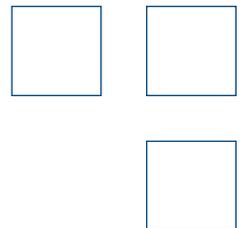




Installation & Operation Guide

Model FS10A Analyzer Flow Switch / Monitor



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Technical Specification

Instrument

Media Compatibility

All gases and liquids compatible with 316L stainless steel and hastelloy C22.

Process Connection

1/4" NPT; compatible with 1/4", 3/8" and 1/2" tube tee, 1/4" tube tee with 1/8" injection tube adapters and SP76 adapter (FCI part number 019897-01)

Flow Sensitivity/Range:

	Air/Gas				Liquids			
	CC/Min		SCFH		CC/Min		GPH	
	Min	Max	Min	Max	Min	Max	Min	Max
1/8" tube adapter with 0.0625" ID injection tube	10	2,000	0.02	5	0.70	18.00	0.01	0.30
1/8" tube adapter with 0.0940" ID injection tube	25	5,000	0.05	10	1.50	40.00	0.03	0.60
1/4" tube tee	50	20,000	0.10	40	4.00	100.00	0.07	1.70
SP76 adapter	50	20,000	0.10	40	4.00	100.00	0.07	1.70
3/8" tube tee	180	50,000	0.40	100	14.00	350.00	0.20	5.50
1/2" tube tee	375	100,000	0.80	200	30.00	750.00	0.50	12.00

Repeatability:

± 0.5% of reading¹

Temperature Coefficient

For temperatures > ± 30 °F [± 16 °C]

Gas: Maximum ± 0.025% of reading/°F up to 500 °F
[± 0.05% of reading/°C up to 260 °C]

Liquid: Maximum ± 0.2% of reading/°F up to 250 °F
[± 0.367% of reading/°C up to 121 °C]

Turndown Ratio: 5:1 to 100:1

Agency Approvals

Integral Electronics

FM, FMc: Nonincendive, Class I Division 2 Groups A, B, C, D; Class II, Division 2 Groups E, F, G; Class III, T4@Ta=71°C Type 4X

ATEX, IEC: Nonincendive for gas and dust, Zone 2
II 3 G Ex nA IIC T4 Gc
II 3 D Ex tc IIIC T 81°C Dc
IP64

CE Mark

Remote Flow Element

FM, FMc: Class I, Division 1, Groups A, B, C, D; T2...T6
Ta = -40 °C TO +65 °C (Electronics)
Class II/III, Division 1 Groups E, F, G; T2...T6
Ta = -40 °C TO +65 °C (Electronics); Type 4x, IP67
Tp = -40 °C TO 260 °C (T1...T6) Includes Div1/Zone1 ambient temperature zone.

ATEX: II 2 G Ex d IIC Gb T2...T6; Ta = 40 °C TO +65 °C
II 2 D Ex tb IIIC Db T300 °C...T85 °C; IP67

IEC: Ex d IIC Gb T2...T6; Ta = 40 °C TO +65 °C
Ex tb IIIC Db T300 °C...T85 °C; IP67

Refer to Probe Installation Operation manual [06EN003428] for Zone 1/Division 1 installation.

Flow Element

Materials of Construction (Wetted parts) 316L stainless steel with Hastelloy C-22 thermowells; optional, all Hastelloy-C22 probe assembly

Operating Temperature

Standard: -40 °F to 250 °F [-40 °C to 121 °C]

Electronics limited to 160 °F [71 °C]

Remote probe with polyurethane cable limited to 194 °F [90 °C]

Medium Temp: -40 °F to 500 °F [-40 °C to 260 °C]; remote configuration only - probe and teflon jacketed cable.

Operating Pressure

Tube tee fitting: 500 psig [34 bar (g)]

SP76 adapter: Per SP76 manifold specifications up to 500 psig [34 bar (g)] maximum

Remote flow element; IP67

Transmitter/Electronics

Enclosure

NEMA 4X [IP64], anodized aluminum

Operating Temperature

-40 °F to 160 °F [-40 °C to 71 °C]

Output Signals

Standard:

(1) Relay (SPDT, 1A @ 24 VDC); [1A @ 24 VDC/120 VAC, FM and FMc only] or (1) Open Collector N-Channel MOSFET (100 mA); (1) 4-20 mA * (500 Ω max. load). User scalable, general purpose, un-calibrated output proportional to flow rate for trend monitoring. (1) RS232C Serial I/O

(For linearized, calibrated analog outputs see FCI thermal mass flow meter products)

* Fault indication per NAMUR NE43 guidelines, user selectable high (> 21.0 mA) or low (< 3.6 mA)

Other Digital Comms: Contact FCI

Display

10 LED array, red; sequential lighting proportional to flow trend and flashes at setpoint

User Interface

Two top-mounted push buttons to program switch/trip point, zero and span setting, relay hysteresis and time delay; button operation may be user disabled to prevent unwanted changes; all set-up functions also programmable via RS232C port

Input Power

24 VDC (21.5 VDC to 30 VDC); maximum 2.5 watts

Remote Configuration

Transmitter/electronics may be remote-mounted from flow element using interconnecting cable; remote flow element available with potted cable in 6', 15' or 30' [2m, 5m or 10m] length and M12 connection plug at electronics; optional extended temperature service to 500 °F [260 °C] with selection of PTFE jacketed cable.

1 INSTRUMENT DESCRIPTION AND IDENTIFICATION

The FS10A is a universal flow monitor and switch specifically designed for gas and liquid process analyzer sampling systems. The FS10A is a fast responding, highly repeatable sensor which installs easily into a standard tube tee fitting or SP76 (NeSSI) modular manifold.

2 INSTRUMENT INSTALLATION

The FS10 is marked with a flow direction arrow  or "A" etched onto the sensor element. It is located on the flattened area of the sensor body close to the housing or on the assembled tee. In 1/4 and 3/8 inch tube tees, the "A" should be mounted upstream of the flow to maximize sensitivity at low flow rates (flow into the "A"). Larger line sizes should follow the flow arrow direction. Refer to Table 1 for optimum results. Where the flow tube is not included with the sensor assembly, the orientation mark must be parallel to flow ($\pm 3^\circ$). For **liquid vertical flows** in particular, **FCI recommends the sensor element be installed where flow is in the up direction. In vertical low flow gas applications, flow in the down direction is recommended.**

As a level device, the orientation mark can be perpendicular or parallel to the liquid level. The sensor element may be installed top mount 90° to the liquid surface. The sensor element can be at any angle as long as the flow direction follows the flow arrow. Liquid applications where the flow element is positioned other than horizontally, FCI recommends the flow go in the up direction.

CAUTION: To minimize the possibility of damage, leave the protective covers over the sensing area until the time of installation. Take extra precaution with the sensing elements and surface when installing.

For NPT process connections, apply the appropriate sealant compatible with the process media to the male threads. Tighten until the orientation mark is positioned correctly. Check for leaks.

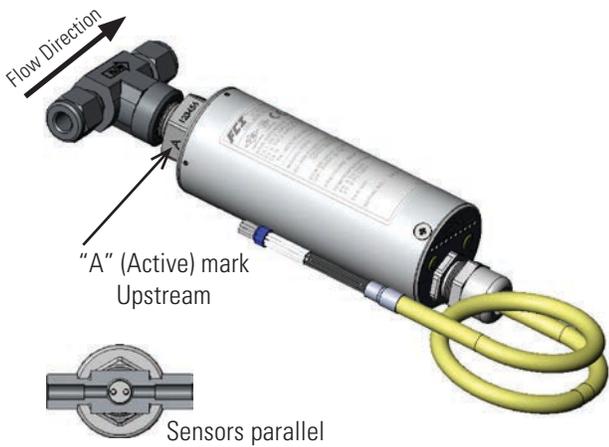
Special Conditions for Safe Use

- a. Provisions shall be made to prevent the rated voltage being exceeded by transient disturbances of more than 40%.
- b. For applications in explosive atmospheres caused by air/dust mixtures, cable and conduit entries used shall provide a degree of ingress protection of at least IP 54 according to EN 60529.
- c. When the temperature under rated conditions exceeds 158°F [70°C] at the cable or conduit entry point, or 176°F [80°C] at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature.
- d. Cable gland assemblies are factory tightened – do not adjust; M12 connectors assembled finger-tight. Mencom MDC-8MR-PG9 or equal M12 connector is used on FS10A.

Remote Flow Element Installation Into Zone 1, Division 1 Areas

Refer to Probe Installation, Operation & Maintenance manual (06EN003428) for Zone 1/Division 1 installation.

Mounting Orientation

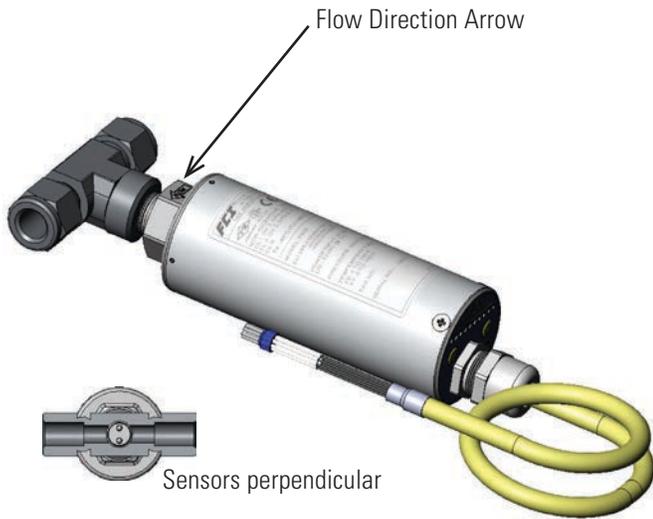


Left to Right Flow Example in 1/4 and 3/8 inch tube tees

For optimum sensitivity in low flow applications, probes should be installed with the "A" (Active) sensor positioned upstream.

