2101226-001– rev. AD

XSeries TFIO Modules

User's Manual

TOTALFLOW
MEASUREMENT & CONTROL SYSTEMS

ABB
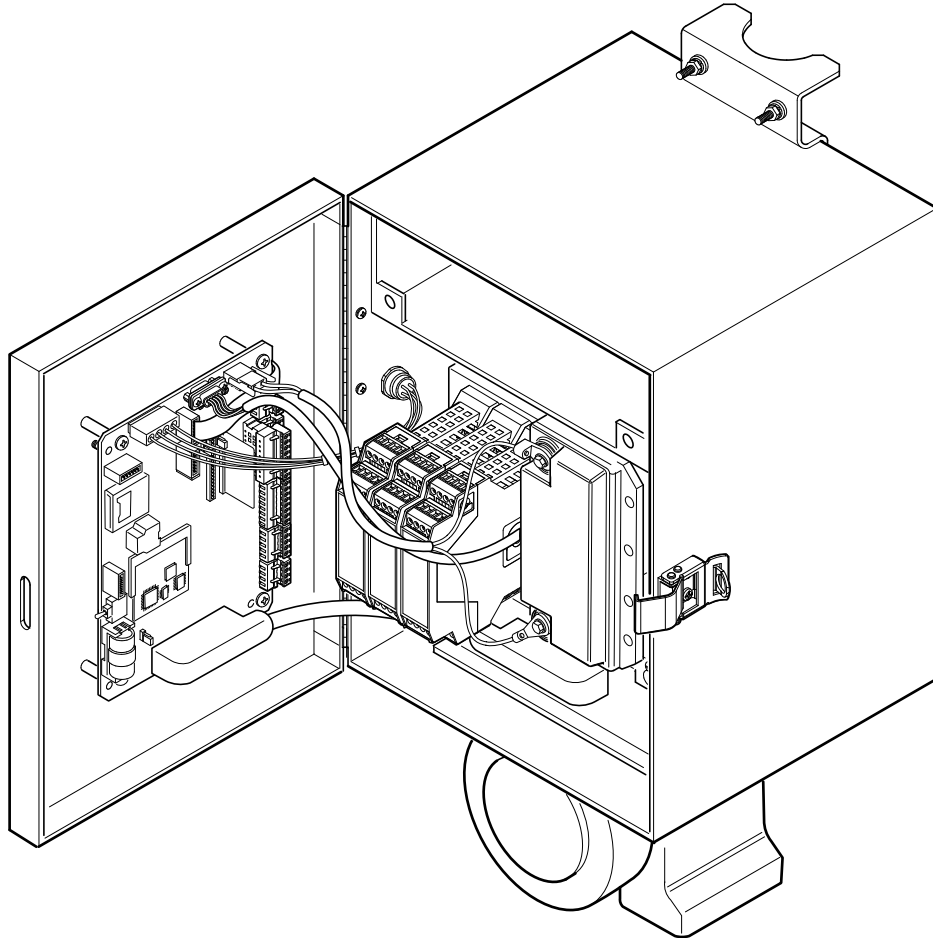
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Introduction

The following manual is to serve as a supplement to the ABB XSeries User's Manual when the user has purchased TFIO modules. The information contained in this manual should provide an experienced flow meter technician with the instructions necessary to install and set up TFIO modules on XSeries equipment.

Organization & Style

Each chapter in this manual presents information in an organized and concise manner. Readers are able to look at the headings and get a broad picture of the content without reading every word. Additionally, there are overviews at the beginning of each chapter that provide the user with an idea of what is in the chapter and how it fits into the overall manual.

Chapter Descriptions

Chapter	Name	Description
1	XSeries Technology	Provides a description of ABB's hardware technology that forms the basis for the XSeries system as well as the software technology that makes it extendable and flexible.
2	TFIO Module System	Provides a general overview of the TFIO module system, general specifications, enclosure sizes and point limitations.
3	TFIO Valve Control Interface Module	Module #2100412 - Provides the user with detailed instructions for wiring and communicating with the module.
4	TFIO Analog Output (4–20mA) Module	Module #2100415 - Provides the user with detailed instructions for wiring and communicating with the module.
5	TFIO Analog Input (Type II) Module	Module #2100418 - Provides the user with detailed instructions for wiring and communicating with the module.
6	TFIO Communication Interface Module	Module #2100421 - Provides the user with detailed instructions for wiring and communicating with the module.
7	TFIO Combo Digital Module	Module #2100543 - Provides the user with detailed instructions for wiring and communicating with the module.
8	TFIO 4-Point Thermocouple Input Module	Module #2100869 - Provides the user with detailed instructions for wiring and communicating with the module.
9	TFIO 4-Point 100Ω Platinum RTD Input Module	Module #2101018 - Provides the user with detailed instructions for wiring and communicating with the module.
Appendix A	I/O Interface Application Registers	Contains a table listing of all the registers that are turned on when the I/O Interface application is selected.
Appendix B	ABB Definitions and Acronyms	Definitions and acronyms for ABB terms used in this manual.

Getting Help

ABB takes pride in the ongoing support provided to customers. When purchasing a product, the user receives documentation that answers many questions; however, ABB Technical Support provides an 800 number as an added source of information.

When requiring assistance, call: USA: (800) 442-3097/International: +1 9183384888.

Before Calling

- Know the ABB model and serial number, if applicable. Serial numbers can be found on a plate located on each unit.
- Be prepared to give the customer service representative a detailed description of the problem.
- Note any alarms or messages as they display.
- Prepare a written description of problem.
- Know the software version, board and optional part numbers.

Key Symbols

The following symbols are used frequently in the manual. These are intended to catch the eye and draw attention to important information.

FYI — Intended to draw attention to useful information or to clarify a statement made earlier.

TIP — Intended to draw attention to a fact that may be useful or helpful in understanding a concept.

CAUTION — Intended to draw attention to a statement that might keep the user from making a mistake, keep the user from destroying equipment or parts or keep the user from creating a situation that could cause personal injury if caution is not used. Please refer to the Safety Practices and Precautions section for additional information.

WARNING — Intended to draw attention to a statement regarding the likelihood of personal injury or fatality that could result from improper access or techniques used while working in hazardous locations. Please refer to the Safety Practices and Precautions section for additional information.

Safety Practices and Precautions

This manual contains information and warnings that have to be followed by the user to ensure safe operation and to retain the product in a safe condition. Installation, maintenance and repairs should only be performed by a trained and qualified technician. Please refer to the certification drawings shipped with this unit for specific guidelines. Extra copies of the certification drawings, referenced on the unit's name tag, can be obtained, free of charge, by contacting ABB Technical Support at the number listed in the Getting Help section.

Safety Guidelines

- DO NOT open the equipment to perform any adjustments, measurements, maintenance, parts replacement or repairs until all external power supplies have been disconnected.
- Only a properly trained technician should work on any equipment with power still applied.
- When opening covers or removing parts, exercise extreme care. Live parts or connections can be exposed.
- Installation and maintenance must be performed by person(s) qualified for the type and area of installation, according to national and local codes.
- Capacitors in the equipment can still be charged even after the unit has been disconnected from all power supplies.

Safety First

Various statements in this manual, identified as conditions or practices that could result in equipment damage, personal injury or loss of life, are highlighted using the following icons:

CAUTION Exercise caution while performing this task. Carelessness could result in damage to the equipment, other property and/or personal injury.

WARNING STOP. Do not proceed without first verifying that a hazardous condition does not exist. This task may not be undertaken until proper protection has been adopted or the hazardous condition has been removed. Personal injury or fatality could result. Examples of these warnings include:

- Removal of enclosure cover(s) in a hazardous location must follow guidelines stipulated in the certification drawings shipped with this unit.
- If unit is installed or to be installed in a hazardous location, the technician must follow the guidelines stipulated in the certification drawings shipped with this unit.
- Access to the unit via PCCU cable in a hazardous location must follow guidelines stipulated in the certification drawings shipped with this unit.
- Connecting or disconnecting equipment in a hazardous location for the installation or maintenance of electrical components must follow guidelines stipulated in the certification drawings shipped with this unit.
- WARNING indicates a personal injury hazard immediately accessible as one reads the markings.
- CAUTION indicates a personal injury hazard not immediately accessible as one reads the markings or a hazard to property including the equipment itself.

Equipment Markings

Protective ground (earth) terminal.

Grounding the Product

If a grounding conductor is required, it should be connected to the grounding terminal before any other connections are made.

Operating Voltage

Before switching on the power, check that the operating voltage listed on the equipment agrees with the power being connected to the equipment.

Danger From Loss of Ground

A grounding conductor may or may not be required, depending on the hazardous classification. If required, any interruption of the grounding conductor inside or outside the equipment or loose connection of the grounding conductor can result in a dangerous unit. Intentional interruption of the grounding conductor is not permitted.

Safe Equipment

If it is determined that the equipment cannot be operated safely, it should be taken out of operation and secured against unintentional usage.

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1.0   ABB® XSERIES TECHNOLOGY

XSeries technology from the Totalflow division of ABB is a unique milestone in the development of technology that targets low power, remote applications. This technology reflects a simplicity that is straightforward, useful, fully functional and expandable.

XSeries technology is a combination of an integrated, object-oriented, real-time software system and state-of-the-art electronics. The system extends into Windows® and .Net® host systems supplied by ABB or others. With tools such as ABB's Protocol Integration Toolkit, ABB can help bring all of this technology, new and legacy, together in the system.

The X in XSeries stands for extendable. At each layer of the system, whether I/O points, communication channels, protocols or software applications, functionality can be extended as time goes by. Product acronyms beginning with the X are extendable devices: XFC (flow computer) and XRC (remote controller or RTU).

FYI   Generic references to XSeries, XFC, and XRC products include the initial XSeries legacy product line, now called G3 (third generation), and the newer G4 (fourth generation) products. References specifically calling out the XFC^{G4} or XRC^{G4} are specific to only the G4 product line. The following electronic board numbers will assist the user in determining the equipment version:

Legacy G3 XSeries boards:

- XFC P/N 2100204-xxx
- XRC P/N 2100355-xxx

Generation 4 (G4) XSeries boards:

- XFC^{G4} P/N 2102838-xxx
- XRC^{G4} P/N 2103022-xxx

1.1   Hardware Technology

The foundation of the XSeries technology begins with two main electronic boards and extends to DIN-mounted module technology. These boards are low power, microprocessor-based devices that are designed to meet a wide range of measurement, automation, monitoring, control and alarming applications for remote oil and gas systems of all types.

1.1.1   XSeries Flow Computer Board

The XFC board is the basis for all XSeries flow computers. By adding TFIO modules, the I/O can be expanded. For more information on the XFC-based I/O, please see the XFC Board section within this manual.

The XFC board is designed to mount inside the enclosure front door. A basic set of I/O is included on the XFC board (See Figure 1-1 and Table 1–1). I/O expansion is accomplished via ABB's I²C I/O bus using TFIO modules.

1.1.1.1   XFC Onboard I/O

- Integral Multivariable Transducer (XIMV) interface: 1 SP, 1 DP and 1 TF

- Two (2) user analog inputs
- Two (2) user digital outputs
- Two (2) user digital inputs or two (2) user high speed pulse inputs
- Two (2) RS-232 or -485 comm ports (selectable via the addition of a comm interface module)
- Interface for TFIO modules
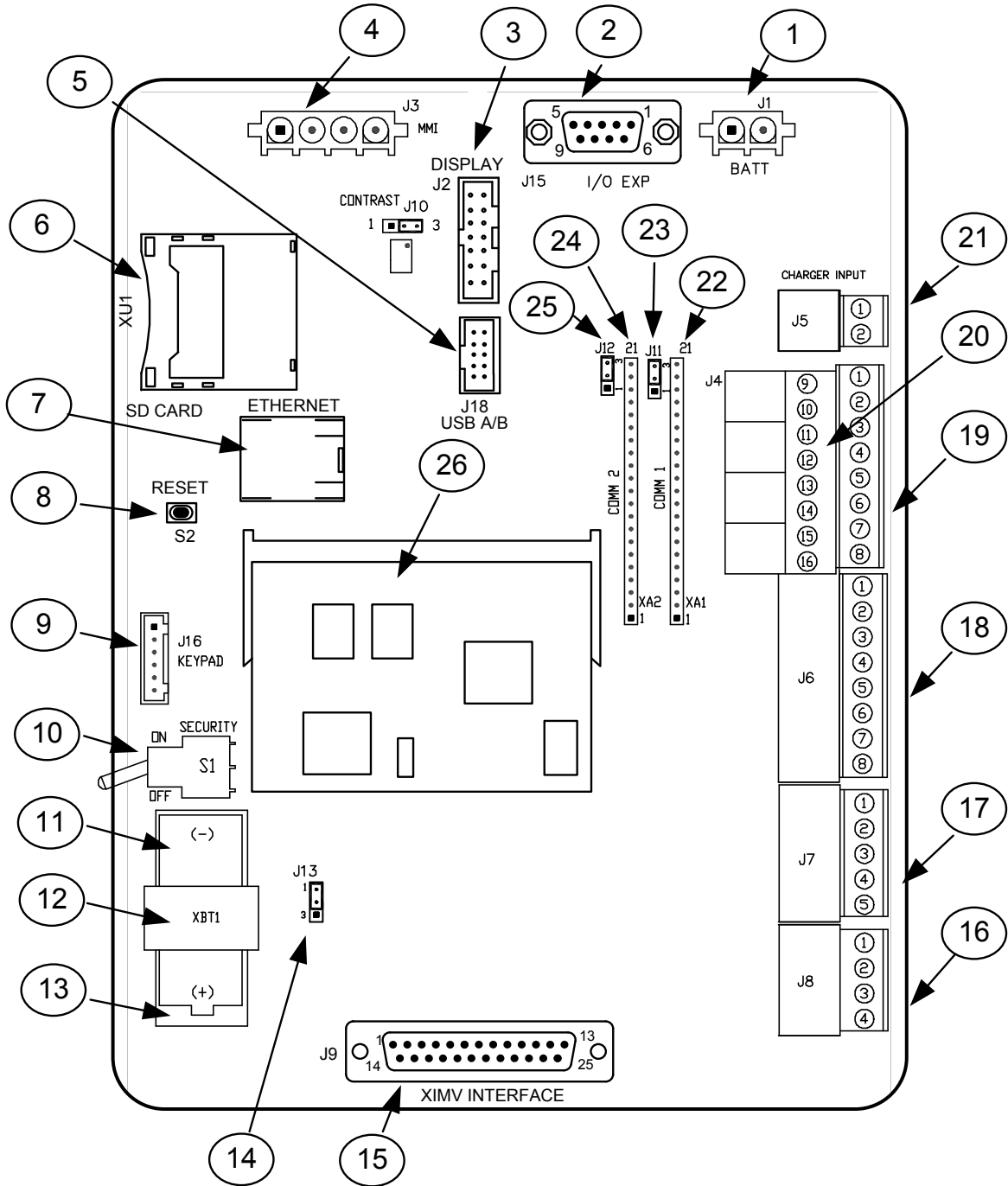
Figure 1-1 XFC^{G4} Board

Table 1–1 XFC^{G4} Board Identification

ID Number	Description	ID Number	Description
1	Battery Connection	14	Memory Backup Enable/Disable
2	I/O Module Interface	15	XIMV Interface
3	LCD Display Interface	16	Analog Input Connector
4	PCCU Interface	17	RTD Connector
5	USB Extension Port	18	Pulse Input and Digital Output Connectors
6	SD Card	19	Remote Communications Connector Comm 1
7	Ethernet Connector	20	Remote Communications Connector Comm 2
8	Reset Button (Warm Start)	21	External Charger
9	Keypad Connector	22	Remote Comm 1: Module Plug-In
10	Security Switch	23	Remote Comm 1: RS-485 Termination Jumper
11	Lithium Battery	24	Remote Comm 2: Module Plug-in
12	Battery Cover	25	Remote Comm 2: RS-485 Termination Jumper
13	Battery Mounting Bracket	26	CPU Engine Card

1.1.2   XSeries Remote Controller Board

The XRC board is the basis for all XSeries remote controllers (RTUs). Its dimensions are the same as the XFC board. As a result, it can be used in all ABB enclosures. By adding TFIO modules, the I/O can be expanded. For more information on the XRC-based I/O, please see the XRC Board section within this manual.

The XRC board is designed to mount inside the enclosure front door. A basic set of I/O is included on the XRC board (See Figure 1-2 and Table 1–2). I/O expansion is accomplished via ABB's I^{2}C I/O bus using TFIO modules.

1.1.2.1   XRC Onboard I/O

- Five (5) user analog inputs
- Four (4) user digital outputs
- Four (4) user digital inputs: can be used as either digital inputs or high speed pulse inputs
- Two (2) RS-232 or -485 comm ports (selectable via the addition of a comm interface module)
- Interface for TFIO modules
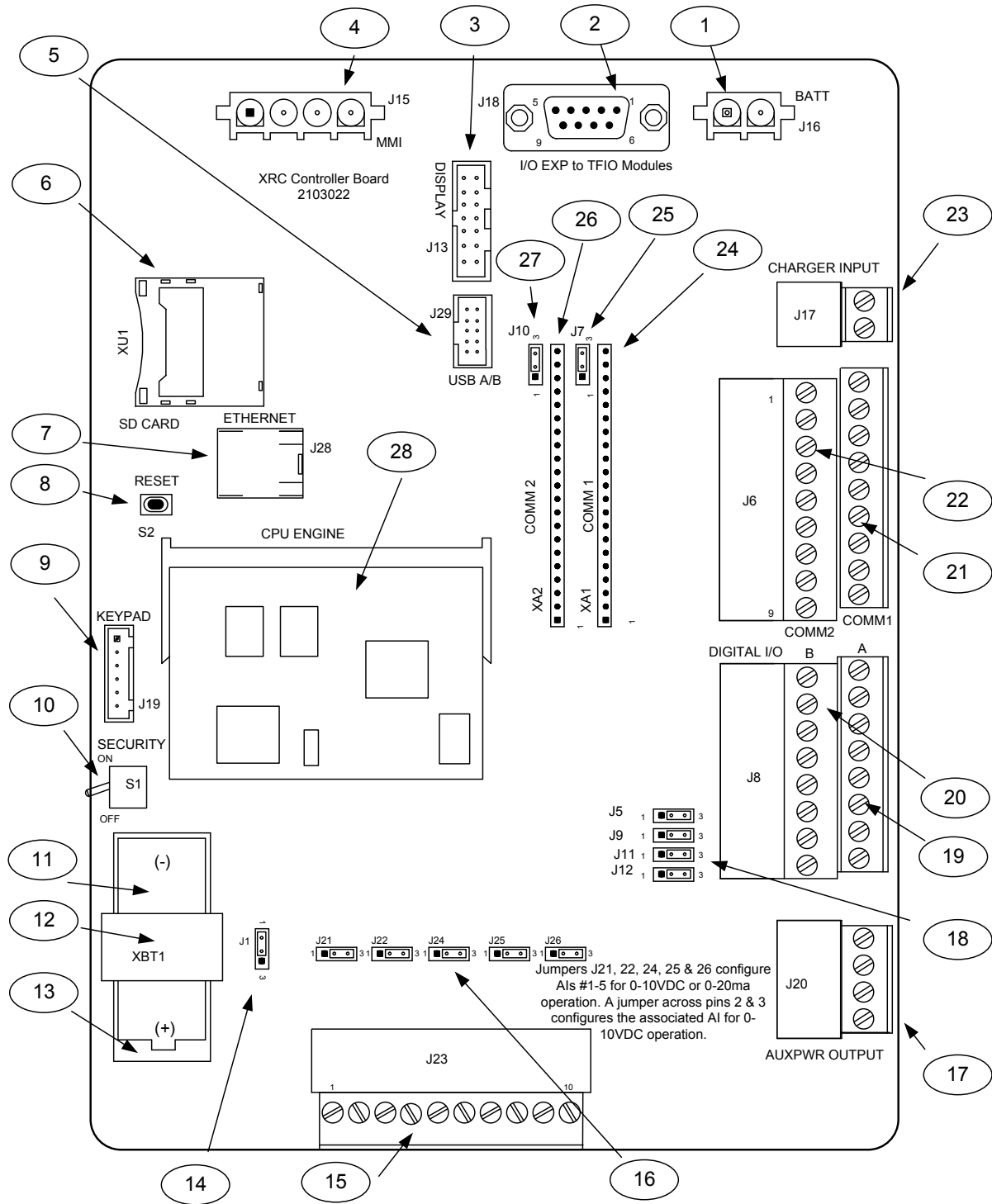
Figure 1-2 XRC^{G4} Board

Table 1–2 XRC^{G4} Board Identification

ID Number	Description	ID Number	Description
1	Battery Connection	15	Analog Input Connector
2	I/O Module Interface	16	Analog Input Type Selection Jumper Pins
3	LCD Display Interface	17	Auxiliary Power Output Connector
4	PCCU Interface	18	DeBounce Enable/Disable
5	USB Extension Port	19	A Pulse Inputs/Digital Outputs Connector
6	SD Card	20	B Pulse Inputs/Digital Outputs Connector
7	Ethernet Connector	21	A Remote Comm 1 Connector
8	Reset Button (Warm Start)	22	B Remote Comm 2 Connector
9	Keypad Connector	23	External Charger (Solar Panel) Connector
10	Security Switch	24	Remote Comm 1: Module Plug-In
11	Lithium Battery	25	Remote Comm 1: RS-485 Termination Jumper
12	Battery Cover	26	Remote Comm 2: Module Plug-in
13	Battery Mounting Bracket	27	Remote Comm 2: RS-485 Termination Jumper
14	Memory Backup Enable/Disable	28	CPU Engine Card

1.1.3   TFIO Modules

The hardware functionality of XSeries devices can be extended in a flexible and simple manner by adding modular I/O, as needed. ABB's TFIO modules are designed to accommodate low power situations and harsh environments at an economical cost (see Figure 1-3). The system recognizes the module types automatically and configures the I/O Scanner subsystem accordingly. For more detailed information, please see Chapter 3 - TFIO Module System.

1.1.3.1   I/O Application

ABB's I/O application provides an environment that automatically recognizes and configures the TFIO modules (as well as supports onboard I/O) for the XSeries products. Its features are:

Features

- Automatically recognize and configure TFIO modules on I^2C bus
- Support onboard I/O
- Efficient I/O protocol between the modules and the main electronics board
- Control "State Of" module LEDs to save power and provide diagnostics
- Support up to eight (8) instances of each module type with the exception of the communication interface module and the digital I/O
- Automatically scales analog channels into preferable units based on user-entered calibration data
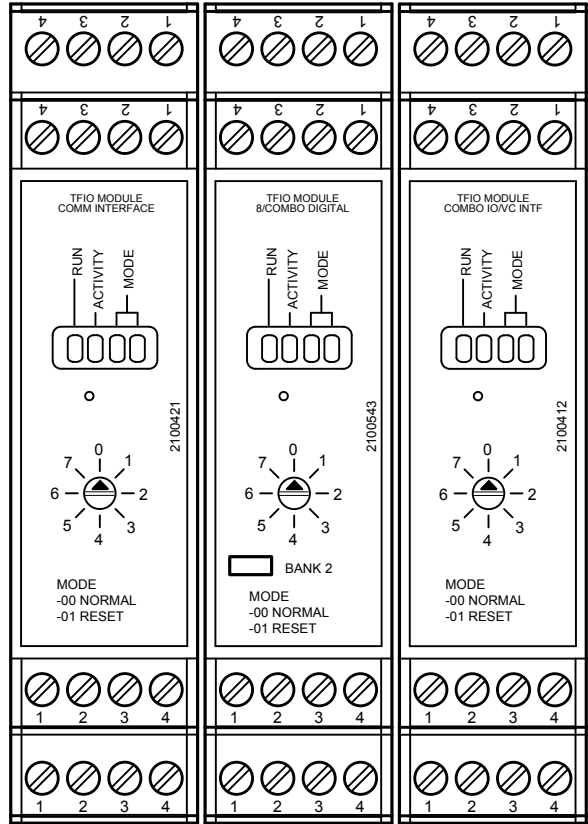
Figure 1-3 TFIO Modules

1.2 ABB XSeries Framework

The XSeries framework incorporates sophisticated and flexible file system architecture, an object-oriented application manager, dynamic data register addressing, pre-built objects (applications) and IEC applications with their variables. This produces an integrated framework that is adaptable by the user.

Access to most data is made available through files and through a unique register referencing scheme. In this scheme, a register reference is composed of three parts: APP.ARAY.REGISTER. This is discussed further within this chapter.

1.2.1 File System Architecture

The XSeries hardware supports two virtual drives: tfData and tfCold (see Figure 1-4). Application configuration and data (i.e., historical logs) information are stored in tfData. Cold boots erase RAM; therefore, this deletes any configuration and/or data files saved in tfData. Applications will have to be reinitialized. Warm boots will not affect configuration and data files in tfData.

1.2.1.1 tfCold

The NAND FLASH contains tfCold and other elements. tfCold is primarily a backup drive to restore the tfData drive, minus any historical data, in case of a cold boot.

1.2.1.2   tfData

RAM includes tfData (current configuration data), historical logs and a file storage area accessible to all applications through the file system. The RAM maintains this information through a warm boot not through a cold boot. Most instances of memory corruption can be corrected by executing a warm boot.
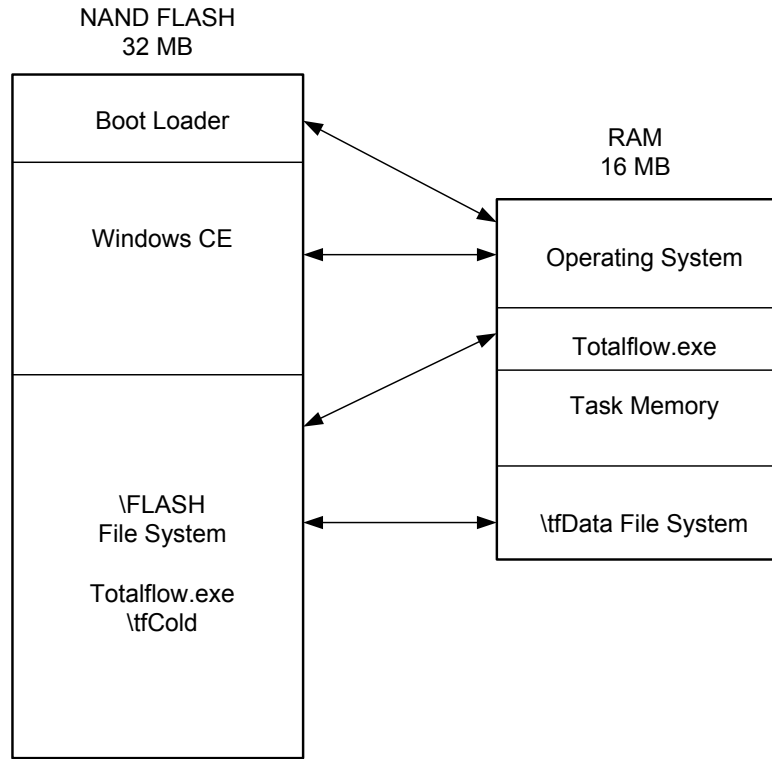
Figure 1-4 System Architecture for the XSeries XFC and XRC

FYI   The RAM is backed up by an onboard lithium cell.

1.2.2   Variable Address Numbering System

ABB's addressing system consists of three parts: the application slot number (APP), the array number (ARRAY) and the register number (REG).

These memory locations (32-bits each) are formatted to hold (APP.ARRAY.REGISTER) address information (see Figure 1-5) and serve as a pointer to system memory.
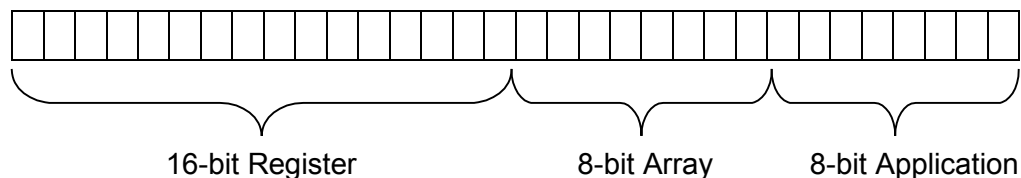
Figure 1-5 (APP.ARRAY.REGISTER) 32-Bit Address Information

A good example of the ABB register addressing format can be seen using PCCU32. This address is shown as three distinct fields separated by a period (i.e., 101.0.9).

Connect PCCU32 to the target's (XFC/XRC) local port. Connect to the target by clicking the Entry button on PCCU32's standard toolbar. In Figure 1-6, the variables displayed under the various PCCU32 tabs are shown with their appropriate register address. Notice that valve control has been turned on as application #101.
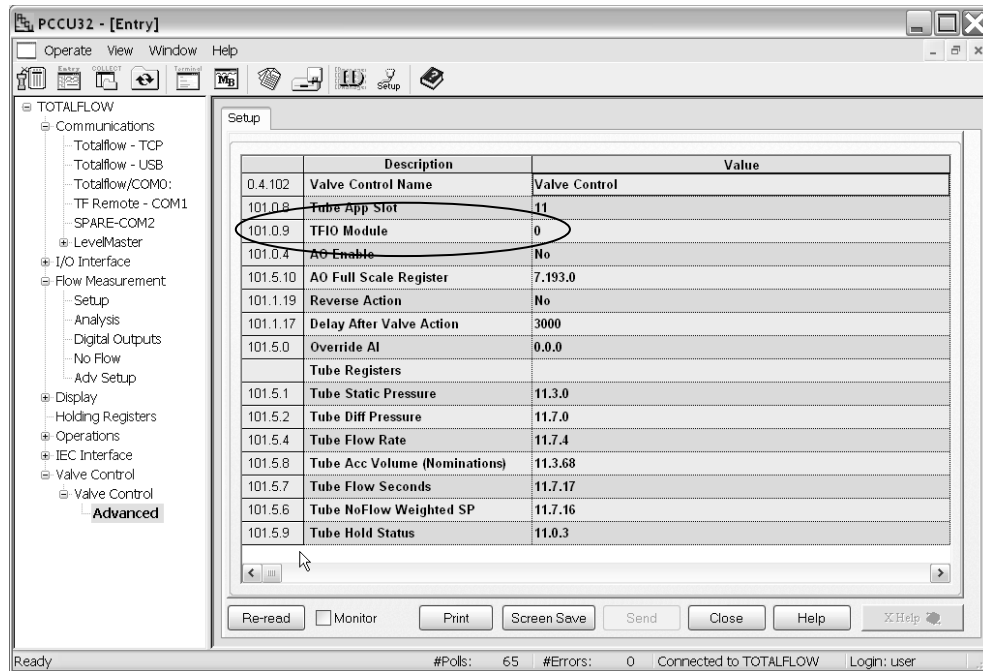
Figure 1-6 ABB PCCU32 Valve Control Registers

1.2.2.1   Application Tables (APP)

The first number of the address is the (APP). The XSeries products maintain an application table. This table provides application information to the system and other applications. The application slot number, the application name, access functions and application instance data are maintained in the application table (see Figure 1-7).
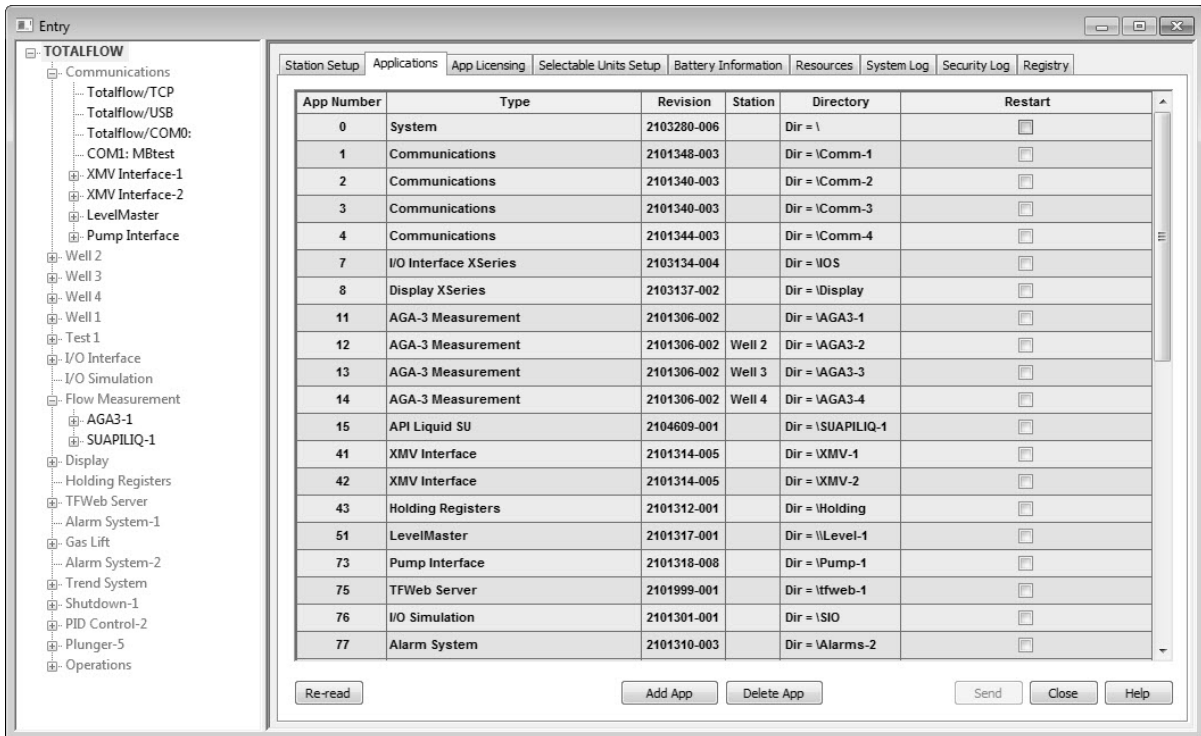
Figure 1-7 Application Table

1.2.2.2   Array (ARRAY)

The second number of the address is the (ARRAY). Each data type determines the (ARRAY) number within a given application. With respect to the I/O Interface and TFIO modules, arrays are mapped uniquely for each type of TFIO module (see Figure 1-8). As such, a table has been included in this manual with each module's relevant information.

