sensors Data View

This section of the Service Transducer Block is read-only. It shows a snapshot of the process data that each individual sensor head is detecting. This section provides information for up to 16 sensors of a multipoint system.

Listed below are typical parameters for a sensor head (Sensor 1 shown).

FLOW_VALUE_SENSOR_1 parameter – Provides the flow value of flow sensor 1 in SFPS.

TEMPERATURE_VALUE_SENSOR_1 parameter – Provides the temperature value associated with flow sensor 1 in °F.

PRESSURE_VALUE_SENSOR_1 parameter – Provides the pressure value associated with flow sensor 1 in PSIA.

Service Transducer Block Parameter List

The table below summarizes the ST100A Series Service Transducer Block.

Table 3 – Service Transducer Block

BLOCK INFO				
INDEX	**PARAMETER**	**DATA TYPE (LENGTH)**	**INITIAL VALUE**	**DESCRIPTION**
0	BLOCK OBJECT	DS-64		
1	ST_REV	Unsigned16	0	
2	TAG_DESC	Octet String	spaces	
3	STRATEGY	Unsigned16	0	
4	ALERT_KEY	Unsigned8	0	
5	MODE_BLK	DS-69	0	
6	BLOCK_ERR	Bit String	0	
7	UPDATE_EVT	DS-73		
8	BLOCK_ALM	DS-72		
9	TRANSDUCER_DIRECTORY	Unsigned16	0	
10	TRANSDUCER_TYPE	Unsigned16	65534	
11	XD_ERROR	Unsigned8	0	
12	COLLECTION_DIRECTORY	Unsigned32		

Table 3 – Service Transducer Block (continued)

INDIVIDUAL SENSOR RD				
INDEX	**PARAMETER**	**DATA TYPE (LENGTH)**	**INITIAL VALUE**	**DESCRIPTION**
Fluid Components Specific Service Parameters				
13	FLOW VALUE SENSOR #1	Floating Point	0	
14	TEMPERATURE VALUE SENSOR #1	Floating Point	0	
15	PRESSURE VALUE SENSOR #1*	Floating Point	0	
16	FLOW VALUE SENSOR #2	Floating Point	0	
17	TEMPERATURE VALUE SENSOR #2	Floating Point	0	
18	PRESSURE VALUE SENSOR #2*	Floating Point	0	
19	FLOW VALUE SENSOR #3	Floating Point	0	
20	TEMPERATURE VALUE SENSOR #3	Floating Point	0	
21	PRESSURE VALUE SENSOR #3*	Floating Point	0	
22	FLOW VALUE SENSOR #4	Floating Point	0	
23	TEMPERATURE VALUE SENSOR #4	Floating Point	0	
24	PRESSURE VALUE SENSOR #4*	Floating Point	0	
25	FLOW VALUE SENSOR #5	Floating Point	0	
26	TEMPERATURE VALUE SENSOR #5	Floating Point	0	
27	PRESSURE VALUE SENSOR #5*	Floating Point	0	
28	FLOW VALUE SENSOR #6	Floating Point	0	
29	TEMPERATURE VALUE SENSOR #6	Floating Point	0	
30	PRESSURE VALUE SENSOR #6*	Floating Point	0	
31	FLOW VALUE SENSOR #7	Floating Point	0	
32	TEMPERATURE VALUE SENSOR #7	Floating Point	0	
33	PRESSURE VALUE SENSOR #7*	Floating Point	0	
34	FLOW VALUE SENSOR #8	Floating Point	0	
35	TEMPERATURE VALUE SENSOR #8	Floating Point	0	
36	PRESSURE VALUE SENSOR #8*	Floating Point	0	
37	FLOW VALUE SENSOR #9	Floating Point	0	
38	TEMPERATURE VALUE SENSOR #9	Floating Point	0	
39	PRESSURE VALUE SENSOR #9*	Floating Point	0	
40	FLOW VALUE SENSOR #10	Floating Point	0	
41	TEMPERATURE VALUE SENSOR #10	Floating Point	0	
42	PRESSURE VALUE SENSOR #10*	Floating Point	0	
43	FLOW VALUE SENSOR #11	Floating Point	0	
44	TEMPERATURE VALUE SENSOR #11	Floating Point	0	
45	PRESSURE VALUE SENSOR #11*	Floating Point	0	
46	FLOW VALUE SENSOR #12	Floating Point	0	
47	TEMPERATURE VALUE SENSOR #12	Floating Point	0	
48	PRESSURE VALUE SENSOR #12*	Floating Point	0	
49	FLOW VALUE SENSOR #13	Floating Point	0	
50	TEMPERATURE VALUE SENSOR #13	Floating Point	0	

Table 3 – Service Transducer Block (continued)

FACTORY SETTINGS				
INDEX	**PARAMETER**	**DATA TYPE (LENGTH)**	**INITIAL VALUE**	**DESCRIPTION**
51	PRESSURE VALUE SENSOR #13*	Floating Point	0	
52	FLOW VALUE SENSOR #14	Floating Point	0	
53	TEMPERATURE VALUE SENSOR #14	Floating Point	0	
54	PRESSURE VALUE SENSOR #14*	Floating Point	0	
55	FLOW VALUE SENSOR #15	Floating Point	0	
56	TEMPERATURE VALUE SENSOR #15	Floating Point	0	
57	PRESSURE VALUE SENSOR #15*	Floating Point	0	
58	FLOW VALUE SENSOR #16	Floating Point	0	
59	TEMPERATURE VALUE SENSOR #16	Floating Point	0	
60	PRESSURE VALUE SENSOR #16*	Floating Point	0	
61	MAX CAL FLOW	Floating Point	0	
62	MIN CAL FLOW	Floating Point	0	
63	MAX CAL TEMP	Floating Point	0	
64	MIN CAL TEMP	Floating Point	0	
65	MAX CAL PRESS*	Floating Point	0	
66	MIN CAL PRESS*	Floating Point	0	
67	FLOW_ENG_UNITS	Unsigned16	0	
68	PLENUM_ENG_UNITS	Unsigned16	0	
69	TEMP_ENG_UNITS	Unsigned16	0	
70	PRESSURE_ENG_UNITS	Unsigned16	0	
71	TOTALIZER_ENG_UNITS	Unsigned16	0	
72	PLENUM_SIZE_VALUE_DIAMETER	Floating Point	0	
73	PLENUM_SIZE_UNITS_HEIGHT	Floating Point	0	
74	FACTORY RESTORE	Unsigned8	0	

Flow Analog Input Block

This block takes the input data from the Process Data Transducer Block, selected by the "Flow Average Channel" and makes it available to other function blocks at its output.

L_TYPE parameter – Determines how the values passed by the Process Transducer Block are used in the block. There are two options: direct and indirect.

Direct: The process data transducer flow value is passed directly to the PV of this AI block, and the XD_SCALE information is not used.