Horizontal lines: gas or liquid.

Vertical lines: gas - flow must be down
liquid - flow must be up



Right to Left Flow Example in 1/2 inch or greater tube or pipe tee

Probes mounted into 1/2 inch or greater tees are installed with the sensors positioned perpendicular to the flow path in the tee. "A" (Active) should be facing up in side mount horizontal configurations. These sensors may also be marked with a flow direction arrow.

Diagram 1

3 INSTRUMENT WIRING

Only qualified personnel are to wire or test this instrument. The operator assumes all responsibilities for safe practices while wiring or troubleshooting. One of the following wiring instruction and diagrams illustrate the requirements for power input, alarm and analog outputs and safety instructions for the unit being installed.

ALERT: The Instrument contains electrostatic discharge (ESD) sensitive devices. Use standard ESD precautions when handling the instrument.

Recommended Minimum Wire Gauge

The following wire gauge chart specifies the correct wire for the distance to the power source or loads. Note that the open collector option is limited to 50 ft. It is also recommended that the open collector cable is shielded and that it is not run in the same conduit with the power source or the relay load.

I/O Wiring Gauge vs. Distance

Connection	Maximum Diameter (gauge)					
	10' (3 m)	50' (15 m)	100' (30 m)	250' (76 m)	500' (152 m)	1000' (305 m)
Input Power (24 VDC nominal)	24	24	22	22	20	18
Relay Output (1 amp contacts)	18	16	14	12	10	X
Open Collector Output	24	22	X	X	X	X
4-20 mA Output	24	24	22	22	20	18

Table 1

Grounding

The switch must be properly grounded for safety and operational reasons.

The circuit board is tied to the enclosure case internally and both are tied to the probe assembly. If the installation pipe or vessel is not properly grounded, connection to earth ground may be connected at the output connector, i.e. M12 or cable pigtail. Use the recommended wire gauge specified for the input power and distance listed in the chart above. **Do not connect the earth ground to DC ground (terminals marked "GND", "COM" or "-").**

Input Power, 24 VDC

FCI recommends installing an input power disconnect and a fuse near the instrument to interrupt power during installation, maintenance, calibration, alarm selection and troubleshooting procedures. Conduit should also be installed according to the local electrical codes or hazardous location requirements.

Attach the power leads according to the Input/Output connection schematic on the following page. If the unit has an M12 interface, verify that the mating connector pin numbers match the designations of the wiring diagram. If the unit is supplied with a cable pigtail, the flying leads should be connected via an approved terminal block or connector in an electrically safe and approved conduit box.

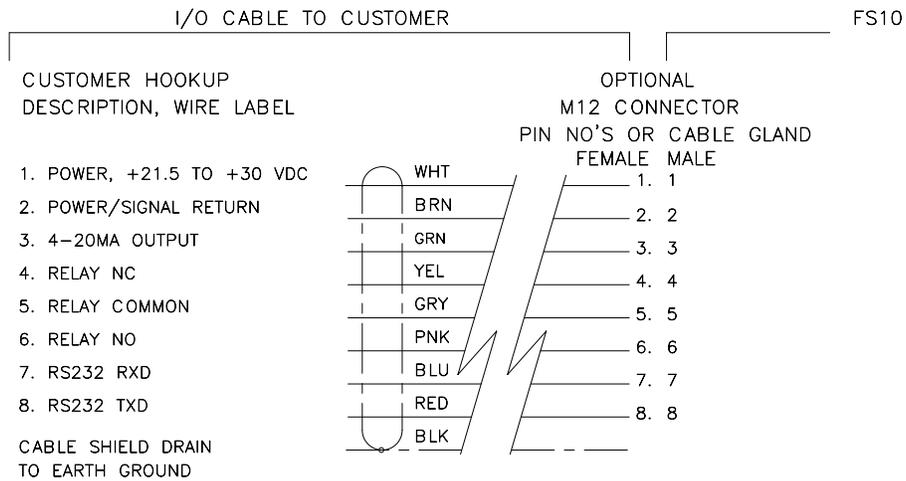
Attach the wires to the relay and other functions as needed. The relay contact conditions are shown in the alarm state (de-energized). The relay's maximum rating is 1 A @ 24 VDC/120 VAC (FM only), 24 VDC (ATEX), resistive loads.

Refer to the next section for the set point and alarm state settings.

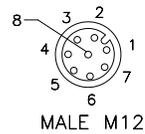
4 POWER UP, FUNCTIONAL VERIFICATION AND ADJUSTMENT

Before applying power to the instrument, it is recommended that a third party inspect the installation workmanship. Make sure wires are not pinched or frayed. Check for matching serial numbers on the sensing element and the control circuit. Verify that the power and alarm circuits are properly connected. Review the instrument configuration and its application.

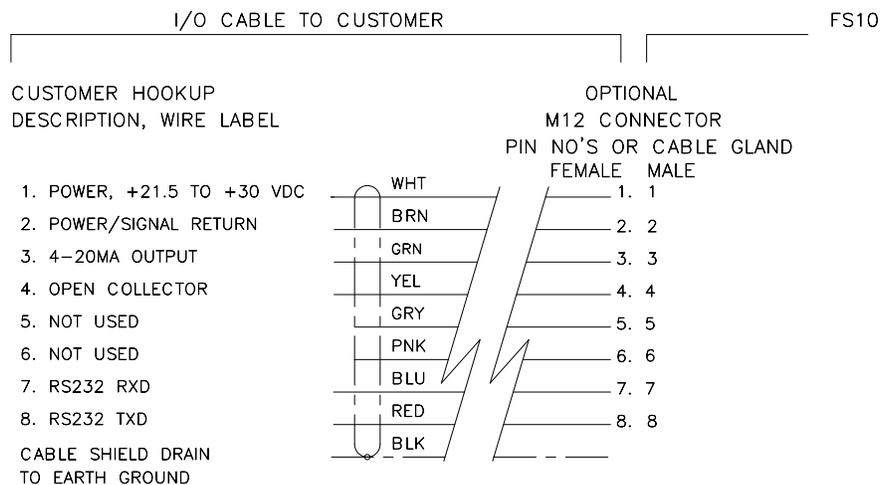
Units supplied with LEDs will have at least one LED on or slowly blinking to indicate power on. Apply power and look for the power indicator light. After power is established let the instrument warm up for 5 minutes. Refer to set-up on following pages. The switch must be properly grounded for safety and operational reasons.



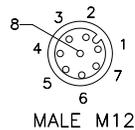
021540-02
I/O WIRING HOOKUP DIAGRAM, FS10,
INTEGRAL AND REMOTE W/O JACK,
8 WIRE CABLE GLAND OR M12,
OUTPUTS: RELAY, 4-20MA, RS232



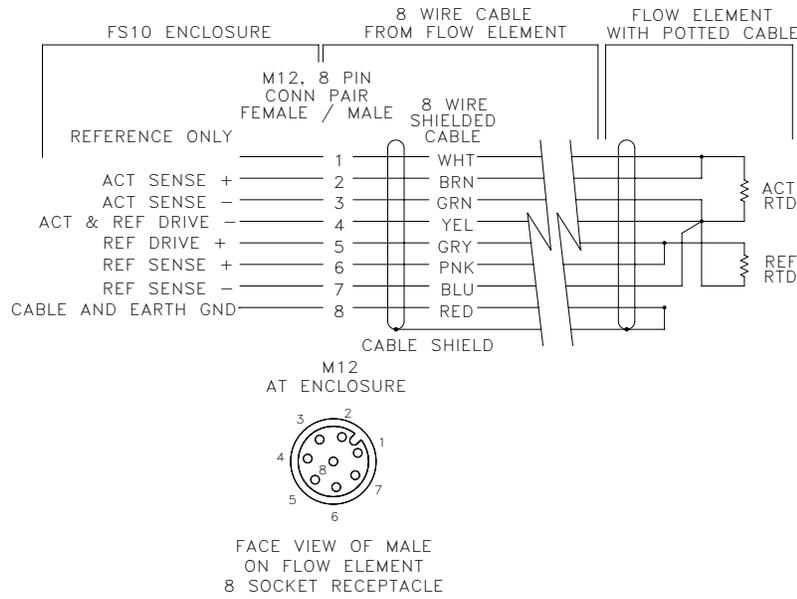
C01041-1-1



021539-02
I/O WIRING HOOKUP DIAGRAM, FS10,
INTEGRAL AND REMOTE W/O JACK,
8 WIRE CABLE GLAND OR M12,
OUTPUTS: OPEN COLLECTOR, 4-20MA, RS232