1.2.2.3   Register (REG)

The third number of the address is the data element index number. This is referred to as the register (REG) (see Figure 1-8). Because the register number is dependent on the I^{2}C module address switch position, determining the register requires that a calculation be performed. For the purpose of this manual, the following views the register number from PCCU32. Details for performing this calculation are located in the Register Mapping section.
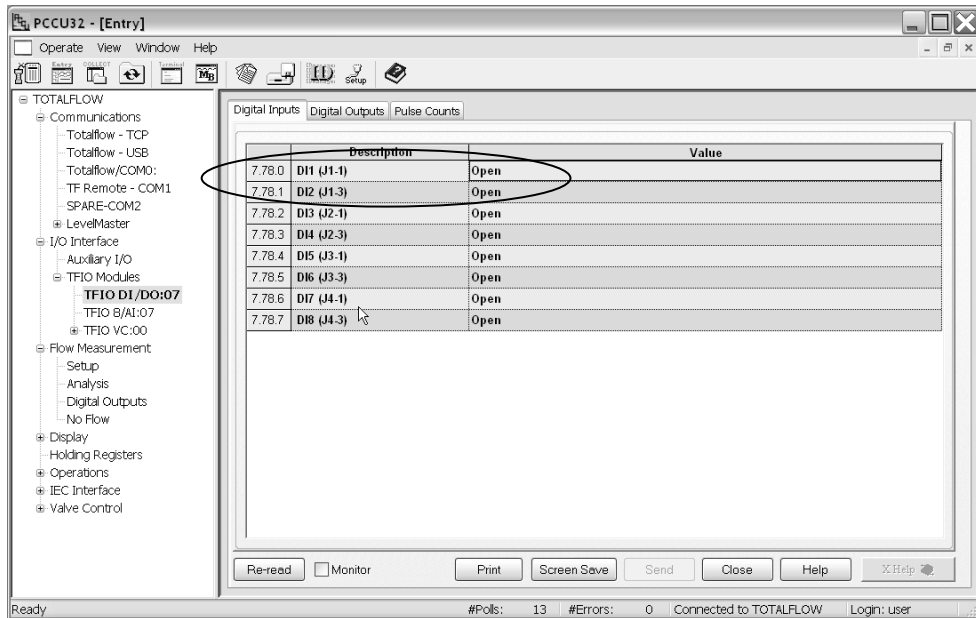
Figure 1-8 PCCU32's TFIO Module

1.2.3   TFIO Module Register Mapping

Each module section contains the information required to locate the register addresses for each data point. Alternately, the user may locate the register address number in PCCU32 by viewing the data point in the appropriate PCCU32 data screen. For the purposes of programming, the user may need to locate the coordinates manually; therefore, instructions are included in each module's section.

Each module and its corresponding register addresses have unique (ARRAY) and (REGISTER) values. The (ARRAY) depends upon the type of data being expected, and the (REGISTER) selects a specific register or data point (i.e., module 3, DI point 4). Each module type (Quad AO, valve control, etc.) can have an address between 0 and 7. This address is selected using the eight position rotary switch on the module's front panel. The module's address determines the array group.

For more information concerning TFIO module register addresses and their use, consult ABB Project Engineering.

2.0   TFIO MODULE SYSTEM

The hardware expansion of XSeries products is accomplished by using ABB input/output (TFIO) modules. The modules are interfaced to the main board by an I²C bus. On top of this bus, ABB has implemented an efficient I/O protocol to exchange information between the modules and the XSeries main board. The bus operates in a master/slave mode with the XSeries main board acting as master.

All modules are designed to meet Class 1, Division 2 and Group C & D certification.

2.1   Module Enclosure

The I/O module hardware is packaged in DIN-mount enclosures that employ Phoenix contact technology for field wiring. The modules also interconnect with each other to provide the necessary power and interface signals along their bus.

All modules have four LED lights, a manual reset button and have a address selector (0 through 7). On the face plate of each module (see Figure 2-1), the user sees:

- Type of module (name and color-coded)
- LED light panel
- Reset button switch
- Module address selector

2.1.1   LED Lights

The first light (RUN) is blinking when the module is recognized by the master. The second light (ACTIVITY) toggles on or off with each communication from the master. The third and fourth lights (MODE) reflect one of two possible statuses within the module, as shown on the bottom of the face plate. See Figure 2-1.

2.1.2   Reset Button

The small hole on the front of the module is the reset button switch. The user should reset the module any time the module address is changed. This constitutes a warm start of the program. To reset the module, use a fine-point instrument, such as the end of a paper clip, and insert into the hole until the module resets.

2.1.3   Address Selector

Each module of the same type must have a unique physical address (0-7) selected prior to powering up the module. Different types of modules may share the same address. If the user changes the address of a module, the unit must be reset.
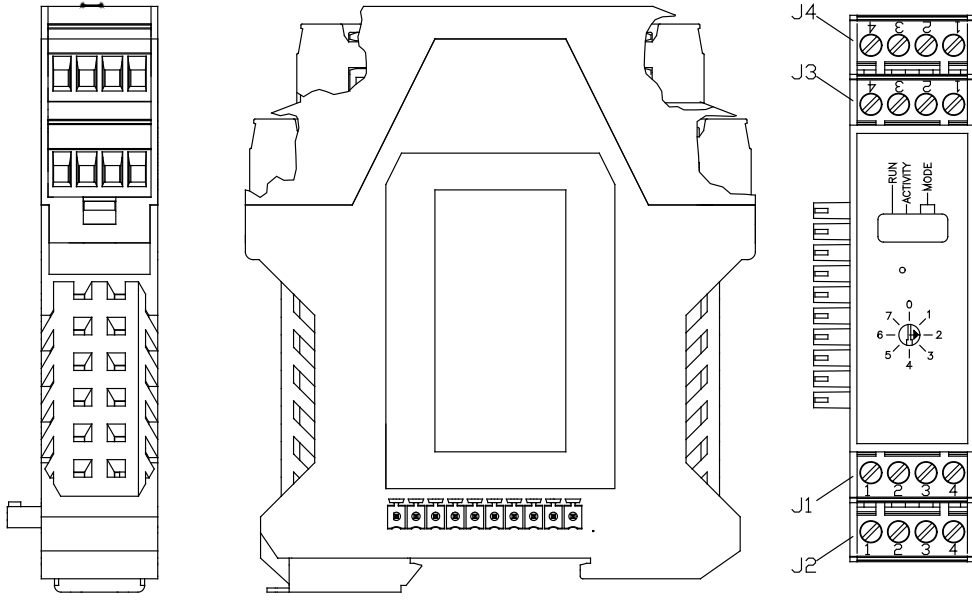
Figure 2-1 TFIO Module Housing

2.1.4   Combo Digital I/O Module

The Combo Digital I/O module provides the user with an additional eight (8) modules. The extended eight modules share the same selector address, but the hardware provides a unique card address that is accessible via a jumper found on the TFIO Combo Digital I/O motherboard. The extended version is identified with a checkmark on the front of the module (see Figure 2-2).
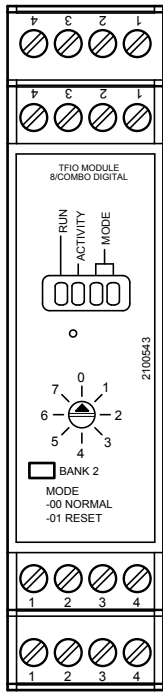
Figure 2-2 Combo Digital I/O Module

2.2   TFIO Module Capacity

Up to eight of each module-type is supported with the exception of the communication interface modules. Generally, I/O module capacity is limited only by the enclosure size (Table 2–1).

Table 2–1 Module Capacity by Model

Model	Enclosure Size (W x H x D)	Maximum Modules	Orifice Meter	Pulse Meter
	Enclosure			
XSeries Flow Computers (XFC)				
XFC^{G4} 6410	10.00" x 12.88" x 9.37"	N/A	●	
XFC^{G4} 6411	10.00" x 11.22" x 9.37"	N/A		●
XFC^{G4} 6413	12.55" x 18.12" x 10.27"	3	●	
XFC^{G4} 6414	12.55" x 15.81" x 10.27"	3		●
XFC^{G4} 6713	15.10" x 21.50" x 13.38"	6	●	
XFC^{G4} 6714	15.10" x 19.84" x 13.38"	6		●
XSeries Remote Controllers (XRC)				
XRC^{G4} 6490	11.52" x 14.81" x 10.27"	3		
XRC^{G4} 6790	15.10" x 18.80" x 13.38"	6		
XRC^{G4} 6890	20.09" x 28.91" x 15.52"	14		
XRC^{G4} 6895	24.00" x 30.00" x 13.50"	22		
XRC^{G4} 6990	16.91" x 10.47" x 10.21"	6 (12/Dual)[1]		

2.3   Module Loading

The current design criteria dictates that module capacity must also be limited by the board's ability to provide power to the modules. Table 2–2 indicates the maximum load capabilities.

Table 2–2 TFIO Module Loading

	XFC^{G4}	XRC^{G4}
# of modules	9	22

2.4   I/O Points Per Module

Due to the identical size of each module and its 16 wiring pins, module points are limited by a combination of multi-wire requirements and voltage requirements. Table 2–3 reflects the number of available I/O points per module.

---

[1] The XRC 6990 models support up to two (2) electronic boards and 12 I/O Modules.

Table 2–3 I/O Points Per Module

Module	Part Number	I/O Points
Valve Control Combo I/O	2100412	2 DO, 4 DI/DO/PI, 1 AO
4—20 mA Analog Output	2100415	4
Type II Analog Input	2100418	8
Communication	2100421	RS232/RS485/RS422 Programmable
Combo Digital	2100543	8 DI/DO/PI
Combo Digital Extended	**210543-006**	**8 DI/DO/P!**
Thermocouple Input	2100869	4
RTD Input	2101018	4

2.5   Module Mounting

Installation consists of snapping the Phoenix connector onto the DIN rail and moving the module into position directly beside and snapped to the next module. Likewise, in removing a module, it must first be separated from the module on either side then removed from the DIN rail.

CAUTION When connecting or disconnecting any wires to the main board or modules, the user should remove all power sources and make sure that they are grounded properly.

Figure 2-3 displays an enclosure with the DIN rail installed. Figure 2-4 through Figure 2-8 display DIN rails installed with one or more I/O modules installed.
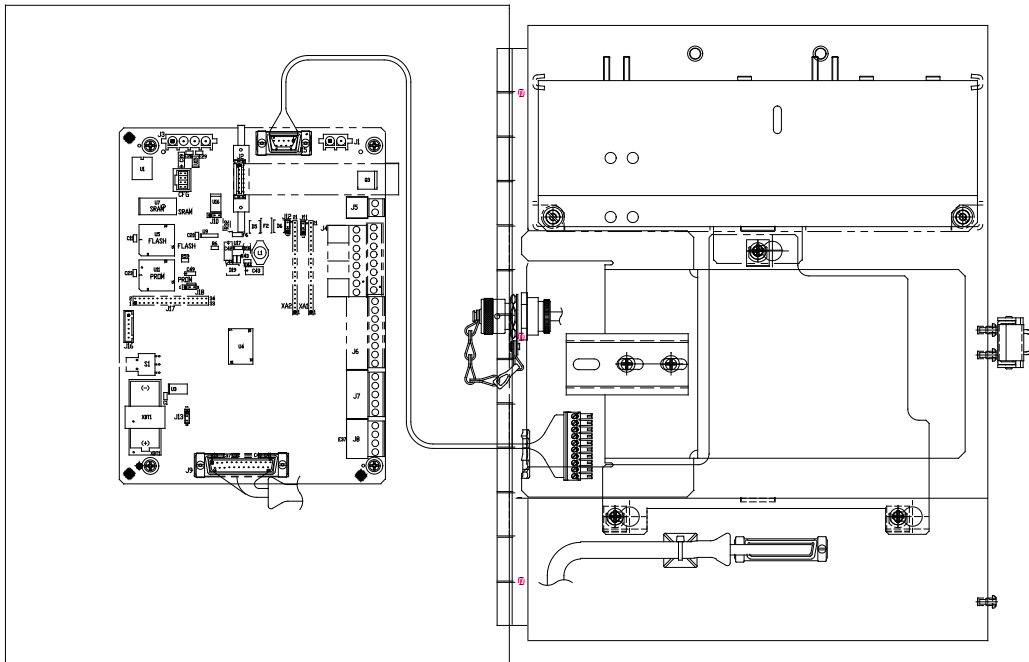
Figure 2-3 XFC 6413/6414 Inside View
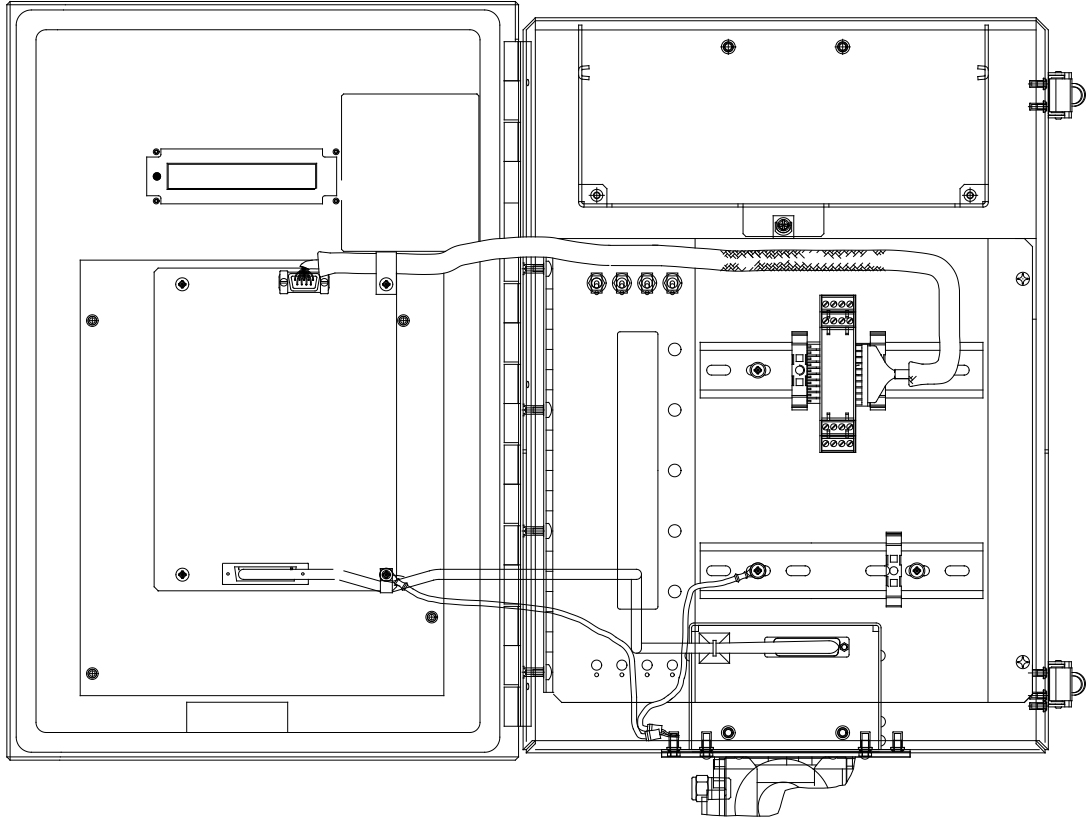
Figure 2-4 XFC 6713/6714 Inside View
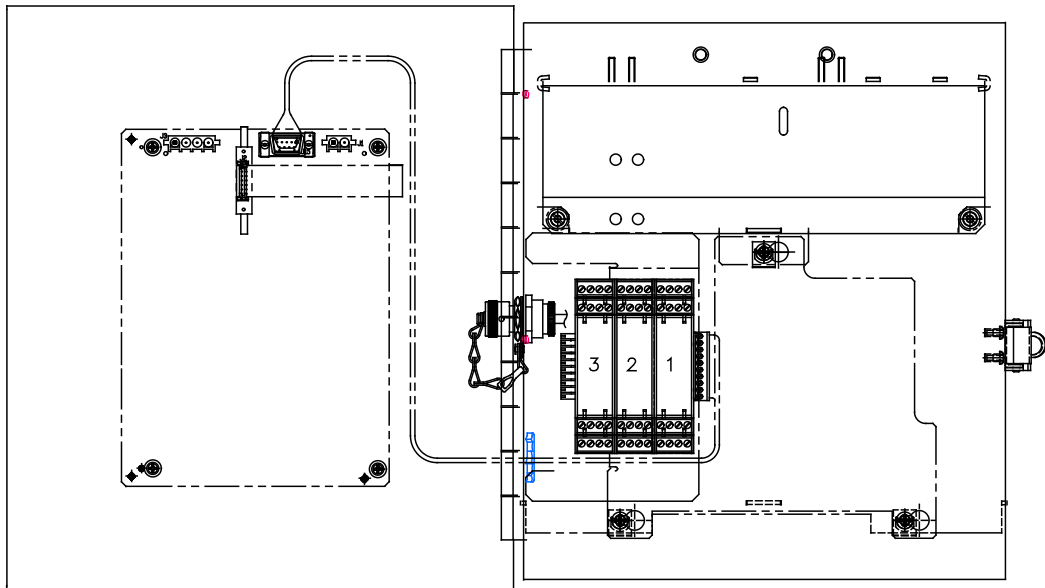
Figure 2-5 XRC 6490 Inside View with I/O Modules Installed
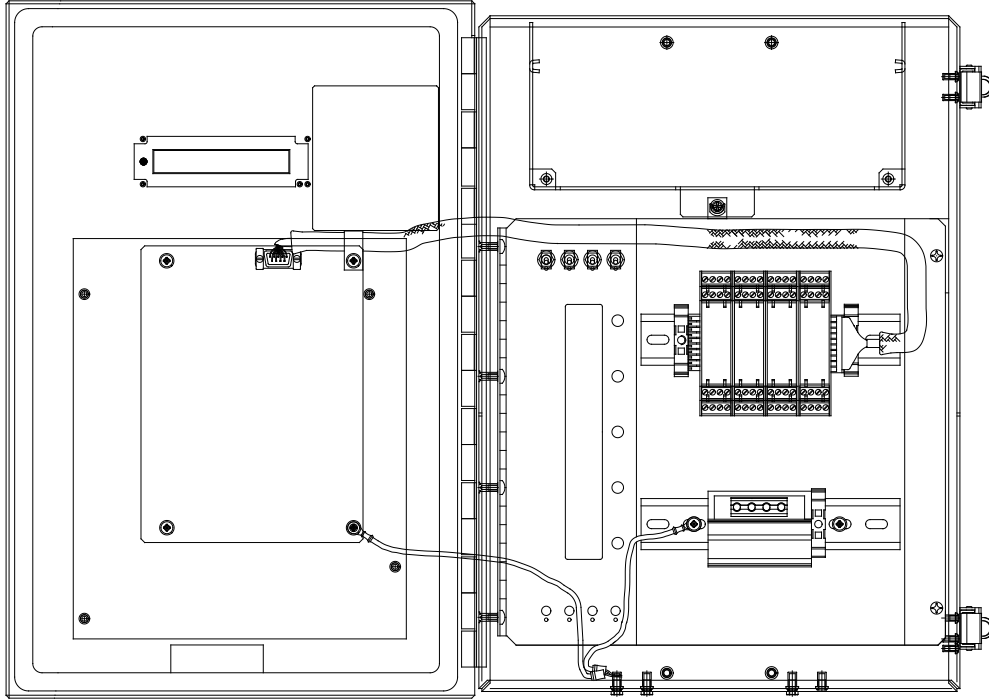
Figure 2-6 XRC 6790 Inside View with I/O Modules Installed
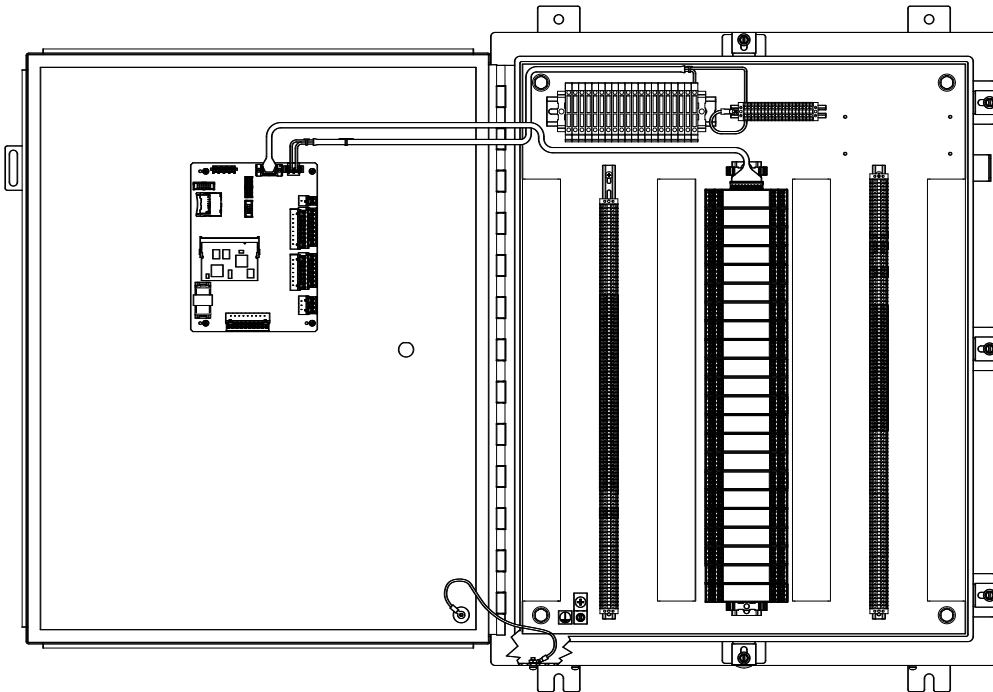
Figure 2-7 XRC 6895 Inside View with I/O Modules Installed

TOP VIEW　　　　　　　　　SIDE VIEW　　　　　　　　　BACK VIEW
(DUAL BOARDS)
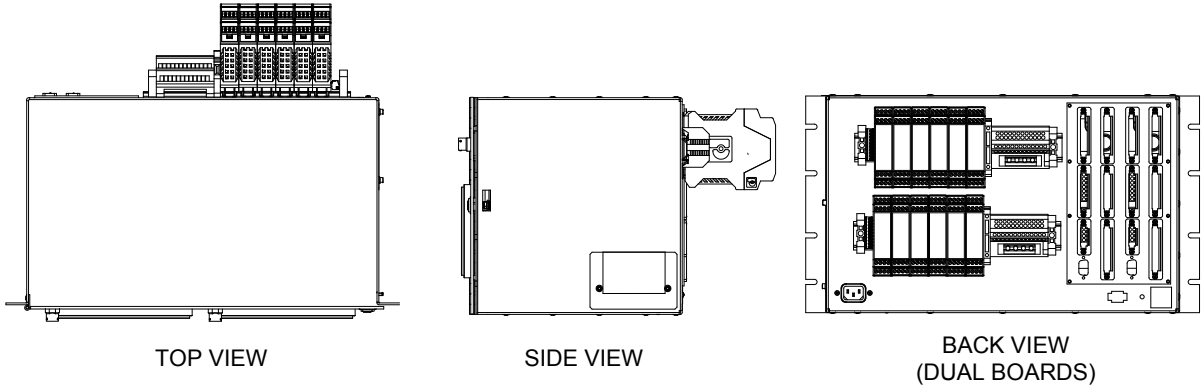
Figure 2-8 XRC 6990 View with I/O Modules Installed

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3.0   TFIO VALVE CONTROL INTERFACE MODULE (2100412)

The 2100412 TFIO module is a software-configurable, combination I/O module specifically tailored for Valve Control applications. The module incorporates six (6) general purpose DI/DO/PI input/outputs, two source mode digital outputs and one 4-20 mA sink/source mode analog output.

3.1   Specifications

Electrical (each point):	Open circuit voltage:		5 Vdc (Internally up to 5 Vdc Nom.)
	Input capacitance:		1000 pF typical
	Short circuit leakage current:		-430 uA typical
	Maximum allowable voltage range on input:		-0.5 Vdc to 26.5 Vdc
Digital Input/Output:	SIG Points 1,2,3,4,6,8 (6 and 8 have no ground)		
	Input:	Dry contact or voltage type	
		Minimum contact resistance to activate input: 15KΩ	
		Max. voltage to activate the input: 2.0 V [2]	
		Min. voltage to deactivate the input: 3.0 V *	
	Output (Sink):	Open drain FET type	
		RDS(ON): 0.060Ω typical	
		Maximum continuous sink current: 2 A @ 24 Vdc	
	Output (Source):	Points 5 and 7: ioVBB supply @ 2 A Max.	
Analog Output	Maximum allowable voltage range on Vdc source, 1 sink or source: 26.5 Vdc		
	Maximum External Power Source: 26.5 Vdc		
	Maximum load resistance (internal/external powered): 0 Ohms		
	Maximum load resistance (internally powered): 350 Ohms		
	Maximum load resistance RMAX (calculated): (Vdc External -4) x 50		

3.1.1   Pin Designation

	J1	J2	J3	J4
1	POINT 1 SIG	AO Vdc source	POINT 3 SIG	POINT 5 SIG
2	POINT 1 GND	AO I sink	POINT 3 GND	POINT 6 SIG
3	POINT 2 SIG	AO I source	POINT 4 SIG	POINT 7 SIG
4	POINT 2 GND	AO Vdc common	POINT 4 GND	POINT 8 SIG

3.2   Wiring Requirements

When digital outputs are used to sink current, the sum total sink current for all points and modules should not exceed 5 A total. If more than 5 A are required, separate the ground wires from the module output ground to the power source ground terminal (bus bar). Failure to do so may cause erratic system operation.

---

[2] Referenced to GND terminal.

Sufficient gauge wire should be used to handle total load current. Use shielded pair or twisted pair conductors to reduce the possibility of erroneous transitions on the inputs in high EMI/RFI environments. Ground the shield at field device only.

TIP See Figure 2-1 for location of each terminal.

3.2.1 Typical Point Schematic
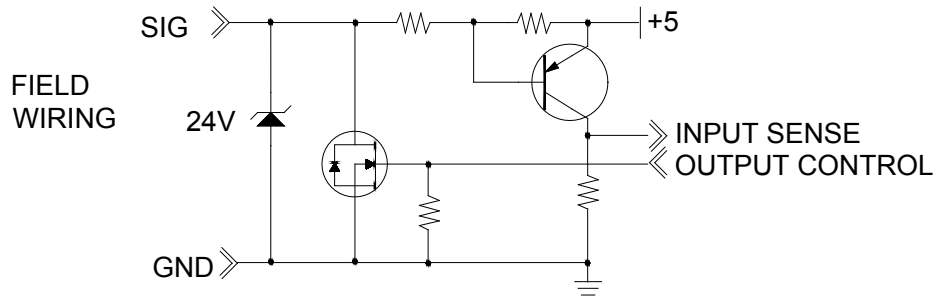
3.3 Examples

3.3.1 Point Connections

POINT CONNECTIONS

TYPICAL VOLTAGE INPUT FIELD

TYPICAL SINK OUTPUT FIELD WIRING
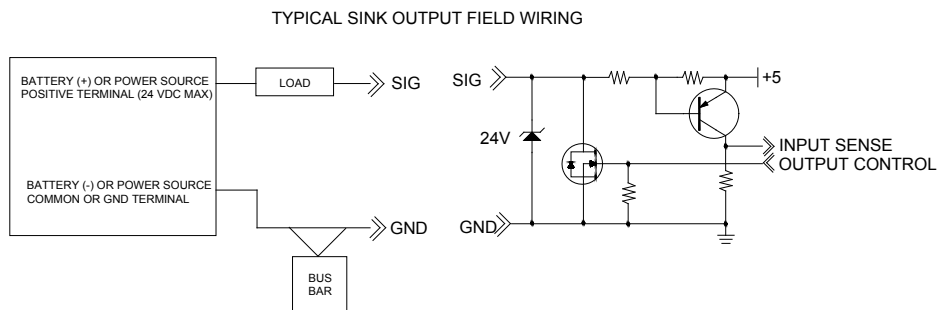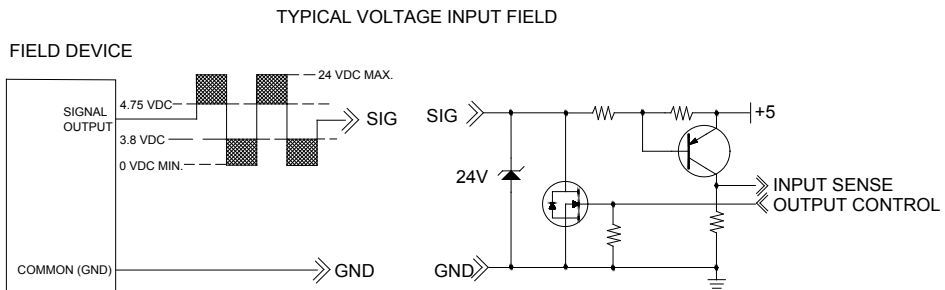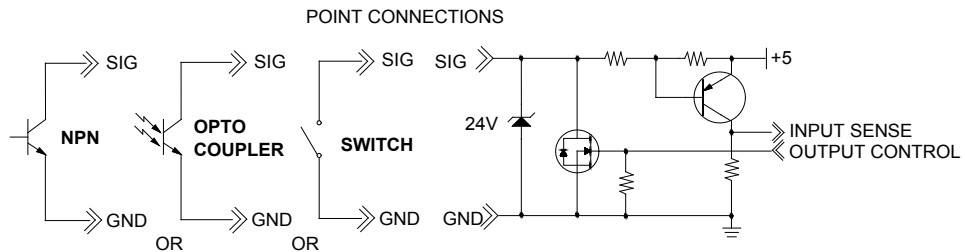
3.3.2 Analog Output

POWER SUPPLY: TFIO MODULE CURRENT SINK MODE
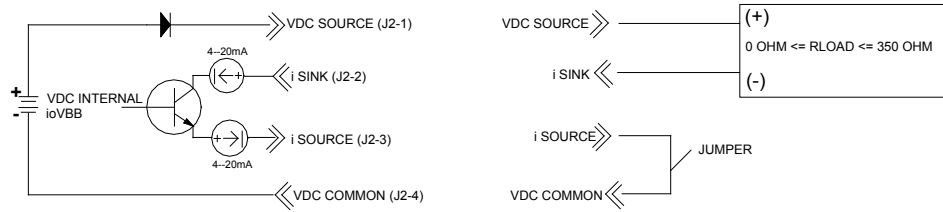
POWER SUPPLY: TFIO MODULE CURRENT SOURCE MODE
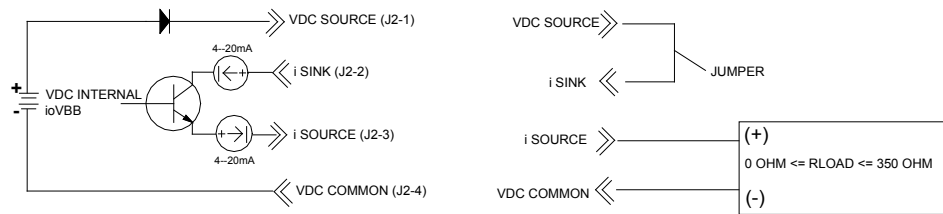
POWER SUPPLY: EXTERNAL CURRENT SINK MODE
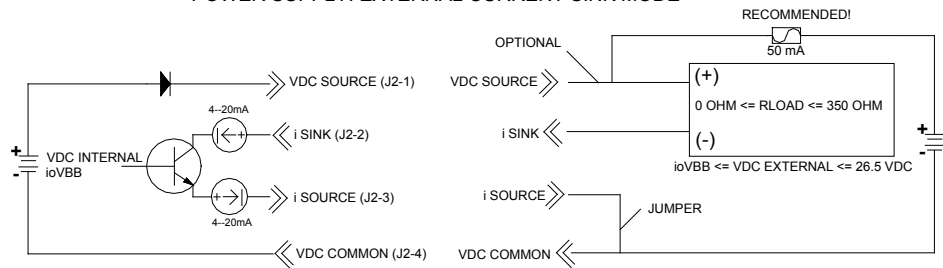
POWER SUPPLY: EXTERNAL CURRENT SOURCE MODE
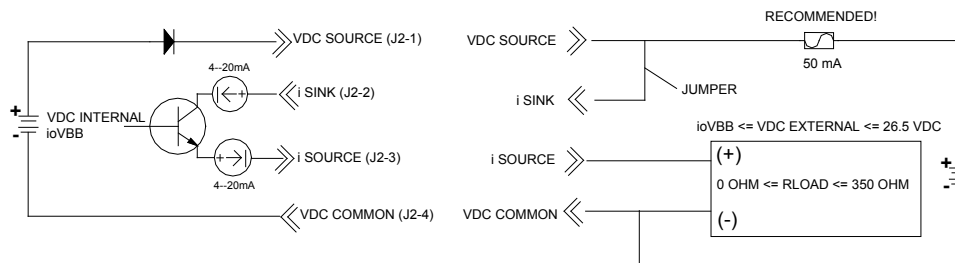
3.3.3 Valve Control Applications

The following drawing is not intended to provide all required information.
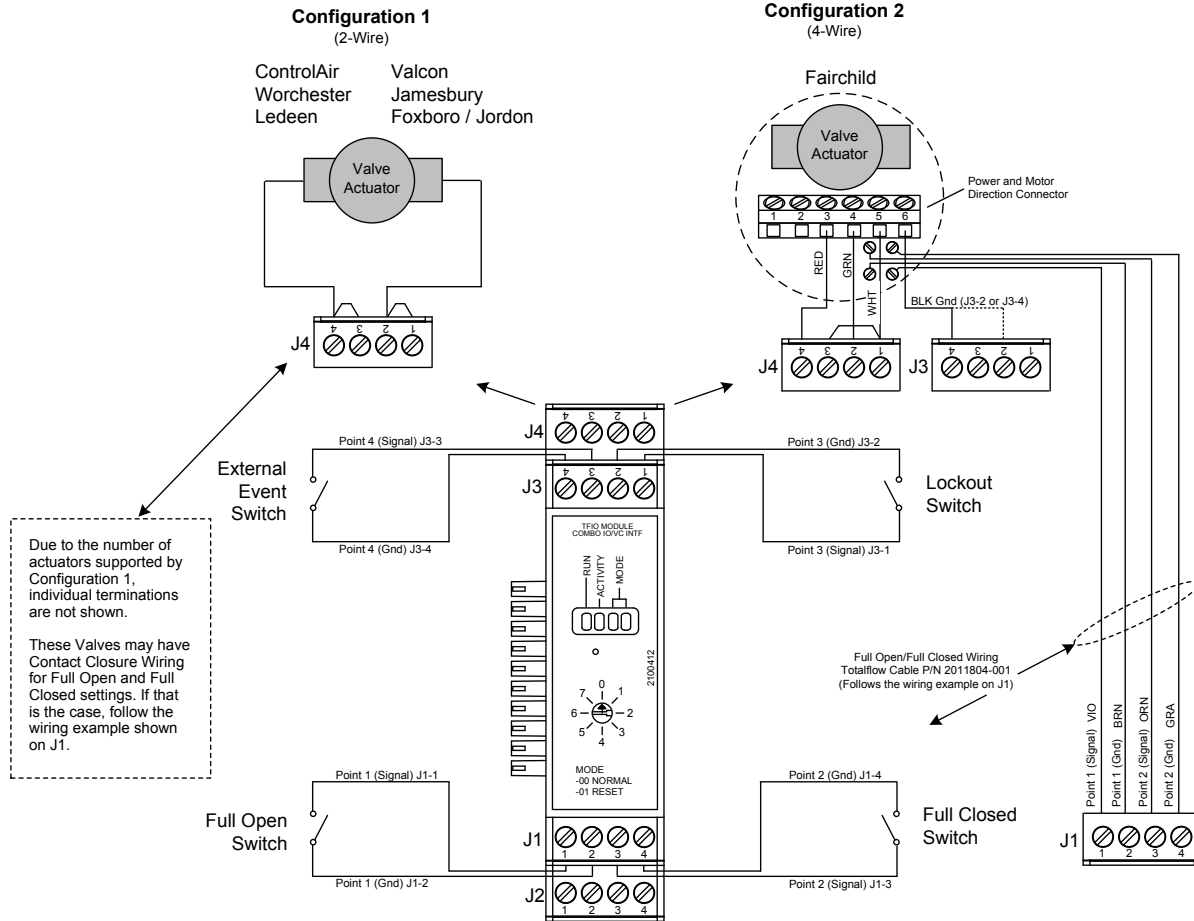
Figure 3-1 Valve Control

3.4   ARRAY Address

Table 3–1 reflects the ARRAY addresses for the module switch address from position zero to seven.