Indirect: The process data transducer flow value is converted to the OUT_SCALE and the information of XD_SCALE is applied.

CHANNEL parameter – Selects the process variable to be used. Set the CHANNEL parameter in the Flow Analog Input Block to "Flow Average."

XD_SCALE parameter – Sets the high and low scale values, the units index, and the number of digits after the decimal point for display purposes.

Flow Analog Input Block Parameter List

The table below summarizes the ST100A Series Flow Analog Input Block.

Table 4 – Flow Analog Input Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
1	ST_REV	Unsigned 16	0	
2	TAG_DESC	OctString(32)	Spaces	
3	STRATEGY	Unsigned 16	0	
4	ALERT_KEY	Unsigned 8	0	
5	MODE_BLK	DS-69	O/S	
6	BLOCK_ERR	Bitstring(2)		
7	PV	DS-65		ST100 FLOW value from the transducer block
8	OUT	DS-65		ST100 FLOW value available to other function blocks
9	SIMULATE	DS-82	Disable	
10	XD_SCALE	DS-68	0 - 100%	
11	OUT_SCALE	DS-68	0 - 100%	
12	GRANT_DENY	DS-70	0	
13	IO_OPTS	Bitstring(2)	0	
15	CHANNEL	Unsigned16	0	Set this channel to "Flow Average."
16	L_TYPE	Unsigned 8	0	
17	LOW_CUT	Float	0	
18	PV_FTIME	Float	0	
19	FIELD_VAL	DS-65		
20	UPDATE_EVT	DS-73		
21	BLOCK_ALM	DS-72		
22	ALARM_SUM	DS-74		
23	ACK_OPTION	Bitstring(2)		
24	ALARM_HYS	Float		
25	HI_HI_PRI	Unsigned 8		
26	H_HI_LIM	Float		
27	HI_PRI	Unsigned 8		
28	HI_LIM	Float		
29	LO_PRI	Unsigned 8		
30	LO_LIM	Float		
31	LO_LO_PRI	Unsigned 8		
32	LO_LO_LIM	Float		
33	HI_HI_ALM	DS-71		
34	HI_ALM	DS-71		
35	LO_ALM	DS-71		
36	LO_LO_ALM	DS-71		

Temperature Analog Input Block

This block takes the input data from the Process Data Transducer Block, selected by the "Temperature Average Channel" and makes it available to other function blocks at its output.

L_TYPE parameter – Determines how the values passed by the Process Transducer Block are used in the block. There are two options: direct and indirect.

Direct: The process data transducer temperature value is passed directly to the PV of this AI block, and the XD_SCALE information is not used.

Indirect: The process data transducer flow value is converted to the OUT_SCALE and the information of XD_SCALE is applied.

CHANNEL parameter – Selects the process variable to be used. Set the CHANNEL parameter in the Temperature Analog Input Block to "Temperature Average."

XD_SCALE parameter – Sets the high and low scale values, the units index, and the number of digits after the decimal point for display purposes.

Temperature Analog Input Block Parameter List

The table below summarizes the ST100A Series Temperature Analog Input Block.

Table 5 – Temperature Analog Input Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
1	ST_REV	Unsigned 16	0	
2	TAG_DESC	OctString(32)	Spaces	
3	STRATEGY	Unsigned 16	0	
4	ALERT_KEY	Unsigned 8	0	
5	MODE_BLK	DS-69	O/S	
6	BLOCK_ERR	Bitstring(2)		
7	PV	DS-65		ST100 TEMPERATURE value from the transducer block
8	OUT	DS-65		ST100 TEMPERATURE value available to other function blocks
9	SIMULATE	DS-82	Disable	
10	XD_SCALE	DS-68	0 - 100%	
11	OUT_SCALE	DS-68	0 - 100%	
12	GRANT_DENY	DS-70	0	
13	IO_OPTS	Bitstring(2)	0	
15	CHANNEL	Unsigned16	0	Set this channel to "Temperature Average."
16	L_TYPE	Unsigned 8	0	
17	LOW_CUT	Float	0	
18	PV_FTIME	Float	0	
19	FIELD_VAL	DS-65		
20	UPDATE_EVT	DS-73		
21	BLOCK_ALM	DS-72		
22	ALARM_SUM	DS-74		

Table 5 – Temperature Analog Input Block (continued)

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
23	ACK_OPTION	Bitstring(2)		
24	ALARM_HYS	Float		
25	HI_HI_PRI	Unsigned 8		
26	H_HI_LIM	Float		
27	HI_PRI	Unsigned 8		
28	HI_LIM	Float		
29	LO_PRI	Unsigned 8		
30	LO_LIM	Float		
31	LO_LO_PRI	Unsigned 8		
32	LO_LO_LIM	Float		
33	HI_HI_ALM	DS-71		
34	HI_ALM	DS-71		
35	LO_ALM	DS-71		
36	LO_LO_ALM	DS-71		

Totalizer Analog Input Block

This block takes the input data from the Process Data Transducer Block, selected by the "Totalizer Average Channel" and makes it available to other function blocks at its output.

L_TYPE parameter – Determines how the values passed by the Process Transducer Block are used in the block. There are two options: direct and indirect.

Direct The process data transducer totalizer value is passed directly to the PV of this AI block, and the XD_SCALE information is not used.

Indirect The process data transducer totalizer value is converted to the OUT_SCALE and the information of XD_SCALE is applied.

CHANNEL parameter – Selects the process variable to be used. Set the CHANNEL parameter in the Totalizer Analog Input Block to "Totalizer Average."

XD_SCALE parameter – Sets the high and low scale values, the units index, and the number of digits after the decimal point for display purposes.

Totalizer Analog Input Block Parameter List

The table below summarizes the ST100A Series Totalizer Analog Input Block.

Table 6 – Totalizer Analog Input Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
1	ST_REV	Unsigned 16	0	
2	TAG_DESC	OctString(32)	Spaces	
3	STRATEGY	Unsigned 16	0	
4	ALERT_KEY	Unsigned 8	0	
5	MODE_BLK	DS-69	O/S	
6	BLOCK_ERR	Bitstring(2)		
7	PV	DS-65		ST100 Totalizer value from the transducer block

Table 6 – Totalizer Analog Input Block (continued)

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
8	OUT	DS-65		ST100 Totalizer value available to other function blocks
9	SIMULATE	DS-82	Disable	
10	XD_SCALE	DS-68	0 - 100%	
11	OUT_SCALE	DS-68	0 - 100%	
12	GRANT_DENY	DS-70	0	
13	IO_OPTS	Bitstring(2)	0	
15	CHANNEL	Unsigned16	0	Set this channel to "Totalizer Average."
16	L_TYPE	Unsigned 8	0	
17	LOW_CUT	Float	0	
18	PV_FTIME	Float	0	
19	FIELD_VAL	DS-65		
20	UPDATE_EVT	DS-73		
21	BLOCK_ALM	DS-72		
22	ALARM_SUM	DS-74		
23	ACK_OPTION	Bitstring(2)		
24	ALARM_HYS	Float		
25	HI_HI_PRI	Unsigned 8		
26	H_HI_LIM	Float		
27	HI_PRI	Unsigned 8		
28	HI_LIM	Float		
29	LO_PRI	Unsigned 8		
30	LO_LIM	Float		
31	LO_LO_PRI	Unsigned 8		
32	LO_LO_LIM	Float		
33	HI_HI_ALM	DS-71		
34	HI_ALM	DS-71		
35	LO_ALM	DS-71		
36	LO_LO_ALM	DS-71		

Pressure Analog Input Block

This block takes the input data from the Process Data Transducer Block, selected by the "Pressure Average Channel" and makes it available to other function blocks at its output.