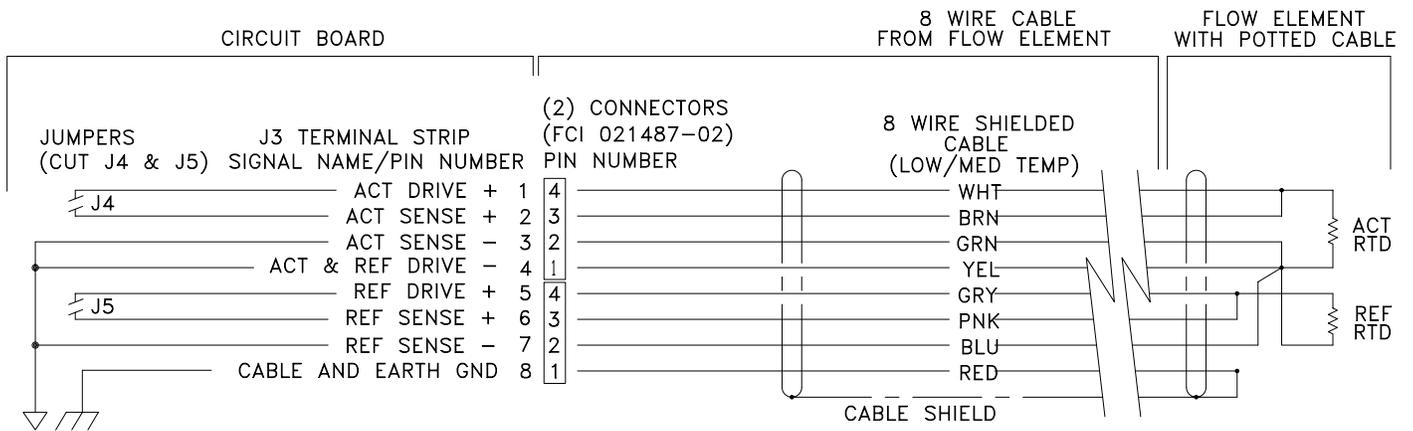


C01040-1-1



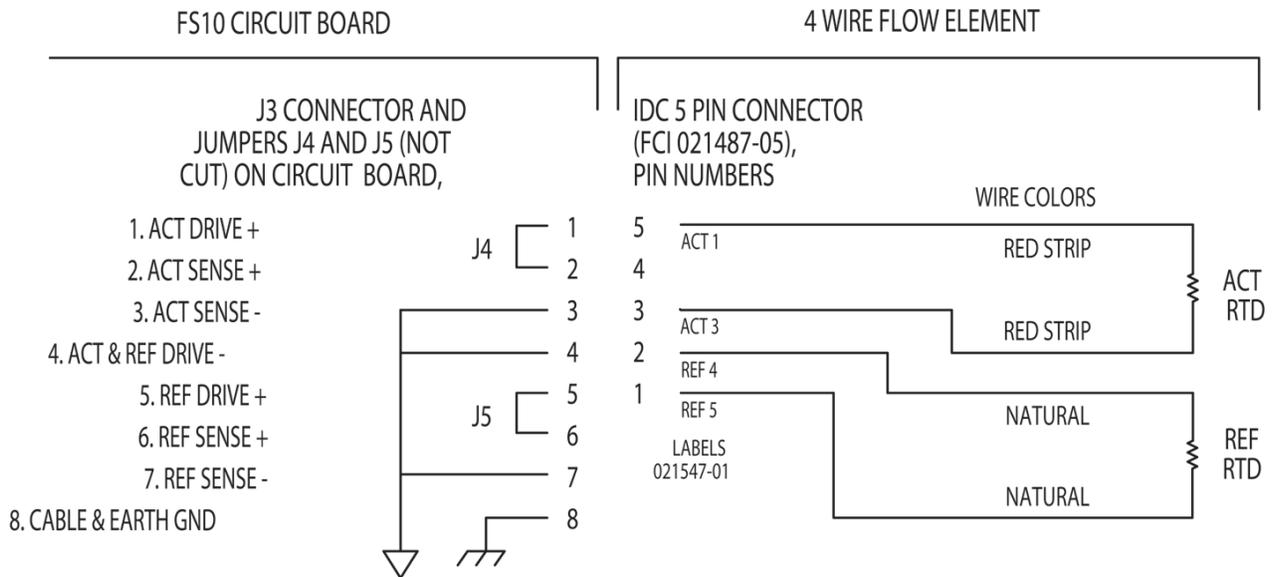
FLOW ELEMENT WIRING DIAGRAM
 REMOTE 8 WIRE CABLE
 M12 8-PIN CONNECTOR AT ENCLOSURE FS10
 021549-01

C01054-1-2



FLOW ELEMENT WIRING DIAGRAM, FS10
 REMOTE W/ 8 WIRE CABLE
 BOARD ONLY (OEM)
 021548-00

C01053-1-1



Flow Element Wiring Schematic, FS10
 Integral Type Assemblies (board only - typically no enclosure)
 4 Wire Hookups With Short Wire Pigtails (OEM)

FCI Dwg 021547

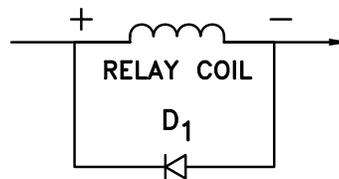
Switching Inductive Loads

If the FS10A relay contacts are to be used to energize or de-energize an external relay, diode suppression must be used across the external relay coil. Use the guidelines in the following example to select the proper diode.

A Tyco Electronics relay K10P-11D15-24 is used as a slave relay. The DC coil voltage is specified at 24 VDC and the specification indicates a coil resistance of 650 Ω. The DC coil current is calculated by dividing the rated coil power by the rated voltage VDC or dividing the rated voltage VDC by the coil resistance. In this case the current through the coil will be around 37 mA (24/650). Refer to the K10P-11D15-24 data sheet.

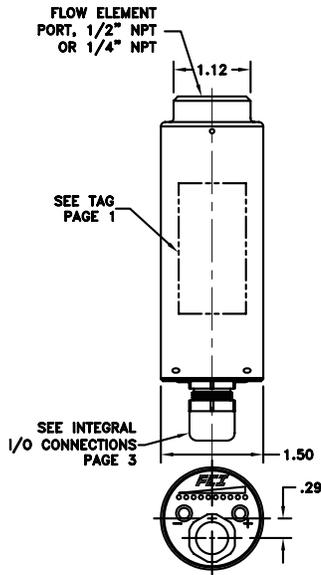
It is recommended the diode reverse voltage (Vr) rating be twice or greater the voltage across the relay and the diode forward current (IF) rating be greater than the relay current. Diodes 1N914 or 1N4148 meet these limits for this case.

POLARITY OF CIRCUIT VOLTAGE

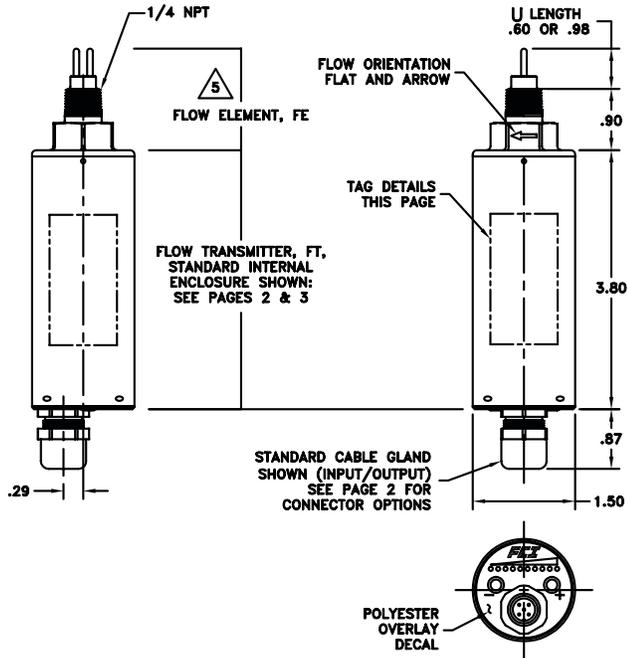


DIODE CONNECTED IN REVERSE BIAS

C01038-1-1



INTEGRAL CONFIGURATION WITH ADAPTABLE FLOW ELEMENTS



INTEGRAL CONFIGURATION WITH STANDARD FLOW ELEMENT

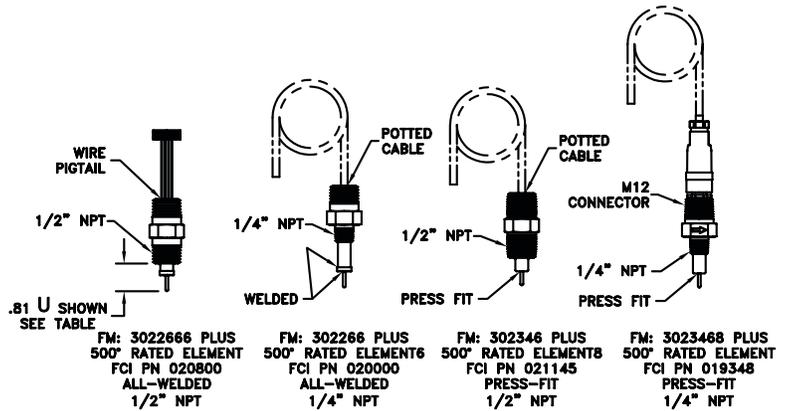
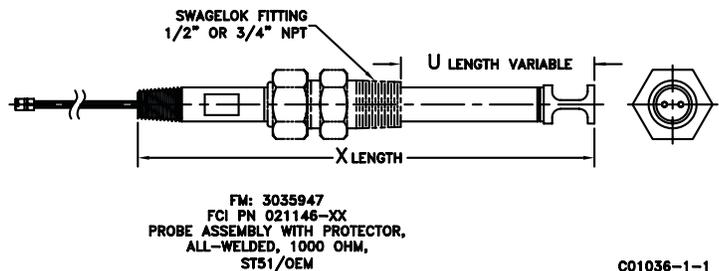
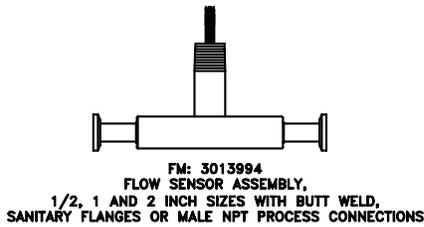
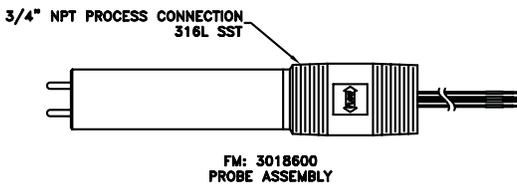
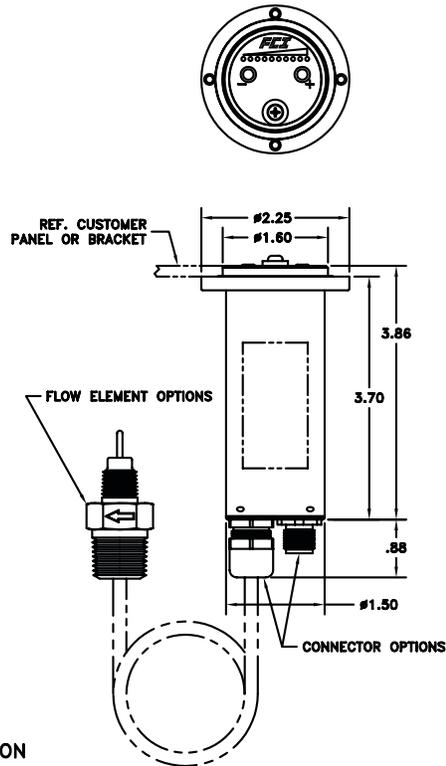