Table 3–1 Valve Control ARRAY Address from Switch Position

Switch Address	UInt32 Array Number	Float Array Number
0	192	193
1	194	195
2	196	197
3	198	199
4	200	201
5	202	203
6	204	205
7	206	207

3.5 REG Address

See Table 3–2 for the different arrays and registers used by the valve control module. Note that the register numbers are listed for this module using the address 0 (on the rotary switch).

Table 3–2 TFIO Valve Control Register Maps

ARR.REG	DESCRIPTION	TYPE	ACCESS
192.0	1st Module Cal Flags	UInt32	Read
192.1	1st Module DI1 Current State[3]	UInt32	Read
192.2	1st Module DI2 Current State[3]	UInt32	Read
192.3	1st Module DI3 Current State[3]	UInt32	Read
192.4	1st Module DI4 Current State[3]	UInt32	Read
192.5	1st Module DI5 Current State[3]	UInt32	Read
192.6	1st Module DI6 Current State[3]	UInt32	Read
192.7	1st Module DI1 Active State[4]	UInt32	Read
192.8	1st Module DI2 Active State[4]	UInt32	Read
192.9	1st Module DI3 Active State[4]	UInt32	Read
192.10	1st Module DI4 Active State[4]	UInt32	Read
192.11	1st Module DI5 Active State[4]	UInt32	Read
192.12	1st Module DI6 Active State[4]	UInt32	Read
192.13	1st Module DO1 Current State[3]	UInt32	Read
192.14	1st Module DO2 Current State[3]	UInt32	Read
192.15	1st Module DO3 Current State[3]	UInt32	Read
192.16	1st Module DO4 Current State[3]	UInt32	Read
192.17	1st Module DO5 Current State[3]	UInt32	Read
192.18	1st Module DO6 Current State[3]	UInt32	Read
192.19	1st Module DO7 Current State[3]	UInt32	Read
192.20	1st Module DO8 Current State[3]	UInt32	Read
192.21	1st Module DO1 Active State[4]	UInt32	Read/Write
192.22	1st Module DO2 Active State	UInt32	Read/Write
192.23	1st Module DO3 Active State [4]	UInt32	Read/Write
192.24	1st Module DO4 Active State[4]	UInt32	Read/Write
192.25	1st Module DO5 Active State[4]	UInt32	Read/Write
192.26	1st Module DO6 Active State[4]	UInt32	Read/Write
192.27	1st Module DO7 Active State[4]	UInt32	Read/Write

[3] 1 = Active, 0 = Inactive

[4] 1 = Open, 0 = Closed

ARR.REG	DESCRIPTION	TYPE	ACCESS
192.28	1st Module DO8 Active State[4]	UInt32	Read/Write
192.29	1st Module DO1 Forced State[4]	UInt32	Read/Write
192.30	1st Module DO2 Forced State[4]	UInt32	Read/Write
192.31	1st Module DO3 Forced State[4]	UInt32	Read/Write
192.32	1st Module DO4 Forced State[4]	UInt32	Read/Write
192.33	1st Module DO5 Forced State[4]	UInt32	Read/Write
192.34	1st Module DO6 Forced State[4]	UInt32	Read/Write
192.35	1st Module DO7 Forced State[4]	UInt32	Read/Write
192.36	1st Module DO8 Forced State[4]	UInt32	Read/Write
192.37	1st Module DO1 Override Assignment	UInt32	Read/Write
192.38	1st Module DO2 Override Assignment	UInt32	Read/Write
192.39	1st Module DO3 Override Assignment	UInt32	Read/Write
192.40	1st Module DO4 Override Assignment	UInt32	Read/Write
192.41	1st Module DO5 Override Assignment	UInt32	Read/Write
192.42	1st Module DO6 Override Assignment	UInt32	Read/Write
192.43	1st Module DO7 Override Assignment	UInt32	Read/Write
192.44	1st Module DO8 Override Assignment	UInt32	Read/Write
192.45	1st Module DO1 Activation Time	UInt32	Read/Write
192.46	1st Module DO2 Activation Time	UInt32	Read/Write
192.47	1st Module DO3 Activation Time	UInt32	Read/Write
192.48	1st Module DO4 Activation Time	UInt32	Read/Write
192.49	1st Module DO5 Activation Time	UInt32	Read/Write
192.50	1st Module DO6 Activation Time	UInt32	Read/Write
192.51	1st Module DO7 Activation Time	UInt32	Read/Write
192.52	1st Module DO8 Activation Time	UInt32	Read/Write
192.53			
192.54	1st Module DO1 Inactive Wait	UInt32	Read
192.55	1st Module DO2 Inactive Wait	UInt32	Read
192.56	1st Module DO3 Inactive Wait	UInt32	Read
192.57	1st Module DO4 Inactive Wait	UInt32	Read
192.58	1st Module DO5 Inactive Wait	UInt32	Read
192.59	1st Module DO6 Inactive Wait	UInt32	Read
192.60	1st Module DO7 Inactive Wait	UInt32	Read
192.61	1st Module DO8 Inactive Wait	UInt32	Read
192.62	1st Module DO1 Residual Time	UInt32	Read
192.63	1st Module DO2 Residual Time	UInt32	Read
192.64	1st Module DO3 Residual Time	UInt32	Read
192.65	1st Module DO4 Residual Time	UInt32	Read
192.66	1st Module DO5 Residual Time	UInt32	Read

ARR.REG	DESCRIPTION	TYPE	ACCESS
192.67	1st Module DO6 Residual Time	UInt32	Read
192.68	1st Module DO7 Residual Time	UInt32	Read
192.69	1st Module DO8 Residual Time	UInt32	Read
192.70	1st Module Analog Output Counts	UInt32	Read
193.0	1st Module % of Full Scale	Float	Read
193.1	1st Module Scaled User Value	Float	Read
193.16	1st Module AO Output Binary	Float	Read
193.17	1st Module Input Current Meter Reading at 0	Float	Read
193.18	1st Module User Units at 4 mA	Float	Read
193.19	1st Module Output Binary Code	Float	Read
193.20	1st Module Current Meter Reading at Full Scale	Float	Read
193.21	1st Module Input Units for 20 A	Float	Read
193.22	1st Module Value added to set before scaling	Float	Read
193.23	1st Module Power-up value	Float	Read
193.30	1st Module Abort Calibration	Float	Read
193.31	1st Module After Cal Output	Float	Read
193.32	1st Module Cal Result Offset	Float	Read
193.33	1st Module Cal Result Slope	Float	Read
193.34	1st Module Cal Result User Offset	Float	Read
193.35	1st Module Cal Result User Slope	Float	Read
193.36	1st Module Cal Result Bias	Float	Read

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4.0   TFIO ANALOG OUTPUT (4-20 mA) MODULE (2100415)

The 2100415 TFIO module is a configurable, 4-point 4-20 mA analog output module. Each point can be configured to either sink or source a 4-20 mA signal using either an internal or external power source.

4.1   Specifications

Electrical (each point):	Maximum allowable voltage range on VDC source	
	Isink or Isource: 26.5 Vdc(Vdc common is essentially system ground)	
Power Source:	Maximum External:	26.5 Vdc
	Minimum Load Resistance:	0 Ohms (Internal/External Power)
	Maximum Load Resistance:	350 Ohms (Internal Power)
	Maximum Load Resistance R_{MAX}:	(Vdc External - 4) X 50 (Calculated)

4.1.1   Pin Designation

	J1	J2	J3	J4
1	AO1 Vdc source	AO2 Vdc source	AO3 Vdc source	AO4 Vdc source
2	AO1 Isink	AO2 Isink	AO3 Isink	AO4 Isink
3	AO1 Isource	AO2 Isource	AO3 Isource	AO4 Isource
4	AO1 Vdc common	AO2 Vdc common	AO3 Vdc common	AO4 Vdc common

4.2   Wiring Requirements

TIP See Figure 2-1 for location of each terminal.

4.2.1   Typical Point Schematic
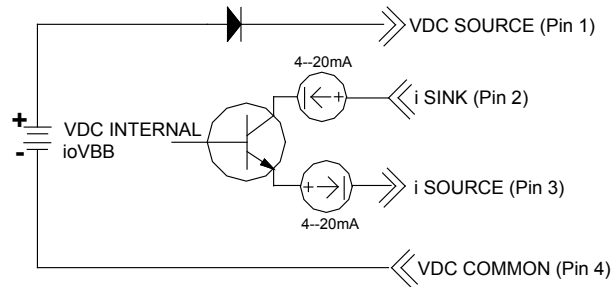
4.3   Examples

4.3.1   Point Connections

POWER SUPPLY: TFIO MODULE CURRENT SINK MODE

POWER SUPPLY: TFIO MODULE CURRENT SOURCE MODE

POWER SUPPLY: EXTERNAL CURRENT SINK MODE

POWER SUPPLY: EXTERNAL CURRENT SOURCE MODE
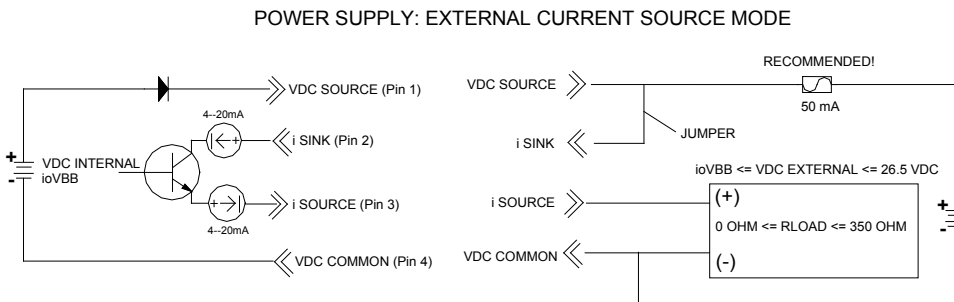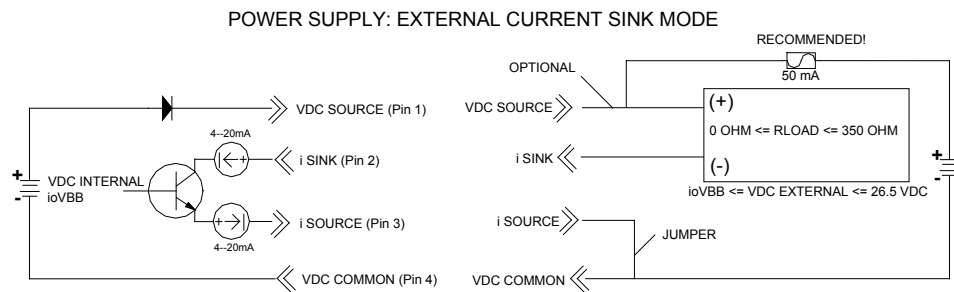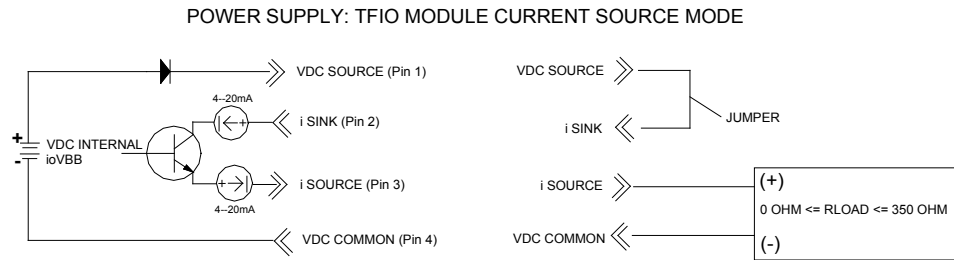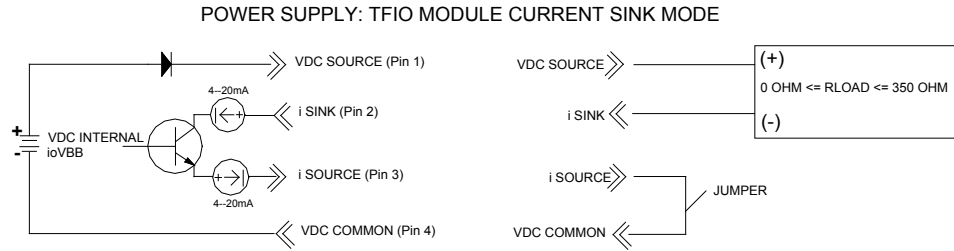
4.4   ARRAY Address

Table 4–1 reflects the ARRAY addresses for the module switch address from position zero to seven.

Table 4–1 Analog Output ARRAY Address from Switch Position

Switch Address	UInt32 Array Number	Float Array Number
0	80	81
1	82	83
2	84	85
3	86	87
4	88	89
5	90	91
6	92	93
7	94	95

4.5 REG Address

See Table 4–2 for the different arrays and registers used by this module. Note that the register numbers are listed for this module using the address 0 (on the rotary switch).

Table 4–2 TFIO Analog Output (4-20 mA) Register Maps

| ARR.REG	DESCRIPTION	TYPE	ACCESS
80.0	1st Module AO1 Cal Stat Byte	UInt32	Read
80.1	1st Module AO2 Cal Stat Byte	UInt32	Read
80.2	1st Module AO3 Cal Stat Byte	UInt32	Read
80.3	1st Module AO4 Cal Stat Byte	UInt32	Read
80.4	1st Module AO1 DAC in/out	UInt32	Read
80.5	1st Module AO2 DAC in/out	UInt32	Read
80.6	1st Module AO3 DAC in/out	UInt32	Read
80.7	1st Module AO4 DAC in/out	UInt32	Read
81.0	1st Module AO 1 % Full Scale	Float	Read/Write
81.1	1st Module AO 2 % Full Scale	Float	Read/Write
81.2	1st Module AO 3 % Full Scale	Float	Read/Write
81.3	1st Module AO 4 % Full Scale	Float	Read/Write
81.4	1st Module AO 1 User Scaled Value	Float	Read/Write
81.5	1st Module AO 2 User Scaled Value	Float	Read/Write
81.6	1st Module AO 3 User Scaled Value	Float	Read/Write
81.7	1st Module AO 4 User Scaled Value	Float	Read/Write
81.16	1st Module AO 1 Output for Offsets	Float	Read/Write
81.17	1st Module AO 1 Input at Zero	Float	Read/Write
81.18	1st Module AO 1 Input Units for 4 ma	Float	Read/Write
81.19	1st Module AO 1Output for Fullscale	Float	Read/Write
81.20	1st Module AO 1 Input at Fullscale	Float	Read/Write
81.21	1st Module AO 1 Input Units for 20 mA	Float	Read/Write
81.22	1st Module AO 1 Value added to set	Float	Read/Write
81.23	1st Module AO 1 PowerOn Value	Float	Read/Write

ARR.REG	DESCRIPTION	TYPE	ACCESS
81.30	1st Module AO 1 Abort Cal	Float	Read/Write
81.31	1st Module AO 1 After Cal Output	Float	Read/Write
81.32	1st Module AO 2 Output for Offsets	Float	Read/Write
81.33	1st Module AO 2 Input at Zero	Float	Read/Write
81.34	1st Module AO 2 Input Units for 4 mA	Float	Read/Write
81.35	1st Module AO 21Output for Fullscale	Float	Read/Write
81.36	1st Module AO 2 Input at Fullscale	Float	Read/Write
81.37	1st Module AO 2 Input Units for 20 mA	Float	Read/Write
81.38	1st Module AO 2 Value added to set	Float	Read/Write
81.39	1st Module AO 2 PowerOn Value	Float	Read/Write
81.46	1st Module AO 2 Abort Cal	Float	Read/Write
81.47	1st Module AO 2 After Cal Output	Float	Read/Write
81.48	1st Module AO 3 Output for Offsets	Float	Read/Write
81.49	1st Module AO 3 Input at Zero	Float	Read/Write
81.50	1st Module AO 3 Input Units for 4 mA	Float	Read/Write
81.51	1st Module AO 31Output for Fullscale	Float	Read/Write
81.52	1st Module AO 3 Input at Fullscale	Float	Read/Write
81.53	1st Module AO 3 Input Units for 20 mA	Float	Read/Write
81.54	1st Module AO 3 Value added to set	Float	Read/Write
81.55	1st Module AO 3 PowerOn Value	Float	Read/Write
81.62	1st Module AO 3 Abort Cal	Float	Read/Write
81.63	1st Module AO 3 After Cal Output	Float	Read/Write
81.64	1st Module AO 4 Output for Offsets	Float	Read/Write
81.65	1st Module AO 4 Input at Zero	Float	Read/Write
81.66	1st Module AO 4 Input Units for 4 mA	Float	Read/Write
81.67	1st Module AO 41Output for Fullscale	Float	Read/Write
81.68	1st Module AO 4 Input at Fullscale	Float	Read/Write
81.69	1st Module AO 4 Input Units for 20 mA	Float	Read/Write
81.70	1st Module AO 4 Value added to set	Float	Read/Write
81.71	1st Module AO 4 PowerOn Value	Float	Read/Write
81.78	1st Module AO 4 Abort Cal	Float	Read/Write
81.79	1st Module AO 4 After Cal Output	Float	Read/Write
81.80	1st Module AO 1 Cal Results Offset	Float	Read/Write
81.81	1st Module AO 1 Cal Results Slope	Float	Read/Write
81.82	1st Module AO 1 Cal Results Scaled Offset	Float	Read/Write
81.83	1st Module AO 1 Cal Results Scaled Slope	Float	Read/Write
81.84	1st Module AO 1 Cal Results Bias	Float	Read/Write
81.85	1st Module AO 2 Cal Results Offset	Float	Read/Write
81.86	1st Module AO 2 Cal Results Slope	Float	Read/Write
81.87	1st Module AO 2 Cal Results Scaled Offset	Float	Read/Write

ARR.REG	DESCRIPTION	TYPE	ACCESS
81.88	1st Module AO 2 Cal Results Scaled Slope	Float	Read/Write
81.89	1st Module AO 2 Cal Results Bias	Float	Read/Write
81.90	1st Module AO 3 Cal Results Offset	Float	Read/Write
81.91	1st Module AO 3 Cal Results Slope	Float	Read/Write
81.92	1st Module AO 3 Cal Results Scaled Offset	Float	Read/Write
81.93	1st Module AO 3 Cal Results Scaled Slope	Float	Read/Write
81.94	1st Module AO 3 Cal Results Bias	Float	Read/Write
81.95	1st Module AO 4 Cal Results Offset	Float	Read/Write
81.96	1st Module AO 4 Cal Results Slope	Float	Read/Write
81.97	1st Module AO 4 Cal Results Scaled Offset	Float	Read/Write
81.98	1st Module AO 4 Cal Results Scaled Slope	Float	Read/Write
81.99	1st Module AO 4 Cal Results Bias	Float	Read/Write

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5.0 TFIO ANALOG INPUT (TYPE II) MODULE (2100418)

The 2100418 TFIO module is a configurable, 8-point analog input module. Each point can be configured to be a 0-10V voltage input or a 0-20 mA current input.

5.1 Specifications

Electrical (each point):	Input Mode:	Range:
	Voltage Mode:	0-10 V
	Current Mode:	0-20 mA
Typical Input Impedance:	Voltage Mode:	91.24 K Ohms
	Current Mode:	249.3 Ohms
Maximum Allowable:	Continuous Input Current:	22.8 mA
Maximum Voltage:	Maximum Input (before soft over-range):	10.7 V

5.1.1 Pin Designation

	J1	J2	J3	J4
1	AI1 (+)	AI3 (+)	AI5 (+)	AI7 (+)
2	AI1 (GND)	AI3 (GND)	AI5 (GND)	AI7 (GND)
3	AI2 (+)	AI4 (+)	AI6 (+)	AI8 (+)
4	AI2 (GND)	AI4 (GND)	AI6 (GND)	AI8 (GND)

5.2 Wiring Requirements

TIP ➤ 🎯 See Figure 2-1 for location of each terminal.

5.2.1 Typical Point Schematic
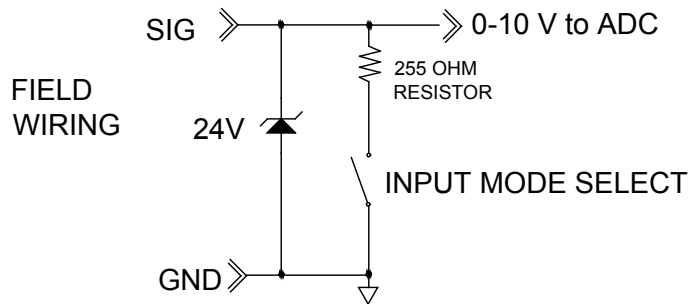
5.3 Examples

5.3.1 Point Connections

TYPICAL VOLTAGE INPUT FIELD WIRING

TYPICAL 2 WIRE 4--20mA DEVICE FIELD WIRING
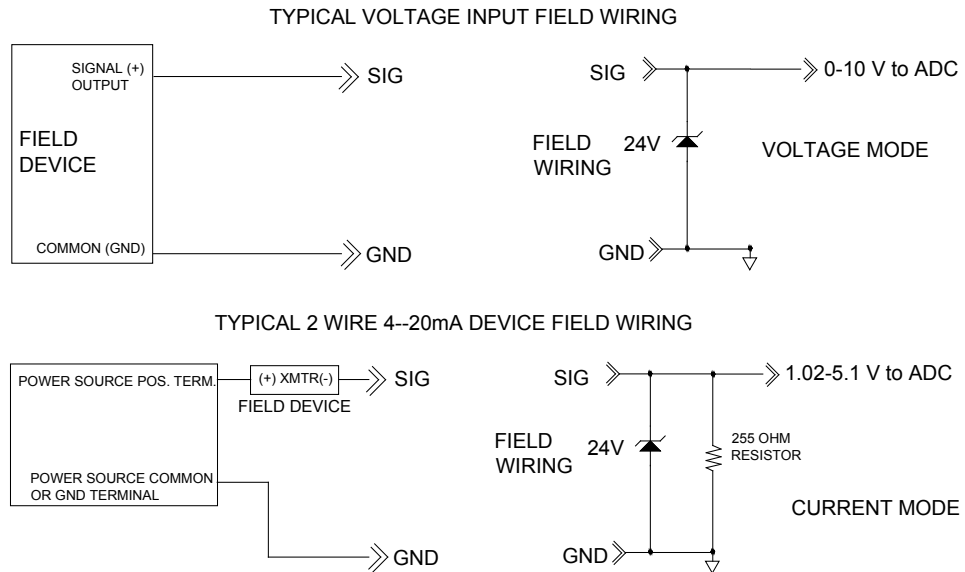
5.4 ARRAY Address

Table 5–1 reflects the ARRAY addresses for the module switch address from position zero to seven.

Table 5–1 Analog Input ARRAY Address from Switch Position

Switch Address	UInt32 Array Number	Float Array Number
0	112	113
1	114	115
2	116	117
3	118	119
4	120	121
5	122	123
6	124	125
7	126	127

5.5 REG Address

See Table 5–2 for the different arrays and registers used by this module. Note that the register numbers are listed for this module using the address 0 (on the rotary switch).

Table 5–2 TFIO Analog Input Register Map

REGISTER	DESCRIPTION	TYPE	ACCESS
112.0	1st Module AI 1 Cal Flags	UInt32	Read
112.1	1st Module AI 2 Cal Flags	UInt32	Read
112.2	1st Module AI 3 Cal Flags	UInt32	Read
112.3	1st Module AI 4 Cal Flags	UInt32	Read
112.4	1st Module AI 5 Cal Flags	UInt32	Read
112.5	1st Module AI 6 Cal Flags	UInt32	Read
112.6	1st Module AI 7 Cal Flags	UInt32	Read
112.7	1st Module AI 8 Cal Flags	UInt32	Read
112.8	1st Module AI 1 Raw A/D Value	UInt32	Read
112.9	1st Module AI 2 Raw A/D Value	UInt32	Read
112.10	1st Module AI 3 Raw A/D Value	UInt32	Read
112.11	1st Module AI 4 Raw A/D Value	UInt32	Read
112.12	1st Module AI 5 Raw A/D Value	UInt32	Read
112.13	1st Module AI 6 Raw A/D Value	UInt32	Read
112.14	1st Module AI 7 Raw A/D Value	UInt32	Read
112.15	1st Module AI 8 Raw A/D Value	UInt32	Read
112.16	1st Module AI 1 Input[5]	UInt32	Read/Write
112.17	1st Module AI 2 Input[5]	UInt32	Read/Write
112.18	1st Module AI 3 Input[5]	UInt32	Read/Write
112.19	1st Module AI 4 Input[5]	UInt32	Read/Write
112.20	1st Module AI 5 Input[5]	UInt32	Read/Write
112.21	1st Module AI 6 Input[5]	UInt32	Read/Write
112.22	1st Module AI 7 Input[5]	UInt32	Read/Write
112.23	1st Module AI 8 Input[5]	UInt32	Read/Write
112.24	1st Module AI 1 Filter[6]	UInt32	Read/Write
112.25	1st Module AI 2 Filter[6]	UInt32	Read/Write
112.26	1st Module AI 3 Filter[6]	UInt32	Read/Write
112.27	1st Module AI 4 Filter[6]	UInt32	Read/Write
112.28	1st Module AI 5 Filter[6]	UInt32	Read/Write
112.29	1st Module AI 6 Filter[6]	UInt32	Read/Write
112.30	1st Module AI 7 Filter[6]	UInt32	Read/Write
112.31	1st Module AI 8 Filter[6]	UInt32	Read/Write
113.0	1st Module AI 1 Scaled Value	Float	Read/Write
113.1	1st Module AI 2 Scaled Value	Float	Read/Write

---

[5] 0 = 0 – 10 V   1 = 4 – 20 mA

[6] 0 = 60hz 1 = 50hz

REGISTER	DESCRIPTION	TYPE	ACCESS
113.2	1st Module AI 3 Scaled Value	Float	Read/Write
113.3	1st Module AI 4 Scaled Value	Float	Read/Write
113.4	1st Module AI 5 Scaled Value	Float	Read/Write
113.5	1st Module AI 6 Scaled Value	Float	Read/Write
113.6	1st Module AI 7 Scaled Value	Float	Read/Write
113.7	1st Module AI 8 Scaled Value	Float	Read/Write
113.16	1st Module AI 1 Cal Zero	Float	Read/Write
113.17	1st Module AI 1 Cal Point One	Float	Read/Write
113.18	1st Module AI 1 Cal Point Two	Float	Read/Write
113.19	1st Module AI 1 Cal Point Three	Float	Read/Write
113.20	1st Module AI 1 Cal Point Four	Float	Read/Write
113.21	1st Module AI 1 Cal Point Five	Float	Read/Write
113.31	1st Module AI 1 Cal Done	Float	Read/Write
113.32	1st Module AI 2 Cal Zero	Float	Read/Write
113.33	1st Module AI 2 Cal Point One	Float	Read/Write
113.34	1st Module AI 2 Cal Point Two	Float	Read/Write
113.35	1st Module AI 2 Cal Point Three	Float	Read/Write
113.36	1st Module AI 2 Cal Point Four	Float	Read/Write
113.37	1st Module AI 2 Cal Point Five	Float	Read/Write
113.47	1st Module AI 2 Cal Done	Float	Read/Write
113.48	1st Module AI 3 Cal Zero	Float	Read/Write
113.49	1st Module AI 3 Cal Point One	Float	Read/Write
113.50	1st Module AI 3 Cal Point Two	Float	Read/Write
113.51	1st Module AI 3 Cal Point Three	Float	Read/Write
113.52	1st Module AI 3 Cal Point Four	Float	Read/Write
113.53	1st Module AI 3 Cal Point Five	Float	Read/Write
113.63	1st Module AI 3 Cal Done	Float	Read/Write
113.64	1st Module AI 4 Cal Zero	Float	Read/Write
113.65	1st Module AI 4 Cal Point One	Float	Read/Write
113.66	1st Module AI 4 Cal Point Two	Float	Read/Write
113.67	1st Module AI 4 Cal Point Three	Float	Read/Write
113.68	1st Module AI 4 Cal Point Four	Float	Read/Write
113.69	1st Module AI 4 Cal Point Five	Float	Read/Write
113.79	1st Module AI 4 Cal Done	Float	Read/Write
113.80	1st Module AI 5 Cal Zero	Float	Read/Write
113.81	1st Module AI 5 Cal Point One	Float	Read/Write
113.82	1st Module AI 5 Cal Point Two	Float	Read/Write
113.83	1st Module AI 5 Cal Point Three	Float	Read/Write
113.84	1st Module AI 5 Cal Point Four	Float	Read/Write
113.85	1st Module AI 5 Cal Point Five	Float	Read/Write

REGISTER	DESCRIPTION	TYPE	ACCESS
113.95	1st Module AI 5 Cal Done	Float	Read/Write
113.96	1st Module AI 6 Cal Zero	Float	Read/Write
113.97	1st Module AI 6 Cal Point One	Float	Read/Write
113.98	1st Module AI 6 Cal Point Two	Float	Read/Write
113.99	1st Module AI 6 Cal Point Three	Float	Read/Write
113.100	1st Module AI 6 Cal Point Four	Float	Read/Write
113.101	1st Module AI 6 Cal Point Five	Float	Read/Write
113.111	1st Module AI 6 Cal Done	Float	Read/Write
113.112	1st Module AI 7 Cal Zero	Float	Read/Write
113.113	1st Module AI 7 Cal Point One	Float	Read/Write
113.114	1st Module AI 7 Cal Point Two	Float	Read/Write
113.115	1st Module AI 7 Cal Point Three	Float	Read/Write
113.116	1st Module AI 7 Cal Point Four	Float	Read/Write
113.117	1st Module AI 7 Cal Point Five	Float	Read/Write
113.127	1st Module AI 7 Cal Done	Float	Read/Write
113.128	1st Module AI 8 Cal Zero	Float	Read/Write
113.129	1st Module AI 8 Cal Point One	Float	Read/Write
113.130	1st Module AI 8 Cal Point Two	Float	Read/Write
113.131	1st Module AI 8 Cal Point Three	Float	Read/Write
113.132	1st Module AI 8 Cal Point Four	Float	Read/Write
113.133	1st Module AI 8 Cal Point Five	Float	Read/Write
113.143	1st Module AI 8 Cal Done	Float	Read/Write

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6.0   TFIO COMMUNICATION INTERFACE MODULE (2100421)

The 2100421 TFIO module is a software-configurable, serial interface capable of communicating with RS–232, RS-422 or two (2) wire RS-485[7] devices at baud rates from 300-38, 400bps.