L_TYPE parameter – Determines how the values passed by the Process Transducer Block are used in the block. There are two options: direct and indirect.

Direct: The Process Data Transducer Pressure value is passed directly to the PV of this AI block, and the XD_SCALE information is not used.

Indirect: The Process Data Transducer Pressure value is converted to the OUT_SCALE and the information of XD_SCALE is applied.

CHANNEL parameter – Selects the process variable to be used. The CHANNEL parameter, in the ST100A for the Totalizer Analog Input Block MUST be set to "Pressure Average."

XD_SCALE parameter – Sets the high and low scale values, the units index, and the number of digits after the decimal point, for display purposes.

Pressure Analog Input Block Parameter List

The table below summarizes the ST100A Series Pressure Analog Input Block.

Table 7 – Pressure Analog Input Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
1	ST_REV	Unsigned 16	0	
2	TAG_DESC	OctString(32)	Spaces	
3	STRATEGY	Unsigned 16	0	
4	ALERT_KEY	Unsigned 8	0	
5	MODE_BLK	DS-69	O/S	
6	BLOCK_ERR	Bitstring(2)		
7	PV	DS-65		ST100 PRESSURE value from the transducer block
8	OUT	DS-65		ST100 PRESSURE value available to other function blocks
9	SIMULATE	DS-82	Disable	
10	XD_SCALE	DS-68	0 - 100%	
11	OUT_SCALE	DS-68	0 - 100%	
12	GRANT_DENY	DS-70	0	
13	IO_OPTS	Bitstring(2)	0	
15	CHANNEL	Unsigned16	0	The channel needs to be set to "Pressure Average"
16	L_TYPE	Unsigned 8	0	
17	LOW_CUT	Float	0	
18	PV_FTIME	Float	0	
19	FIELD_VAL	DS-65		
20	UPDATE_EVT	DS-73		
21	BLOCK_ALM	DS-72		
22	ALARM_SUM	DS-74		
23	ACK_OPTION	Bitstring(2)		
24	ALARM_HYS	Float		
25	HI_HI_PRI	Unsigned 8		
26	H_HI_LIM	Float		
27	HI_PRI	Unsigned 8		
28	HI_LIM	Float		
29	LO_PRI	Unsigned 8		
30	LO_LIM	Float		
31	LO_LO_PRI	Unsigned 8		
32	LO_LO_LIM	Float		
33	HI_HI_ALM	DS-71		
34	HI_ALM	DS-71		
35	LO_ALM	DS-71		
36	LO_LO_ALM	DS-71		

PID Block

This block offers control algorithms that use the Proportional, Integral and Derivative terms. The algorithm is non-iterative or ISA. In this algorithm the GAIN is applied to all terms of the PID, and the proportional and the integral actuate over the error, and the derivative actuates over the PV value.

PID Block Parameter List

The table below summarizes the ST100A Series PID Block.

Table 8 – PID Block

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
1	ST_REV	Unsigned16	0	
2	TAG_DESC	OctString(32)	Blanks	
3	STRATEGY	Unsigned16	0	
4	ALERT_KEY	Unsigned8	0	
5	MODE_BLK	DS-69	OOS	
6	BLOCK_ERR	Bitstring(2)		
7	PV	DS-65	Bad ns 0	ns = non specific
8	SP	DS-65	G C/0	G C/0 = GOOD_CAS/0
9	OUT	DS-65	BOS	BOS = BAD_Out of service 0
10	PV_SCALE	DS-68	0-100%	
11	OUT_SCALE	DS-68	0-100%	
12	GRANT_DENY	DS-70	0,0	
13	CONTROL_OPTS	Bitstring(2)	0	
14	STATUS_OPTS	Bitstring(2)	0	
15	IN	DS-65	BNc	BNc= Bad-Not connected 0
16	PV_FTIME	Float	0	
17	BYPASS	Unsigned8	Unititialized	
18	CAS_IN	DS-65	BNc	BNc= Bad-Not connected 0
19	SP_RATE_DN	Float	+INF	
20	SP_RATE_UP	Float	+INF	
21	SP_HI_LIM	Float	100	
22	SP_LO_LIM	Float	0	
23	GAIN	Float	0	
24	RESET	Float	+INF	
25	BAL_TIME	Float	0	
26	RATE	Float	0	
27	BKCAL_IN	DS-65	BNc	BNc = Bad_Not connected /0
28	OUT_HI_LIM	Float	100	
29	OUT_LO_LIM	Float	0	
30	BKCAL_HYS	Float	0.5%	
31	BKCAL_OUT	DS-65	BNs0	BNs0 = Bad-Non Specific 0
32	RCAS_IN	DS-65	Bos0	Bos0=Bad-Out of Service/0
33	ROUT_IN	DS-65	Bos0	Bos0=Bad-Out of Service/0
34	SHED_OPT	Unsigned8	Uninitialized	
35	RCAS_OUT	DS-65	BNs0	BNs0 = Bad-Non Specific 0
36	ROUT_OUT	DS-65	BNs0	BNs0 = Bad-Non Specific 0

Table 9 – PID Block (continued)

INDEX	PARAMETER	DATA TYPE (LENGTH)	INITIAL VALUE	DESCRIPTION
37	TRK_SCALE	DS-68	0-100%	
38	TRK_IN_D	DS-66	BNcO	BncO=Bad-Not connected/ off
39	TRK_VAL	DS-65	BNc	BNc = Bad_Not connected /0.0
40	FF_VAL	DS-65	BNc	BNc = Bad_Not connected /0.0
41	FF_SCALE	DS-68	0-100%	
42	FF_GAIN	Float	0.0	
43	UPDATE_EVT	DS-73		
44	BLOCK_ALM	DS-72		
45	ALARM_SUM	DS-74	All alarms enabled	
46	ACK_OPTION	Bitstring(2)	Auto ACK disabled	
47	ALARM_HYS	Float	0.5%	
48	HI_HI_PRI	Unsigned8	0	
49	HI_HI_LIM	Float	+INF	
50	HI_PRI	Unsigned8	0	
51	HI_LIM	Float	+INF	
52	LO_PRI	Unsigned8	0	
53	LO_LIM	Float	-INF	
54	LO_LO_PRI	Unsigned8	0	
55	LO_LO_LIM	Float	-INF	
56	DV_HI_PRI	Unsigned8	0	
57	DV_HI_LIM	Float	+INF	
58	DV_LO_PRI	Unsigned8	0	
59	DV_LO_LIM	Float	-INF	
60	HI_HI_ALM	DS-71		
61	HI_ALM	DS-71		
62	LO_ALM	DS-71		
63	LO_LO_ALM	DS-71		
64	DV_HI_ALM	DS-71		
65	DV_LO_ALM	DS-71		

Link Master Function

The ST100A Series with FOUNDATION Fieldbus protocol supports the Link Master function with Link Active Scheduler (LAS) capability.