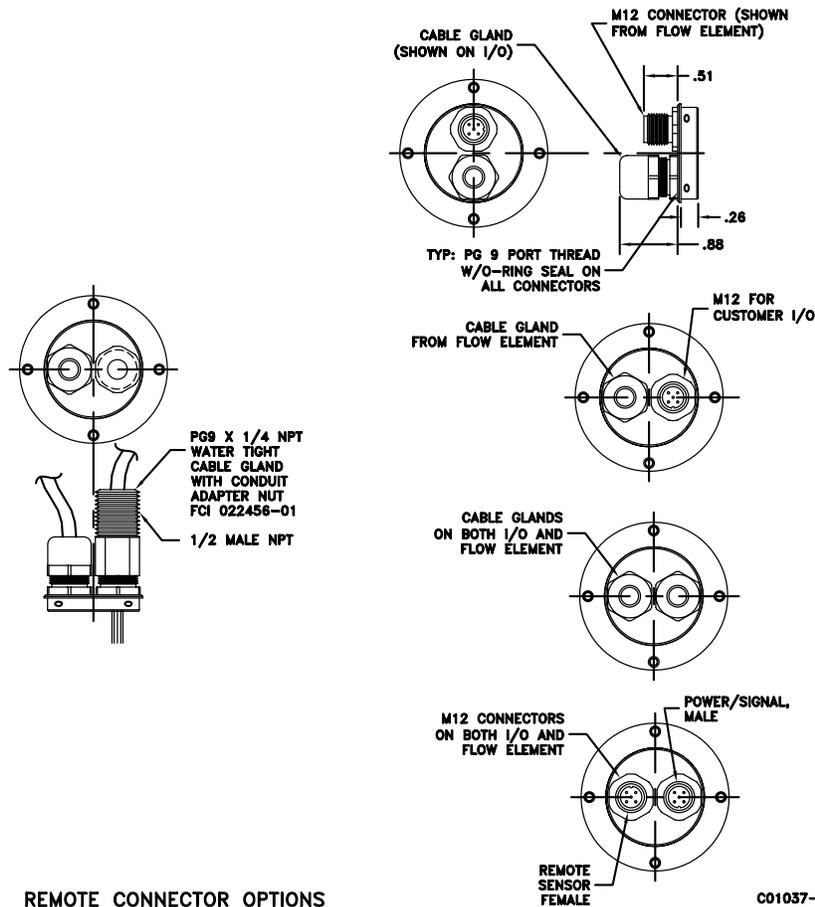
TABLE OF AVAILABLE U LENGTHS ADAPTABLE FLOW ELEMENTS							
NPT SIZE	U LENGTHS AVAILABLE						
1/4"	0.46	0.60	1.34	1.67	2.00	2.13	2.74
1/2"	0.65	0.81	1.34	1.57	1.90	2.13	2.64



C01036-1-1



REMOTE ENCLOSURE CONFIGURATION



REMOTE CONNECTOR OPTIONS

C01037-1-1

5 SET-UP AND OPERATION

FS10 Function Overview

The FS10 flow monitor may come configured for use as a flow or temperature meter. The output of the switch configuration is a SPDT relay contact or binary collector to ground [N-channel MOSFET] output (sync). A 4-20mA output signal is also active as a signal reference. In the transmitter configuration, either the flow or temperature functions may be assigned to the 4-20 mA output. The table below shows the possible output configurations, including the status of the LED bar display.

Output Configuration [Field Selectable with PC Interface Kit]

Configuration	4-20ma Output	Relay on/off Output	LEDs
1 (default)	Corresponds to Flow measurement	Controls Relay switch on/off from Flow	Reflects Flow. Flashing LED indicates Relay Limit.
4	Corresponds to Temp measurement	Controls Relay switch on/off from Flow	Reflects Temperature. No Relay Limit indication.
5	Corresponds to Temp measurement	Controls Relay switch on/off from Flow	Reflects Flow. Flashing LED indicates Relay Limit.

Table 2

- Flow measurement will be mapped using CUST_FLOW_MIN and CUST_FLOW_MAX in the 4-20 mA output configuration.
- Temperature measurement will be mapped using CUST_TEMP_MIN and CUST_TEMP_MAX in the output configuration and reflected in the 4-20 mA output when configuration 4 or 5 is selected. The default temperature range mapped to the 4-20 mA output is 0 °F to 250 °F [-17.8 °C to 121 °C]. Rescaling temperature output may be performed with the PC interface program.

The output configuration setting is normally factory set but may be changed in the field if required. Use caution when making any configuration changes, as the monitor may not have been properly calibrated to accommodate the new setting. Only the RS232 interface may be used to make a change in output configuration.

FS10 Field Quick Setup Procedure

Quick Setup Mode *

This feature permits field setting the critical zero and span parameters of the FS10A with a single push of the button and throttling the process flow over the desired range to capture the low and high ends. All defaults applicable to a low flow indication/alarm application apply along with a trip-point default setting at 30% of span.

To activate the Quick Setup Mode (QSM), simply press and hold for at least 10 seconds:

“ – ” button, for process fluids that are gases or very low flow liquid hydrocarbons

“ + ” button, for process fluids that are liquids or high velocity gases (+50% sensor excitation).

The first three and last three LEDs will alternately flash to acknowledge entry into the Quick Setup Mode. The FS10A is now cued to remember the lowest and highest flow signal it sees while in this mode. Pressing either button momentarily exits into the normal operating mode and saves the detected limits as the zero and span. LED's 1 and 10 and corresponding trip point LED will alternately flash (3 sec), indicating zero and span have been properly set.

A minimum span setting of 0.05% is required to save new parameters. If minimum span is not reached during QSM, the first two, middle two and last two LEDs will flash; indicating an error (3 sec) and resume last operation without saving new parameters.

Note: Apply any desired hysteresis, time delay, failsafe, etc. changes to the standard default settings after establishing the zero and max flow using the Quick Setup Mode. Entering the QSM resets these parameters to the standard low flow alarm default settings as defined for bank 1(-button) or bank 3(+button).

Tip:

- 1) The 4-20 mA analog output is not calibrated and will likely be non-linear over the full range (or span) created during the QSM. To improve the linearity of the output, set the zero at about 10% to 15% of the span (zero offset). That will remove the steep portion of the overall output curve and provide a more linear result over the usable span.
- 2) To use the QSM in the field after changing the factory low flow alarm default settings (i.e. failsafe, hysteresis, time delays, etc.); setup as desired and save changes to bank 7 (under Calibration Bank Setup window in the PC interface program). Then go to the Quick Setup Mode window and change the default “Bank Selection” for either the - button or + button to bank 7. Now when the newly assigned button is used to learn the zero, span and trip point, it will use the saved parameters stored in bank 7.

Recommendations

Gas applications

The high flow limit or span setting is normally the most difficult to stabilize in a gas application; therefore, simulating the desired high flow rate at normal process conditions and allowing it to stabilize before entering into the QSM is recommended. Using in-line valves or other throttling means, establish the desired full scale flow rate and allow system to stabilize. Now enter into the QSM (FS10 immediately captures this high flow signal) and then slowly throttle the flow down until the zero flow setting is reached (i.e. valve closed, no flow). Allow to stabilize, then momentarily press either button to save parameters and return to normal operating mode with the new scaled operating range established.

Liquid applications

To optimize the performance of the FS10A in liquids, it is critical to establish a stable zero setting under a packed line (full) condition. It is recommended the FS10A be operating and allowed to come to equilibrium with a downstream valve closed and the line completely filled with the process fluid and no flow. At this point, enter into the QSM (FS10 immediately captures this low flow signal), and then slowly open the downstream valve to allow flow up to the maximum span desired. Momentarily press either button to save parameters and return to normal operating mode with the new scaled operating range established.

In some cases the high liquid flow signal will saturate before reaching the high flow that is simulated, but the FS10A will save the highest value it is capable of sensing in that application and use it as the high end limit.