TFIO Communication Interface Modules (CIM) were designed to be used as Modbus hosts (or masters). They can be used as slaves but may have limitations when used in a slave capacity.

6.1   Specifications

Operational Specifications	VBATT:	TFIO Bus ioVBB @ 2 A Max
	SW. VBATT:	TFIO Bus ioVBB @ 2 A Max
Transient Protection[8]	VBATT:	1500W @ 15 V
	SW. VBATT:	1500W @ 15 V
	Communication Signals:	400W @ ±12 V, IEC 1000-4-2, IEC 1000-4-4
		10/1000usec (non-repetitive)

6.1.1   RS-232 Mode Pin Designation

	J1	J2	J3	J4
1	CTS (input)	RTS (output)	N/A	N.C.
2	RXD (input)	TXD (output)	N/A	N.C.
3	GND	GND	N.C.	N.C.
4	VBATT	SW.VBATT	N.C.	N.C.

6.1.2   RS-422/-485 Mode Pin Designation

	J1	J2	J3	J4
1	RCV+	XMT+	TRM+	N.C.
2	RCV-	XMT-	TRM-	N.C.
3	GND	GND	N.C.	N.C.
4	VBATT	SW.VBATT	N.C.	N.C.

FYI — RCV+, XMT+, RCV- and XMT- respectively must be connected together to form BUS+ and BUS- for two-wire, RS-485 mode operation.

FYI — When terminating an RS-422 or RS-485 bus, jumper J3-1 to J3-2.

TIP — See Figure 2-1 for location of each terminal.

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[7] This implementation does not support Legacy (3-wire) UCI type direction control.

[8] 10/1000usec (non-repetitive).

6.2   Registers

Please note that the CIM has no registers that are accessible by the user.

6.3   CIM Considerations

Several issues need to be considered when implementing protocols on the TFIO CIM. Protocol slaves should use the onboard comm ports, if at all possible. The I^2C bus (serving the TFIO modules) has limited bandwidth. This can affect the processor's ability to keep pace with the communication requirements. Processor loading is extremely dynamic and difficult to predict.

FYI
In regards to CIM communication on the I^2C bus, ABB recommends the following:

- G3 (XFC 2100204 and XRC 2100355 electronic boards)
- Do not use CIMS for slave (interrupting) applications (i.e., Modbus slave, Therms slave, etc.)
- G4 (XFC^{G4} 2102838 and XRC^{G4} 2103022 electronic boards)
- Limit CIM slaves to two (2) CIM devices communicating at 9600 baud or less

CAUTION
Failing to adhere to these recommendations could lead to system communication problems. Should the user attempt to exceed these recommendations, please refer to the following section.

6.3.1   G4 Considerations

If the user attempts to exceed the above ABB recommendations, communication problems could ensue. The following is a list of technical issues that should be considered if communication problems are encountered:

- When experiencing a CIM communication problem, try removing one of the other TFIO modules. If this helps, it would indicate a possible bandwidth limitation.
- Some protocols can be more forgiving than others with respect to bandwidth. If an ASCII protocol is being used, try RTU or vice versa.
- Lowering the baud rate might be helpful.
- Lowering the polling rate or selecting smaller packets can improve performance when bandwidth is limited.
- AGA-7 applications are interrupt-driven by the pulse input. This places heavier timing demands on the processor than AGA-3 applications. If temporarily suspending the AGA-7 application improves performance, it would indicate a possible bandwidth limitation.
- High CPU loading can affect CIM performance. If CPU loading is relatively high (> 70%), the user might temporarily turn off a few applications. If this improves performance, it could be an indicator of excessive processor loading or bandwidth limitations. Refer to the Resources tab in PCCU32.

TIP ⟶◎ Many of the above suggestions are for testing purposes only. These suggestions are aimed at helping the operator isolate the root cause of any communication issue. Primarily, issues pertaining to using TFIO CIM modules in a slave application.

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7.0   TFIO COMBO DIGITAL MODULE (2100543)

The 2100543 TFIO module is a configurable, 8-point digital I/O module. Each point can be configured to be either an input or output. All points are always inputs. However, if the output is activated, the input will be held in a steady state. The module also maintains a 16-bit (module 65536) accumulator for each input.

7.1   Specifications

Electrical (each point)	Open Circuit Voltage:	Vdc (Internally pulled up to 5 Vdc Nom.)
	Short Circuit Leakage Current:	430 uA typical
	Input Capacitance:	000 pF typical
	Maximum Allowable Voltage Range on Input:	0.5 Vdc to 26.5 Vdc
Digital Input	Dry Contact or Voltage Type:	
	Minimum Contact Resistance to Activate Input:	5 KΩ
	Maximum Voltage to Activate the Input:	.0 V (referenced to GND terminal.)
	Minimum Voltage to Deactivate the Input:	.0 V (referenced to GND terminal.)
Digital Output	Open Drain FET Type:	
	RDS(ON.):	0.060 Ω Typical
	Maximum Continuous Sink Current:	A @ 24 Vdc
Pulse Input	Maximum Input Frequency:	850 Hz @ 50% duty cycle
	Minimum High or Low Period:	75 Us

7.1.1   Pin Designation

	J1	J2	J3	J4
1	POINT 1 SIG	POINT 3 SIG	POINT 5 SIG	POINT 7 SIG
2	POINT 1 GND	POINT 3 GND	POINT 5 GND	POINT 7 GND
3	POINT 2 SIG	POINT 4 SIG	POINT 6 SIG	POINT 8 SIG
4	POINT 2 GND	POINT 4 GND	POINT 6 GND	POINT 8 GND

TIP   See Figure 2-1 for location of each terminal.

7.2   Wiring Requirements

When digital outputs are used to sink current, the sum total sink current for all points and modules should not exceed 5 A total. If more than 5 A are required, separate ground wires from the module output ground to the power source ground terminal (bus bar). Failure to do so may cause erratic system operation. Sufficient gauge wire should be used to handle total load current.

Use shielded pair or twisted pair conductors to reduce the possibility of erroneous transitions on the inputs in high EMI/RFI environments (ground the shield at the field device).

7.2.1   Typical Point Schematic
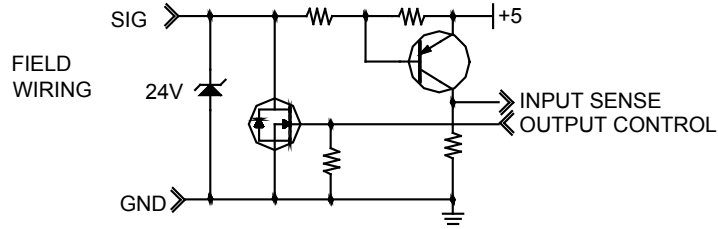
7.3   Examples

7.3.1   Example Connections

POINT CONNECTIONS

TYPICAL VOLTAGE INPUT FIELD

TYPICAL OUTPUT FIELD WIRING
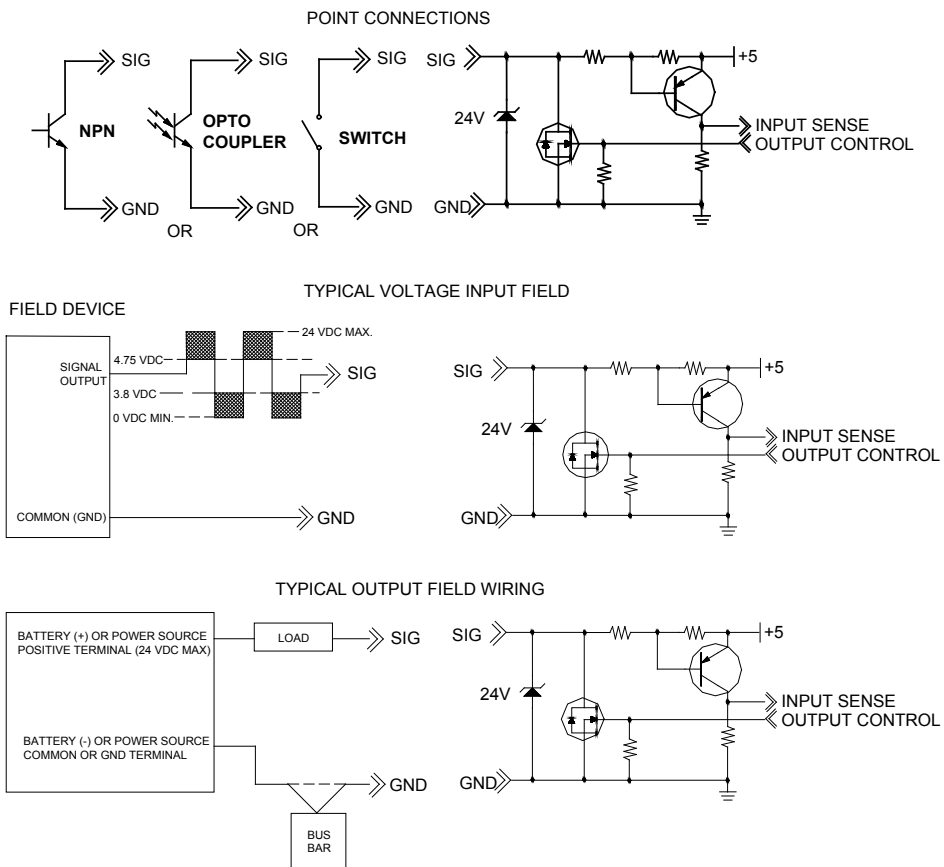
7.4   ARRAY Address

Table 7–1 reflects the ARRAY addresses for the module switch address from position zero to seven.

Table 7–1 Combo Digital ARRAY Address from Switch Position

Switch Address	UInt32 Array Number	Float Array Number
0	64	65
1	66	67
2	68	69
3	70	71
4	72	73
5	74	75
6	76	77
7	78	79

7.5   REG Address

See Table 7–2 for the different arrays and registers used by this module. Note that the register numbers are listed for a combo digital module using the address 0 (on the rotary switch).

Table 7–2 TFIO Combo Digital Register Map

ARR.REG	DESCRIPTION	TYPE	ACCESS
64.0	1st Module Digital Input 1	Float	Read
64.1	1st Module Digital Input 2	Float	Read
64.2	1st Module Digital Input 3	Float	Read
64.3	1st Module Digital Input 4	Float	Read
64.4	1st Module Digital Input 5	Float	Read
64.5	1st Module Digital Input 6	Float	Read
64.6	1st Module Digital Input 7	Float	Read
64.7	1st Module Digital Input 8	Float	Read
64.8	1st Module Digital Output 1	Float	Read
64.9	1st Module Digital Output 2	Float	Read
64.10	1st Module Digital Output 3	Float	Read
64.11	1st Module Digital Output 4	Float	Read
64.12	1st Module Digital Output 5	Float	Read
64.13	1st Module Digital Output 6	Float	Read
64.14	1st Module Digital Output 7	Float	Read
64.15	1st Module Digital Output 8	Float	Read
64.16	1st Module Output Polarity 1	Float	Read/Write
64.17	1st Module Output Polarity 2	Float	Read/Write
64.18	1st Module Output Polarity 3	Float	Read/Write
64.19	1st Module Output Polarity 4	Float	Read/Write
64.20	1st Module Output Polarity 5	Float	Read/Write
64.21	1st Module Output Polarity 6	Float	Read/Write
64.22	1st Module Output Polarity 7	Float	Read/Write

ARR.REG	DESCRIPTION	TYPE	ACCESS
64.23	1st Module Output Polarity 8	Float	Read/Write
65.0	1st Module Pulse Input 1	UInt32	Read
65.1	1st Module Pulse Input 2	UInt32	Read
65.2	1st Module Pulse Input 3	UInt32	Read
65.3	1st Module Pulse Input 4	UInt32	Read
65.4	1st Module Pulse Input 5	UInt32	Read
65.5	1st Module Pulse Input 6	UInt32	Read
65.6	1st Module Pulse Input 7	UInt32	Read
65.7	1st Module Pulse Input 8	UInt32	Read
65.8	1st Module Previous Pulse 1	UInt32	Read
65.9	1st Module Previous Pulse 2	UInt32	Read
65.10	1st Module Previous Pulse 3	UInt32	Read
65.11	1st Module Previous Pulse 4	UInt32	Read
65.12	1st Module Previous Pulse 5	UInt32	Read
65.13	1st Module Previous Pulse 6	UInt32	Read
65.14	1st Module Previous Pulse 7	UInt32	Read
65.15	1st Module Previous Pulse 8	UInt32	Read
65.16	1st Module Total Pulse Count 1	UInt32	Read
65.17	1st Module Total Pulse Count 2	UInt32	Read
65.18	1st Module Total Pulse Count 3	UInt32	Read
65.19	1st Module Total Pulse Count 4	UInt32	Read
65.20	1st Module Total Pulse Count 5	UInt32	Read
65.21	1st Module Total Pulse Count 6	UInt32	Read
65.22	1st Module Total Pulse Count 7	UInt32	Read
65.23	1st Module Total Pulse Count 8	UInt32	Read
65.24	1st Module Raw Pulse Count 1	UInt32	Read
65.25	1st Module Raw Pulse Count 2	UInt32	Read
65.26	1st Module Raw Pulse Count 3	UInt32	Read
65.27	1st Module Raw Pulse Count 4	UInt32	Read
65.28	1st Module Raw Pulse Count 5	UInt32	Read
65.29	1st Module Raw Pulse Count 6	UInt32	Read
65.30	1st Module Raw Pulse Count 7	UInt32	Read
65.31	1st Module Raw Pulse Count 8	UInt32	Read

FYI   The Combo Digital Extended module uses the same Application.Array as seen in Table 7–2.

8.0   TFIO 4-POINT THERMOCOUPLE INPUT MODULE (2100869)

The 2100869 TFIO module is a configurable, 4-point thermocouple input module. The module is designed to monitor temperatures using industry standard thermocouple probes. Each point can be configured to be either J or K type. For proper operation, the installation instructions must be strictly adhered to.

CAUTION The thermocouple leads connected to this device must not contact any external voltage source. Damage to the device will result from connection between the thermocouple leads and the ignition system or any AC or DC power source.

8.1   Specifications

Electrical (each point)	Input Mode	Range
	Type J Mode	-346 to 1400°F (-210 to 760°C)
	Type K Mode	-454 to 2192°F (-270 to 1200°C)
Accuracy	± 1°F (± 0.5°C)	

8.1.1   Pin Designation

	J1	J2	J3	J4
1	Shield	Shield	Shield	Shield
2	TC1 (J-Wht/K-Yel)	TC2 (J-Wht/K-Yel)	TC3 (J-Wht/K-Yel)	TC4 (J-Wht/K-Yel)
3	TC1 Red (-)	TC2 Red (-)	TC3 Red (-)	TC4 Red (-)
4	Shield	Shield	Shield	Shield

8.2   Wiring Requirements

8.2.1   Thermocouples and Thermocouple Extension Wire

Type J or K (ungrounded or grounded) thermocouples may be used; ungrounded thermocouples are recommended, where possible. The appropriate Type J or K thermocouple extension wire must be run from the device thermocouple terminals to each thermocouple-sensing source. Use stranded thermocouple wire with a good moisture-resistant insulation such as PVC; for higher temperatures, Teflon or B-fibre-insulated thermocouple wire is recommended.

Avoid any added junctions, splices and contact with other metals. Take care not to damage the insulation of the thermocouple extension wire when installing. Take precautions against later damage from vibration, abrasion or liquids in conduits.

CAUTION Never run thermocouple wire in the same conduit as ignition wire or other high-energy wiring such as AC line power.

Keep secondary wires to spark plugs and other high voltage wiring at least eight-inches away from thermocouples and extension wiring.

Jumper across the terminals of unused thermocouple inputs.

8.2.2   Testing Thermocouple Leads

If it becomes necessary to check the thermocouple to terminal strip wiring with an ohmmeter or other device, first unplug the thermocouple connector at the module. This will prevent possible damage to the device's sensitive low voltage detection circuitry.

8.3   ARRAY Address

Table 8–1 reflects the ARRAY addresses for the module switch address from position zero to seven.

Table 8–1 Thermocouple ARRAY Address from Switch Position

Switch Address	UInt32 Array Number	Float Array Number
0	128	129
1	130	131
2	132	133
3	134	135
4	136	137
5	138	139
6	140	141
7	142	143

8.4   REG Address

See Table 8–2 for the different arrays and registers used by this module. Note that the register numbers are listed for this module using the address 0 (on the rotary switch).

Table 8–2 TFIO Thermocouple Register Address

REGISTER	DESCRIPTION	TYPE	ACCESS
128.0	1st Module J1 ThermalCouple ADC	UInt32	Read
128.1	1st Module J2 ThermalCouple ADC	UInt32	Read
128.2	1st Module J3 ThermalCouple ADC	UInt32	Read
128.3	1st Module J4 ThermalCouple ADC	UInt32	Read
128.4	1st Module J1 Junction Ref ADC	UInt32	Read
128.5	1st Module J2 Junction Ref ADC	UInt32	Read
128.6	1st Module J3 Junction Ref ADC	UInt32	Read
128.7	1st Module J4 Junction Ref ADC	UInt32	Read
128.8	1st Module J1 Type [9]	UInt32	Read/Write
128.9	1st Module J2 Type[9]	UInt32	Read/Write
128.10	1st Module J3 Type[9]	UInt32	Read/Write
128.11	1st Module J4 Type[9]	UInt32	Read/Write

---

[9] 0 = J type, 1 = K type, 2 RTD type

REGISTER	DESCRIPTION	TYPE	ACCESS
128.12	1st Module Line Filter	UInt32	Read/Write
128.13	1st Module Noise Filter	UInt32	Read/Write
129.0	1st Module J1 DegF Temp	Float	Read
129.1	1st Module J2 DegF Temp	Float	Read
129.2	1st Module J3 DegF Temp	Float	Read
129.3	1st Module J4 DegF Temp	Float	Read
129.4	1st Module J1 DegC Temp	Float	Read
129.5	1st Module J2 DegC Temp	Float	Read
129.6	1st Module J3 DegC Temp	Float	Read
129.7	1st Module J4 DegC Temp	Float	Read
129.8	1st Module J1 DegF Temp Bias	Float	Read/Write
129.9	1st Module J2 DegF Temp Bias	Float	Read/Write
129.10	1st Module J3 DegF Temp Bias	Float	Read/Write
129.11	1st Module J4 DegF Temp Bias	Float	Read/Write
129.12	1st Module J1 DegC Temp Bias	Float	Read/Write
129.13	1st Module J2 DegC Temp Bias	Float	Read/Write
129.14	1st Module J3 DegC Temp Bias	Float	Read/Write
129.15	1st Module J4 DegC Temp Bias	Float	Read/Write

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9.0   TFIO 4-POINT 100Ω PLATINUM RTD INPUT MODULE (2101018)

The 2101018 TFIO module is a configurable, 4-point RTD input module. The module is designed to monitor temperatures using industry standard, 4-wire 100Ω platinum RTD probes with a temperature compensation of 0.00385Ω/Ω/°C. For proper operation, the installation instructions must be strictly adhered to.

CAUTION   The RTD leads connected to this device must not contact any external voltage source. Damage to the device will result from connection between the RTD leads and the ignition system or any AC or DC power source.

9.1   Specifications

Electrical (each point[10]):	Input Mode	Range
	4-Wire 100Ω Platinum	-200 to 850°C (-328 to 1562°F)
	Alpha = 0.00385 (Measurement range of electronics)	
Accuracy:	± 0.25°C (± .5°F)	

9.1.1   Pin Designation

	J1	J2	J3	J4
1	OUT	OUT	OUT	OUT
2	(+)	(+)	(+)	(+)
3	(-)	(-)	(-)	(-)
4	IN	IN	IN	IN

9.2   Wiring Requirements

9.2.1   4-Wire RTD

Take care not to damage the insulation of the RTD wire when installing. Additionally, take precautions against later damage from vibration, abrasion or liquids in conduits.

CAUTION   Never run RTD wire in the same conduit as ignition wire or other high-energy wiring such as AC line power.

Keep secondary wires to spark plugs and other high voltage wiring at least eight-inches away from a RTD and extension wiring.

9.2.2   Testing RTD Leads

If it becomes necessary to check RTD to terminal strip wiring with an ohmmeter or other device, first unplug the RTD connector at the module. This will prevent possible damage to the device's sensitive, low voltage detection circuitry.

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[10] Not inclusive of RTD specifications.

9.3   ARRAY Address

Table 9–1 reflects the ARRAY addresses for the module switch address from position zero to seven.

Table 9–1 4 Point RTD ARRAY Address from Switch Position

Switch Address	UInt32 Array Number	Float Array Number
0	128	129
1	130	131
2	132	133
3	134	135
4	136	137
5	138	139
6	140	141
7	142	143

9.4   REG Address

See Table 9–2 for the different arrays and registers used by this module. Note that the register numbers are listed for this module using the address 0 (on the rotary switch).

Table 9–2 TFIO RTD Register Map

ARR.REG	DESCRIPTION	TYPE	ACCESS
128.0	1st Module J1 ThermalCouple ADC	UInt32	Read
128.1	1st Module J2 ThermalCouple ADC	UInt32	Read
128.2	1st Module J3 ThermalCouple ADC	UInt32	Read
128.3	1st Module J4 ThermalCouple ADC	UInt32	Read
128.4	1st Module J1 Junction Ref ADC	UInt32	Read
128.5	1st Module J2 Junction Ref ADC	UInt32	Read
128.6	1st Module J3 Junction Ref ADC	UInt32	Read
128.7	1st Module J4 Junction Ref ADC	UInt32	Read
128.8	1st Module J1 Type [11]	UInt32	Read/Write
128.9	1st Module J2 Type[11]	UInt32	Read/Write
128.10	1st Module J3 Type[11]	UInt32	Read/Write
128.11	1st Module J4 Type[11]	UInt32	Read/Write
128.12	1st Module Line Filter	UInt32	Read/Write
128.13	1st Module Noise Filter	UInt32	Read/Write
129.0	1st Module J1 DegF Temp	Float	Read
129.1	1st Module J2 DegF Temp	Float	Read
129.2	1st Module J3 DegF Temp	Float	Read

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[11] 0 = J type, 1 = K type, 2 RTD type

ARR.REG	DESCRIPTION	TYPE	ACCESS
129.3	1st Module J4 DegF Temp	Float	Read
129.4	1st Module J1 DegC Temp	Float	Read
129.5	1st Module J2 DegC Temp	Float	Read
129.6	1st Module J3 DegC Temp	Float	Read
129.7	1st Module J4 DegC Temp	Float	Read
129.8	1st Module J1 DegF Temp Bias	Float	Read/Write
129.9	1st Module J2 DegF Temp Bias	Float	Read/Write
129.10	1st Module J3 DegF Temp Bias	Float	Read/Write
129.11	1st Module J4 DegF Temp Bias	Float	Read/Write
129.12	1st Module J1 DegC Temp Bias	Float	Read/Write
129.13	1st Module J2 DegC Temp Bias	Float	Read/Write
129.14	1st Module J3 DegC Temp Bias	Float	Read/Write
129.15	1st Module J4 DegC Temp Bias	Float	Read/Write

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APPENDIX A   I/O INTERFACE APPLICATION REGISTERS

REGISTER	DESCRIPTION	TYPE	ACCESS
0.100	Current Pulse Count 1	UInt32	Read
0.101	Current Pulse Count 2	UInt32	Read
0.104	Previous Pulse Count 1	UInt32	Read
0.105	Previous Pulse Count 2	UInt32	Read
0.108	Total Pulse Count 1	UInt32	Read
0.109	Total Pulse Count 2	UInt32	Read
0.112	Pulse Output 1 Frequency	UInt32	Read/Write
0.113	Pulse Output 2 Frequency	UInt32	Read/Write
0.116	Pulse Output 1 Width	UInt32	Read/Write
0.117	Pulse Output 2 Width	UInt32	Read/Write
0.120	Raw Pulse Counter 1	UInt32	Read
0.121	Raw Pulse Counter 2	UInt32	Read
1.0	Dp Cal Flags	UInt16	Read
1.1	Ap Cal Flags	UInt16	Read
1.2	RTD Cal Flags	UInt16	Read
1.3	AI1 Cal Flags	UInt16	Read
1.4	AI2 Cal Flags	UInt16	Read
1.5	Aix Cal Flags	UInt16	Read
1.6	Statistics Filter Bias	UInt16	Read
1.7	Ground and VREF Sample Count	UInt16	Read
1.8	Temp Sample Count	UInt16	Read
1.9	Pressure Sample Count	UInt16	Read
1.10	Ground and VREF Limit Count	UInt16	Read
1.11	Temp Limit Count	UInt16	Read
1.12	Pressure Limit Count	UInt16	Read
1.13	DP Thermal Recalc Threshold	UInt16	Read/Write
1.14	SP Thermal Recalc Threshold	UInt16	Read/Write
1.15	DP Hardware Revision	UInt16	Read
1.16	SP Hardware Revision	UInt16	Read
1.17	Hardware Init Result	UInt16	Read
2.0	DI 1 State	Byte	Read
2.1	DI 2 State	Byte	Read
2.4	DO 1 State	Byte	Read/Write
2.5	DO 2 State	Byte	Read/Write
2.8	Switched VBatt	Byte	Read
2.11	LCD Power	Byte	Read
2.12	Low Lithium	Byte	Read

REGISTER	DESCRIPTION	TYPE	ACCESS
2.13	Security Switch	Byte	Read
2.14	Local Connection	Byte	Read
2.15	Input 1 Debounce	Byte	Read
2.16	Input 2 Debounce	Byte	Read
2.17	Thread Priority	Byte	Read
2.18	IIC Scan Enabled	Byte	Read/Write
2.65535	Prom Write Enabled	Byte	Read/Write
3.0	DP Live Value	Float	Read
3.1	SP Live Value	Float	Read
3.2	RTD Live Value	Float	Read
3.3	AI 1 Live Value	Float	Read
3.4	AI 2 Live Value	Float	Read
3.5	Battery Voltage	Float	Read
3.6	Charger Voltage	Float	Read
3.7	DP Ground	Float	Read
3.8	SP Ground	Float	Read
3.9	Main Ground	Float	Read
3.10	DP Temp	Float	Read
3.11	SP temp	Float	Read
3.12	RTD Temp	Float	Read
3.13	DP vref	Float	Read
3.14	SP vref	Float	Read
3.15	RTD vref	Float	Read
3.16	RTD Ground	Float	Read
3.17	Map AIS	Float	Read
4.0	DP Live Value	Float	Read
4.1	SP Live Value	Float	Read
4.2	RTD Live Value	Float	Read
4.3	AI 1 Live Value	Float	Read
4.4	AI 2 Live Value	Float	Read
5.0	DP Zero Transducer Value	Float	Read/Write
5.1	DP 0% User Value	Float	Read/Write
5.2	DP 25% User Value	Float	Read/Write
5.3	DP 50% User Value	Float	Read/Write
5.4	DP 75% User Value	Float	Read/Write
5.5	DP 100% User Value	Float	Read/Write
5.6	DP Bias User Value	Float	Read/Write

REGISTER	DESCRIPTION	TYPE	ACCESS
5.14	DP Abort Cal	Float	Read/Write
5.15	DP Finish Cal	Float	Read/Write
5.16	SP Zero Transducer Value	Float	Read/Write
5.17	SP 0% User Value	Float	Read/Write
5.18	SP 25% User Value	Float	Read/Write
5.19	SP 50% User Value	Float	Read/Write
5.20	SP 75% User Value	Float	Read/Write
5.21	SP 100% User Value	Float	Read/Write
5.22	SP Bias User Value	Float	Read/Write
5.30	SP Abort Cal	Float	Read/Write
5.31	SP Finish Cal	Float	Read/Write
5.32	RTD Zero Transducer Value	Float	Read/Write
5.33	RTD 0% User Value	Float	Read/Write
5.34	RTD 25% User Value	Float	Read/Write
5.35	RTD 50% User Value	Float	Read/Write
5.36	RTD 75% User Value	Float	Read/Write
5.37	RTD 100% User Value	Float	Read/Write
5.38	RTD Bias User Value	Float	Read/Write
5.48	AI 1 Zero Transducer Value	Float	Read/Write
5.49	AI 1 0% User Value	Float	Read/Write
5.50	AI 1 25% User Value	Float	Read/Write
5.51	AI 1 50% User Value	Float	Read/Write
5.52	AI 1 75% User Value	Float	Read/Write
5.53	AI 1 100% User Value	Float	Read/Write
5.54	AI 1 Bias User Value	Float	Read/Write
5.62	AI 1 Abort Cal	Float	Read/Write
5.63	AI 1 Finish Cal	Float	Read/Write
5.64	AI 2 Zero Transducer Value	Float	Read/Write
5.65	AI 2 0% User Value	Float	Read/Write
5.66	AI 2 25% User Value	Float	Read/Write
5.67	AI 2 50% User Value	Float	Read/Write
5.68	AI 2 75% User Value	Float	Read/Write
5.69	AI 2 100% User Value	Float	Read/Write
5.70	AI 2 Bias User Value	Float	Read/Write
5.78	AI 2 Abort Cal	Float	Read/Write
5.79	AI 2 Finish Cal	Float	Read/Write
7.0	DP Raw Count	UInt32	Read
7.1	SP Raw Count	UInt32	Read
7.2	RTD Raw Count	UInt32	Read

REGISTER	DESCRIPTION	TYPE	ACCESS
7.3	AI1 Raw Count	UInt32	Read
7.4	AI2 Raw Count	UInt32	Read
7.5	Battery Raw Count	UInt32	Read
7.6	Charger Raw Count	UInt32	Read
7.7	DP Ground Raw Count	UInt32	Read
7.8	SP Ground Raw Count	UInt32	Read
7.9	Main Ground Raw Count	UInt32	Read
7.10	DP Temp Raw Count	UInt32	Read
7.11	SP Temp Raw Count	UInt32	Read
7.12	RTD Temp Raw Count	UInt32	Read
7.13	DP Reference Raw Count	UInt32	Read
7.14	SP Reference Raw Count	UInt32	Read
7.15	RTD Reference Raw Count	UInt32	Read
7.16	RTD Ground Raw Count	UInt32	Read
9.0	DP Status Flag	Byte	Read
9.1	SP Status Flag	Byte	Read
9.2	RTD Status Flag	Byte	Read
9.3	AI1 Status Flag	Byte	Read
9.4	AI2 Status Flag	Byte	Read
9.5	Battery Status Flag	Byte	Read
9.6	Charger Status Flag	Byte	Read
9.7	DP Ground Status Flag	Byte	Read
9.8	SP Ground Status Flag	Byte	Read
9.9	Main Ground Status Flag	Byte	Read
9.10	Dp Temp Status Flag	Byte	Read
9.11	Sp Temp Status Flag	Byte	Read
9.12	RTD Status Flag	Byte	Read
9.13	DP Reference Status Flag	Byte	Read
9.14	SP Reference Status Flag	Byte	Read
9.15	RTD Reference Status Flag	Byte	Read
9.16	RTD Ground Status Flag	Byte	Read
9.17	DP Force Calc Flags	Byte	Read
9.18	SP Force Calc Flags	Byte	Read
9.19	DP Hold Calc Flags	Byte	Read
9.20	SP HOLD Calc Flags	Byte	Read
9.21	DP Temp Stability Statistics Enable	Byte	Read
9.22	DP Stability Statistics Enable	Byte	Read
9.23	SP Temp Stability Statistics Enable	Byte	Read
9.24	SP Stability Statistics Enable	Byte	Read

REGISTER	DESCRIPTION	TYPE	ACCESS
9.25	Battery Stability Statistics Enable	Byte	Read
9.26	Charger Stability Statistics Enable	Byte	Read
9.27	AI1 Stability Statistics Enable	Byte	Read
9.28	AI2 Stability Statistics Enable	Byte	Read
9.29	RTD Stability Statistics Enable	Byte	Read
9.30	DP Cal Low Point Flag	Byte	Read
9.31	DP Cal Mid Point Flag	Byte	Read
9.32	DP Cal High Point Flag	Byte	Read
9.33	DP Cal Mid Low Point Flag	Byte	Read
9.34	DP Cal Mid High Point Flag	Byte	Read
9.35	DP Cal Zero Point Flag	Byte	Read
9.36	DP Field Cal Flag	Byte	Read
9.37	DP Factory Cal Flag	Byte	Read
9.38	SP Cal Low Point Flag	Byte	Read
9.39	SP Cal Mid Point Flag	Byte	Read
9.40	SP Cal High Point Flag	Byte	Read
9.41	SP Cal Mid Low Point Flag	Byte	Read
9.42	SP Cal Mid High Point Flag	Byte	Read
9.43	SP Cal Zero Point Flag	Byte	Read
9.44	SP Field Cal Flag	Byte	Read
9.45	SP Factory Cal Flag	Byte	Read
9.47	AI1 Cal Low Point Flag	Byte	Read
9.48	AI1 Cal Mid Point Flag	Byte	Read
9.49	AI1 Cal High Point Flag	Byte	Read
9.50	AI1 Cal Mid Low Point Flag	Byte	Read
9.51	AI1 Cal Mid High Point Flag	Byte	Read
9.52	AI1 Cal Zero Point Flag	Byte	Read
9.53	AI1 Field Cal Flag	Byte	Read
9.54	AI1 Factory Cal Flag	Byte	Read
9.55	AI2 Cal Low Point Flag	Byte	Read
9.56	AI2 Cal Mid Point Flag	Byte	Read
9.57	AI2 Cal High Point Flag	Byte	Read
9.58	AI2 Cal Mid Low Point Flag	Byte	Read
9.59	AI2 Cal Mid High Point Flag	Byte	Read
9.60	AI2 Cal Zero Point Flag	Byte	Read
9.61	AI2 Field Cal Flag	Byte	Read
9.62	AI2 Factory Cal Flag	Byte	Read
10.48	Scans Started	UInt32	Read
10.49	Scans Finished	UInt32	Read
10.50	A/D Transfers	UInt32	Read

REGISTER	DESCRIPTION	TYPE	ACCESS
10.51	A/D Interrupts	UInt32	Read
10.52	Interrupt Timeouts	UInt32	Read
10.53	A/D Start Failures	UInt32	Read
10.54	Previous Scan Interval	UInt32	Read
10.55	Minimum Scan Interval	UInt32	Read
10.56	Maximum Scan Interval	UInt32	Read
11.0	Part Number	String	Read/Write
11.1	Serial Number	String	Read/Write
11.2	Ethernet MAC Address	String	Read/Write
255.0	Number of Modules	UInt32	Read
255.1	Number of VC Modules	UInt32	Read
255.2	Number of AO Modules	UInt32	Read
255.3	Number of AI Modules	UInt32	Read
255.4	Number of DI Modules	UInt32	Read
255.5	Number of TI Modules	UInt32	Read
254.0-X	Module Type	String	Read

APPENDIX B ABB® DEFINITIONS AND ACRONYMS

TERM	DEFINITION
μ	Greek letter for "mu". Often used in math and engineering as the symbol for "micro". Pronounced as a long u.
μ FLO IMV	μFLO's measurement and operational features are housed in this single unit assembly. The main electronic board (μFLO-195 Board), communication connection, power, SP, DP and Temperature readings are all housed in this unit.
μ FLO-2100767 Board	Main Electronic Board used in the μFLO Computers. It is housed on an integrated assembly and includes the IMV. It operates at 195 MHz while drawing minimal power.
μ Sec	Micro Second.
μFLO 6200	This ABB flow computer is housed in a small lightweight enclosure. It's main feature is its low power, microprocessor based units designed to meet a wide range of measurement, monitor and alarming applications for remote gas systems, while being a cost effective alternative.
*.CSV file	See Comma Separated Values (I.E. spreadsheet format).
*.INI file	See Initialization File.
A/D	Analog-to-digital.
ABB Inc.	Asea, Brown & Boveri, parent company of Totalflow
Absolute Pressure	Gauge pressure plus barometric pressure. ABB devices use Static Pressure (SP) for flow calculations.
Absolute Zero	The zero point on the absolute temperature scale. It is equal to -273.16 degrees C, or 0 degrees K (Kelvin), or -459.69 degrees F, or 0 degrees R (Rankine).
Absorber	A tower or column that provides contact between natural gas being processed and a liquid solvent.
Absorption	The process of removing vapors from a stream of natural gas by passing the natural gas through liquids or chemicals which have a natural attraction to the vapors to be removed from the stream.
Absorption Factor	A factor which is an indication of the tendency for a given gas phase component to be transferred to the liquid solvent. It is generally expressed as A=L/KV where L and V are the moles of liquid and vapor, and K is the average value of the vapor-liquid equilibrium constant for the component of concern.
Absorption Oil	A hydrocarbon liquid used to absorb and recover components from the natural gas being processed.
AC	See Alternating Current.
Accuracy	How closely a measured value agrees with the correct value. Usually expressed as ± percent of full scale output or reading.
Acid Gas	See Gas, Acid.
ACK	See Acknowledgment.