A Link Master (LM) is a device that can function as a Link Active Scheduler (LAS) for controlling communications on an H1 Fieldbus link. Only one LM device can serve as LAS. The LM LAS assignment is determined during a bidding process that starts on link startup or LAS failure.

A Link Active Scheduler (LAS) is essentially a bus arbiter that performs housekeeping (adding new devices/removing non-responsive devices), polls devices for process loop data, and distributes Data Link (DL) and Link Scheduling (LS) time to synchronize devices on the network.

Operation

The Link Active Scheduler (LAS) has a list of transmit times for all data buffers in all devices that need to be cyclically transmitted.

When it is time for a device to send a buffer, the LAS issues a Compel Data (CD) message to the device.

Upon receipt of the CD, the device broadcasts or "publishes" the data in the buffer to all devices on the Fieldbus. Any device configured to receive the data is called a "subscriber".

Scheduled data transfers are typically used for the regular, cyclic transfer of control loop data between devices on the Fieldbus.

Configuring FOUNDATION Fieldbus

For details on ST100A Series installation and operation, see the main manual document number **06EN003480**.

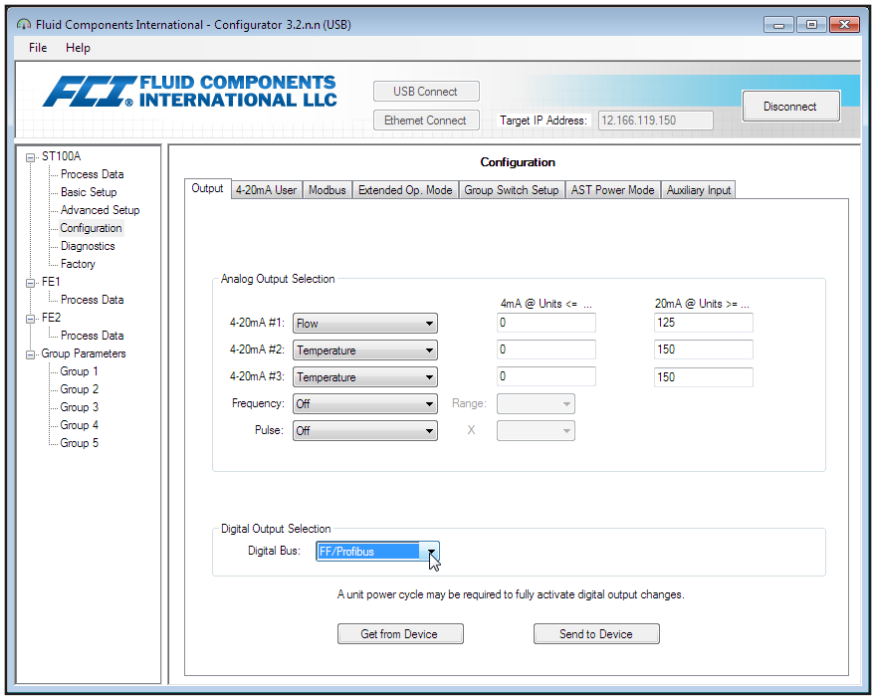
Setting the ST100A Series for FOUNDATION Fieldbus Operation

Note: The instrument requires no configuration if ordered with the FOUNDATION Fieldbus option.

The ST100A Series Configuration Software application is used to select the instrument's digital communication protocol.

Using the USB cable supplied with the instrument, connect the ST100A Series USB port to a USB port on the PC on which the ST100A Series configurator software is installed.

Launch the ST100A Series configurator (with the PC already running and connected to the instrument). Select *Configuration* branch from the menu tree on the window's left side, Observe that the **Output** tab is selected. In the window's *Digital Output Selection* field, click the *Digital Bus* pull-down menu and select **FF/Profibus**. Then click **Send to Device** to program the ST100A Series (enter "2772" user password). Refer to the ST100A Series Configuration Software manual **06EN003481** for details on digital bus configuration and general software operation.



Configuring the FOUNDATION Fieldbus AI Blocks

All activities described below are done with the use of the National Instruments Windows-based NI-FBUS Configurator utility program. These steps represent the minimum steps to put an AI block into AUTO mode.

Note: The utility program's Windows title bar shows "ST100" when connected to the instrument. This is normal as the Fieldbus firmware runs on the ST100 family of products.

Configuring Flow Analog Input Block (AI)

If the DD files are not yet loaded use the NI-FBUS Configurator utility to import the DD files.

Start up the NI configurator and allow it find the ST100 family product instrument in the FF segment.

Open up the "Function Block Application" in the NI configurator, and drag the desired AI block into it, in this case the Flow AI block. If there are other AI blocks to be loaded drag those in the Function Block Application area.

In the NI configurator under the "Configure" pull down menu select "Download Configuration." Then in the "Download Configuration" pop-up screen check the "Clear Device" check box, and then click "Download."

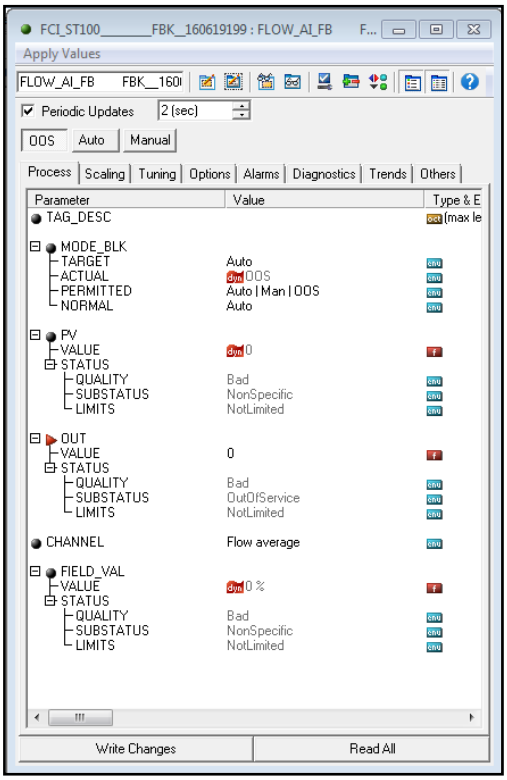
Double click on the “Flow” AI block.