Trip point

By factory default, the trip-point is set to 30% of the established span when using the Quick Setup Mode. This may be changed in the field using the standard button commands (refer to Functions 1 and 2 under Normal set-up and operation using the button interface in the operating manual). Alternatively, the QSM factory trip-point default of 30% of span may be changed in the field using the PC interface program before entering into the QSM. Selecting the factory setup option at order will also permit designating an alternative customer desired default value at the factory. Note, this value is always a % of the established span and alters any previous trip point that may have been attained on a previous setup.

Note: The 4-20 mA output and relay trip will continue to operate at the previously set range while in the Quick Setup Mode

Summary

1. Activate QSM: Press “-” button (gas) or “+” button (liquid) minimum 10 seconds (LEDs will acknowledge entry into QSM).
2. Throttle flow valve to simulate zero and full scale flow.
3. Press either button momentarily to save parameter values and exit into normal operating mode.

* FS10A with Firmware version 4.0 or greater

FS10 Button Controls

It is recommended the unit be powered-up for 10-15 minutes before making changes to any of the flow settings.

General Control Description

The FS10 control “functions” can be accessed through the two buttons by:

1. Entering “Function Selection”
 2. Selecting the desired function to adjust
 3. Adjusting the function control
 4. Exiting to normal operation
1. To Enter “Function Selection” mode:
 - a. Press and hold both buttons down for 3 seconds
 - b. When “function selection” is entered, all the LEDs will flash “on”, then
 - c. The first function (LED # 1) will be illuminated
2. “Function Selection” mode:

Once the unit is in “function selection” mode, the buttons take on new controls:

 - The “-” and “+” buttons will step (increment down or up respectively) through the different functions. The current function number will be indicated on the LED blinking at the slow rate.
 - Holding either the “+” or “-” for 3 seconds will “select” the current function to be adjusted.
3. When a function has been selected for adjustment:

After selecting the desired function by pushing and holding either the “-” or “+” button for 3 seconds the LEDs will flash at a faster rate. The pattern of the LEDs will either reflect the current value of the parameter being adjusted, or the “ready to capture” pattern for parameters to be captured (see specific function descriptions for details).

The buttons will either increment or decrement the function parameter, or capture a value for the corresponding parameter.
4. To exit out of the current function, push and hold both buttons down for 3 seconds. The LEDs indicate that you are once again in “function election” mode, and the current mode is incremented to the next function. To exit completely (into operational mode), press the two buttons simultaneously for 3 seconds once again.

Note: Function #4 (load a bank) and function #15 (save to a bank), requires holding either button for 3 seconds to load or save.
Holding both buttons will exit either function without performing the operation.

Button Operation

1	Enter “function selection”	Push and hold both buttons simultaneously 3 seconds
2	Select desired “function”	Push “+” or “-” to step through (LEDs indicate function #)
3a.	Enter “function adjust”	Push and hold either “-” or “+” button 3 seconds
3b.	Adjust within function	Follow instructions for particular function entry
4a.	Exit “function adjust”	Push and hold either “-” or “+” button 3 seconds (now in “function selection” operation) [NOTE: Function #4 or #15 requires holding both buttons to exit into function select operation]
4b.	Exit “function selection”	Push and hold both buttons simultaneously 3 seconds (now in normal operation)

Table 3

Normal set-up and operation using the button interface

Refer to **Table 5, Button Controls** to address the following functions in the field.

Bank Selection of Stored Parameters (Function 4)

Select function 4 to change bank selection of stored parameters. The FS10 has 7 storage banks. Banks 1-6 are factory set defaults of common applications or specific factory calibrations. Bank 7 is available for user saved parameters. Refer to complete FS10 configuration number to determine the factory supplied bank setting. Note, an error pattern will result when selecting through the banks if the bank contains no valid calibration parameters.

Units that do not come factory calibrated use Universal Setting A from Bank 1 as the settings for operational Bank 0. These parameters cover the entire range (delta R) of the device. Therefore, spans and trip-points can be set in the field using this bank regardless of process fluid.

Once a unit is set-up in the field, the changed parameters now in Bank 0 may be stored to bank 7 using Function 15 and later retrieved using Function 4 if unwanted changes were made in the interim.

Important: If a bank change is made using the buttons, it is important to completely exit the button function to save this setting. Then re-enter the button function mode to establish a new zero, span and trip point.

Bank Default Values

Bank No.	Process Fluid	Range Setting
0	FS10 Current Active Parameters	
1	Universal Default Setting A - Low flow sensitivity	Un-calibrated output - low sensor excitation power setting Full range gas or liquid
2	Reserved for customer saved settings [user defined and stored]	
3	Universal Setting B - High flow gas, liquids	Un-calibrated output – 1.5X sensor excitation power setting Full range liquid and gas
4	Reserved for customer saved settings [user defined and stored]	
5	Reserved for custom calibration	
6	Reserved for custom calibration	
7	User defined and stored	

Table 4

Flow Switch Operation

Units supplied without factory trip point setting should be scaled in situ before setting the trip point. Default Universal Setting A from Bank 1 is recommended for most low flow sampling gas or liquid service. Gas and liquid service applications where higher flow rate detection is required may select Universal Setting B from Bank 3.

Scaling is performed in the following order:

Minimum Flow Setting (Function 6)

Select function 6 to capture the minimum flow rate. In liquids, optimum performance is achieved by setting the Minimum Flow to a full line at no flow. If possible, with liquids, slightly pressurize the pipe and block the flow using valves to assure a full and static condition. Capturing the no-flow value in Function 6 establishes the zero point.

Maximum Flow Setting (Function 7)

Run the process at maximum flow and use this function to capture the maximum flow in gas or liquid. Since liquids transfer heat very efficiently, depending on the sensor assembly and fluid, maximum signal level will likely be achieved at flow rates under 2 feet per second, though the actual flow in the tube may be higher. Capturing the maximum flow effectively establishes the span in the installation.

Note: Be sure to pause at least 30 seconds before capturing zero and span to assure unit has reached equilibrium.

Static/Dynamic Mode Option (Function 5)

This option provides dynamic ranging (span setting) of the unit for purposes of calibration. It is intended to aid the user in ranging the FS10 in cases where the maximum flow is fluctuating and difficult to capture or requires action away from the FS10 installation.

Select button Function 5 to change between static and dynamic mode for setting the maximum span value [CUST_FLOW_MAX]. The "static" default setting is used to capture the maximum flow in Function 7. If function 5 is changed to "dynamic" setting, the FS10 will constantly update the maximum span value to reflect the maximum flow. The span setting increases (re-scales) to match an increasing process flow and remains at the highest level achieved as long as the unit remains powered.

Important Note: When Function 5 is changed to Dynamic Mode, the span immediately drops to the value of the trip-point setting and climbs from that point with flow. Therefore, a trip point should be captured (Function 2) at a flow lower than the anticipated max span flow before placing unit in Dynamic Mode. Once the user is satisfied the maximum flow is captured in Dynamic Mode, the unit should be switched back to Static Mode. The established span will remain. **CAUTION:** A loss of power while in Dynamic Mode results in resetting the CUST_FLOW_MAX to the original trip point value. Dynamic mode is not recommended if the application may see spiking flows or wet conditions in gas applications that could result in a temporary and false indication of what the maximum flow should be.

Trip Point Adjust (Function 1 or 2)

There are two ways to set the trip point using the buttons.

Function 1 uses the LEDs as indicators to set the trip point in 10% increments within the established span.

Function 2 may be used to set the precise trip point by "capturing" the exact process flow rate. In liquids, make certain the desired trip point is within the set operating range. That is, when capturing at the trip-point, the LEDs should be showing no greater than 90% flow. **NOTE:** The trip-point setting is saved in feet/sec, therefore, changing the span later may alter the relative position of the flashing LED indicating the trip-point value.

Low flow alarm applications with relay energized above the trip point (default setting): the trip point LED will flash quickly when the flow is below the trip point. The LED flashes at a slower rate when the flow is at or above the trip-point.

Additional Switch Settings

Failsafe Position (Function 3)

This function establishes the state of the relay during normal operation and alarm condition. It is common to set the failsafe so that the relay is "energized" or activated under normal operating conditions. An alarm condition (trip point activated) results in the de-energized state. That assures an alarm state if power is lost to the device as well.

If the relay is bypassed and the device is used with the solid-state binary output, the system should be set up so a no-power condition results in an alarm state. The transistor should be "on" under normal operating conditions, resulting in an approximate 5 VDC signal to ground. Power loss or alarm condition, results in 0 VDC to ground.

Hysteresis (Function 8 and 9)

In the case of the flow switch, hysteresis is defined as the difference in signal level between turning on the relay and turning it off. If the hysteresis is set to zero, that point is the same and can result in chattering, rapidly turning the relay on and off, in slow moving processes. A hysteresis level is applied to minimize the possibility of chattering around the trip point. It is set as a percent of the established span.

The hysteresis may be applied above the trip point or below the trip point. As an example, if set above the trip-point in an application requiring low flow detection, the relay will change state as the signal falls below the trip point, but will not reset until it reaches the trip-point value plus the added hysteresis value. The default setting is hysteresis above the trip-point and set at 2% of the span value. If changes are required to the default, see how the hysteresis is applied in Function 8 and set the value in Function 9. Any value hysteresis may be applied through the RS232 PC (recommended) or command line interface. The button functions are limited to settings between 0% and 10% in 1% increments.

Time Delay (Function 10 or 11)

A time delay may be applied to the trip-point in one of two ways. The time delay may be applied to activate (Function 10) the relay after the trip-point has been reached, or may be applied to de-activate (Function 11) the relay after the trip-point has been reached. The time starts as the trip-point is reached and counts down as long as the trip-point value is retained. The relay then changes state. If the trip-point was reached, but not maintained during this period, the time delay resets and the relay does not change state. The default value is zero seconds and may be increased in 1-second increments up to 10 seconds with the buttons (time delays considerably higher are achievable through the RS232 interface >65,000 sec. with PC interface).