TERM	DEFINITION
Acknowledgment	This refers to a response over a remote communication device to a request such as a PING. Basically, saying, "I'm here, and I saw your request!"
ACM	See Analyzer Control Module.
Acoustics	The degree of sound. The nature, cause, and phenomena of the vibrations of elastic bodies; which vibrations create compressional waves or wave fronts which are transmitted through various media, such as air, water, wood, steel, etc.
Active Analog Output	Analog Output to a host providing power to the host.
Active Mode	An operational mode used by the LevelMaster for measuring dual float levels by applying a signal to the primary windings, reading the voltage level on the secondary windings and using an algorithm to determine the oil and water levels.
Adapter	A mechanism or device for attaching non-mating parts.
ADC	See Analog-to-Digital Converter.
Address	A unique memory designation for location of data or the identity of a peripheral device; allows each device on a single communications line to respond to its own message.
Adiabatic Expansion	The expansion of a gas, vapor, or liquid stream from a higher pressure to a lower pressure in which there is no heat transfer between the gas, vapor, or liquid and the surroundings.
Adsorption	The process of removing natural gas liquids from a stream of natural gas by passing the natural gas through granular solids which have a natural attraction to the liquids to be removed from the stream.
Aerial	A length of wire designed to transmit or receive radio waves. (See also Antenna)
Aerosol Liquids	Minute liquid particles suspended in gas. Aerosols will behave like a fluid and can be transported by pipes and pumping. When aerosols contact each other they coalesce into droplets. Aerosols may be present in gas, or may be generated by glow shearing off the skim inside of a pipeline.
AGA	American Gas Association. Trade group representing natural gas distributors and pipelines.
AGA-10	American Gas Association Report No. 10, Speed of Sound in Natural Gas and Other Related Hydrocarbon Gases. Method for calculation of the speed of sound in gases.
AGA-3	American Gas Association Report No. 3, Orifice Metering of Natural Gas. Method for calculating gas volume across an Orifice Plate. This method requires two pressure readings, Differential Pressure (DP) and Static Pressure (SP).
AGA-5	American Gas Association Report No. 5, Fuel Gas Energy Metering. Methods (Volume, Mass or Energy) for calculating BTUs without knowing the composition of the gas.

TERM	DEFINITION
AGA-7	American Gas Association Report No. 7, Measurement of Gas by Turbine Meters. Method for calculating gas volume using a Pulse Meter. This method requires one pressure reading, Static Pressure (SP).
AGA-8	American Gas Association Report No. 8, Compressibility Factor of Natural Gas and Related Hydrocarbon Gases. Method for calculating the Super Compressibility Factor, Fpv.
AGA-9	American Gas Association Report No. 9, Measurement of Gas by Multipath Ultrasonic Meters. Method for calculating gas based on transit-times.
AGC	Automatic Gain Control
AH	See Ampere-Hour.
AI	Analog Input
AIU	Analyzer Interface Unit.
Alkane	The simplest homologous series of saturated aliphatic hydrocarbons, consisting of methane, ethane, propane, butane; also know as olefins. Unsaturated hydrocarbons that contain one or more carbon-carbon double bonds.
Alkanolamine	See Amine.
Alkynes	Unsaturated hydrocarbons that contain one or more carbon-carbon triple bonds.
Alphanumeric	A character set that contains both letters and digits.
Alternating Current	An electric current whose direction changes with a frequency independent of circuit components.
Aluminum Powder Coating	ABB aluminum enclosures have a baked-on Powder Coating designed to our specifications to ensure paint adhesion, weather resistance and durability.
Ambient Compensation	The design of an instrument such that changes in ambient temperature do not affect the readings of the instrument.
Ambient Conditions	The conditions around the transducer (pressure, temperature, etc.).
Ambient Pressure	Pressure of the air surrounding a transducer.
Ambient Temperature	The average or mean temperature of the surrounding air which comes in contact with the equipment and instruments under test.
Amine (Alkanolamine)	Any of several liquid compounds containing amino nitrogen generally used in water solution to remove, by reversible chemical reaction, hydrogen sulfide and/or carbon dioxide from gas and liquid hydrocarbon streams.
Ammeter	An instrument used to measure current.
Amp	See Ampere.

TERM	DEFINITION
Ampere	The unit of electrical current. Also milliamp (one thousandth of an amp) and micro amp (one millionth of an amp). One amp corresponds to the flow of about 6×10^{18} electrons per second.
Ampere-Hour	The quantity of electricity measured in ampere-hours (Ah) which may be delivered by a cell or battery under specified conditions. A current of one ampere flowing for one hour.
Ampere-Hour Efficiency	The ratio of the output of a secondary cell or battery, measured in ampere-hours, to the input required to restore the initial state of charge, under specified conditions.
Amplifier	A device which draws power from a source other than the input signal and which produces as an output an enlarged reproduction of the essential features of its input.
Amplitude	The highest value reached by voltage, current or power during a complete cycle.
Amplitude Modulation	Where audio signals increase and decrease the amplitude of the "carrier wave".
Amplitude Span	The Y-axis range of a graphic display of data in either the time or frequency domain. Usually a log display (dB) but can also be linear.
AMU	See Analog Measurement Unit.
AMU/IMV	Generic reference to the Measurement unit. See Analog Measurement Unit and Integral Multivariable Transducer for more definition.
Analog	A system in which data is represented as a continuously varying voltage/current.
Analog Input	Data received as varying voltage/current.
Analog Measurement Unit	A transducer for converting energy from one form to another. (e.g. Static and Differential pressure to electrical signals)
Analog Output	A voltage or current signal that is a continuous function of the measured parameter. Data that is transmitted as varying voltage/current.
Analog Trigger	A trigger that occurs at a user-selected point on an incoming analog signal. Triggering can be set to occur at a specific level on either an increasing or a decreasing signal (positive or negative slope).
Analog-to-Digital Converter	An electronic device, often an integrated circuit, that converts an analog voltage to a number.
Analytical Module	The primary component of the NGC8200's modular design is the analytical module. This module comes in a 12VDC or a 24VDC configuration and contains the GC module, Analytical Processing system and manifold. Replacement of this component is enhanced by the single bolt removal feature. This module may also be broken down into the GC module, manifold assembly and analytical processor assembly.

TERM	DEFINITION
Analytical Module	ABB Analytical module assembly contains the GC module, Manifold and Analytical Processor. The modular design features Single Bolt removal.
Analytical Processor Assembly	The Analytical Processor board interfaces with the analog circuits to monitor temperatures, and pressures, and also control the processes. The data generated by the Analytical Processor is passed to the Digital Controller board.
Analyzer Control Module	Consists of various electronic components used for analysis.
Anemometer	An instrument for measuring and/or indicating the velocity of air flow.
Annealed	Toughen (steel or glass) by a process of gradually heating and cooling,
Annunciator	Display of a status on a screen.
ANSI	American National Standards Institute.
Antenna	A length of wire or similar that radiates (such as a transmitting antenna) or absorbs (such as a radio antenna) radio waves. The two basic types are: Yagi (directional) or Omni (bi-directional).
AO	Analog Output
AP	See Absolute Pressure.
API 14.3	American Petroleum Institute Report No. 14.3 addresses the 1992 equation regarding the AGA-3 method for calculating gas volume across an Orifice Plate.
API 21.1	American Petroleum Institute Report No. 21.1 addresses the equation regarding AGA-8 Fpv or Supercompressibility Factor and the energy content of the gas.
API Gravity	An arbitrary scale expressing the relative density of liquid petroleum products. The scale is calibrated in degrees API. The formula is: $DegAPI = \left[\dfrac{141.5}{\gamma(60°F/60°F)} \right] - 131.5$ where γ =relative density.
Archive	A file containing historical records in a compressed format for more efficient long term storage and transfer. ABB archive records are non-editable, meaning that when they are stored they may not be changed. These records are used during an audit of data.
Artificial Drives	Techniques for producing oil after depletion or in lieu of natural drives; includes water flooding, natural gas re-injection, inert gas injection, flue gas injection and in-situ combustion.
Artificial Lift	Any of the techniques, other than natural drives, for bringing oil to the surface.
ASCII	American Standard Code for Information Interchange. A very popular standard method of encoding alphanumeric characters into 7 or 8 binary bits.
ASME	American Society of Mechanical Engineers.

TERM	DEFINITION
ASTM	American Society for Testing and Materials (ASTM International).
ASTM D 3588	ASTM International Standard Practice for calculating heat value, compressibility factor and relative density of gaseous fuels.
Asynchronous	A communications protocol where information can be transmitted at an arbitrary, unsynchronized point in time, without synchronization to a reference time or "clock".
ATC	Automatic temperature compensation.
ATEX	Term used for European Union's New Approach Directive 94/9/EC which concerns equipment and protective systems intended for use in potentially explosive atmospheres.
Atmosphere (one)	A unit of pressure; the pressure that will support a column of mercury 760 mm high at 0 °C.
Atmospheric Pressure	The pressure exerted on the earth by the earth's atmosphere (air and water vapor). A pressure of 760 mm of mercury, 29.92 inches of mercury, or 14.696 pounds per square inch absolute is used as a (scientific) standard for some measurements. Atmospheric pressure may also refer to the absolute ambient pressure at any given location.
Audio Frequency	Generally in the range 20 Hz to 20 KHz.
Audit	To examine or verify data for accuracy. ABB's DB1 and DB2 records may be edited to generate a more accurate representation of data information.
Audit Trail	Using the Long Term Archive files to justify changes made to records that more accurately reflects the correct data. Peripheral information used to edit data is recorded without exception, to justify the accuracy of the edited data records.
Automatic Frequency Control	Similar to Automatic Fine Tune (AFT). A circuit that keeps a receiver in tune with the wanted transmission.
AWG	American Wire Gage.
AWG	Acronym for American Wire Gauge.
Back Pressure	Pressure against which a fluid is flowing. May be composed of friction in pipes, restrictions in pipes, valves, pressure in vessels to which fluid is flowing, hydrostatic head, or other resistance to fluid flow.
Backflush	Technique used in chromatography to reverse direction of the flow after the lighter components have been measured, allowing the heavier components to remain in the column until measured, shortening the length of the column.
Background Acquisition	Data is acquired by a DAQ system while another program or processing routine is running without apparent interruption.
Background Noise	The total noise floor from all sources of interference in a measurement system, independent of the presence of a data signal.
Backup	A system, device, file or facility that can be used as an alternative in case of a malfunction or loss of data.

TERM	DEFINITION
Bandwidth	The range of frequencies available for signaling; the difference between the highest and lowest frequencies of a band expressed in Hertz.
Bar	Bar is equal to 1 atmosphere of pressure. I.e. .987 Standard atmospheric pressure or 14.5 lbs./psia.
Barometer	An instrument which measures atmospheric pressure.
Barrel	A unit of liquid volume measurement in the petroleum industry that equals 42 U.S. gallons (.159 cubic meters) for petroleum or natural gas liquid products, measured at 60 degrees Fahrenheit and at an equilibrium vapor pressure.
Base Pressure	The pressure used as a standard in determining gas volume. Volumes are measured at operating pressures and then corrected to base pressure volume. Base pressure is normally defined in any gas measurement contract. The standard value for natural gas in the United States is 14.73 psia, established by the American National Standards Institute as standard Z-132.1 in 1969.
Basic Sediment and Water	Waste that collects in the bottom of vessels and tanks containing petroleum or petroleum products.
Battery	Two or more electrochemical cells electrically interconnected in an appropriate series/parallel arrangement to provide the required operating voltage and current levels.
Baud	Unit of signaling speed. The speed in baud is the number of discrete conditions or events per second. If each event represents only one bit condition, baud rate equals bits per second (bps).
Baud Rate	Serial communications data transmission rate expressed in bits per second (b/s).
Bbl	See Barrel.
Bcf	Abbreviation for one billion standard cubic feet or one thousand MMcf or one million Mcf.
BG Mix	A liquefied hydrocarbon product composed primarily of butanes and natural gasoline.
Bias	Term used when calibrating. Amounts to offset the actual measurement taken. On a LevelMaster, it refers to adjusting the measurement of the float level to agree with a calibrated measurement. On an RTD (Resistant Thermal Detector), it refers to adjusting the measurement of the temperature to agree with a calibrated temperature. This figure maybe either a positive or negative figure.
BIAS Current	A very low-level DC current generated by the panel meter and superimposed on the signal. This current may introduce a measurable offset across a very high source impedance.
Binary Number	System based on the number 2. The binary digits are 0 and 1.
Binary-Coded Decimal	A code for representing decimal digits in a binary format.

TERM	DEFINITION
BIOS	Basic Input/Output System. A program, usually stored in ROM, which provides the fundamental services required for the operation of the computer. These services range from peripheral control to updating the time of day.
Bipolar	A signal range that includes both positive and negative values.
Bipolar Transistor	The most common form of transistor.
Bit	Binary Digit - the smallest unit of binary data. One binary digit, either 0 or 1. See also byte.
Bits Per Second	Unit of data transmission rate.
Blue Dot Technology	Technological changes to the DC and ACM modules, decreasing noise by changing ground. Allows amplification of the results, gains resolution.
Board	Common name used to identify the Main Electronic Board. Also called Motherboard, Engine Card and Circuit Board.
Boiling Point	The temperature at which a substance in the liquid phase transforms to the gaseous phase; commonly refers to the boiling point of water which is 100°C (212°F) at sea level.
Bootstrap Loader	Abbreviated BSL. Software enabling user to communicate with the PCBA for the purpose of programming the FLASH memory in the microcontroller.
Bounce	Bouncing is the tendency of any two metal contacts in an electronic device to generate multiple signals as the contacts close or open. When you press a key on your computer keyboard, you expect a single contact to be recorded by your computer. In fact, however, there is an initial contact, a slight bounce or lightening up of the contact, then another contact as the bounce ends, yet another bounce back, and so forth. A similar effect takes place when a switch made using a metal contact is opened.
BP Mix	A liquefied hydrocarbon product composed primarily of butanes and propane.
BPS	See Bits Per Second.
Bridge	Generally a short-circuit on a PC board caused by solder joining two adjacent tracks.
Bridge Resistance	See Input impedance and Output impedance.
British Thermal Unit	Energy required to raise one pound of water one degree Fahrenheit. One pound of water at 32 F° requires the transfer of 144 BTUs to freeze into solid ice.
Browser	Software which formats Web pages for viewing; the Web client
BS&W	See Basic Sediment and Water.
BSL	See Bootstrap Loader.
Btu	See British Thermal Unit.

TERM	DEFINITION
Btu Factor	A numerical representation of the heating value of natural gas which may be calculated or presented to indicate varying relationships (e.g., the number of Btu contained in one standard cubic foot or the number of MMBtu contained in one Mcf of gas. The factor for a given relationship will vary depending upon whether the gas is "dry" or "saturated".
Btu Method	A method of allocating costs between different operations or between different products based upon the heat content of products produced in the various operations or of the various produced products.
Btu per Cubic Foot	A measure of the heat available or released when one cubic foot of gas is burned.
Btu, Dry	Heating value contained in cubic foot of natural gas measured and calculated free of moisture content. Contractually, dry may be defined as less than or equal to seven pounds of water per Mcf.
Btu, Saturated	The number of Btu's contained in a cubic foot of natural gas fully saturated with water under actual delivery pressure, temperature and gravity conditions. See BTU, DRY.
Btu/CV	Used to express the heating content of gas. See British Thermal Units or Calorific Value.
BtuMMI	Refers to the interface program or software that operates the Btu Analyzer.
Buffer	(1) A temporary storage device used to compensate for a difference in data rate and data flow between two devices (typically a computer and a printer); also called a spooler; (2) An amplifier to increase the drive capability, current or distance, of an analog or digital signal.
Burst Pressure	The maximum pressure applied to a transducer sensing element or case without causing leakage.
BUS	A data path shared by many devices (e.g., multipoint line) with one or more conductors for transmitting signals, data, or power.
Bus Master	A type of controller with the ability to read and write to devices on the computer bus.
Busbar	A heavy, rigid conductor used for high voltage feeders.
Butane (C4H10)	A saturated hydrocarbon (Alkane) with four carbon atoms in its molecule (C_4H_{10}). A gas at atmospheric pressure and normal temperature, but easily liquefied by pressure. Generally stored and delivered in liquefied form and used as a fuel in gaseous form, obtained by processing natural gas as produced and also from a process in petroleum refining. Contains approximately 3,260 Btu per cubic foot.
Butane, Normal	see Normal Butane.

TERM	DEFINITION
Butylene (C4H8)	A saturated hydrocarbon (Alkane) with four carbon atoms in its molecule (C_4H_8). A gas at room temperature and pressure, but easily liquefied by lowering the temperature or raising the pressure. This gas is colorless, has a distinct odor, and is highly flammable. Although not naturally present in petroleum in high percentages, they can be produced from petrochemicals or by catalytic cracking of petroleum.
Byte	A group of binary digits that combine to make a word. Generally 8 bits. Half byte is called a nibble. Large computers use 16 bits and 32 bits. Also used to denote the amount of memory required to store one byte of data.
C10H22	The molecular formula for Decane.
C1H4	The molecular formula for Methane.
C2H4	The molecular formula for Ethylene.
C2H6	The molecular formula for Ethane.
C3H6	The molecular formula for Propylene.
C3H8	The molecular formula for Propane.
C4H10	The molecular formula for Butane.
C4H8C	The molecular formula for Butylene.
C5+	A standard abbreviation for Pentanes Plus (IC5, NC5 and C6+).
C5H12	The molecular formula for Pentane.
C6+	A standard abbreviation for Hexane Plus.
C6H14	The molecular formula for Hexane.
C7H16	The molecular formula for Heptane.
C8H18	The molecular formula for Octane.
C9H20	The molecular formula for Nonane.
Cache Memory	Fast memory used to improve the performance of a CPU. Instructions that will soon be executed are placed in cache memory shortly before they are needed. This process speeds up the operation of the CPU.
Calibrate	To ascertain, usually by comparison with a standard, the locations at which scale or chart graduations should be placed to correspond to a series of values of the quantity which the instrument is to measure, receive or transmit. Also, to adjust the output of a device, to bring it to a desired value, within a specified tolerance for a particular value of the input. Also, to ascertain the error in the output of a device by checking it against a standard.
Calorie	The quantity of thermal energy required to raise one gram of water 1°C at 15°C.
Calorimeter	An apparatus which is used to determine the heating value of a combustible material.
Capacitor	An electronic component that stores electrical charge.

TERM	DEFINITION
Capacity	The total number of ampere-hours (or watt-hours) that can be withdrawn from a cell/battery under specified conditions of discharge.
CAR	Carrier Gas (located on NGC8200 series Feed-Through Assembly).
Carbon	Base of all hydrocarbons and is capable of combining with hydrogen in many proportions, resulting in numberless hydrocarbon compounds. The carbon content of a hydrocarbon determines, to a degree, the hydrocarbon's burning characteristics and qualities.
Carbon Dioxide	Colorless, odorless and slightly acid-tasting gas, consisting of one atom of carbon joined to two atoms of oxygen. C02. Produced by combustion or oxidation of materials containing carbon. Commonly referred to as dry ice when in its solid form.
Carrier Gas	ABB recommends that Helium be used as a carrier gas. Carrier gas is used in the "Mobile Phase" of chromatography, pushing the sample gas through the columns ("Stationary Phase"). Because Helium has no heating value, it does not affect the Btu values.
Casinghead Gas	Natural gas that is produced from oil wells along with crude oil.
Catalyst	A substance that speeds up a chemical reaction without being consumed itself in the reaction. A substance that alters (usually increases) the rate at which a reaction occurs.
Catalytic	The process of altering, accelerating or instigating a chemical reaction.
Cathode	An electrode through which current leaves any nonmetallic conductor. An electrolytic cathode is an electrode at which positive ions are discharged, or negative ions are formed, or at which other reducing reactions occur. The negative electrode of a galvanic cell; of an electrolytic capacitor.
Cavitation	The boiling of a liquid caused by a decrease in pressure rather than an increase in temperature.
CC	Cubic Centimeters. Measurement unit for measuring volume or capacity in one hundredth of a meter.
CC	Acronym for Cubic Centimeter.
C-Code	C language (IEC supported programming language)
CCU	See DosCCU, WINCCU, PCCU or WEBCCU.
CCV	See Closed Circuit Voltage.
Cd	Coefficient of Discharge factor.
CDPD	Cellular Digital Packet Data
CE	European Community Certification Bureau.
Cell	The basic electrochemical unit used to generate or store electrical energy.
Celsius (centigrade)	A temperature scale defined by 0°C at the ice point and 100°C at boiling point of water at sea level.

TERM	DEFINITION
CENELEC	European Committee for Electro-technical Standardization. Also known as the European Standards Organization.
Centimeter	Acronym c. Metric measurement equal to .3937 inch.
Central Processing Unit	The central part of a computer system that performs operations on data. In a personal computer the CPU is typically a single microprocessor integrated circuit.
Ceramic Insulation	High-temperature compositions of metal oxides used to insulate a pair of thermocouple wires The most common are Alumina (Al2O3), Beryllium (BeO), and Magnesia (MgO). Their application depends upon temperature and type of thermocouple. High-purity alumina is required for platinum alloy thermocouples. Ceramic insulators are available as single and multihole tubes or as beads.
Certification	The process of submitting equipment to specific tests to determine that the equipment meets the specifications or safety standards.
Cf	A standard abbreviation for Cubic foot.
CFG	Configuration File. When saving new configuration files, the file is saved as a *.cfg file.
CFM	The volumetric flow rate of a liquid or gas in cubic feet per minute.
Character	A letter, digit or other symbol that is used as the representation of data. A connected sequence of characters is called a character string.
Characteristics	Detailed information pertaining to its description. The XFC stores this information in the PROM chip. A feature or quality that makes somebody or something recognizable.
Charge	The conversion of electrical energy, provided in the form of a current from an external source, into chemical energy within a cell or battery.
Chip	Another name for integrated circuit or the piece of silicon on which semiconductors are created.
Chromatograph	An instrument used in chemical analysis, to determine the make-up of various substances, and often used to determine the Btu content of natural gas. Chromatography- A method of separating gas compounds by allowing it to seep through an adsorbent so that each compound is adsorbed in a separate layer.
CIM	Communication Interface module. ABB's version is called TFIO Communication Interface module.
Circuit	1. The complete path between two terminals over which one-way or two-way communications may be provided. 2. An electronic path between two or more points, capable of providing a number of channels. 3. A number of conductors connected together for the purpose of carrying an electrical current. 4. An electronic closed-loop path among two or more points used for signal transfer. 5. A number of electrical components, such as resistors, inductances, capacitors, transistors, and power sources connected together in one or more closed loops.

TERM	DEFINITION
Circuit board	Sometimes abbreviated PCB. Printed circuit boards are also called cards. A thin plate on which chips and other electronic components are placed. They fall into the following categories: Motherboard: Typically, the mother board contains the CPU, memory and basic controllers for the system. Sometimes call the system board or main board. Expansion board: Any board that plugs into one of the computer's expansion slots, including controller boards, LAN cards, and video adapters. Daughter Card: Any board that attaches directly to another board. Controller board: A special type of expansion board that contains a controller for a peripheral device. Network Interface Card (NIC): An expansion board that enables a PC to be connected to a local-area network (LAN). Video Adapter: An expansion board that contains a controller for a graphics monitor.
Class 1, Division 1	Class 1 refers to the presence of flammable gases, vapors or liquids. Division 1 indicates an area where ignitable concentrations of flammable gases, vapors or liquids can exist all of the time or some of the time under normal operating conditions.
Class 1, Division 2	Class 1 refers to the presence of flammable gases, vapors or liquids. Division 2 indicates an area where ignitable concentrations of flammable gases, vapors or liquids are not likely to exist under normal operating conditions.
Class 1, Zone 0	Class 1 refers to the presence of flammable gases, vapors or liquids. Zone 0 refers to a place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist is present continuously or for long periods or frequently.
Class 1, Zone 1	Class 1 refers to the presence of flammable gases, vapors or liquids. Zone 1 refers to a place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist is likely to occur in normal operation occasionally.
Class 1, Zone 2	Class 1 refers to the presence of flammable gases, vapors or liquids. Zone 2 refers to a place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist is not likely to occur in normal operation.
Clean Gas	Gas that has no particles larger than one micron and no more than one milligram of solids per cubic meter.
Clear	To restore a device to a prescribed initial state, usually the zero state.
Clock	The source(s) of timing signals for sequencing electronic events (e.g. synchronous data transfer).
Closed Circuit Voltage	The difference in potential between the terminals of a cell/battery when it is discharging (on- load condition).
CM	Acronym for Cubic Meter.

TERM	DEFINITION
Cm	Acronym for Centimeter.
CMM	Acronym for Cubic Meter per Minute.
CMOS	See Complimentary Metal-Oxide-Semiconductor.
CNG	See Compressed Natural Gas
CO_2	A standard abbreviation for Carbon Dioxide.
Coalbed Methane	A methane-rich, sulfur-free natural gas contained within underground coal beds.
Coefficient of expansion	The ratio of the change in length or volume of a body to the original length or volume for a unit change in temperature.
Coil	A conductor wound in a series of turns.
Cold Start	A rebooting technique which will clear all operational errors, loose all data files, but will not damage configuration files if stored on the SDRIVE or tfCold chip.
Cold Weather Enclosure	ABB insulated and heated enclosure designed to house either the NGC8200 or Btu 8000/8100 Chromatographs in inclement climates.
Collector	The semiconductor region in a bipolar junction transistor through which a flow of charge carriers leaves the base region.
Column	Hardware component used in gas chromatography to separate components into measurable units.
Combustible	Classification of liquid substances that will burn on the basis of flash points. A combustible liquid means any liquid having a flash point at or above 37.8°C (100°F) but below 93.3°C (200°F), except any mixture having components with flash points of 93.3°C (200°F) or higher, the total of which makes up 99 percent or more of the total volume of the mixture.
Comma Separated Values	These file types are importable records used by spreadsheet programs to display and manipulate data.
Communication	Transmission and reception of data among data processing equipment and related peripherals.
Communication Port	Comm. Port (abbreviation) refers to the host computer's physical communication's port being used to communicate with the equipment. Used by ABB when discussing local or remote communication with various equipment including the XFC, FCU, XRC, RTU and LevelMaster etc.
Compensation	An addition of specific materials or devices to counteract a known error.
Complimentary Metal-Oxide-Semiconductor	Family of logic devices that uses p-type and n-type channel devices on the same integrated circuit. It has the advantage of offering medium speed and very low power requirements.
Component	(1) A small object or program that performs a specific function and is designed in such a way to easily operate with other components and applications. Increasingly, the term is being used interchangeably with applet. (2) A part of a device.

TERM	DEFINITION
Compressed Gas	A gas or mixture of gases having, in a container an absolute pressure exceeding 40 psi at 21.1°C (70°F). A gas or mixture having in a container, an absolute pressure exceeding 104 psi at 54.4°C (130°F) regardless of the pressure at (21.1°C (70°F). A liquid having a vapor pressure exceeding 40 psi at 37.8°C (70°F) as determined by ASTM D-323-72.
Compressed Natural Gas	Natural gas in high-pressure surface containers that is highly compressed (though not to the point of liquefaction). CNG is used extensively as a transportation fuel for automobiles, trucks and buses in some parts of the world. Small amounts of natural gas are also transported overland in high-pressure containers.
Compressibility	The property of a material which permits it to decrease in volume when subjected to an increase in pressure. In gas-measurement usage, the compressibility factor "Z" is the deviation from the ideal Boyle and Charles' law behavior. See SUPERCOMPRESSIBILITY FACTOR.
Compressibility Factor	See Supercompressibility Factor.
Compressibility Factor	A factor usually expressed as "z" which gives the ratio of the actual volume of gas at a given temperature and pressure to the volume of gas when calculated by the ideal gas law without any consideration of the compressibility factor.
Concentration	Amount of solute per unit volume or mass of solvent or of solution.
Concurrent	Performing more than one task at a time.
Condensate	1) The liquid formed by the condensation of a vapor or gas; specifically, the hydrocarbon liquid separated from natural gas because of changes in temperature and pressure when the gas from the reservoir was delivered to the surface separators. 2) A term used to describe light liquid hydrocarbons separated from crude oil after production and sold separately.
Condensation	Liquefaction of vapor.
Condensed Phases	The liquid and solid phases; phases in which particles interact strongly.
Condensed States	The solid and liquid states.
Conduction	The conveying of electrical energy or heat through or by means of a conductor.
Configuration No.	The Configuration number is a suffix of the serial number which defines the characteristics of the unit.
Console Mode	A local user interface typically used with custom applications that are not supported through any other mechanism. Also referred to as Printer Console Mode.
Contact	Current carrying part of a switch, relay or connector.
Conversion Time	The time required, in an analog input or output system, from the moment a channel is interrogated (such as with a read instruction) to the moment that accurate data is available. This could include switching time, settling time, acquisition time, A/D conversion time, etc.