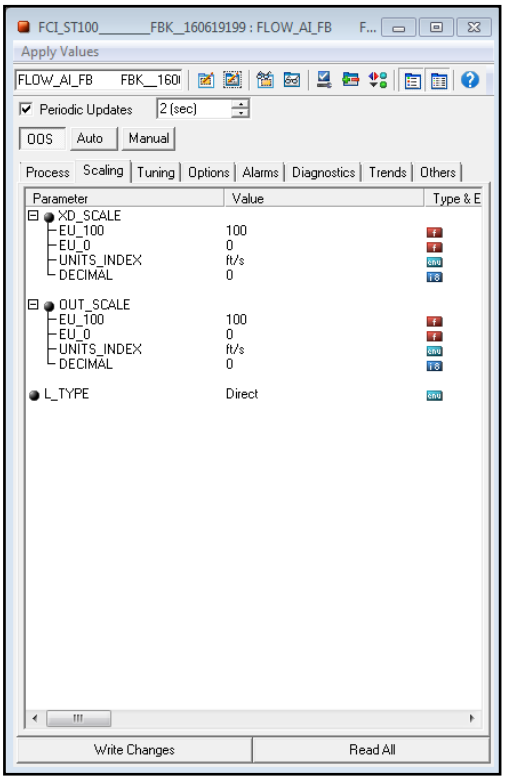
Set the MODE_BLK.TARGET of the AI block to ‘OOS’ (if not already set).

Note: Some parameters can be written only if the MODE_BLK.ACTUAL is set to ‘OOS’.

- Set the CHANNEL parameter to “Flow average.”
- Set the UNITS_INDEX parameter to the desired flow units; e.g., “L/s.”
- Set the L_TYPE parameter to “Indirect” It can also be “Direct” if XD_SCALE and OUT_SCALE parameters have the same values.

Confirm that the BLOCK_ERR parameter shows “Out of Service.” Once all of the above have been confirmed, set the block Mode into AUTO, and confirm that the bock is providing updated flow process data in the OUT parameter. If all conditions are met then the MODE_BLK.ACTUAL parameter of AI block goes into ‘Auto .’

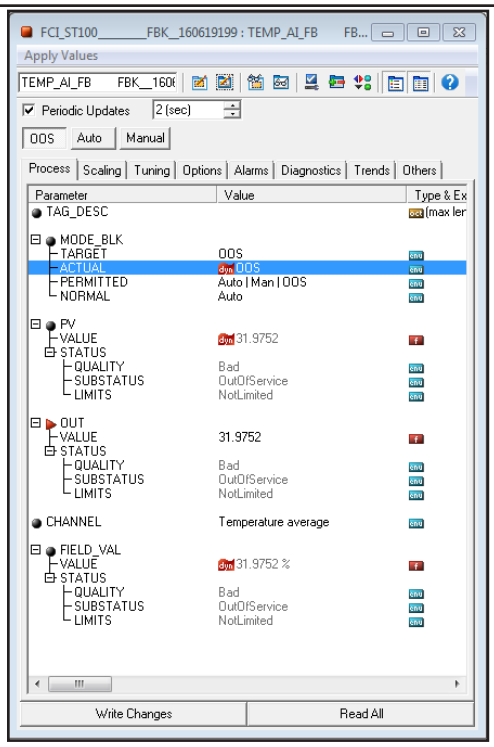


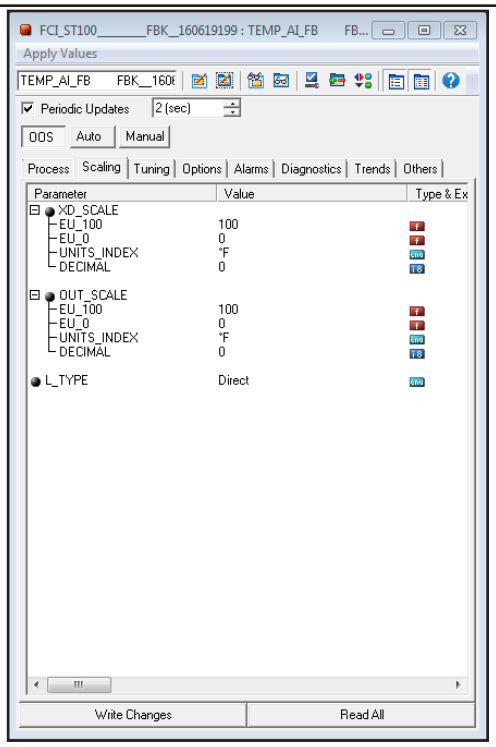


Configuring Temperature AI Block

The configuration process is similar to the Flow AI block except for the parameter settings below.

- Set the CHANNEL parameter to "Temperature average."
- Set the UNITS_INDEX parameter to the desired temperature units; e.g., "°F."

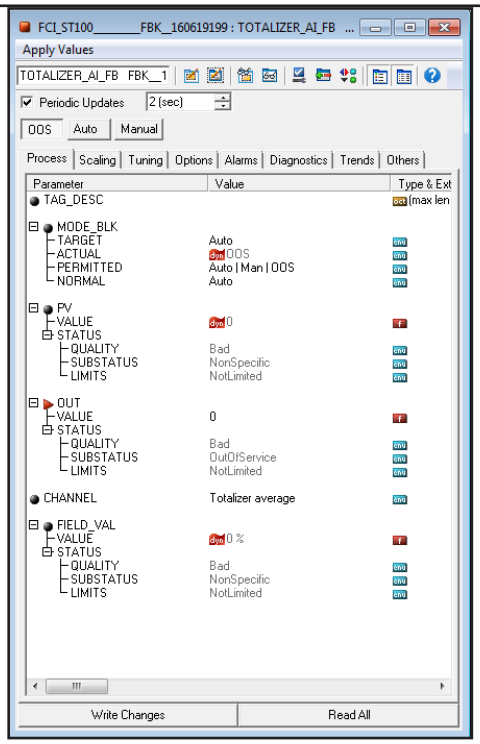


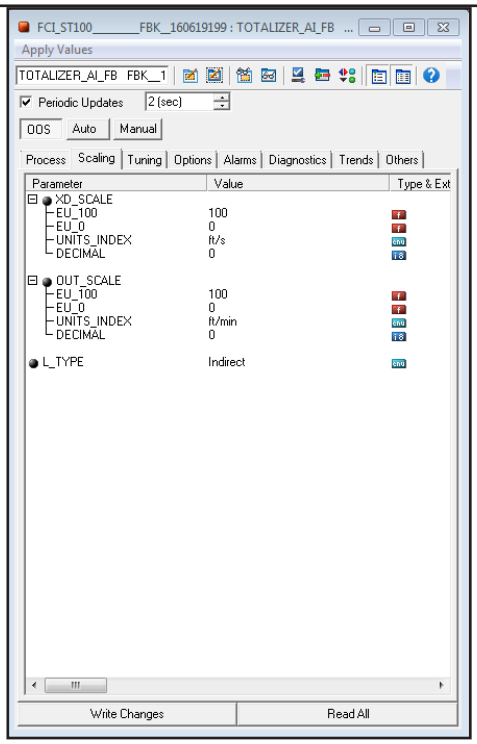


Configuring Totalizer AI Block

The configuration process is similar to the Flow AI block except for the parameter settings below.