Function 10 operation (relay change of state is delayed this amount [sec.] after signal reaches trip-point) is normally used in applications where false trips may occur due to turbulent or cyclic flow action or in wet dry applications where splashing during vessel filling, for example, may cause premature actuation. Proper setting of the time delay in this mode can be very effective in preventing problematic nuisance trips.

Function 11 operation (relay change of state is delayed this amount [sec] after signal leaves trip-point) may also be used in cyclic flow conditions. Another possible use may be to fill a vessel after a low level is reached. For example, the level reaches the low level trip-point; the relay immediately changes state and is set to actuate a solenoid valve that begins the filling action. A time delay may be set that corresponds to the time needed to fill the vessel.

Important: The time delay function is dependent on the Failsafe Position (Function 3). Therefore, select the proper mode of delay based on relay being activated in normal operation and de-activated in the alarm condition. These selections are likely to be different when alarm settings are for low flow (or dry) verses high flow (or wet) applications.

Alarm Simulation (Function 12)

This function is used to force the output to the highest or lowest value, resulting in a change of relay state as well. Alarm simulation may be useful in testing the system in which the FS10 is installed.

Keypad Lockout (Function 13)

This function changes the time required to depress the two buttons to enter into the set-up mode from the default 3 seconds to 10 seconds (and back). Total button lockout may be achieved through the digital interface program via the RS232 connection.

Filter Setting (Function 14)

A filter is applied to the raw input signal (delta R). It is used to smooth the output against fluctuating or turbulent flow conditions. The range of the filter setting is 3-100. The default setting is 18 and reduces the time response by < 2 seconds. A setting of 100 will provide the maximum dampening of the signal and decreases the response time approximately 10 seconds. Settings from 3 to 100 may be applied using the RS232 PC interface or command line interface. The buttons permit changes of values 3, 18, 30, 50 and 100 only.

Save to Bank (Function 15)

Set-up configurations may be saved to bank 7. After the FS10 is field configured, storing the parameter settings to bank 7 is performed in this function.

Output and Display Parameters

FS10 Output and Display Parameters

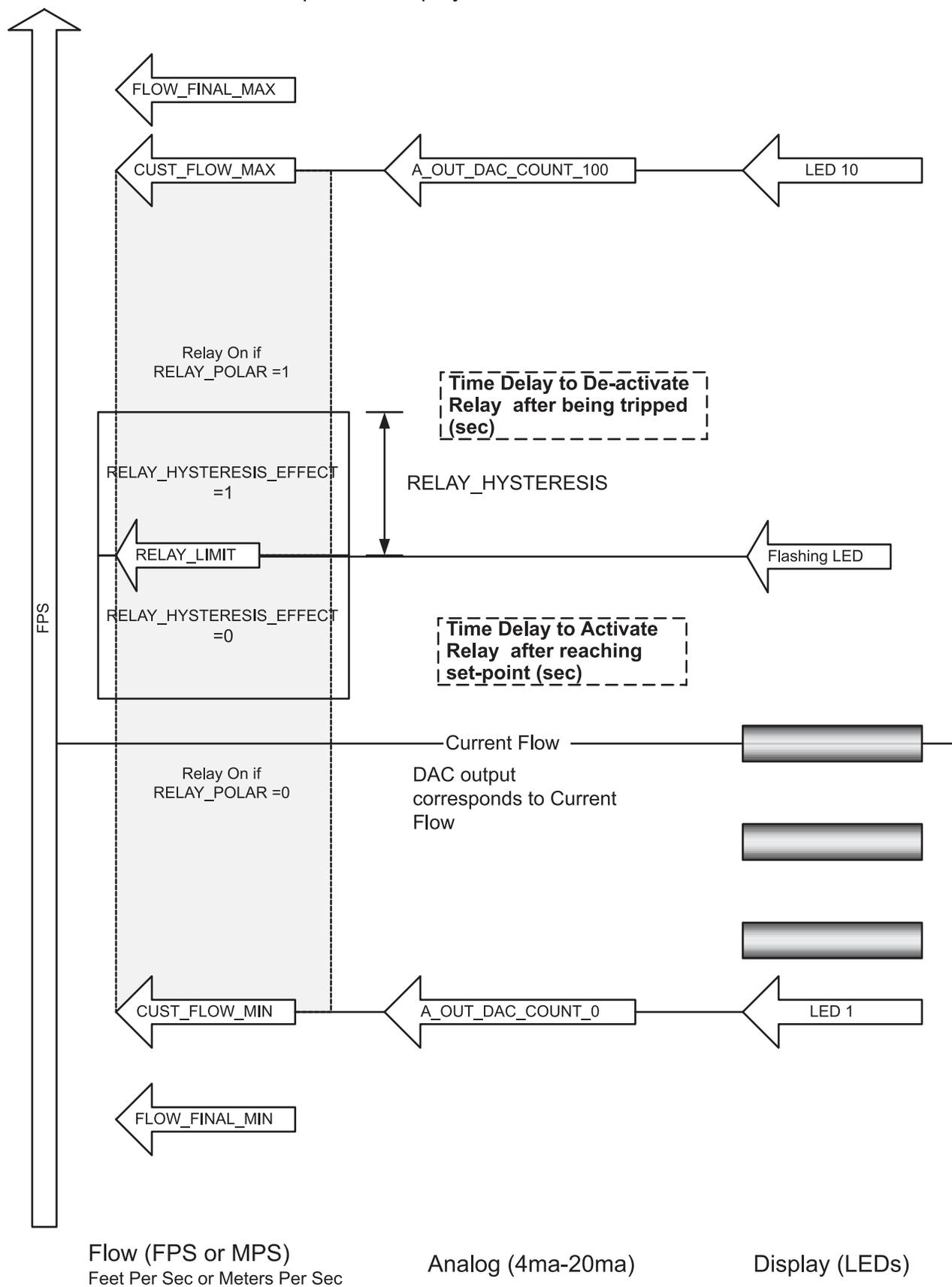


Diagram 2

Table 5 Button Controls

Function #	Function Name	0 = LED off, 1 = LED on		Parameter	LED Pattern for Parameter	Description
		LED Pattern				
1	Trip Point Adjust	1000000000 - +		RELAY_LIMIT	1 – indicates current value relative to full scale	Button controls adjust relay trip point in 10% increments.
2	Trip Point Capture	1100000000 - +		RELAY_LIMIT	1 – indicates current value relative to full scale	When entering this function the “ready to capture” LED pattern will be presented (0101010101). Pressing either button will “capture” precisely the current flow value as the new relay trip point.
3	Failsafe	1110000000 - +		RELAY_POLAR	0000011111 = “on” above (default) 1111100000 = “on” below	Selects whether the relay is “on” (energized) if the flow value is above the relay trip point, or if the relay is “on” (energized) when the flow value is below the relay trip point. Pressing the buttons will toggle between the two options (default = “on” above trip point -- typical for low flow alarm).
4	Bank Selection of Stored Parameters	1111000000 - +		CAL_DATA_INDEX	1 – indicates current index (1..7)	Select and load a bank of configuration parameters. If the bank corresponding to the selected index has not been set, the “error pattern” (1100110011) will display. Use “+” or “-” to move to a bank that has desired parameters populated for loading into active bank (0). **
5	Static or Dynamic Range Selection	1111100000 - +		DISPLAY_RANGE_MODE	1111100000 = “static” 0000011111 = “dynamic”	Selects the output range function static/dynamic. If “static” mode, then the output range is defined by the CUST_FLOW_MIN and CUST_FLOW_MAX parameters. If “dynamic” mode the CUST_FLOW_MAX will adjust if the flow value is greater than the current maximum value. Default value is “static.”
6	Minimum Flow Capture	1111110000 - +		CUST_FLOW_MIN	1 – indicates current value relative to full scale	When entering this function the “ready to capture” LED pattern will be presented (0101010101). Pressing either button will “capture” the current flow value as the new display “zero” point.
7	Maximum Flow Capture	1111111000 - +		CUST_FLOW_MAX	1 – indicates current value relative to full scale	When entering this function the “ready to capture” LED pattern will be presented (0101010101). Pressing either button will “capture” the current flow value as the new display “maximum flow” point. Note: this mode is only valid if the DISPLAY_RANGE_MODE (5) is “static.”