TERM	DEFINITION
Coprocessor	Another computer processor unit that operates in conjunction with the standard CPU. Can be used to enhance execution speed. For example, the 8087 is designed to perform floating point arithmetic.
COR	See Corrected Runtime.
Corrected Runtime	Correction to signal made to decrease/increase "ZERO phase" and eliminate the shift between RT and COR for increased accuracy.
Cos	See Cosine.
Cosine	The sine of the complement of an arc or angle.
Counterclockwise	Movement in the direct opposite to the rotation of the hands of a clock.
Counts	The number of time intervals counted by the dual-slope A/D converter and displayed as the reading of the panel meter, before addition of the decimal point.
CPS	Cycles per second; the rate or number of periodic events in one second, expressed in Hertz (Hz).
CPU	See Central Processing Unit.
CPUC	California Public Utilities Commission
CRC	See Cyclic Redundancy Check.
Cryogenic Plant	A gas processing plant which is capable of producing natural gas liquids products, including ethane, at very low operating temperatures.
CSA	CSA International: Formerly Canadian Standards Association. Canadian certification agency.
CTS	Communication abbreviation for Clear To Send.
Cubic	Three-dimensional shape with six equal sides. Used in measuring volume.
Cubic Centimeter	Acronym CC. Metric volume equal to a 1 Centimeter to the 3rd power.
Cubic Foot	The most common unit of measurement of gas volume in the US. It is the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure, and water vapor.
Cubic Foot Metered	The quantity of gas that occupies one cubic foot under pressure and temperature conditions in the meter.
Cubic Foot, Standard	That quantity of gas which under a pressure of 14.73 psia and at a temperature of 60 degrees occupies a volume of one cubic foot without adjustment for water vapor content.
Cubic Meter	Acronym CM. Metric volume equal to 35.31467 Cubic Feet.
Cubic Meter Per Minute	Acronym CMM. Metric flow rate equal to 35.31467 Cubic Feet per Minute.
Cumulative Capacity	The total number of ampere-hours (or watt hours) that can be withdrawn from a cell/battery under specified conditions of discharge over a predetermined number of cycles or the cycle life.

TERM	DEFINITION
Current	Current is measured in amps (milliamps and micro amps). It is the passage of electrons. Conventional current flows from positive to negative. Electrons flow from negative to positive - called "electron flow".
Cursor	Dots used to indicate the location of the next character or symbol to be entered.
Custody Transfer	The legal and commercial transfer of a commodity such as natural gas, LNG, etc. from one party to another.
Custody Transfer Transaction	The Custody Transfer Transaction is the hand-off of the physical commodity from one operator to another.
Cut-Off Voltage	The cell/battery voltage at which the discharge is terminated.
CV	Calorific Value. European value of heating content.
CV1	Column 1 Vent (located on NGC8200 series Feed-Through Assembly).
CV2	Column 2 Vent (located on NGC8200 series Feed-Through Assembly).
CWE	Cold Weather Enclosure.
Cycle	One complete sequence of events. One complete alteration of an AC current or Volt. The discharge and subsequent charge of a rechargeable cell/battery is called a cycle.
Cycle Life	The number of cycles under specified conditions which were available from a rechargeable cell/battery before it fails to meet specified criteria as to performance.
Cycle Time	The time usually expressed in seconds for a controller to complete one on/off cycle.
Cyclic Redundancy Check	An ongoing verification of the validity of transmitted and received data providing assurance that the message conforms to a pre-agreed upon convention of communications.
D/A	See Digital-to-analog.
D/I	See Digital Input.
D/O	See Digital Output.
DAC	See Digital to Analog Converter.
DACU	Data Acquisition Control Unit.
Data Acquisition	Gathering information from sources such as sensors and AMUs in an accurate, timely and organized manner. Modern systems convert this information to digital data, which can be stored and processed by a computer.
Data Collect	Physically, locally or remotely, retrieving data stored with a ABB unit. This data is typically stored in records located in a data base format.
DB	See Decibel.
DB1	Acronym for Data Base 1. This refers to the previous data base structure used to store data in ABB products.

TERM	DEFINITION
DB2	Acronym for Data Base 2. This refers to the current data base structure used to store data in ABB products.
DC	See Direct Current
DCD	Communication abbreviation for Data Carrier Detect
DCS/PLC	Distribution Control System/Programmable Logic Controller
DDE	See Digital Data Exchange. Also called Dynamic Data Exchange. May refer to ABB's DDE Server TDS32.
Dead Weight Tester	Portable pressure tester used to check calibration and to calibrate AMU's utilizing a system of calibrated weights.
De-bounce	De-bouncing is any kind of hardware device or software that ensures that only a single signal will be acted upon for a single opening or closing of a contact. When you press a key on your computer keyboard, you expect a single contact to be recorded by your computer. In fact, however, there is an initial contact, a slight bounce or lightening up of the contact, then another contact as the bounce ends, yet another bounce back, and so forth. A similar effect takes place when a switch made using a metal contact is opened. The usual solution is a de-bouncing device or software that ensures that only one digital signal can be registered within the space of a given time (usually milliseconds)
Decane (C10H22)	A hydrocarbon (Alkane) flammable colorless liquid with ten carbon atoms.
Decibel	A logarithmic measure of the ratio of two signal levels. A practical unit of gain.
Decimal	A numbering system based on 10.
Default	A value assigned or an action taken automatically unless another is specified.
Degree	An incremental value in the temperature scale, i.e., there are 100 degrees between the ice point and the boiling point of water in the Celsius scale and 180°F between the same two points in the Fahrenheit scale.
Delivery Point	Point at which gas leaves a transporter's system completing a sale or transportation service transaction between the pipeline company and a sale or transportation service customer.
Demand Day	That 24-hour period specified by a supplier-user contract for purposes of determining the purchaser's daily quantity of gas used (e.g., 8 AM to 8 AM, etc.). This term is primarily used in pipeline-distribution company agreements. It is similar to, and usually coincides with, the distribution company "Contract Day".
Demand Load	The rate of flow of gas required by a consumer or a group of consumers, often an average over a specified short time interval (cf/hr or Mcf/hr). Demand is the cause; load is the effect.
Demand Meters	A device which indicates or records the instantaneous, maximum or integrated (over a specified period) demand.

TERM	DEFINITION
Demand, Average	The demand on a system or any of its parts over an interval of time, determined by dividing the total volume in therms by the number of units of time in the interval.
Density	Mass per unit Volume: D=MV
Desaturization	Doesn't cause the composition of the gas to change, enabling a more representative sample of gas.
Detector Bead	See Thermal Conductivity Detector.
Deviation	The difference between the value of the controlled variable and the value at which it is being controlled.
Dew Point	The temperature at any given pressure at which liquid initially condenses from a gas or vapor. It is specifically applied to the temperature at which water vapor starts to condense from a gas mixture (water dew point) or at which hydrocarbons start to condense (hydrocarbon dew point).
Dewar	A glass or metal container made like a vacuum bottle that is used especially for storing liquefied gases. Also called "Dewar flask".
DG	Display Group. When display group files are created
Diaphragm	A bellows inside a displacement type gas meter. Also, a membrane separating two different pressure areas within a control valve or regulator.
Differential	For an on/off controller, it refers to the temperature difference between the temperature at which the controller turns heat off and the temperature at which the heat is turned back on. It is expressed in degrees.
Differential Input	A signal-input circuit where SIG LO and SIG HI are electrically floating with respect to ANALOG GND (METER GND, which is normally tied to DIG GND). This allows the measurement of the voltage difference between two signals tied to the same ground and provides superior common-mode noise rejection.
Differential Pressure	The pressure difference between two points in a system. For example, the difference in pressure between the upstream and downstream taps of an orifice plate, used to measure volume passing through the orifice.
Digit	A measure of the display span of a panel meter. By convention, a full digit can assume any value from 0 through 9, a 1/2-digit will display a 1 and overload at 2, a 3/4-digit will display digits up to 3 and overload at 4, etc. For example, a meter with a display span of ±3999 counts is said to be a 3-3/4 digit meter.
Digital	A signal which has distinct states, either on or off (0 or 1). Digital computers process data as binary information having either true of false states.

TERM	DEFINITION
Digital Controller Assembly	The Digital Controller Assembly contains the Digital Electronic Board, Mounting Assembly and optionally a VGA Display. The Digital Controller board provides control parameters to the Analytical Processor board, stores and processes the data sent from the Analytical Processor board. The Digital Controller also processes communication with other devices.
Digital Controller Assy.	The NGC8200's digital controller assembly provides control parameters to the analytical processor board, stores and processes the data sent from the analytical processor board. The digital controller also processes communication with other devices. This assembly may also contain an optional VGA display.
Digital Data	Information transmitted in a coded form (from a computer), represented by discrete signal elements.
Digital Data Exchange or Dynamic Data Exchange	A Microsoft data exchange format generally used to transfer data from one program to another. It is a very simple format to use and ABB customers often use TDS to acquire data from ABB devices and then transfer the data to an Excel spreadsheet using DDE. The ABB Driver, TDS32, supports DDE and its network version, NetDDE.
Digital Electronics	The branch of electronics dealing with information in binary form.
Digital Input	Refers to the signal received in binary format.
Digital Output	Refers to the signal emitted in binary format. An output signal which represents the size of an input in the form of a series of discrete quantities.
Digital to Analog Conversion	The process of translating discrete data into a continuously varying signal. Common uses are to present the output of a digital computer as a graphic display or as a test stimulus.
Digital-to-Analog Converter	An electronic device, often an integrated circuit, that converts a digital number into a corresponding analog voltage or current.
DIN	Deutsches Institut für Normung. German Institute for Standardization set of standards recognized throughout the world.
DIN Rail	Rail on which modules are mounted. Allows modules to snap on and slide right and left.
Diode	A semiconductor that allows current to flow in one direction only.
DIP Switches	A bank of switches typically used in setting the hardware configuration and base address of an option card.
Direct Current	A current that does not change in direction and is substantially constant in value.
Direct Memory Access	A method by which information can be transferred from the computer memory to a device on the bus without using the processor.
Discharge	The conversion of chemical energy of a cell/battery into electrical energy and withdrawal of the electrical energy into a load.
Discharge Rate	The rate, usually expressed in amperes, at which electrical current is taken from the cell/battery.

TERM	DEFINITION
Discrete Manifold	Also called Tubing Manifold. Used in instances when the XFC is not mounted directly on the Orifice, usually pipe mount or wall mount.
Distillates	The distillate or middle range of petroleum liquids produced during the processing of crude oil. Products include diesel fuel, heating oil, kerosene and turbine fuel for airplanes.
Distillation	The first stage in the refining process in which crude oil is heated and unfinished petroleum products are initially separated.
Distribution	The act or process of distributing gas from the city gas or plant that portion of utility plant used for the purpose of delivering gas from the city gate or plant to the consumers, or to expenses relating to the operating and maintenance of distribution plant.
Distribution Company	Gas Company which obtains the major portion of its gas operating revenues from the operation of a retail gas distribution system, and which operates no transmission system other than incidental connections within its own system or to the system of another company. For purposes of A.G.A. statistics, a distribution company obtains at least 90 percent of its gas operating revenues from sales to ultimate customers, and classifies at least 90 percent of mains (other than service pipe) as distribution. Compare INTEGRATED COMPANY; TRANSMISSION COMPANY, GAS.
Dkt	Abbreviation for Dekatherm, equivalent to one MMBtu.
DMM	Digital Multi-Meter.
DN	Inside diameter standard.
DOS	Disk Operating System.
DOS CCU	Refers to the DOS version of the Calibration and Collection Unit. Also known as FS/2, hand held or Dog Bone.
DOT Matrix	A group of dots/pixels forming a character or symbol, usually five dots across and seven dots down.
DOT/Pixel	An active element that forms a character or symbol when combined in a matrix.
Download	This refers to a ABB procedure in which any file(s) located on a laptop PC or storage device, may be copied to the on-board memory of a ABB Host device for purposes of restoring, configuration or repair.
Downstream	The oil industry term used to refer to all petroleum activities from the processing of refining crude oil into petroleum products to the distribution, marketing, and shipping of the products. Also see Upstream.
Downstream Pipeline	The pipeline receiving natural gas at a pipeline inter-connect point.
DP	See Differential Pressure.
DRAM	See Dynamic Random Access memory.
Drift	A change of a reading or a set point value over long periods due to several factors including change in ambient temperature, time, and line voltage.

TERM	DEFINITION
Drip Gasoline	Hydrocarbon liquid that separates in a pipeline transporting gas from the well casing, lease separation, or other facilities and drains into equipment from which the liquid can be removed.
Driver (Hardware)	An electronic circuit that provides input to another electronic circuit.
Driver (Software)	A program that exercises a system or system component by simulating the activity of a higher level component.
Drivers	Software that controls a specific hardware device, such as interface boards, PLCs, RTUs, and other I/O devices.
Droplet Liquids	Large liquid particles
Dry Contact	Contacts which neither break nor make a circuit. 0 Ohms.
Dry Gas	Has no more than seven pounds of water per million cubic feet of gas. Gas has less than 0.1 PPM of liquid at the coldest ambient condition expected at the coldest point in the system. The liquid can be water, oil, synthetic lubrication, glycol, condensed sample or any other non vapor contaminate.
DSP	Digital Signal Processor.
Dual Element Sensor	A sensor assembly with two independent sensing elements.
Dual-Access Memory	Memory that can be sequentially accessed by more than one controller or processor but not simultaneously accessed. Also known as shared memory.
Duplex	The ability to both send and receive data simultaneously over the same communications line.
Duplex Wire	A pair of wires insulated from each other and with an outer jacket of insulation around the inner insulated pair.
Duty Cycle	The total time to one on/off cycle. Usually refers to the on/off cycle time of a temperature controller.
DVI	The Port Manager and communication engine of the SCADAvantage System. This software can multiplex among several communication formats and thus supporting several vendor's equipment over a single radio frequency. It "pushes" new data to the SCADA database, saving time and network resources by not transmitting redundant data. The DVI includes the ABB WinCPC code and thus supports all ABB software and functions – including WinCCU, TDS, PCCU, Report by exception, cryout, etc.
Dynamic Random Access memory	This is the most common form of computer memory It needs to be continually refreshed in order to properly hold data, thus the term "dynamic."
E^2Prom	See Electrically Erasable Programmable Read-Only Memory. Also called EEPROM.
Earth	Can mean a connection to the earth itself or the negative lead to the chassis or any point to zero voltage.
EC	European Community.

TERM	DEFINITION
Echo	To reflect received data to the sender. i.e., depressed on a keyboard are usually echoed as characters displayed on the screen.
Edit	Making changes to information, data or configuration files.
EEPROM	See Electrically Erasable Programmable Read-Only Memory. The PROM can be erased by electricity.
EFI	Electromechanical Frequency Interface.
EFM	See Electronic Flow Measurement.
EFR	Enhance Feature Release.
Electrical Interference	Electrical noise induced upon the signal wires that obscures the wanted information signal.
Electrically Erasable Programmable Read-Only Memory	ROM that can be erased with an electrical signal and reprogrammed. Also referred to as the S Drive. It is a persistent drive that will not loose its memory unless manually reprogrammed. Also called E^2Prom. ABB's XFC and XRC have a Serial EEPROM on board, which generally holds registry, application configuration and warranty information (non-volatile).
Electrode	The site, area, or location at which electrochemical processes take place.
Electromagnetic Compatibility	Term used for European Union's New Approach Directive 2004/108/EC, which means the device or system is able to function in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.
Electromagnetic Interference	Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. It can be induced intentionally, as in some forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, intermodulation products, and the like.
Electronic Flow Measurement	Historically, flow measurement was tracked using a chart recording technology. Developments in the field of electronics allowed for electronic measurement devices to overtake the chart recording market. This field continues to develop into peripheral markets, making the "Flow Meter" a valuable asset with multi-tasking "Control" capabilities. ABB's answer to this developing market is the XSeries equipment.
EMC	See Electromagnetic Compatibility
EMI	See Electromagnetic Interference.
Emitter	One terminal of a transistor.
EN	Euro Norm (European Standard)
Enagas	Spain's Certification Board
Encoder	A device that converts linear or rotary displacement into digital or pulse signals. The most popular type of encoder is the optical encoder, which uses a rotating disk with alternating opaque areas, a light source, and a photodetector.

TERM	DEFINITION
Environmental Conditions	All conditions in which a transducer may be exposed during shipping, storage, handling, and operation.
EP Mix	A liquefiable hydrocarbon product consisting primarily of ethane and propane.
EPROM	See Erasable Programmable Read-Only Memory. The PROM can be erased by ultraviolet light or electricity.
Erasable Programmable Read-Only Memory	ROM that can be erased using Ultraviolet Light. The EPROM maybe re-programmed by removing the EPROM from the circuit and using special equipment to write to it.
Ethane (C2H6)	A colorless hydrocarbon gas of slight odor having a gross heating value of 1,773 Btu per cubic foot and a specific gravity of 1.0488. It is a normal constituent of natural gas.
Ethylene (C2H4)	A colorless unsaturated hydrocarbon gas of slight odor having a gross heating value of 1,604 Btu per cubic foot and a specific gravity of 0.9740. It is usually present in manufactured gas, constituting one of its elements and is very flammable.
EU	European Union. Formerly known as the European Community (EC). Members of this union are replacing individual national regulations of member countries with a series of Directives. These Directives are legislative instruments which oblige member states to introduce them into their existing laws. These directives harmonize a variety of existing practices, preserve the different legal traditions and settle constraints for further developments.
Event	Important incident: an occurrence, especially one that is particularly significant.
Event File	Stored records specifying a notable change. The XFC stores up to 200 records, containing: Time, Day, Description, Old Value, New Value.
Events	Signals or interrupts generated by a device to notify another device of an asynchronous event. The contents of events are device-dependent.
Ex	Potential Explosive.
EXIMV	Explosion Proof Integral Multivariable Transducer.
Expansion Board	A plug-in circuit board that adds features or capabilities beyond those basic to a computer, such as a data acquisition system expansion board.
Expansion Factor	Correction factor for the change in density between two pressure measurement areas in a constricted flow.
Expansion Slots	The spaces provided in a computer for expansion boards than enhance the basic operation of the computer.
Explosion-proof Enclosure	Explosion Proof Enclosure for Class 1 Division 1 locations. An enclosure that can withstand an explosion of gases within it and prevent the explosion of gases surrounding it due to sparks, flashes or the explosion of the container itself, and maintain an external temperature which will not ignite the surrounding gases.

TERM	DEFINITION
Extended Binary Coded Decimal Interchange Code	EBCDIC. An eight-bit character code used primarily in IBM equipment. The code allows for 256 different bit patterns.
External Multivariable Transducer	Multivariable Transducer located outside of the flow computer enclosure. Used in multi-tube configurations and on systems where the actual flow computer is located at a distance from the flowing tube.
External Transducer	DP/SP Transducer located outside the enclosure. All electronics are located inside the enclosure and communicate via a ribbon cable.
F.O.B.	Abbreviation of free on board with the cost of delivery to a port and loading onto a ship included.
Fa	Orifice Thermal Expansion factor.
Fahrenheit	A temperature scale defined by 32° at the ice point and 212° at the boiling point of water at sea level.
Faux	Full Well Stream Factor.
Fb	Basic Orifice factor.
FBD	Function Block Diagram (IEC supported programming language)
FCC	Federal Communications Commission.
FCU	Flow computer unit
Feed Points	Connections between gas feeder lines and distribution networks.
Feedback	Occurs when some or all of the output of the device (such as an amplifier) is taken back to the input. This may be accidental (such as the acoustic feedback from a speaker to microphone) or intentional , to reduce distortion.
Feeder (Main)	A gas main or supply line that delivers gas from a city gate station or other source of supply to the distribution networks.
Feed-Through Assembly	The Feed-Through Assembly also serves as the connection for sample streams, carrier gas and calibration streams, and contains the vents for sample and column gases.
Feed-through Assy.	Independent process streams are connected to the NGC8200 directly through the feed-through assembly or through an optionally installed sample conditioning system. The feed-through assembly also serves as the connection for carrier gas and calibration streams and contains the vents for sample and column gases.
FET	Field-effect transistor. Transistor with electric field controlling output: a transistor, with three or more electrodes, in which the output current is controlled by a variable electric field.
Fg	Specific Gravity factor.
Field Pressure	The pressure of natural gas as it is found in the underground formations from which it is produced.
File	A set of related records or data treated as a unit.

TERM	DEFINITION
Film Liquids	Aerosols liquids who have contacted each other and become adhered to the inside of the pipeline.
Firmware	A computer program or software stored permanently in PROM or ROM or semi-permanently in EPROM.
Firmware Version	This refers to the version of firmware contained in the equipment.
Fixed-Point	A format for processing or storing numbers as digital integers.
Flag	Any of various types of indicators used for identification of a condition or event; for example, a character that signals the termination of a transmission.
Flameproof Enclosure "d"	Enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture, and which prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure.
Flammable	A liquid as defined by NFPD and DOT as having a flash point below 37.8°C (100°F).
Flange	For pipe, a metal collar drilled with bolt holes and attached to the pipe with its flat surface at right angles to the pipe axis so that it can be securely bolted to a mating flange on a valve, another pipe section, etc.
FLASH	Re-programmable memory onboard an XFC/XRC, similar to an EPROM, except that it can be programmed while in circuit using a Boot Loader Program to write to it. Generally used for the operating system and application code space (non-volatile).
Flash ADC	An Analog to Digital Converter whose output code is determined in a single step by a bank of comparators and encoding logic.
Flash Point	The temperature at which a liquid will yield enough flammable vapor to ignite. There are various recognized industrial testing methods; therefore the method used must be stated.
Flash Vapors	Gas vapors released from a stream of natural gas liquids as a result of an increase in temperature or a decrease in pressure.
Flow	Travel of liquids or gases in response to a force (i.e., pressure or gravity).
Flow Computer, XSeries	A device placed on location to measure SP, DP and temperature (to calculate flow) of gases or liquids being transferred, for remote unattended operation.
Flow Formulas	In the gas industry, formulas used to determine gas flow rates or pressure drops in pipelines, regulators, valves, meters, etc.
Flow Rate	Actual speed or velocity of fluid movement .
Flowmeter	A device used for measuring the flow or quantity of a moving fluid.
Fluids	Substances that flow freely; gases and liquids.
FM	Factory Mutual Research Corporation. An organization which sets industrial safety standards.

TERM	DEFINITION
FM Approved	An instrument that meets a specific set of specifications established by Factory Mutual Research Corporation.
Font	The style of lettering used to display information.
Footprint	The surface space required for an object.
Fpb	Pressure Base factor.
FPM	Flow velocity in feet per minute.
FPS	Flow velocity in feet per second.
Fpv	See Supercompressibility Factor.
Fr	Reynolds Number factor.
Fractionation	The process of separating a steam of natural gas liquids into its separate components.
Freezing Point	The temperature at which the substance goes from the liquid phase to the solid phase.
Frequency	The number of cycles per second for any periodic waveform - measured in cycles per second - now called Hertz. The number of repeating corresponding points on a wave that pass a given observation point per unit time.
Frequency Modulation	Modulation where the frequency of the sine wave carrier alters with the amplitude of the modulating signal.
Frequency Output	An output in the form of frequency which varies as a function of the applied input.
Frit Filter	A small fine filter used primarily on the NGC8200 product line in the feed-through assembly as a last stage gas filter. This filter is not designed to replace an appropriate sample conditioning system.
FRP	Fiberglass Reinforced Polyurethane. A non-flexible material used for LevelMaster sensors.
FS/2	Ruggadized handheld computer device for programming and collecting data from an XFC. Also referred to a Husky or Dog Bone.
FT^3	A standard abbreviation for Cubic Foot.
Ftb	Temperature Base factor.
Ftf	Flowing Temperature factor.
Fuel Oils	The heavy distillates from the oil refining process that are used primarily for heating, for fueling industrial processes, for fueling locomotives and ships, and for fueling power generation systems.
Full Bridge	Wheatstone bridge configuration utilizing four active elements or strain gauges.
Full Duplex	Simultaneous, two-way (transmit and receive), transmission.
Function	A set of software instructions executed by a single line of code that may have input and/or output parameters and returns a value when executed.

TERM	DEFINITION
Fuse	A short length of wire that will easily burn out when excessive current flows.
Fw	Water Vapor factor.
G	The symbol used for giga or gigabyte.
G4	ABB's new Generation 4 extendable XFC equipment featuring technology that is expandable and flexible for ever changing needs.
Gain	The factor by which a signal is amplified, sometimes expressed in dB.
Gain Accuracy	A measure of deviation of the gain of an amplifier from the ideal gain.
Gal	An abbreviation for one gallon.
Gas	That state of matter which has neither independent shape nor volume. It expands to fill the entire container in which it is held. It is one of the three forms of matter, the other two being solid and liquid.
Gas Chromatograph	An analytical instrument that separates mixtures of gas into identifiable components by means of chromatography.
Gas Chromatograph Module	Software module used in conjunction with PCCU32 and WINCCU to interact with Btu Chromatograph equipment and software.
Gas Chromatograph Module Coefficient	A co-efficient generated by the factory allowing user to start calibration on location without having a calibration gas available.
Gas Chromatography	Preferred method for determining the Btu value of natural gas.
Gas Field	A district or area from which natural gas is produced.
Gas Injection	An enhanced recovery technique in which natural gas is injected under pressure into a producing reservoir through an injection well to drive oil to the well bore and the surface.
Gas Processing	The separation of components by absorption, adsorption, refrigeration or cryogenics from a stream of natural gas for the purpose of making salable liquid products and for treating the residue gas to meet required specifications.
Gas, Acid	The hydrogen sulfide and/or carbon dioxide contained in, or extracted from, gas or other streams.
Gas, Associated	Gas produced in association with oil, or from a gas cap overlying and in contact with the crude oil in the reservoir. In general, most states restrict associated gas production since its indiscriminate production could reduce the ultimate oil recovery. Also, since some wells producing associated gas cannot be shut-in without also shutting-in the oil production, natural gas pipelines are generally required to take associated gas produced from oil wells on a priority basis.
Gas, C1	See Methane.
Gas, C2	See Ethane.
Gas, C3	See Propane.
Gas, C5+	Pentanes Plus (IC5, NeoC5, NC5 and C6+)

TERM	DEFINITION
Gas, C6+	Hexanes Plus (C6, C7, C8, C9, C10, C11, etc.).
Gas, CO2	See Carbon Dioxide.
Gas, Dry	Gas whose water content has been reduced by a dehydration process. Gas containing little or no hydrocarbons commercially recoverable as liquid product. Specified small quantities of liquids are permitted by varying statutory definitions in certain states.
Gas, IC4	See Iso-Butane.
Gas, IC5	See Iso-Pentane.
Gas, Liquefied Petroleum (LPG)	A gas containing certain specific hydrocarbons which are gaseous under normal atmospheric conditions but can be liquefied under moderate pressure at normal temperatures. Propane and butane are the principal examples.
Gas, Manufactured	A gas obtained by destructive distillation of coal, or by the thermal decomposition of oil, or by the reaction of steam passing through a bed of heated coal or coke, or catalyst beds. Examples are coal gases, coke oven gases, producer gas, blast furnace gas, blue (water) gas, and carbureted water gas. Btu content varies widely.
Gas, Natural	A naturally occurring mixture of hydrocarbon and non-hydrocarbon gases found in porous geologic formations beneath the earth's surface, often in association with petroleum. The principal constituent is methane.
Gas, NC4	See Normal Butane.
Gas, NC5	See Normal Pentane.
Gas, NeoC5	See Neo-Pentane.
Gas, Non-associated	Free natural gas not in contact with, nor dissolved in, crude oil in the reservoir.
Gas, Oil	A gas resulting from the thermal decomposition of petroleum oils, composed mainly of volatile hydrocarbons and hydrogen. The true heating value of oil gas may vary between 800 and 1600 Btu per cubic foot depending on operating conditions and feedstock properties.
Gas, Sour	Gas found in its natural state, containing such amounts of compounds of sulfur as to make it impractical to use, without purifying, because of its corrosive effect on piping and equipment.
Gas, Sweet	Gas found in its natural state, containing such small amounts of compounds of sulfur that it can be used without purifying, with no deleterious effect on piping and equipment.
Gas, Unconventional	Gas that can not be economically produced using current technology.
Gas, Wet	Wet natural gas is unprocessed natural gas or partially processed natural gas produced from strata containing condensable hydrocarbons. The term is subject to varying legal definitions as specified by certain state statutes.

TERM	DEFINITION
Gate Station	Generally a location at which gas changes ownership, from one party to another, neither of which is the ultimate consumer. It should be noted, however, that the gas may change from one system to another at this point without changing ownership. Also referred to as city gate station, town border station, or delivery point.
Gathering	The act of operating extensive low-pressure gas lines which aggregate the production of several separate gas wells into one larger receipt point into an interstate pipeline.
Gathering Agreement	Agreement between a producer and a gathering system operator specifying the terms and conditions for entry of the producer's gas into the gathering system.
Gathering Line	A pipeline, usually of small diameter, used in gathering gas from the field to a central point.
Gathering Station	A compressor station at which gas is gathered from wells by means of suction because pressure is not sufficient to produce the desired rate of flow into a transmission or distribution system.
Gathering System	The gathering pipelines plus any pumps, tanks, or additional equipment used to move oil or gas from the wellhead to the main pipeline for delivery to a processing facility or consumer.
Gauge Factor	A measure of the ratio of the relative change of resistance to the relative change in length of a piezoresistive strain gage.
Gauge Pressure	Absolute pressure minus local atmospheric pressure.
Gauge, Pressure	Instrument for measuring the relative pressure of a fluid. Types include gauge, absolute, and differential.
Gauging Tape Measurements	This refers to a manual method of measuring the level of a liquid in a tank. These measurements may be used to calibrate float levels.
GC	See Gas Chromatograph.
GC Module	The NGC8200's GC module is comprised of three parts: columns, chromatographic valve and GC module circuit board. The valve controls the flow of gas within the system. The columns perform the separation of the gas into component parts for analysis. The GC module circuit board contains the sensors for the carrier pressure regulators, the sample pressure sensor and the thermal conductivity detectors (TCD's) which detect the different gas components as they leave the GC columns. It also contains an EEPROM or FLASH memory for storage of calibration and characterization information of the module and its sensors.
GC Module Assembly	The GC module is comprised of 3 parts; Columns, Valves and Electronic Interface. The Valves control flow of gas within the system. The Columns perform the separation of the gas into component parts for analysis. The Electronic Interface contains pressure and temperature sensors to monitor and detect the different gas components as they leave the GC Columns.
GCM	See Gas Chromatograph Module

TERM	DEFINITION
GCM	See Gas Chromatograph Module Coefficient.
GCN	Gravity, Carbon Dioxide and Nitrogen compounds. Used in NX-19 GCN Supercompressibility Factor.
GCNM	Gravity, Carbon Dioxide, Nitrogen and Methane compounds. Used in NX-19 GCNM Supercompressibility Factor.
GDF	Gasde of France
Gj	An abbreviation for gigajoule, equivalent to one thousand mega joules or one billion joules.
GND	See Ground.
GOST	Russian Government Standards for Importation.
GPA 2145-03	Gas Processors Association Physical Constants for Paraffin Hydrocarbons and other Components of Natural Gas
GPA 2172-96	Gas Processors Association Calculation of Gross Heating Value, Relative Density and Compressibility of Natural Gas Mixtures from Compositional Analysis.
GPM	Gallons of liquid per thousand cubic feet.
GPS 2261	See Gas Processors Standard 2261.
GPV	Gauge Port Vent. Refers to the NGC8200 Port designed to equalize the pressure inside of the explosion-proof enclosure.
GPV	Gauge Port Valve (located on NGC8200 series Feed-Through Assembly).
GRD	See Ground.
Gross Heating Value	The heating value measured in a calorimeter when the water produced during the combustion process is condensed to a liquid state. The heat of condensation of the water is included in the total measured heat.
Ground	1) An electronically neutral circuit having the same potential as the surrounding earth. Normally, a non-current carrying circuit intended for the safety purposes. A reference point for an electrical system. 2) A large conducting body (as the earth) used as a common return for an electric circuit and as an arbitrary zero of potential. 3) Reference point for an electrical system.
Grounding Strap	A grounding strap is a conductive device used to make connection between the person handling the board, and a high quality ground potential.
H2	The molecular formula for Hydrogen.
H2S	The molecular formula for Hydrogen Sulfide.
Half Duplex	Communication transmission in one direction at a time.
Handshake	An interface procedure that is based on status/data signals that assure orderly data transfer as opposed to asynchronous exchange.