- Set the CHANNEL parameter to "Totalizer average."
- Set the UNITS_INDEX parameter to the Totalizer units that match the flow units. If the flow units are 'ft/s' then the Totalizer units must be 'ft.'

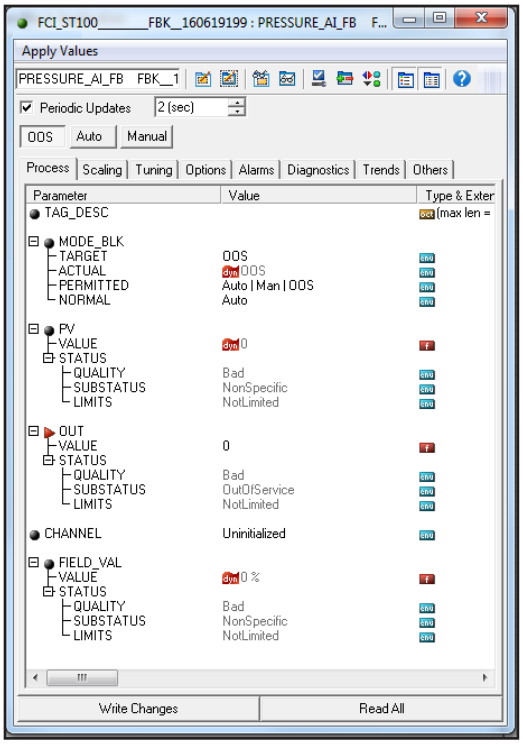


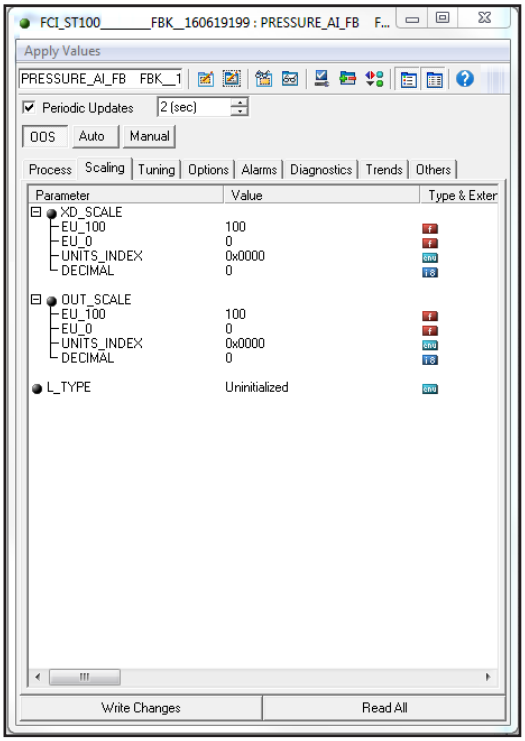


Configuring the Pressure AI Block

The configuration process is similar to the Flow AI block except for the parameter setting below.

- Set the CHANNEL parameter to "Pressure Average."
- Set the UNITS_INDEX parameter to the desired pressure units i.e. "PSIG."





Using the Foundation Fieldbus Service Transducer Block

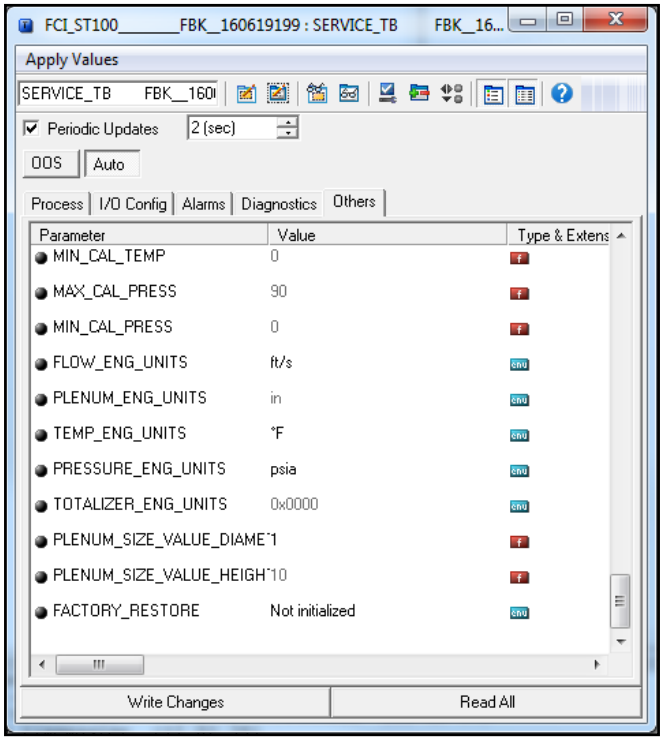
Service Transducer Block, Introduction

The Service Transducer Block provides read/write access to a number of instrument parameters via the FOUNDATION Fieldbus Configurator tool.

This section is organized into three parts, 1) Basic instrument setup functions, 2) Instrument min/max settings for process variables, and 3) Advanced instrument functions that present individual process parameters in a multipoint system.

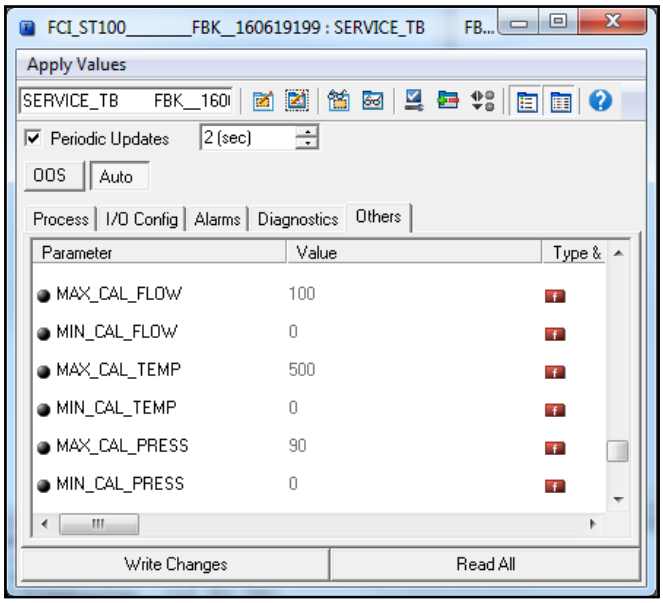
Basic Instrument Setup Functions

The basic setup functions include read/write of engineering units for the process variable and the plenum, read/write of the plenum dimensions, and restoration of factory calibration and setup values for the current Calibration Group.