8	Hysteresis Applied Above or Below Trip Point	111111100 - +	RELAY_HYSTERESIS_EFFECT	0000011111 = apply above 1111100000 = apply below	Selects whether the hysteresis is to be applied above (default) or below the relay trip point. Pressing the buttons will toggle between the two options.
9	Maximum Hysteresis Value	111111110 - +	RELAY_HYSTERESIS	1 – indicates current value relative to maximum 10% hysteresis (MAX_HYSTERESIS)	Buttons adjust the value of the dead band effect. Increments in 1 percent of trip-point value. Default setting is 2% of span. Button range 0-10%. Wider range available through RS232 interface.
10	Time Delay to Activate Relay or Binary Pulse	111111111 - +	RELAY_TURN_ON_DELAY	1 – indicates current value relative to maximum delay (MAX_DELAY)	Time delay from when flow measurement is greater/less than relay trip point, to turn on relay. Increments and decrements in 1 second steps [Max default setting 10 seconds when using buttons].*
11	Time Delay to De-activate Relay or Binary Pulse	100000001 - +	RELAY_TURN_OFF_DELAY	1 – indicates current value relative to maximum delay (MAX_DELAY)	Time delay from when flow measurement is greater/less than relay trip point, to turn off relay. Increments and decrements in 1 second steps [Max default setting 10 seconds when using buttons].*
12	Alarm Simulation	110000001 - +		0000011111 = output "max" 1111100000 = output "min"	Alarm simulation mode. Pressing the "+" button forces "maximum" (corresponds to A_OUT_DAC_COUNT_100) 4-20 mA output. Pressing "-" forces "minimum" (corresponds to A_OUT_DAC_COUNT_0) 4-20 mA output. Relay output will correspond with RELAY_POLAR setting.
13	Keypad Lockout	111000001 - +	BTN_ENTER_TIMEOUT	1111100000 = 3 seconds 0000011111 = 10 seconds	Keypad lockout time. Pressing the buttons toggles between either 3 seconds or 10 seconds to hold both buttons to enter "function selection" mode.
14	Filter Setting	111100001 - +	INPUT_FILTER_COUNT	LED 1 on = setting 3 LEDs 1-3 on = 18 LEDs 1-5 on = 30 LEDs 1-7 on = 50 LEDs 1-10 on = 100	Input filtering count: Default = 18. "-" decreases filter, min. = 3. "+" increases filter, max. = 100. Filter value 18 reduces response time <2 sec
15	Save To Bank	111110001 - +		111111000=7	User preset. Save current active parameters (in 0 bank) to user bank location 7. (Hint- use "-" button to quickly move to FUNCTION 15 from FUNCTION position 1). **

* Maximum time delay may be up to 65,000 seconds when using RS232 command line or PC interface.

** Function #4 (load a bank) and function #15 (save to a bank), requires holding either button for 3 seconds to load or save. Holding both buttons will exit either function without performing the operation.

PC Interface and Command Line Interface Configurations

FS10 Communication Options

In addition to the button interface, the FS10 may be addressed directly through the RS232 interface. This type of communication offers convenient access to all user available parameters. There are two methods for interfacing through the RS232 connections:

1. A **Windows PC Interface** program is available that allows reading and writing to all user available functions and parameters.
2. A **Command Line Interface** through a HyperTerminal (MS) type program will access all functions and parameters (see RS232 Interface Reference Table on the following pages).

In both cases the parameters are accessed directly through the RS232 terminals. Depending on the hardware configuration selected, the RS232 signals are available through any of the following:

1. M12 pins - for units supplied with M12 power and output (I/O) connector
2. 8-wire cable units - for units supplied with cable pigtail, terminate to 3 wires
3. 2.5mm phone jack connector - available on remote mount units only

IMPORTANT NOTE: RS232 Rx/D, RS232 Tx/D **and** SIGNAL RETURN (3-connections) must be used to for effective communication.

An RS232 to 9 pin serial (DB9) to USB interface cable is available from FCI to connect directly to a PC or PLC. An RS232 interface from either of the 3 configurations above is available from the table on the following page. NOTE: The USB interface cable is supplied with a device driver disk. Depending on the computer operating system, installation may be necessary for communication. Entry of the USB port # will be requested. It is normally the highest value listed.

Password Protection

Factory settings are protected with a level 1 factory password. End user settings are protected with a level 2 password. The following password will provide access and allow changes to any level 2 parameters: **19113**

Refer to Table 7 for parameter command reference. Access to all level 2 (user configurable) parameters are available through the FC10 PC interface software.

Flow Rate Indication on PC Interface

Units will read values in percent, trend with flow and be repeatable. The PC interface provides a convenient means of capturing zero, span and trip-point settings in lieu of using the buttons.

Power Supply Interface Kit

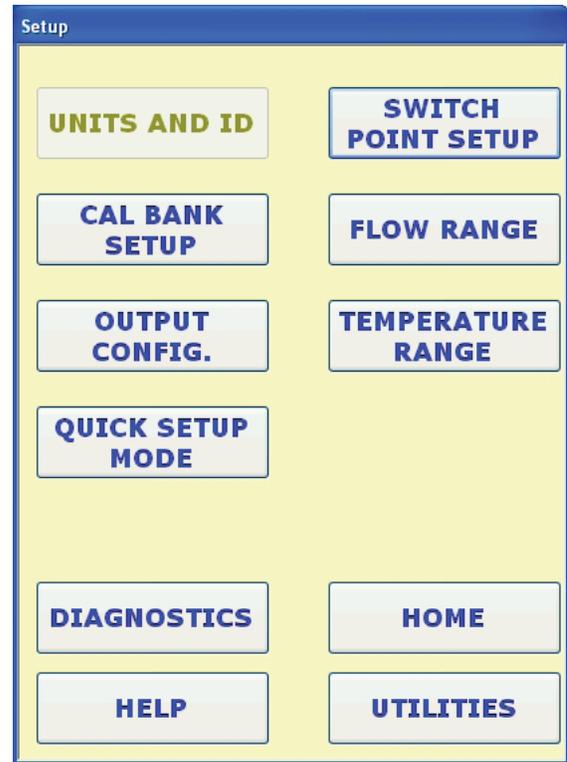
FCI offers an interface kit that makes it easy to connect to a notebook computer in the field. Kit PN number 022083-02 is described on page 32 of this manual. It may also be used to simply power up the unit using an AC connection. Relay function and 4-20 mA output may be monitored using this interface.