TERM	DEFINITION
Handshaking	Exchange of predetermined signals between two devices establishing a connection. Usually part of a communications protocol.
Hardware	The physical components of a computer system, such as the circuit boards, plug-in boards, chassis, enclosures, peripherals, cables, and so on. It does not include data or computer programs.
Harmonic	A sinusoidal component of a waveform that is a whole multiple of the fundamental frequency. An oscillation that is an integral sub-multiple of the fundamental is called a sub-harmonic.
HART	Communication Interface.
Hazardous Area	Area in which an explosive gas atmosphere is present or may be expected to be present.
Heat	Thermal energy. Heat is expressed in units of calories or Btu's
Heat Capacity	The amount of heat required to raise the temperature of a body (of any mass) one degree Celsius.
Heat of Condensation	The amount of heat that must be removed from one gram of a vapor at its condensation point to condense the vapor with no change in temperature.
Heat of Vaporization	The amount of heat required to vaporize one gram of a liquid at its boiling point with no change in temperature. Usually expressed in J/g. The molar heat of vaporization is the amount of heat required to vaporize one mole of liquid at its boiling point with no change in temperature and usually expressed ion kJ/mol.
Heat Transfer	A form of energy that flows between two samples of matter because of their differences in temperature.
Heating Value	The amount of heat developed by the complete combustion of a unit quantity of a material. Heating values for natural gas are usually expressed as the Btu per Cf of gas at designated conditions (temperature and pressure) and either on the dry or water saturated basis.
Heavy Crude	Crude oil of 20-degree API gravity or less; often very thick and viscous.
Heavy Ends	The portion of a hydrocarbon mixture having the highest boiling point. Hexanes or heptanes and all heavier hydrocarbons are usually the heavy ends in a natural gas stream.
Heavy Hydrocarbons	More susceptible to increases in temperature and decreases in pressure, thus causing liquids to form.
Heptane (C7H16)	A saturated hydrocarbon (Alkane) with 7 carbon atoms in its molecule (C7H16). A liquid under normal conditions.
Hertz	Cycles per second. A measure of frequency or bandwidth.
Hexadecimal	A numbering system to the base 16, 0 through F.
Hexane (C6H14)	A saturated hydrocarbon (Alkane) with six carbon atoms in its molecule (C6H14). A liquid under normal conditions.

TERM	DEFINITION
Hexane Plus or Heptane Plus	The portion of a hydrocarbon fluid mixture or the last component of a hydrocarbon analysis which contains the hexanes (or heptanes) and all hydrocarbons heavier than the hexanes (or heptanes).
Hierarchical	A method of organizing computer programs with a series of levels, each with further subdivisions, as in a pyramid or tree structure.
Hold	Meter HOLD is an external input which is used to stop the A/D process and freeze the display. BCD HOLD is an external input used to freeze the BCD output while allowing the A/D process to continue operation.
Host	The primary or controlling computer in a multiple part system.
Host Console	Host Console via Local Port uses the PCCU cable between the computer and the device's Local PCCU port but running Remote Protocol. Host Console via Remote Port uses the remote protocol
Hub	A market or supply area pooling/delivery where gas supply transaction point occur that serve to facilitate the movement of gas between and among interstate pipelines. Transactions can include a change in title, a change in transporter, or other similar items.
HV	See Heating Value.
Hydrocarbon	A chemical compound composed solely of carbon and hydrogen. The compounds having a small number of carbon and hydrogen atoms in their molecules are usually gaseous; those with a larger number of atoms are liquid, and the compounds with the largest number of atoms are solid.
Hydrogen Sulfide	A flammable, very poisonous and corrosive gas with a markedly disagreeable odor, having the chemical formula of H_2S that is a contaminant in natural gas and natural gas liquids.
Hyper term	Terminal emulation program provided with Windows.
Hysteresis	The maximum difference between output readings for the same measured point, one point obtained while increasing from zero and the other while decreasing from full scale. The points are taken on the same continuous cycle. The deviation is expressed as a percent of full scale.
I/O	See Input/Output.
I/O Address	A method that allows the CPU to distinguish between the different boards in a system. All boards must have different addresses.
I^2C	Inter-Integrated Circuit. Serial communications bus to I/O modules (developed by Phillips Semiconductor)
IAR	Maker and distributor of the Embedded Workbench, a compiler, assembler, linker development system for the Z80/64180 microprocessor family.
IC	See Integrated Circuit
IC4	A standard abbreviation for Isobutane.
IC5	A standard abbreviation for Isopentane.

TERM	DEFINITION
Icon	A graphic functional symbol display. A graphic representation of a function or functions to be performed by the computer.
ID	Identification Number. You must assign an ID to the unit. Units are communicated to by this ID number, therefore the ID assigned in the software must agree with the hardware.
IEC	International Electrotechnical Commission. Developers of the IEC-61131-3 standard. Programming Language used by ABB for user applications in XSeries equipment.
IECE$_x$	The IEC scheme for certification to standards relating to equipment for use in explosive atmospheres.
IEEE	Institute of Electrical and Electronics Engineers
IIC	Inter-Integrated Circuit. Also see I^{2}C.
IL	Instruction List (IEC supported programming language)
Impedance	The total opposition to electrical flow (resistive plus reactive).
IMV	See Integral Multivariable Transducer.
Inch of Mercury	A pressure unit representing the pressure required to support a column of mercury one inch high at a specified temperature; 2.036 inches of mercury (at 32 degrees F and standard gravity of 32.174 ft/sec^2) is equal to a gauge pressure of one pound per square inch.
Inch of Water	A pressure unit representing the pressure required to support a column of water one inch high. Usually reported as inches W.C. (water column) at a specified temperature; 27.707 inches of water (at 60o and standard gravity of 32.174 ft/sec2) is equal to a gauge pressure of one pound per square inch.
Industry Canada	Canadian Certification.
Inerts	Elements or compounds not acted upon chemically by the surrounding environment. Nitrogen and carbon dioxide are examples of inert components in natural gas. Inerts dilute the natural gas and since they do not burn or combust, have no heating value.
Initialization File	Generic file used to support the display of ABB application data in PCCU32.
Input	That part of a circuit that accepts a signal for processing.
Input Impedance	The resistance measured across the excitation terminals of a transducer.
Input Sense	To examine or determine the status of the input.
Input/Output	The transfer of data to/from a computer system involving communications channels, operator interface devices, and/or data acquisition and control interfaces.
Instantiate	Starting an instance of an object.
Instrument Manifold	Manifold type used when XFC is mounted directly on the Orifice.
Insulator	Any material that resists the flow of electrical current.

TERM	DEFINITION
Integral Multivariable Transducer	A Multivariable Transducer that is an integral part of the flow computer, measuring DP and SP. This refers only to the transducer portion of the device and makes no assumption whether or not the circuitry is located as part of the unit, or if the circuitry is located on the Mother Board and attached via wiring. Also see Multivariable Transducer.
Integrated Circuit	A circuit component consisting of a piece of semiconductor material containing up to thousands of transistor and diodes. A chip.
Integrating ADC	An ADC whose output code represents the average value of the input voltage over a given time interval.
Interface (computer)	Usually refers to the hardware that provides communication between various items of equipment.
Interface (liquid)	The area between two liquids that are not easily mixed, i.e., oil and water.
Interference	A disturbance to the signal in any communications system.
Intrinsically Safe	An instrument which will not produce any spark or thermal effects under normal and specified fault conditions, that is capable of causing ignition of a specified gas mixture.
Inverter	A circuit in both analogue and digital systems that provides an output that is inverse to the input.
Inverter, DC to AC	Converts DC to AC at a high frequency.
ioINT	Interrupt signal from the I/O modules.
ioVBB	i/o Battery Voltage- Unregulated 13.8 volts. Host supplies 2.5 amps to the I/O modules.
ioVDD	Unregulated 5.6 volts from the host for I/O modules.
ISA	Instrument Society of America.
ISO	International Standards Organization.
ISO 5167	International Standards Organization Report No. 5167, Measurement of Fluid Flow by Means of Pressure Differential Devices.
ISO 6976-95	International Standards Organization Report No. 6976-95, Calculation of Calorific Values, Density, Relative Density and Wobbe Index from Composition.
Isobutane (C4H10)	A hydrocarbon of the same chemical formula as butane but different molecular structure, resulting in different physical properties, notably lower boiling point. Gross heating value 3261 Btu/cu. ft. gas.
Isokenetic Sampling	Laboratory technique where gas sample is tested after removing liquids, therefore not allowing the atomized liquid to return to the gaseous state, changing the sample accuracy.
Isolation	The reduction of the capacity of a system to respond to an external force by use of resilient isolating materials.
Isopentane (C5H12)	A hydrocarbon of the paraffin series having a chemical formula of C5H12 and having its carbon atoms branched.

TERM	DEFINITION
IUPAC	Acronym for International Union of Pure and Applied Chemistry. It is an international non-governmental organization devoted to the advancement of chemistry. It is most well known as the recognized authority in developing standards for the naming of the chemical elements and their compounds
Joule	The basic unit of thermal energy.
Joule-Thompson Effect	The change in gas temperature which occurs when the gas is expanded at constant enthalpy from a higher pressure to a lower pressure. The effect for most gases at normal pressure, except hydrogen and helium, is a cooling of the gas creating condensation.
K	Kilo. 1) In referring to computers, a "kilo" is 1024 or 2 to the 10th power (Note that it is actually slightly more than an even 1000.). 2) the standard metric prefix for 1,000, or 10^3, used with units of measure such as volts, hertz, and meters.
Kbytes/s	A unit for data transfer that means 1,000 or 10^3 bytes/s.
Kerosene	An oily liquid obtained in the distilling of gasoline in a temperature range from 174-288 degree C. A hydrocarbon of specific gravity of 0.747 to 0.775. Used as fuel for some internal combustion engines, heating equipment, and illuminating purposes. A heavy grade known as range oil is used for cooking and heating.
KHz	Electronic abbreviation for Kilohertz.
kilobyte	1024 bytes.
Kilowatt	Equivalent to 1000 watts.
kilowatt-hour	A unit of energy when one kilowatt of power is expended for one hour. Example A radiator bar is usually rated at 1,000 watts and this switched on for one hour consumes one kilowatt-hour of electricity.
KPa	Kilopascal-Measure of Pressure
kw	See Kilowatt.
kwh	See Kilowatt-hour.
LACT	Lease Automatic Custody Transfer.
Lag	1) A time delay between the output of a signal and the response of the instrument to which the signal is sent. 2) A time relationship between two waveforms where a fixed reference point on one wave occurs after the same point of the reference wave.
Latent Heat of Vaporization	Represents the amount of heat required to vaporize a liquid. In the instance of natural gas, the equation appears: 1 Btu = heat to change. This is the most likely scenario for causing gas to liquefy.
LCD	Liquid Crystal Display.
LD	Ladder Diagram (IEC supported programming language)
LED	Light Emitting Diodes.

TERM	DEFINITION
LevelMaster	Intelligent Digital Level Sensor and is designed for custody transfer accuracy in demanding level measurement applications in tanks. LevelMaster is the name of the ABB's Tank Gauging System.
Life	For rechargeable batteries, the duration of satisfactory performance, measured in years (float life) or in the number of charge/discharge cycles (cycle life).
Life Cycle	The minimum number of pressure cycles the transducer can endure and still remain within a specified tolerance.
Light Crude	Crude oil with a high API gravity due to the presence of a high proportion of light hydrocarbon fractions.
Light Ends	The portion of a liquid hydrocarbon mixture having the lowest boiling points which are easily evaporated.
Light Hydrocarbons	The low molecular weight hydrocarbons such as methane, ethane, propane and butanes. More Volatile.
Linearity	The maximum deviation of the calibration curve from a straight line between zero and full scale, expressed as a percent of full scale output and measured on increasing measurement only.
Liquefiable Hydrocarbons	The components of natural gas that may be recovered as liquid products.
Liquefied Natural Gas	Natural gas which has been liquefied by reducing its temperature to minus 260 degrees Fahrenheit at atmospheric pressure. It remains a liquid at -116 degrees Fahrenheit and 673 psig. In volume, it occupies 1/600 of that of the vapor at standard conditions. Natural gasoline and liquefied petroleum gases fall in this category.
Liquefied Petroleum Gas	A gas containing certain specific hydrocarbons which are gaseous under normal atmospheric conditions, but can be liquefied under moderate pressure at normal temperatures. Propane and butane are the principal examples.
Liquid Crystal Display	A reflective display that requires very low power for operation.
LNG	See Liquefied Natural Gas.
Load (electrical)	A load is an energy consuming device. The device can be an actual device such as a bulb of a flash light, radio, cassette player, motor, etc., a resistor or a constant current load.
Load (units)	The amount of gas delivered or required at any specified point or points on a system; load originates primarily at the gas consuming equipment of the customers. Also, to load a pressure regulator is to set the regulator to maintain a given pressure as the rate of gas flow through the regulator varies. Compare DEMAND.
Location File	This is a file containing the configuration of the Location or site and the LevelMasters assigned to the Location. You may have a file that contains everything or a file for each Location name. The information from the file is displayed on the main MasterLink screen in the form of a tree structure. See the Main Screen topic for more information.

TERM	DEFINITION
Location Name	Location Name is the top of the hierarchy tree of a Location File. Included in the Location Name is the LevelMaster's name, ID, S/N, Sensor File and Configuration no.
Log Period	In a XFC, the specified length between writing the calculated accumulated volume to record. You may record volumes as often as every minute and as seldom as every hour. More frequent recording reduces the number of days of records possible between collection.
Long Term	For ABB's purpose, the application of this term refers to storing data over a period of time that is greater than a minimal time. Such as data collected weekly versus data collected weekly but stored indefinitely.
LPG	See Liquefied Petroleum Gas.
LSB	Least Significant Byte
M	Mega, the prefix for 1,048,576, or 2^{20}, when used with byte to quantify data or computer memory. Also 1000, as in MCF or 1000 Cubic Ft.
Manifold	The conduit of an appliance which supplies gas to the individual burners. Also, a pipe to which two or more outlet pipes are connected.
Manifold Assembly	The Manifold Assembly is comprised of the Manifold Plate, Heater, Valves, and various Cables to other major components. The Manifold Plate and Heater maintain constant temperature for the GC module and Columns. The Valves control Stream processing, Carrier and Calibrations gases. The Cables complete the information chain from the GC module to the Analytical Processor and the Digital Controller Assembly.
Man-Machine Interface	Software program that converts machine instructions and commands into a user interface.
Manometer	A two-armed barometer.
Manual Reset	The switch in a limit controller that manually resets the controller after the limit has been exceeded.
MasterLink	MasterLink is the name of the software program used to communicate with the LevelMaster for purposes of doing setup, calibration, troubleshooting, generating site files, monitoring levels and collecting data.
Mbytes/s	A unit for data transfer that means 1 million or 10^6 bytes/s.
Mcf	The quantity of natural gas occupying a volume of 1000 cubic feet at a temperature of $60°$ Fahrenheit and at a pressure of 14.73 psia.
Mean Temperature	The average of the maximum and minimum temperature of a process equilibrium.
Measurement Unit Assembly	μFLO's measurement and operational features are housed in this single unit assembly. The main electronic board (μFLO-195 Board), communication connection, power, SP, DP and Temperature readings are all housed in this unit.
Mega	Multiplier indicating that a quantity should be multiplied by 1,000,000.

TERM	DEFINITION
Melting Point	The temperature at which a substance transforms from a solid phase to a liquid phase.
Membrane	The pH-sensitive glass bulb is the membrane across which the potential difference due to the formation of double layers with ion-exchange properties on the two swollen glass surfaces is developed. The membrane makes contact with and separates the internal element and filling solution from the sample solution.
Memory	Electronic devices that enable a computer to store and recall information. In its broadest sense, memory refers to any hardware capable of serving that end, e.g., disk, tape, or semiconductor storage.
Menu	The list of available functions for selection by the operator, usually displayed on the computer screen once a program has been entered.
MEPAFLOW	SICK Engineering's Menu-based Measurement and Parameterization Software for the TotalSonic system (MMI).
Mercaptans	Compounds of carbon, hydrogen and sulfur found in sour crude and gas; the lower mercaptans have a strong, repulsive odor and are used, among other things, to odorize natural gas.
Meter	Acronym M. Metric measurement equal to 1.09361 yards.
Meter Manifold	Gas piping between gas service line and meter. Also, gas piping supplying two or more meters.
Meter, Orifice	A meter using the differential pressure across an orifice plate as a basis for determining volume flowing through the meter. Ordinarily, the differential pressure is charted.
Meter, PD	See Meter, Positive Displacement.
Meter, Positive Displacement	An instrument which measures volume on the basis of filling and discharging gas in a chamber.
Meter, Turbine	1) Pulse meter. 2)A velocity measuring device in which the flow is parallel to the rotor axis and the speed of rotation is proportional to the rate of flow. The volume of gas measured is determined by the revolutions of the rotor and converting them to a continuously totalized volumetric reading.
Methane (C_1H_4)	A hydrocarbon (Alkane) with the lightest molecule. A gas under normal conditions. The first of the paraffin series of hydrocarbons. The chief constituent of natural gas. Pure methane is odorless and has a heating value of 1012 Btu per cubic foot. Typically mixed with a sulfur compound to aid in leak detection.
microFlo Computer	See µFLO.
Microprocessor	This term is commonly used to describe the CPU. More specifically, it refers to the part of the CPU that actually does the work, since many CPUs now contain L1 and L2 caches on-chip.
Milli	One thousandth e.g. one milli-watt - 1mW. one milli-amp - 1mA. one milli-volt -1mV.
Millimeter	Acronym mm. Metric measurement equal to .03937 inch.

TERM	DEFINITION
MIPS	Million instructions per second. The unit for expressing the speed of processor machine code instructions.
Mj	Abbreviation for mega joule, equivalent to one million joules.
Mm	Acronym for Millimeter.
MMBtu	A thermal unit of energy equal to 1,000,000 Btu's, that is, the equivalent of 1,000 cubic feet of gas having a heating content of 1,000 BTUs per cubic foot, as provided by contract measurement terms.
MMcf	A million cubic feet. See CUBIC FOOT. (1,000,000 CF)
MMI	See Man-Machine Interface.
Modbus	Messaging structure developed and used to establish master-slave/client-server communication between intelligent devices. Generic protocol supported by most process automation vendors.
Modem	Modulator-Demodulator. A device used to convert serial digital data from a transmitting terminal to a signal suitable for transmission over a common carrier, or to reconvert the transmitted signal to digital data for acceptance by a receiving terminal.
Module	Typically a board assembly and its associated mechanical parts, front panel, optional shields, and so on. A module contains everything required to occupy one or more slots in a mainframe.
Mol%	See Mole Percent.
Mole Percent	The number of moles of a component of a mixture divided by the total number of moles in the mixture.
MRB	Modbus Request Block. When requesting storage space after adding a new Modbus application, the file is saved as a *.mrb file.
MRM	Modbus register map. When requesting storage space after adding a new Modbus register, the file is saved as a *.mrm file.
MS	Milliseconds. One-thousandth of a second.
MSB	Most Significant Byte
Mueller Bridge	A high-accuracy bridge configuration used to measure three-wire RTD thermometers.
Multiplex	A technique which allows different input (or output) signals to use the same lines at different times, controlled by an external signal. Multiplexing is used to save on wiring and I/O ports.
Multi-tasking	A property of an operating system in which several processes can be run simultaneously.
Multi-tube Sites	Locations where many flow tubes are all within a prescribed distance allowing one flow meter with multitube capabilities, such as the XSeries product line, to monitor and maintain flow records for each tube in one flow computer.

TERM	DEFINITION
Multivariable Transducer	Transducer supplying more than 1 variable. ABB uses this term to encompass units that read Static Pressure, Differential Pressure. Historically these units were coined AMU for Analog Measurement Unit. As a result of advanced technology, the unit no longer functions as only an analog measurement unit. Therefore the newer terminology, Multivariable Transducer, more aptly describes the functionality of this design. The abbreviation IMV refers to the Integral version of the multivariable. The abbreviation XIMV, refers to the XSeries IMV version of the multivariable, which contains the circuitry as part of the unit and the abbreviation IMVX, refers to the Explosion Proof IMV, where the required circuitry resides on the Main Processor Board. See each instance for additional explanation.
MW	Acronym for Molecular Weight.
N2	A standard abbreviation for Nitrogen.
NAK	See Negative Acknowledgement
NAMUR	Normenarbeitsgemeinschaft für Mess- und Regeltechnik in der chemischen Industrie (Standards study group for measurement and process control technology in the chemical industry).
Natural Gas	See Gas, Natural.
Natural Gas Distillate	Material removed from natural gas at the "heavy end" portion; that is, aliphatic compounds ranging from C4 to C8 (butanes and heavier).
Natural Gas Liquids	The hydrocarbon components: propane, butanes, and pentanes (also referred to as condensate), or a combination of them that are subject to recovery from raw gas liquids by processing in field separators, scrubbers, gas processing and reprocessing plants, or cycling plants. The propane and butane components are often referred to as liquefied petroleum gases or LPG.
Natural Gasoline	A mixture of hydrocarbons, mostly pentanes and heavier, extracted from natural gas, which meets vapor pressure and other specifications.
NBS	National Bureau of Standards.
NC	See Normally Closed.
NC4	A standard abbreviation for Normal Butane.
NC5	A standard abbreviation for Normal Pentane.
NEC	National Electrical Codes
Negative Acknowledgment	This refers to a response over a remote communication device, such as a PING. Basically, saying, "I don't acknowledge your request!" This is the opposite of ACK. NAK is a slang term that means that you disagree or do not acknowledge something.
NEMA	National Electrical Manufacturers Association.
NEMA, Type 3R	A standard from the National Electrical Manufacturers Association. Enclosure constructed for indoor/outdoor use to provide protection against falling dirt, rain, sleet and snow and remain undamaged by external formation of ice.

TERM	DEFINITION
NEMA, Type 4	A standard from the National Electrical Manufacturers Association. Enclosure constructed for indoor/outdoor use to provide protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water and remain undamaged by external formation of ice.
NEMA, Type 4X	A standard from the National Electrical Manufacturers Association. Enclosure constructed as for Type 4 with protection against corrosion.
NeoC4	A standard abbreviation for Neobutane.
NeoC5	A standard abbreviation for Neopentane.
Network	A group of computers that are connected to each other by communications lines to share information and resources.
Newton Meter	Torque measurement unit equal to 8.84 Inch Pounds.
NGC	Natural Gas Chromatograph
NGC Termination Panel	The NGC8200 Termination Panel acts as a connection to the outside world. It features Transient Protection, a built-in voltage regulator, Positive Temperature Co-efficient Fuses (PTC) and many other safeguards to protect the remainder of the system from electrical damage. All outside communications and I/O are channeled through this board. It is designed to be a low cost, field replaceable maintenance solution and is designed to operate on either 12V or 24V.
NGC8201	ABB NGC8201 Gas Chromatograph for Process Gas Chromatography. The NGC is designed to continually analyze process gas streams, on-site, determine composition, calorific value, and store the analysis information. The unit can collect and retain analysis information for one to four independent sample streams.
NGC8206	ABB NGC8200 Gas Chromatograph, with C6+. The NGC is designed to continually analyze natural gas streams, on-site, determine composition, calorific value, and store the analysis information. It is designed for natural gas streams, 800 to 1500 Btu/scf (29.8 to 55.9 Mega joules/meter^3) with less than 100 PPM H2S. The unit is a fully functional gas chromatograph for "Pipeline Quality" natural gas, designed to analyze natural gas streams, dry of both hydrocarbon liquids and water. The unit can collect and retain analysis information for one to four independent sample streams. Applicable installations include: Transmission, Distribution, Custody Transfer with Metrology quality results, Production, Gas Gathering and End User Gas Markets.
NGL	See Natural Gas Liquids.
NGL	A standard abbreviation for Natural Gas Liquids.
Nm	Abbreviation for Newton Meter. Metric Torque measurement.
NO	See Normally Open.

TERM	DEFINITION
Noise	An undesirable electrical signal. Noise comes from external sources such as the AC power line, motors, generators, transformers, fluorescent lights, soldering irons, CRT displays, computers, electrical storms, welders, radio transmitters, and internal sources such as semiconductors, resistors, and capacitors. Unwanted disturbances superimposed upon a useful signal that tends to obscure its information content.
Nonane (C9H20)	A hydrocarbon (Alkane) flammable colorless liquid with nine carbon atoms.
Non-hazardous area	Area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions.
Non-Persistent	Refers to data that is no longer available after a Warm Start.
Normal Butane	An aliphatic compound of the paraffin series having the chemical formula of C4H10 and having all of its carbon atoms joined in a straight chain.
Normal Pentane	A hydrocarbon of the paraffin series having a chemical formula of C5H12 and having all its carbon atoms joined in a straight chain.
Normalization of Component Mole Percentages	The exact amount of sample which is injected onto the columns of the chromatograph must be a very reproducible volume in order to give consistent values for the resulting calculated Btu. The calculation controls the volume, temperature and pressure of the sample to be injected by a very simple means. A few seconds before the sample is actually injected, the flow of sample through the sample valve injection loop is stopped by automatically shutting the sample shut-off valve. This allows the pressure of the sample in the sample loop to bleed down to atmospheric pressure. Since the temperature is controlled and the size of sample loop does not vary then the only change possible in sample size is related to variations in atmospheric pressure. Atmospheric pressure does vary with the weather and in order to compensate for this or any other slight sample size change, the mole percentages of each component are adjusted to equal a total of 100% through a calculation called normalization. The values in mole percents are determined by the chromatographic analysis and then totaled to a value that is near 100%, which is called the unnormalized total. The unnormalized total is divided by 100% and the resulting factor is then multiplied by the mole% value for each component. This calculation will adjust each component's mole% in the correct manner as to result in a new total of exactly 100%. The calculation also checks to see if the unnormalized total is out of a specified range for alarm purposes. This is an overall performance check to determine if the chromatograph has some problem or has drifted out of calibration.
Normally Closed	Designation which states that the contacts of a switch or relay are closed or connected when at rest. When activated, the contacts open or separated.

TERM	DEFINITION
Normally Open	Designation which states that the contacts of a switch or relay are normally open or not connected. When activated the contacts close or become connected.
Norsok	Norwegian Certification Bureau
NPN	Negative-Positive-Negative (Transistor).
NPT	National Pipe Thread.
NRTL	Nationally Recognized Testing Laboratory.
Null	A condition, such as balance, which results in a minimum absolute value of output.
NX-19	American Gas Association Report referring to a specific method to calculate the Supercompressibility factor.
O2	A standard abbreviation for oxygen.
Octane (C8H18)	A hydrocarbon (Alkane) flammable colorless liquid with eight carbon atoms. Is the 100 point on the Octane Rating Scale.
OCV	See Open Circuit Voltage.
ODBC	See Open Database Connectivity.
OEU	Optional Equipment Unit.
Offset	The difference in temperature between the set point and the actual process temperature. Also, referred to as droop.
OHM	The unit of resistance usually shown as the symbol "R". One thousand ohms is written "k" and one million ohms is written "M". Resistance is measured with a multimeter, set to the "ohms range".
Ohmmeter	An instrument used to measure electrical resistance.
OLE	Object Linking and Embedding. A set of system services that provides a means for applications to interact and interoperate. Based on the underlying Component Object Model, OLE is object-enabling system software. Through OLE Automation, an application can dynamically identify and use the services of other applications, to build powerful solutions using packaged software. OLE also makes it possible to create compound documents consisting of multiple sources of information from different applications.
Ole for Process Control	This is a data interchange format and supporting software. Typically, vendors (such as ABB) write OPC server drivers which can talk to their devices. SCADA system vendors (again like ABB) write OPC clients that can gather data from OPC Servers. The idea is to provide a universal way to collect data into a SCADA system regardless of the equipment vendor. This standard was developed and is maintained by the OPC Foundation. The ABB Driver, TDS32, supports OPC.
Ole for Process Control Database	A programming interface to databases. Supports the OLEDB interface.
OLEDB	See Ole for Process Control Database.

TERM	DEFINITION
Olefins	Basic chemicals made from oil or natural gas liquids feedstocks; commonly used to manufacture plastics and gasoline. Examples are ethylene and propylene.
OOP	Object-Oriented Programming. The XFC/XRC architecture incorporates an object-oriented approach.
OPC	See Ole for Process Control.
Open Circuit	A complete break in a metal conductor path.
Open Circuit Voltage	The difference in potential between the terminals of a cell/battery when the circuit is open (no-load condition).
Open Collector	A single NPN transistor with the base connected to the logic driving circuitry and with the emitter grounded. The collector is the output pin of the gate.
Open Database Connectivity	A widely accepted application-programming interface (API) for database access. It is based on the Call-Level Interface (CLI) specifications from X/Open and ISO/IEC for database APIs and uses Structured Query Language (SQL) as its database access language. Using ODBC, you can create database applications with access to any database for which your end-user has an ODBC driver. This allows access for authorized users to databases over any network, including the Internet. The SCADA system provides an ODBC driver, making the database accessible to authorized users anywhere on a corporate network, or even over the Internet if the network is properly configured.
Operating System	Base-level software that controls a computer, runs programs, interacts with users, and communicates with installed hardware or peripheral devices.
Optional Equipment Unit	ABB enclosure designed to house optional power and communication devices.
Orifice Meter	Device to record differential pressure measurement which uses a steel plate with a calibrated hole or orifice to generate a drop in pressure between the two sides of the plate. Also the primary element of the meter run.
Orifice Plate	A plate of non-corrosive material which can be fastened between flanges or in a special fitting perpendicular to the axis of flow and having a concentric circular hole. The primary use is for the measurement of gas flow.
ORing	Boolean algebra logical function. Described as the addition or summing of switches or inputs, in the case of Boolean elements, the 0 and 1 represent two possible states of a premise or hypothesis: True or False, On or Off. When adding Boolean elements not real numbers, you will find these results: 1 or 1 = 1 1 or 0 = 1 0 or 1 = 1 0 or 0 = 0
O-Ring	A flat ring made of rubber or plastic, used as a gasket.

TERM	DEFINITION
Output	That part of a circuit where the processed signal is available.
Output Impedance	The resistance as measured on the output terminals of a pressure transducer.
Output Noise	The RMS, peak-to-peak (as specified) ac component of a transducer's dc output in the absence of a measurand variation.
P/I	See Pulse Input.
Parameter	(1) Characteristic. For example, *specifying parameters* means defining the characteristics of something. In general, parameters are used to customize a program. For example, file names, page lengths, and font specifications could all be considered parameters. (2) In programming, the term *parameter* is synonymous with argument, a value that is passed to a routine.
Parity	A technique for testing transmitting data. Typically, a binary digit is added to the data to make the sum of all the digits of the binary data either always even (even parity) or always odd (odd parity).
Parts per Million	Acronym PPM.
Passive Analog Output	Analog Output to a host that is powered by an outside source.
PCCU	Portable Collection and Calibration Unit.
PCCU32	Windows version of PCCU communications software to process, archive and collect data from the ABB equipment. Generally run from a laptop.
Peak Area	The retention time the element takes to exit the column. This is used in calculating the amount of each component in the sample or Mole %.
Pentane (C5H12)	A saturated hydrocarbon (Alkane) with five carbon atoms in its molecule (C5H12). A liquid under normal conditions.
Pentane, Normal	See Normal Pentane.
Pentanes Plus	A hydrocarbon mixture consisting mostly of normal pentane and heavier components.
Peripheral	The input/output and data storage devices attached to a computer such as disk drives, printers, keyboards, displays, data acquisition systems, etc.
Persistent	Refers to data that remains available after a Warm Start.
PEX	A flexible material used for LevelMaster sensors.
PGC	Process Gas Chromatograph
Phase	A time based relationship between a periodic function and a reference. In electricity, it is expressed in angular degrees to describe the voltage or current relationship of two alternating waveforms.
Phenol	Hydrocarbon derivative containing an [OH] group bound to an aromatic ring.

TERM	DEFINITION
Physical Change	A change in which a substance changes from one physical state to another but no substances with different composition are formed. Example Gas to Liquid - Solid.
PID	Proportional, Integral, Derivative. A three mode control action where the controller has time proportioning, integral (auto reset) and derivative rate action.
Piezoceramic	A ceramic material that has piezoelectric properties similar to those of some natural crystals.
Pipeline Condensate	Liquid hydrocarbons that have condensed from gas to liquid as a result of changes in pressure and temperature as gas flows in a pipeline. Pipeline condensate only remains as a liquid under high-pressure conditions and would vaporize at atmospheric pressure.
Plant Products	All liquid hydrocarbons and other products (including sulfur and excluding residue gas) recovered in a gas processing plant.
PLC	See Programmable logic controller
Plunger Lift	A technique used to optimize gas production. A Steel plunger is inserted into the production tubing in the well. The flow is turned off and this shut-in causes plunger to fall allowing fluid to collect above plunger. Different techniques are used to decide how long to shut in and flow the well.
Polarity	In electricity, the quality of having two oppositely charged poles, one positive one negative.
Polling	A snapshot view of the readings taken by the ABB equipment.
Port	A communications connection on a computer or a remote controller. A place of access to a device or network, used for input/output of digital and analog signals.
Positive Temperature Co-efficient	An increase in resistance due to an increase in temperature.
Positive Temperature Co-efficient Fuse	Opens circuit when high current condition occurs. Closes when condition no longer exists. Replaces typical fuses, which require replacement when blown.
POU	Program Organization Unit. This is Softing's term for an 'independent programming unit'. Programs, functions, etc.
Power Supply	A separate unit or part of a circuit that supplies power to the rest of the circuit or to a system.
PPM	Acronym for parts per million.
Pressure Base	The contractual, regulatory or standard ambient pressure at which natural gas is measured or sampled expressed in psia (pounds per square inch absolute).
Pressure Differential	Difference in pressure between any two points in a continuous system.
Pressure Markers	Pressure testing at different levels of pressure. Used for comparison purposes.