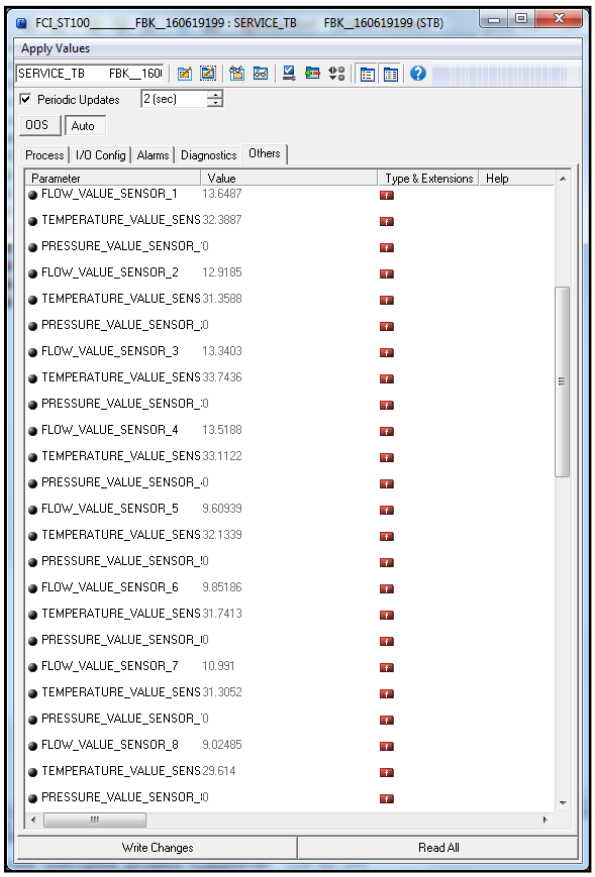
Instrument Min/Max Settings

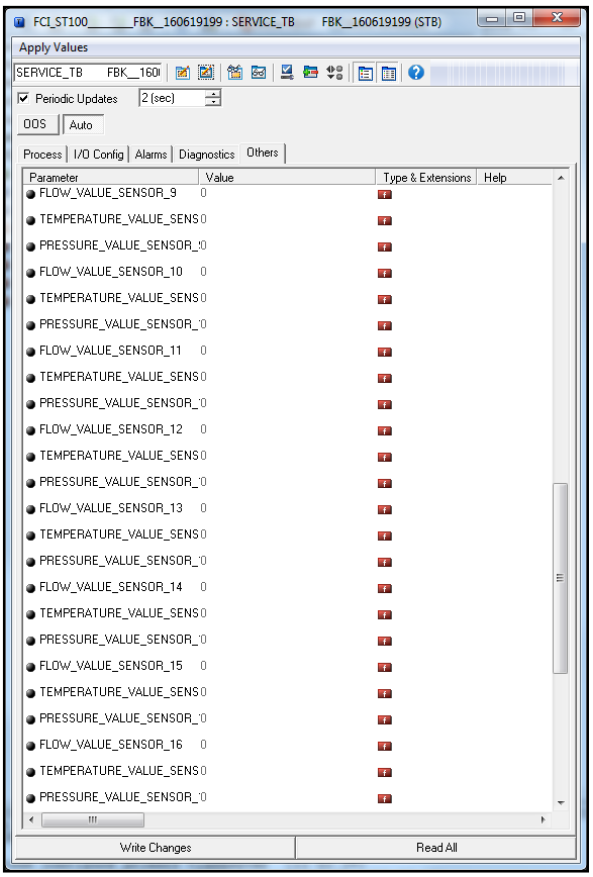
The Min/Max settings lets you read the instrument's Flow Calibration maximum and minimum limits, and the instrument's Temperature Calibration maximum and minimum limits.



Advanced Instrument Functions

Use the Advanced Instrument functions to review the process variable data of each sensor element channel in a multi-point instrument. The data is not a continuous read but a one-shot read when the block is open. Click **Read Select** button or **Read All** button to update the value(s) of selected or all parameters, respectively.





Device Description Files

General DD FILES

The DD files are device support files that include two device description files, and one capability file. DDs are platform and operating system independent.

The DD provides an extended description of each object in the Virtual Field Device (VFD).

The DD provides information needed for a control system or host to understand the meaning of the data in the VFD including the human interface for functions such as calibration and diagnostics. Thus, the DD can be thought of as a “driver” for the device.

The ST100A Series DD files are found under a file folder labeled “01FC49”, and subfolder 0001:

- 0101.ffo
- 0101.sym
- 010101.cff

Emerson 475 Field Communicator

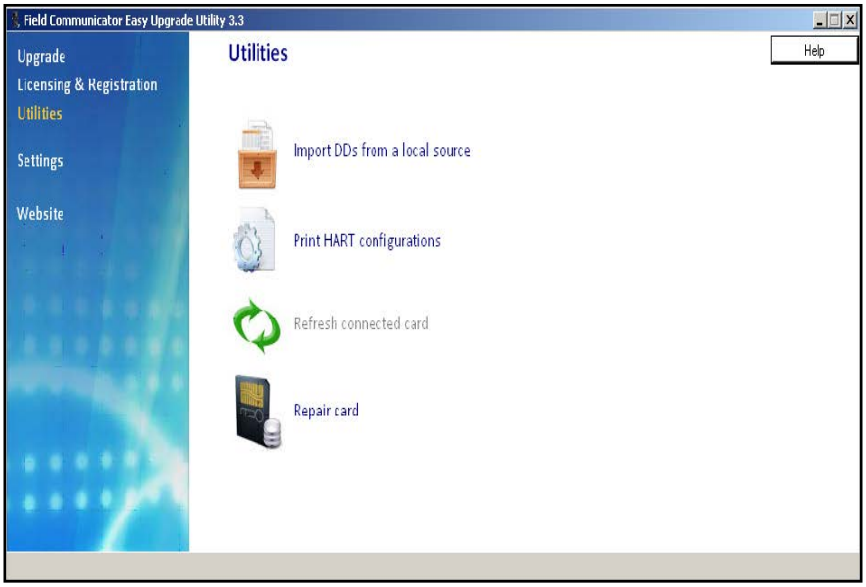
The Emerson Communicator uses the FOUNDATION Fieldbus DDP files to interface with the FOUNDATION Fieldbus device. These files must be loaded into the Emerson Fieldbus Communicator.