TERM	DEFINITION
Pressure, Absolute	See PSIA.
Pressure, Atmospheric	See Atmospheric Pressure.
Pressure, Gas	In the natural gas industry pressure is measured by the force applied to a designated area. PSI and OSI refer to how much pressure (pound or ounce) is applied to one square inch. Inches Water Column (In.W.C.) is also used to express gas pressure and is measured using a manometer for lower pressure readings. 1 PSIG=27.21 Inches Water Column.
Pressure, Gauge	See PSIG.
Primary Cell (or Battery)	A cell or battery which is not intended to be recharged and is discarded when the cell or battery has delivered all its electrical energy.
PRM	Acronym for Pressure Regulator Module.
Probe	A generic term that is used to describe many types of temperature sensors.
Process Gas	Gas use for which alternate fuels are not technically feasible, such as in applications requiring precise temperature controls and precise flame characteristics.
Program	A list of instructions that a computer follows to perform a task.
Programmable Logic Controller	A highly reliable special-purpose computer used in industrial monitoring and control applications. PLCs typically have proprietary programming and networking protocols, and special-purpose digital and analog I/O ports.
Programmable Read Only Memory	Computer memory in which data can be written to. ROM is used for storing programs (e.g. operating systems) and characteristic files on a permanent basis. (non-volatile)
Programmed I/O	The standard method a CPU uses to access an I/O device-- each byte of data is read or written by the CPU.
PROM	See Programmable Read Only Memory
Propane (C3H8)	A saturated hydrocarbon (Alkane) gas, the molecule of which is composed of three carbon and eight hydrogen atoms. Propane is present in most natural gas and is the first product refined from crude petroleum. It has many industrial uses and may be used for heating and lighting. Contains approximately 2,500 Btu per cubic foot.
Proportional, Integral, Derivative	PID Controllers are designed to eliminate the need for continuous operator attention. An example would be the cruise control in a car or a house thermostat. These controllers are used to automatically adjust some variable to hold the measurement (or process variable) at the set-point. The set-point is where you would like the measurement to be. Error is defined as the difference between set-point and measurement.
Propylene (C3H6)	A saturated hydrocarbon (Alkane) gas, the molecule of which is composed of three carbon and six hydrogen atoms. At room temperature and pressure, propylene is a gas. It is colorless, highly flammable, and has a odor similar to garlic. It is found in coal gas and can be synthesized by cracking petroleum. The main use of propylene is as a monomer, mostly for the production of polypropylene.

TERM	DEFINITION
Protocol	A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.
PSI	Pounds per Square Inch.
PSIA	Pounds per Square Inch Absolute. Absolute pressure uses a perfect vacuum as the zero point. A perfect vacuum is 0 PSIA. PSIA=PSIG + Atmospheric Pressure.
PSID	Pounds per square inch differential. Pressure difference between two points.
PSIG	Pounds per Square Inch Gauge. Gauge pressure uses the actual atmospheric pressure as the zero point.
PSIS	Pounds per square inch standard. Pressure referenced to a standard atmosphere.
PTB	Physikalisch Technische Bundesanstalt (Federal Physical Technical Office) or Technical Institute for Certification.
PTC	See Positive Temperature Co-efficient Fuse.
Pulse Input	Any digital input to a meter (usually a turbine) that is used to measure pulses over a time period. This calculates volume and flow rate for each period of time.
Pulse Mode	An operational mode used by the LevelMaster for measuring single float levels by transmitting a pulse to the primary windings, reading the voltage level on both the primary and secondary windings and using a calculation whereby one is subtracted from another to determine the single fluid level.
Pulse Output	Any digital output that is used to measure pulses over a period of time. Frequency of Pulses in a predetermined time frame represents a value to be used in calculating volume and flow rate.
Radio Frequency	RF for short. That part of the spectrum from approx. 50kHz to gigahertz.
Radio Frequency Interference	Electromagnetic radiation which is emitted by electrical circuits carrying rapidly changing signals, as a by-product of their normal operation, and which causes unwanted signals (interference or noise) to be induced in other circuits.
RAM	See Random Access Memory.
RAM Disk	A lithium backed storage chip. Also see Random Access Memory.
RAMS	Acronym for Remote Alarms Monitoring System.
Random Access Memory	Onboard read/write volatile memory, generally used for application variables and the file system. Data stored is lost if power is removed (volatile).
Range	Those values over which a transducer is intended to measure, specified by its upper and lower limits.
Rangeability	The ratio of the maximum flowrate to the minimum flowrate of a meter.

TERM	DEFINITION
Rated Capacity	The number of ampere-hours a cell/battery can deliver under specific conditions (rate of discharge, cut-off voltage, temperature).
Raw Gas	Natural gas that has not been processed.
Raw Mix Liquids	A mixture of natural gas liquids that has not been fractionated or separated into its various components.
RBUS	Communication abbreviation for Results Bus.
RCV	Communication abbreviation for Received.
RD	Acronym for Relative Density.
RDrive	Refers to ABB's SRam Drive (solid state memory chip) located on the main board, used to store data and configuration files. The RDrive is a lithium backed, volatile memory chip and is not affected by a warm start. Generation 3 only.
Read Only Memory	Computer memory in which data can be routinely read but written to only once using special means when the ROM is manufactured. ROM is used for storing data or programs (e.g. operating systems) on a permanent basis.
Real Time	Data acted upon immediately instead of being accumulated and processed at a later time.
Real Time Data Base	The SCADA system has an in-memory RTDB for the data it collects from various devices. Real-time generally means that the data is acquired often enough that the user can make operational changes to the process while it is still useful to do so. On a factory floor, this can be in milliseconds. For remote devices which may require a couple of hours of drive time to reach, real-time can be thought of in tens of minutes or even hours. The data base can meet either of these requirements.
Real Time Operating System	Any operating system where interrupts are guaranteed to be handled within a certain specified maximum time, thereby making it suitable for control of hardware in embedded systems and other time-critical applications. RTOS is not a specific product but a class of operating system.
Recharge/Charge	The conversion of electrical energy, provided in the form of a current from an external source (charger), into chemical energy within a cell/battery.
Recommended Standard 232	This is the standard interface for full-duplex data communication conducted with two way independent channels. It employs unbalanced signaling and refers to point-to-point communications between one driver and one receiver in a 4-wire bus system.
	The RS-232 (single-ended) transmits at a relatively slow data rate (up to 20K bits per second) and short distances (up to 50 Ft. @ the maximum data rate).

TERM	DEFINITION
Recommended Standard 422	This is the standard interface for half-duplex communications conducted with a dual-state driver. It employs balanced signaling and refers to multi-drop communications between one driver and up to ten receivers, known as "straight-through" cabling in a 4-wire bus system. The RS-422 (Differential) transmits a much faster data rate (up to 100K bits per second) and longer distances (up to 4000 Ft. @ the maximum data rate).
Recommended Standard 485	This is the standard interface for half-duplex communications conducted in the tri-state or common mode. It employs balanced signaling and refers to true multi-point communications between up to 32 drivers and 32 receivers, in 2-wire bus system. The RS-485 (Differential) transmits a much faster data rate (up to 100K bits per second) and longer distances (up to 4000 Ft. @ the maximum data rate). It also supports more nodes per line because it uses lower impedance drivers and receivers.
Record	A collection of unrelated information that is treated as a single unit.
Register	A storage device with a specific capacity, such as a bit, byte or word.
Relay	Electromechanical device containing a coil and set of contacts. The contacts close when the coil is activated.
Remote	Not hard-wired; communicating via switched lines, such as telephone lines. Usually refers to peripheral devices that are located a site away from the CPU.
Remote Controller, XSeries.	ABB's XSeries remote controller is a low power, microprocessor based unit designed to meet a wide range of automation, monitor, control, alarming and measurement applications.
Remote Terminal Unit	An industrial data collection device similar to a PLC, designed for location at a remote site, that communicates data to a host system by using telemetry (such as radio, dial-up telephone, or leased lines).
Repeatability	The ability of a transducer to reproduce output readings when the same measurement value is applied to it consecutively, under the same conditions, and in the same direction. Repeatability is expressed as the maximum difference between output readings.
Residue Gas	The portion of natural gas remaining in a gaseous state after recovery of certain components through gas processing.
Resistance	The measure of the ability of a material to pass a current.
Resistance Temperature Characteristic	A relationship between a thermistors resistance and the temperature.
Resistant Thermal Detector	A metallic probe that measures temperature based upon its coefficient of resistivity.
Resistor	Passive component with a known resistance. The value of resistance is usually shown by a set of colored bands on the body of the component.
Resolution	The smallest significant number to which a measurement can be determined. For example, a converter with 12-bit resolution can resolve 1 part in 4096.

TERM	DEFINITION
Response Factor	A calculated value determined by analyzing a known substance under precise conditions (temperature, pressure, carrier flow rate) which equals the area of the peak divided by the weight or volume of the injected substance. This calculated value is then used as a response multiplier or offset for analyzing a "sample" of this same substance from another source. In the case of Natural gas, each component will have its own Response Factor.
Response Time	1) The length of time required for the output of a transducer to rise to a specified percentage of its final value as a result of a step change of input. 2) The time required by a sensor to reach 63.2% of a step change in temperature under a specified set of conditions. Five time constants are required for the sensor to stabilize at 600 of the step change value.
Restore	This refers to a ABB procedure in which all the Station or Configuration files are restored to the SDRIVE or tfCold chip from the file located on the laptop. This process is very helpful prior to doing a Cold Start when you want to continue using the Configuration and Station files.
Reynolds Number	The ratio of inertial and viscous forces in a fluid defined by the formula $Re = rVD/\mu$, where: r = Density of fluid, μ = Viscosity in centipoise (CP), V = Velocity, and D = Inside diameter of pipe.
RFI	See Radio Frequency Interference.
Ribbon Cable	A flat cable in which the conductors are side by side rather than in a bundle.
Rich Gas	Natural gas which, based on its content of liquefiable hydrocarbons, is suitable for processing in a gas plant for recovery of plant products.
ROM	See Read Only Memory
RRTS	Communication abbreviation for Remote Ready To Send.
RS-232	See Recommended Standard 232.
RS-422	See Recommended Standard 422.
RS-485	See Recommended Standard 485.
RT	See Runtime.
RTD	See Resistant Temperature Detector.
RTDB	See Real Time Data Base.
RTOS	See Real Time Operating System.
RTS	Communication abbreviation for Ready To Send.
RTU	See Remote Terminal Unit
Runtime	The time required for an acoustic signal to travel from point A to point B. This measurement is used in calculating the speed of Sound, gas velocity and volume in the TotalSonic Meter.
RXD	Communication abbreviation for Receive Data.

TERM	DEFINITION
S/N	Serial Number. The whole Serial Number is made up of a prefix of 5 digits and the suffix, a 10 digit configuration number.
S1	Sample Line 1 (located on NGC8200 series Feed-Through Assembly).
S2	Sample Line 2 (located on NGC8200 series Feed-Through Assembly).
S3	Sample Line 3 (located on NGC8200 series Feed-Through Assembly).
S4	Sample Line 4 (located on NGC8200 series Feed-Through Assembly).
Saddle	A fitted plate held in place by clamps, straps, heat fusion, or welding over a hole punched or drilled in a gas main to which a branch line or service line connection is made. The saddle also may serve as a reinforcing member for repair.
Sample Loop	A tube with a given volume used in conjunction with a valve for measuring and holding the sample gas before pushing it into the chromatograph column.
Saturated BTU	The heating value of natural gas that is saturated with water vapor.
Saturated Hydrocarbons	Hydrocarbons that contain only single bonds. They are also called Alkanes or paraffin hydrocarbons.
Save	This refers to a ABB procedure in which all the Station or Configuration files are copied from the RDRIVE or the SDRIVE or tfCold chip, to a file created on a laptop.
Savitsky-Golay Smoothing	Digital Signal Smoothing. A special class of a digital signal processing filter. Specifically determines the coefficients that are used for signal processing.
SCADA	See Supervisory Control and Data Acquisition
Scf	Abbreviation for one standard cubic foot, a measurement of a gas volume at a contractual, regulatory or standard specified temperature and pressure.
Schematic	Another name for a circuit diagram.
SCM	Acronym for Sample Conditioning module.
Scroll	To move all or part of the screen material up to down, left or right, to allow new information to appear.
SD Card	Secure Digital Card.
SDRIVE	ABB's Serial E^2 PROM solid state memory chip, located on the main board (volatile memory, affected by a cold start), used to store configuration or station files.
Selectable Units	Selectable measurement units for various international and specialized application needs.
Self-Calibrating	A property of a DAQ board that has an extremely stable onboard reference and calibrates its own A/D and D/A circuits without manual adjustments by the user.
Semiconductor	Material that is nether a conductor nor insulator. Its properties can be altered by a control voltage.

TERM	DEFINITION
Sensing Element	That part of the transducer which reacts directly in response to the input.
Sensor	A device that responds to a physical stimulus (heat, light, sound, pressure, motion, flow, and so on), and produces a corresponding electrical signal.
Sensor File	The Sensor File contains all the setup/calibration information of the unit. The Sensor File is a (.dat) file and by default is named after the base serial number proceeded by an "s", such as s00108.dat. Although the name can be overwritten, it is recommended that the default name be kept.
Serial I/O	A common form of data transmission, in which the bits of each character are sent one at a time over the line.
Serial Port	A communications interface that uses one data line to transfer data bits sequentially. On the IBM PC the serial port refers to a standard asynchronous serial interface which uses the 8250/16450/16550 family of UARTs.
Service Life	The period of useful life (usually in hours or minutes) of a primary cell/battery before a predetermined cut-off voltage is reached.
Set Point	The temperature at which a controller is set to control a system.
Set-Point	A "level" or control point in a feedback system.
SFC	Sequential Function Chart (IEC supported programming language)
SG	Acronym for Specific Gravity.
Short Circuit	A connection of comparatively low resistance accidentally or intentionally made between points on a circuit between which the resistance is normally much greater. Also called a "bridge" or "short" such as when solder from two tracks touch on a PC board.
Shrinkage	The reduction in volume and/or heating value of a natural gas stream due to extraction or removal of some of its components.
SIG	See Signal.
Signal	Any communication between message-based devices consisting of a write to a signal register.
Signal Generator	A circuit that produces a variable and controllable signal.
Signed Integer	Can represent a number half the size of a "unsigned integer", including a negative number.
Sink	Device such as a load that consumes power or conducts away heat.
Skip Days	Extra Daily records for recording events that require the start of a new day. i.e., Volume Reset, Backward Time change over the hour, and Contract Hour change.
SNAM	Italy's Certification Board
SNR	Signal to Noise Ratio.
SoftCONTROL	Softing's IEC compiler environment

TERM	DEFINITION
Softing	Maker and distributor of the IEC compiler softCONTROL
Software	The non-physical parts of a computer system that include computer programs such as the operating system, high-level languages, applications programs, etc.
Solar cell	A cell that produces current under sunlight.
Solenoid	A coil of wire that is long compared to its diameter, through which a current will flow and produce a magnetic flux to push or pull a rod (called an armature).
SOS	See Speed of Sound.
Sour Gas	Natural gas that has a high concentration of H2S.
Source	Device that provides signal power or energy to a load.
SP	See Static Pressure
Span	The difference between the upper and lower limits of a range expressed in the same units as the range.
Specific Gravity	The ratio of the mass of a solid or liquid to the mass of an equal volume of distilled water at 4°C (39°F) or of a gas to an equal volume of air or hydrogen under prescribed conditions of temperature and pressure. Also called *relative density*.
Speed of Gas	Rate at which gas travels through the pipeline. Used in flow calculations in the TotalSonic Meter. Calculations follow AGA 9 Report.
Speed of Sound	Rate at which sound travels through the medium. Used in flow calculations in the TotalSonic Meter. Calculations follow AGA 10 Report.
SPU	Signal Processing Unit (measurement transducer).
SQL	See Structured Query Language.
SRAM	See Static Random Access Memory
SSM	Acronym for Stream Selector module.
ST	Structured Text (IEC supported programming language)
Stability	The quality of an instrument or sensor to maintain a consistent output when a constant input is applied.
Stable Gas	Is a vapor containing less than 0.1 PPM of liquid when vapor is cooled to 18.3°F (10°C) below the coldest ambient temperature possible at any point in the system.
Static Pressure	Equals PSIA or PSIG. Referenced to atmospheric pressure versus absolute pressure in a vacuum. It is defined as the pressure exerted by a non-moving liquid or gas. In the case of a gas well this would be the natural PSI of the gas inside of the well.
Static Random Access Memory	The place in your computer that programs reside when running. You can access any part of the memory, and it can easily be overwritten with new values. SRAM is much more expensive and physically larger than DRAM but much faster.

TERM	DEFINITION
Status Output	Any digital output that uses "On" or "Off" conditions to determine the status of the assigned description. Changing from one to the other represents a change in the condition.
STP	Standard Temperature and Pressure
Structured Query Language	IBM developed this language in the 60's as a way of accessing data from a relational database. It has a very simple syntax for simple functions but can become complex for sophisticated applications. This language is standardized by international standards bodies, and is almost universal in application. Almost all databases support SQL. The RTDB supports SQL and this makes it extremely flexible within a corporate network. Authorized users throughout the organization can write SQL statements to acquire data from this database that they need for Marketing, Accounting, Engineering, or other functions.
Sulfur	A pale, yellow, non-metallic chemical element that may be found in a gas stream and which needs to be removed or reduced from the gas stream for corrosion control or health or safety reasons.
Supercompressibility Factor	A factor used to account for the following effect: Boyle's law for gases states that the specific weight of a gas is directly proportional to the absolute pressure, the temperature remaining constant. All gases deviate from this law by varying amounts, and within the range of conditions ordinarily encountered in the natural gas industry, the actual specific weight under the higher pressure is usually greater than the theoretical. The factor used to reflect this deviation from the ideal gas law in gas measurement with an orifice meter is called the "Supercompressibility factor Fpv". The factor is used to calculate corrected from volumes at standard temperatures and pressures. The factor is of increasing importance at high pressures and low temperatures.
Supervisory Control and Data Acquisition	A common PC function in process control applications, where programmable logic controllers (PLCs) perform control functions but are monitored and supervised by a PC.
Surge	A sudden change (usually an increase) in the voltage on a power line. A surge is similar to a spike, but is of longer duration.
SV	Sample Vent (located on NGC8200 series Feed-Through Assembly).
SW VBATT	Switched Battery Voltage. Cycles power to equipment to save power.
Switch	An electrical device for connecting and disconnecting power to a circuit, having two states, on (closed) or off (open). Ideally having zero impedance when closed and infinite impedance when open.
Synchronous	(1) Hardware - A property of an event that is synchronized to a reference clock. (2) Software - A property of a function that begins an operation and returns only when the operation is complete.
Syntax	Comparable to the grammar of a human language, syntax is the set of rules used for forming statements in a particular programming language.

TERM	DEFINITION
System Noise	A measure of the amount of noise seen by an analog circuit or an ADC when the analog inputs are grounded.
TankMaster	ABB Control System for LevelMaster Tank Units.
Tap	To cut threads in a round hole so that other fittings or equipment can be screwed into the hole. Also to make an opening in a vessel or pipe.
TBUS	Communication abbreviation for Transmit Bus.
TCD	See Thermal Conductivity Detector.
TCP/IP	TCP/IP – This is the basic communication format for the Internet, and for much of what happens on a corporate network. Virtually all networked PCs and other computers have an "IP address" having the format xxx.xxx.xxx.xxx (xxx can range from 0 to 255 in most cases). You can see the IP address of your PC by going to the start menu, selecting run, and entering cmd. A "DOS Box" will be displayed on your screen. Type ipconfig to get the IP address. When you enter a URL (e.g., www.ABB.com) in a browser, a DNS server (on the network) resolves this into an IP address and directs your request to the machine with that address.
TCR	Temperature Compensated Regulator.
TDS32	ABB DDE Server that allows Microsoft Windows applications with DDE capabilities to communicate with ABB's equipment. For example data can be retrieved and placed in an Excel spreadsheet.
Temperature Coefficient	An experimental number used to modify the calibration of a device (ABB transducer) to account for changes in environmental temperature.
Temperature Error	The maximum change in output, at any measured value within the specified range, when the transducer temperature is changed from room temperature to specified temperature extremes.
Temperature Range, Compensated	The range of ambient temperatures within which all tolerances specified for Thermal Zero Shift and Thermal Sensitivity Shift are applicable (temperature error).
Temperature, Ambient	The temperature of the air, atmosphere or other fluid that completely surrounds the apparatus, equipment or the work piece under consideration. For devices which do not generate heat, this temperature is the same as the temperature of the medium at the point of device location when the device is not present. For devices which do generate heat, this temperature is the temperature of the medium surrounding the device when the device is present and generating heat. Allowable ambient-temperature limits are based on the assumption that the device in question is not exposed to significant radiant-energy sources such as sunlight or heated surfaces.
Temperature, Flowing	Temperature of the flowing fluid. Usually gas and measured by an RTD.
Terminal Mode	Man-Machine interface tool used as and engineering interface with equipment.
Termination	Placement of a connector on a cable.

TERM	DEFINITION
Termination Panel	The NGC8200's termination panel acts as a connection to the outside world. It features transient protection, a voltage regulator for the digital controller, positive temperature co-efficient fuses (PTC) and many other safeguards to protect the remainder of the system from electrical damage. All outside communications and I/O are channeled through this board. It is designed to be a low cost, field replaceable maintenance solution and is designed to operate on either 12V or 24V.
Termination Panel	A circuit board with screw terminals or other connector system that allows convenient connection of field signals to a data acquisition or communication system.
TF Loader Packages	In PCCU32, the 32-Bit XSeries Loader is the program that allows for the downloading of specific files to an NGC, XFC, XRC or µFLO XSeries device. The 32-Bit XSeries Loader application allows packages containing a combination of Flash, WinCE OS (nk.bin), ISaGraf Runtime, Blackfin Firmware (NGC) and configuration files to be downloaded to XFCs, XRCs, NGCs or µFLO machine types. These same packages can be downloaded to other machines of the same type to expedite configurations for machines having the same purpose. With the creation of these packages, the user is then prevented from accidentally loading incompatible packages to the wrong device.
TF.NET	ABB network used to access web data.
tfCold	ABB's Serial E^2 PROM solid state memory chip, located on the main board (volatile memory, affected by a cold start), used to store configuration or station files.
tfData	Refers to ABB's SRam Drive (solid state memory chip) located on the main board, used to store data and configuration files. The tfData drive is a lithium backed, volatile memory chip and is not affected by a warm start.
TFIO Module	ABB Input/Output module (i.e., quad AO)
Thermal Conductivity Detector	Universal detector that shows a response to all compounds. An electrical component that changes resistance based on the components ability to conduct heat. In chromatography, two TCDs are used, 1)as a reference detector and 2) as the sensor detector. The reference detector is exposed to only the carrier gas and the Sensor detector is exposed to the sample.
Thermistor	A temperature-sensing element composed of sintered semiconductor material which exhibits a large change in resistance proportional to a small change in temperature. Thermistors usually have negative temperature coefficients.
Thermistor Bead	See Thermal Conductivity Detector.
Thermocouple	A temperature sensor created by joining two dissimilar metals. The junction produces a small voltage as a function of the temperature.

TERM	DEFINITION
Thermowell	A closed-end tube designed to protect temperature sensors from harsh environments, high pressure, and flows. They can be installed into a system by pipe thread or welded flange and are usually made of corrosion-resistant metal or ceramic material depending upon the application.
Therms Master	ABB application for Gas Analyzer.
Tolerance	The allowable percentage variation of any component from that stated on its body.
Totalflow	Product line of ABB Inc. Maker and distributor of the XSeries flow computers (XFC) and remote controllers (XRC).
TotalSonic MMI	TotalSonic's Man Machine Interface software program. May also be called MEPAFLOW 600.
Transducer	A device for converting energy from one form to another, specifically the measurement of pressure differential in natural gas gate stations. I.e. Pressure to voltage or current.
Transfer Rate	The rate, measured in bytes/s, at which data is moved from source to destination after software initialization and set up operations; the maximum rate at which the hardware can operate.
Transient	An abrupt change in voltage, of short duration (e.g. a brief pulse caused by the operation of a switch).
Transistor	A three leaded device (Collector, Base, Emitter) used for amplifying or switching. Also called a bi-polar transistor to distinguish it from Field Effect Transistor etc.
Transmitter	A device that converts audio, video or coded signals into modulated radio frequency signals which can be propagated by electromagnetic waves (radio waves).
Tranzorb	Transient Voltage Suppression device.
TRB	Tank Request Block Editor. When requesting storage space after adding a LevelMaster application, the file is saved as a *.trb file.
Tube	Cylinder for transporting or storing liquids: any long hollow cylinder used to transport or store liquids.
Tuned Radio Frequency	An amplitude modulated (AM) receiver with one or more stages of radio frequency before the detector.
TXD	Communication abbreviation for Transmit Data.
UDINT	Unsigned Double Integer
UL	Underwriters Laboratories, Inc. An independent laboratory that establishes standards for commercial and industrial products.
Union	A form of pipe fitting where two extension pipes are joined at a separable coupling.

TERM	DEFINITION
Universal Serial Bus	An external peripheral interface standard for communication between a computer and external peripherals over a cable using biserial transmission. It supports both isochronous and asynchronous data transfers.
Unnormalized Total	Is a calculation of the Peak Area divided by the Response Factor for each component, then summed by each component.
Unsigned Integer	Can represent a number twice the size of a "signed integer", but cannot represent a large negative number.
Upload	This refers to a ABB procedure in which any file(s) located in the on-board memory of a ABB Host is copied to a file created on a laptop PC.
UPS	Un-interruptible power supply. A power conditioning unit placed between the commercial power service and the protected device. The UPS uses line power to charge batteries, which, in the case of a power failure, can drive electronic circuitry to produce the appropriate AC requirements for some time period.
Upstream	Oil and natural gas exploration and production activities; plus gas gathering, processing and marketing operations.
Upstream Pipeline	The first pipeline to transport natural gas en route to an inter-connect point for delivery to another pipeline. See DOWNSTREAM PIPELINE.
USB	Acronym for Universal Serial Bus.
USB Client	Generally refers to the peripheral device (slave or client) that is driven by a computer (Master or Host). Examples are a printer and digital camera.
USB Host	Generally refers to the computer device (Master or Host) that drives a peripheral piece of equipment (slave or client). An example is a Laptop or Desktop Computer.
USX	Provider of the RTOS used by the XSeries product line
VAC	Volts of alternating current.
Vacuum	A pressure less than atmospheric pressure, measured either from the base of zero pressure or from the base of atmospheric pressure (PSIA).
Valve	A mechanical device for controlling the flow of fluids and gases; types such as gate, ball, globe, needle, and plug valves are used.
Valve Control	This feature provides automatic feedback control of Differential Pressure (DP), Static Pressure (SP), and Flow Rate for the purpose of positioning a flow valve to maintain a desired value of DP, SP, or Flow Rate.
Vapor Pressure	The pressure exerted by a liquid when confined in a specified tank or test apparatus.
VAS32	ABB's Voice Alarm System. A software program that receives and transmits alarm notifications via cell, telephone or pager systems.
VBATT	Battery Voltage. The voltage output from the battery source.
VCI	Valve Control Interface.

TERM	DEFINITION
VDC	Volts of direct current.
VDE	Verband der Elektrotechnik Elektronik Informationstechnik [Association for Electrical, Electronic & Information Technologies]
Velocity	The time rate of change of displacement; dx/dt.
Vent	A normally sealed mechanism which allows for the controlled escape of gases from within a cell.
VGA	Video Graphic Array.
Virtual Memory	A method of making disk storage appear like RAM memory to the CPU, thus allowing programs that need more RAM memory than is installed to run in the system. This technique is slow compared to "real" memory.
Viscosity	The inherent resistance of a substance to flow.
VOG	Velocity of Gas.
Volatile Memory	A storage medium that loses all data when power is removed.
Volt	The unit of voltage or potential difference.. One thousand volts = 1kV.
Voltage	Electrical pressure, the force, which causes current to flow through a conductor. Voltage must be expressed as a difference of potential between two points since it is a relational term. Connecting both voltmeter leads to the same point will show no voltage present although the voltage between that point and ground may be hundred or thousands of volts.
Voltmeter	A meter for reading voltage. It is one of the ranges in a multimeter.
Volume Calculation Period	The specified length between reading and calculating volume data.
Volume Flow Rate	Calculated using the area of the full closed conduit and the average fluid velocity in the form, Q = V x A, to arrive at the total volume quantity of flow. Q = volumetric flowrate, V = average fluid velocity, and A = cross sectional area of the pipe.
VOS	Velocity of Sound.
Warm Start	A rebooting technique which will clear most operational errors, without damaging either the data or configuration files. This causes the equipment to boot from the RDRIVE or tfData, which is a solid state memory chip.
Watt	Symbol W. The unit of power. One watt is the product of one volt and one amp. Power (W) = Current (I) X Energy (E). (E = Volts)
Wavelength	The distance between two points of corresponding phase in consecutive cycles
Web Page	All the text, graphics, and sound visible with a single access to a Web site; what you see when you request a particular URL.
Web Server	The hardware and software required to make Web pages available for delivery to others on networks connected with yours.
Web Site	A collection of electronic "pages" of information on a Web server

TERM	DEFINITION
Well, Development	A well drilled in order to obtain production of gas or oil known to exist.
Well, Disposal	A deep well in which to inject waste chemicals, etc., such as a well to dispose of salt brine from the solution mining of salt dome gas storage caverns.
Well, Exploratory	A well drilled to a previously untested geologic structure to determine the presence of oil or gas.
Well, Gas	A well which produces at surface conditions the contents of a gas reservoir; legal definitions vary among the states.
Well, Marginal	A well which is producing oil or gas at such a low rate that it may not pay for the drilling.
Well, Stripper	Non-associated gas well capable of producing no more than 90 Mcf/day at its maximum rate of flow.
Well, Wildcat	An exploratory well being drilled in unproven territory, that is, in a horizon from which there is no production in the general area.
Wellhead	The assembly of fittings, valves, and controls located at the surface and connected to the flow lines, tubing, and Casing of the well so as to control the flow from the reservoir.
WellTell Wireless	Product line designed to communicate RS-485 without the use of cabling. Group consists of the wireless host (WellTell-X), wireless IS client (WellTell-IS) and wireless IO client (WellTell-IO).
WellTell-IO	Client communication device designed with extra on-board IO.
WellTell-IS	Client communication device designed with an intrinsically safe barrier.
WellTell-X	Host communication device for WTW product line.
Wheatstone Bridge	Circuit design using two TCDs to measure components in chromatography.
WINCCU	Windows Central Collection Unit. Windows version of software to process, archive and manipulate data collected from the ABB products.
Window	In computer graphics, a defined area in a system not bounded by any limits; unlimited "space" in graphics.
Witness	In the field, where hydrocarbons are changing hands and actual cash register transactions being performed, it is not uncommon for one party or the other to request / require a representative or company employee be present during calibrations and or routine maintenance. Often this arrangement is contractually linked.
Wobbe Index	Calculated from the energy content, or a higher heating value of the gas, and the relative density of the gas ($Btu/RD^{1/2}$).
Wobbe Number	A number proportional to the heat input to a burner at constant pressure. In British practice, it is the gross heating value of a gas divided by the square root of its gravity. Widely used in Europe, together with a measured or calculated flame speed, to determine interchangeability of fuel gases.

TERM	DEFINITION
Working Voltage	The highest voltage that should be applied to a product in normal use, normally well under the breakdown voltage for safety margin. See also Breakdown Voltage.
World Wide Web	An Internet service facilitating access to electronic information - also known as the Web, WWW, or W3.
Write	To record data in a storage device or on a data medium.
WTW	Acronym for WellTell Wireless products.
WTW	WellTell Wireless product line. See WellTell Wireless.
XDCR	See External Transducer.
XFC	See flow computer, XSeries.
XFC G4	ABB's new Generation 4 extendable XFC equipment featuring technology that is expandable and flexible for ever changing needs.
XFC-195 Board	The main electronic board used in XSeries flow computers. The XFC-195 Board mounts on the inside of the enclosure's front door.
XFC6200EX	ABB's Class 1 Div 1 flow computer. This ABB flow computer is housed in an explosion proof housing and has similar operational features as the μFLO, with additional capabilities.
XIMV	See XSeries Integral Multivariable Transducer.
XMV	See Multivariable Transducer.
XRC	XSeries remote controller. Also see remote controller, XSeries.
XRC G4	ABB's new Generation 4 extendable XRC equipment featuring technology that is expandable and flexible for ever changing needs.
XSeries	ABB's new extendable equipment series featuring technology that is expandable and flexible for ever changing needs.
XSeries Integral Multivariable	Abbreviated XIMV. A smart Multivariable Transducer that is an integral part of the XSeries flow computer, measuring Static Pressure (SP), Differential Pressure (DP) and Flowing Temperature (Tf). This refers to both the transducer portion of the device and the circuitry required to supply measurements to the Main Processor Board, which is housed in a factory sealed unit. See Multivariable Transducer for more information.
Y	Expansion factor.
Zero Gas	Gas at atmospheric pressure.
Zero Offset	The difference expressed in degrees between true zero and an indication given by a measuring instrument.

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