The ST100A Series FOUNDATION Fieldbus DDP files are found under a file folder labeled **EMERSON_475_FILES**, and subfolder 01FC49\0001:

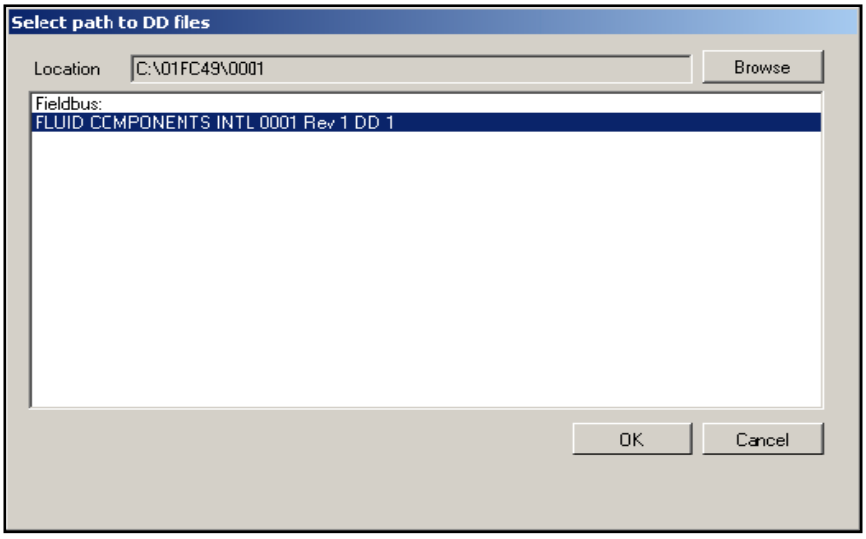
- 01FC49000101.fdd
- 01FFC9000101.fhd
- 0101.ffo
- 0101.sym
- 010101.cff

Load these files in the C:\01FC49\0001 directory.

To load the DDPs into the Field Communicator use the *Field Communicator Easy Upgrade Utility* from Emerson. First import the DDs by selecting "Utilities" and "Import DDs from a local source."



Select the FCI files and click **OK**.



Technical Characteristics

Item	Description
Manufacturer ID:	01FC49
Output Signal:	H1 compliant to IEC 61158-2, bus powered. Integral reverse polarity protection.
Data transmission rate:	31.25 kBit/s, voltage mode
Signal coding:	Manchester II
LAS function:	LAS function supported
Supported communication:	Publisher, Subscriber
H1 Profile Class:	31PS, 32L
H1 Device Class:	Link Master
Function Blocks:	Process Data TB Service Data TB Flow AI Temperature AI Totalizer AI Pressure AI PID
Certification:	Register Instrument (Test Campaign # IT071900)
Register Features:	Alarms and Events Function Blocks (1-RB2(e), 4-AI(s), 1-PID(s), 2-TB(s)) Linking Trending Muti-bit Alert Reporting Field Diagnostics

Customer Service/Technical Support

FCI provides full in-house technical support. Additional technical representation is also provided by FCI field representatives. Before contacting a field or in-house representative, please perform the troubleshooting techniques outlined in this document.

By Mail

Fluid Components International LLC

1755 La Costa Meadows Dr.

San Marcos, CA 92078-5115 USA

Attn: Customer Service Department

By Phone

Contact the area FCI regional representative. If a field representative is unable to be contacted or if a situation is unable to be resolved, contact the FCI Customer Service Department toll free at 1 (800) 854-1993.

By Fax

To describe problems in a graphical or pictorial manner, send a fax including a phone or fax number to the regional representative. Again, FCI is available by facsimile if all possibilities have been exhausted with the authorized factory representative. Our fax number is 1 (760) 736-6250; it is available 7 days a week, 24 hours a day.

By Email

FCI Customer Service can be contacted by email at: techsupport@fluidcomponents.com.

Describe the problem in detail making sure a telephone number and best time to be contacted is stated in the email.

International Support

For product information or product support outside the contiguous United States, Alaska, or Hawaii, contact your country's FCI International Representative or the one nearest to you.

After Hours Support

For product information visit FCI at www.fluidcomponents.com. For product support call 1 (800) 854-1993 and follow the prerecorded instructions.

Point of Contact

The point of contact for service, or return of equipment to FCI is your authorized FCI sales/service office. To locate the office nearest you, visit the FCI website at www.fluidcomponents.com.

Appendix A – ST100 Product Family Foundation Fieldbus Engineering Units/Codes

Temperature

Unit	CLI	FOUNDATION Fieldbus
Fahrenheit	70	1002
Celsius	67	1001

Flow

Unit		CLI	FOUNDATION Fieldbus
Standard Feet (vel)	SFPS	70	1067
	SFPM	83	1070
	SFPH	84	1073
	SFPD	85	32768
Normal Meters (vel)	NMPS	86	1061
	NMPM	87	32769
	NMPH	88	1063
	NMPD	89	32770
Standard Cubic Feet (vol)	SCFS	90	32771
	SCFM	67	1360
	SCFH	72	1361
	SCFD	91	32772
Pounds (mass)	LBPS	80	1330
	LBPM	65	1331
	LBPH	76	1332
	LBPD	92	1333
Kilograms (mass)	KGPS	73	1322
	KGPM	74	1323
	KGPH	75	1324
	KGPD	93	1325
Normal Cubic Meters (vol)	NCMS	94	1522
	NCMM	79	1523
	NCMH	78	1524
	NCMD	95	1525
Normal Liters (vol)	NLPS	68	1351
	NLPM	96	1352
	NLPH	97	1353
	NLPD	98	1354
Tonnes (mass)	TNPS	99	1326
	TNPM	100	1327
	TNPH	101	1328
	TNPD	102	1329

Totalizer

Unit	CLI	FOUNDATION Fieldbus
Standard Cubic Feet	90	1053
Pounds	80	1094
Kilograms	73	1088
Normal Cubic meters	94	1521
Normal Liters	68	1038
Tonnes	99	1092

Pressure

Unit	CLI	FOUNDATION Fieldbus
psi A	1	1142
psi G	2	1143
inches H2O G	3	1560
inches Hg	4	1155
bar A	5	1597
bar G	6	1590
kPa A	7	1547
kPa G	8	1548
cm H2O G	9	32773
mm Hg	10	1157
torr A	11	1139

Plenum

Unit	CLI	FOUNDATION Fieldbus
inches	0	1019
millimeters	1	1013

Flow & Level Instrumentation
Solutions for Industrial Processes

FCI's Complete Customer Commitment. Worldwide
ISO 9001 and AS9100 Certified

Visit FCI on the Worldwide Web: www.fluidcomponents.com

FCI World Headquarters
1755 La Costa Meadows Drive | San Marcos, California 92078 USA | Phone: 760-744-6950 Toll Free (US): 800-854-1993 Fax: 760-736-6250

FCI Europe
Persephonestraat 3-01 | 5047 TT Tilburg, The Netherlands | Phone: 31-13-5159989 Fax: 31-13-5799036

FCI Measurement and Control Technology (Beijing) Co., LTD | www.fluidcomponents.cn
Room 107, Xianfeng Building II, No.7 Kaituo Road, Shangdi IT Industry Base, Haidian District | Beijing 100085, P. R. China
Phone: 86-10-82782381 Fax: 86-10-58851152