PC Interface Software

Typical screen shots using the Windows based PC interface



DISPLAY WINDOW

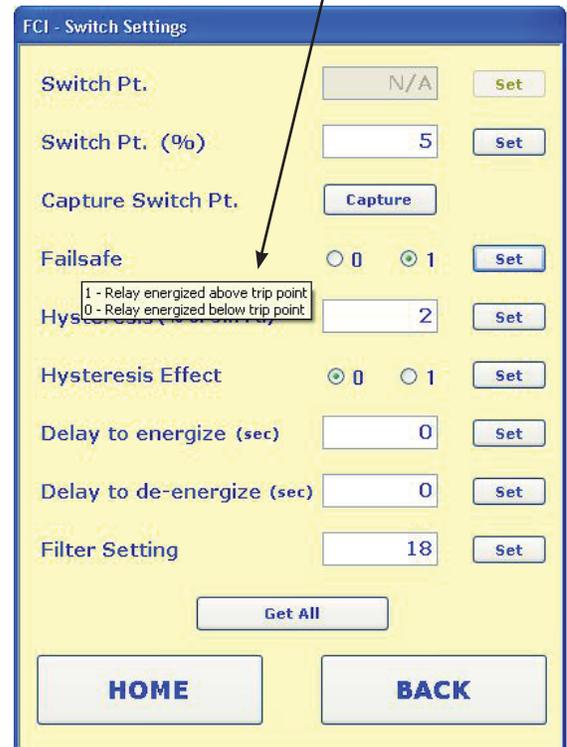


SET-UP WINDOW



SET-UP/FLOW RANGE WINDOW

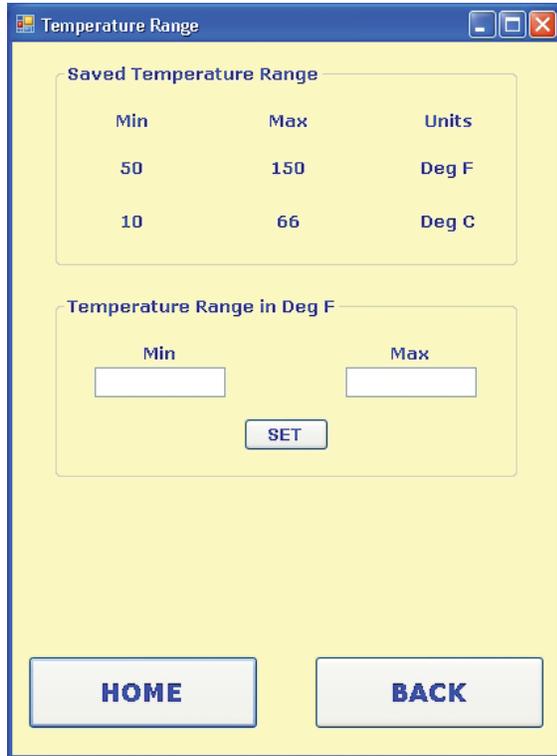
Capture Zero and Full Scale Flow



Move mouse cursor over description to uncover additional notes

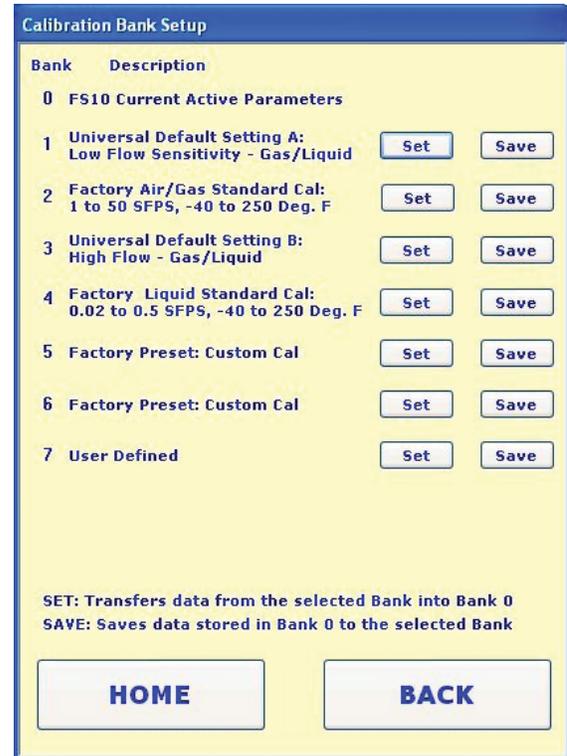
SET-UP/SWITCH POINT SET-UP WINDOW

Set trip-point with Capture button or by entering % of span



SET-UP/TEMPERATURE RANGE WINDOW

Range temperature output if using 4-20 mA out as temperature indication



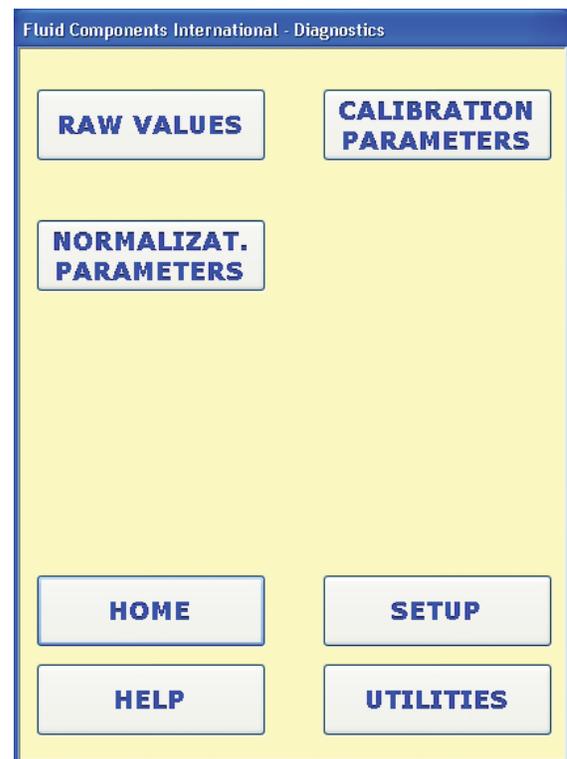
SET-UP/CAL BANK SET-UP WINDOW

Saving/retrieving calibrations to and from banks



SET-UP/OUTPUT CONFIGURATION WINDOW

Select 4-20mA and LED mapping (flow or temperature)



DIAGNOSTICS WINDOW

FCI - Calibration Parameters

Group 1 - C1	7.153421E-02
Group 1 - C2	1.585168E-01
Group 1 - C3	-3.454408E+01
Group 1 - C4	1.991256E+03
Group 1 - C5	-3.730825E+02
Group 2 - C1	-2.870800E-02
Group 2 - C2	4.287234E-01
Group 2 - C3	-4.091959E+01
Group 2 - C4	-1.234006E+03
Group 2 - C5	1.797524E+03
Break Point	98.06
Cal Ref	1080.13
dR Min	19.60
dR Max	209.51
Cal Min Flow (fps)	0.01000
Cal Max Flow (fps)	120.00
Cust Min Flow (fps)	0.0000000
Cust Max Flow (fps)	100.00
TCslp	0.0002744
TCslp0	0.0000000

HOME **BACK**

**DIAGNOSTICS / CALIBRATION
PARAMETERS WINDOW**

FCI - Raw Values

Raw Flow ADC Counts	674.00
Adj'd Filtered Flow ADC Counts	674.00
dR	45.83
PCED dR	49.51
TCdR	48.42
RefR	999.96
Raw Ref ADC Counts	1328.00
Adj'd Filtered Ref ADC Counts	1328.10
Flow in SFPS	N/A
Flow in Customer Units	N/A
Temperature	31.93

HOME **BACK**

**DIAGNOSTICS / RAW VALUES
WINDOW**

FCI - NAMUR

NAMUR Settings:

Disable

Enable

Set High (above 20 mA)

Set Low (below 4 mA)

HOME **BACK**

UTILITIES / NAMUR SETTINGS

Quick Setup Mode

QUICK SETUP MODE
Default Settings

Bank Selection	Trip Point
Button "-"	1 30
Button "+"	3 30

SAVE

HOME **BACK**

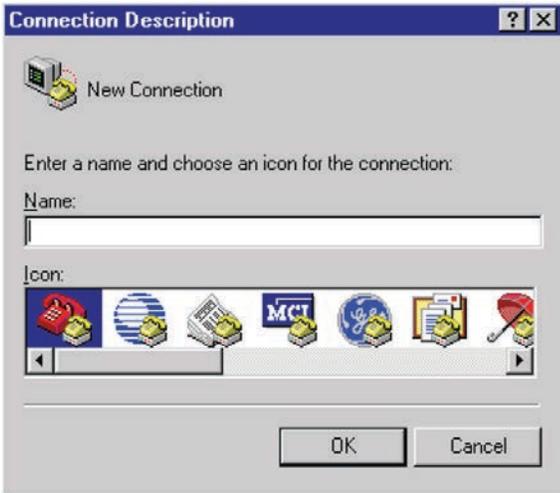
QUICK SETUP

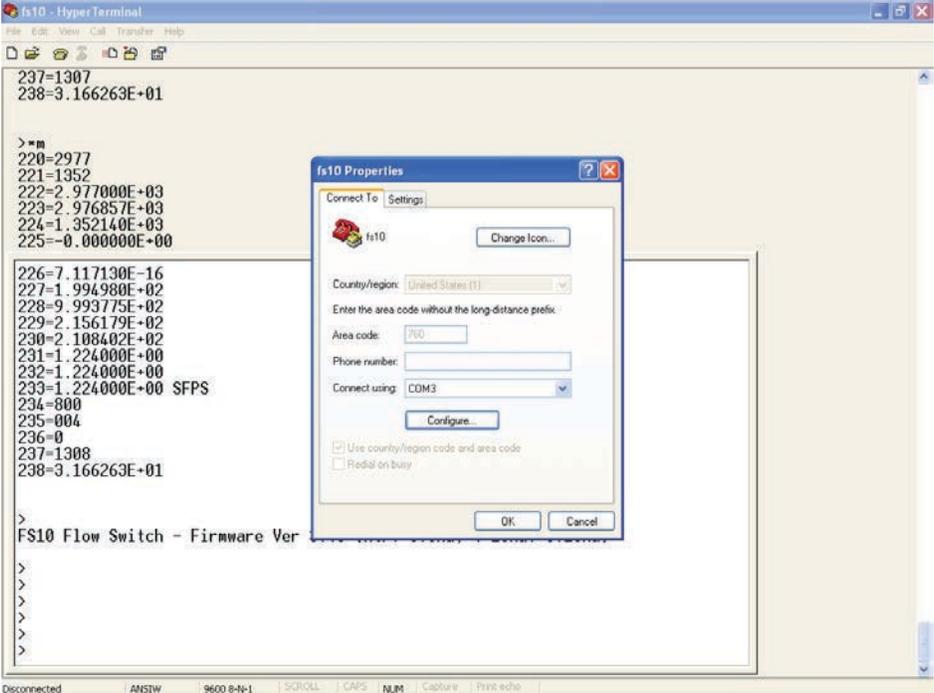
FS10 Serial Interface

Interface example using HyperTerminal set-up:

HyperTerminal, which comes with Windows95, 98, Me, NT, 2K XP & Windows 7 and can be used to communicate directly with the FS10.

To set up HyperTerminal to interface with computer modem:

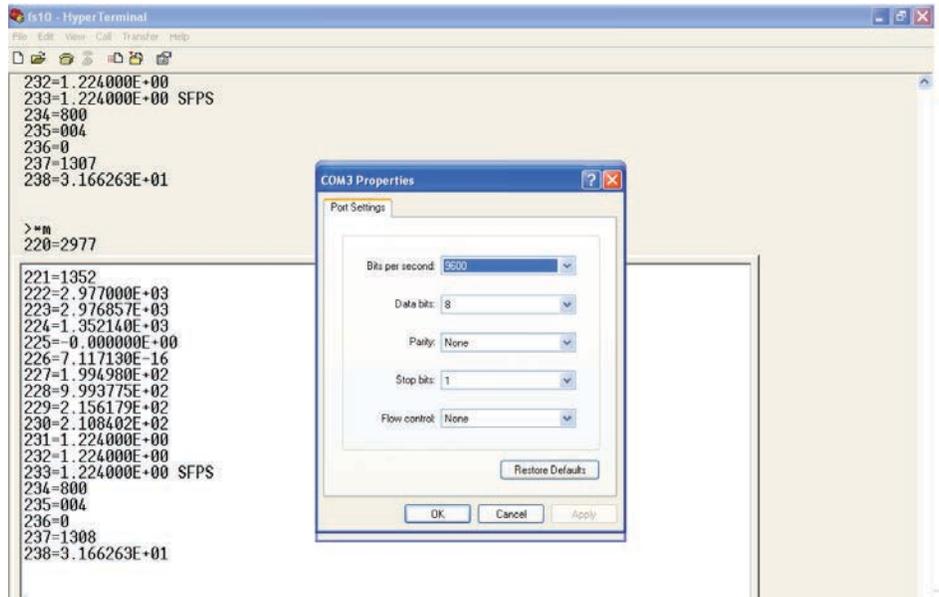
<p>1. Start the HyperTerminal .exe program (hypترم.exe). Click on START, then ACCESSORIES, then COMMUNICATIONS, then HYPERTERMINAL, then choose the HyperTerminal entry that does not have an .ht extension.</p> <p>Note: Some Windows versions store HyperTerminal as an Accessory.</p>	
<p>2. This brings up this dialog. Enter a name (such as "FS10")</p> <p>Select any ICON.</p> <p>Click OK</p>	

<p>3. This dialog will appear. Click the selection arrow on the "Connect using" list box, and select the COM port your modem is connected to – not the modem name.</p> <p>When you select the COM port, the phone number to dial boxes are grayed.</p> <p>Click OK</p>	
--	--

- The COM port properties box comes up. Make sure that you set the Bits per second to 9600.

The other defaults shown here are correct.

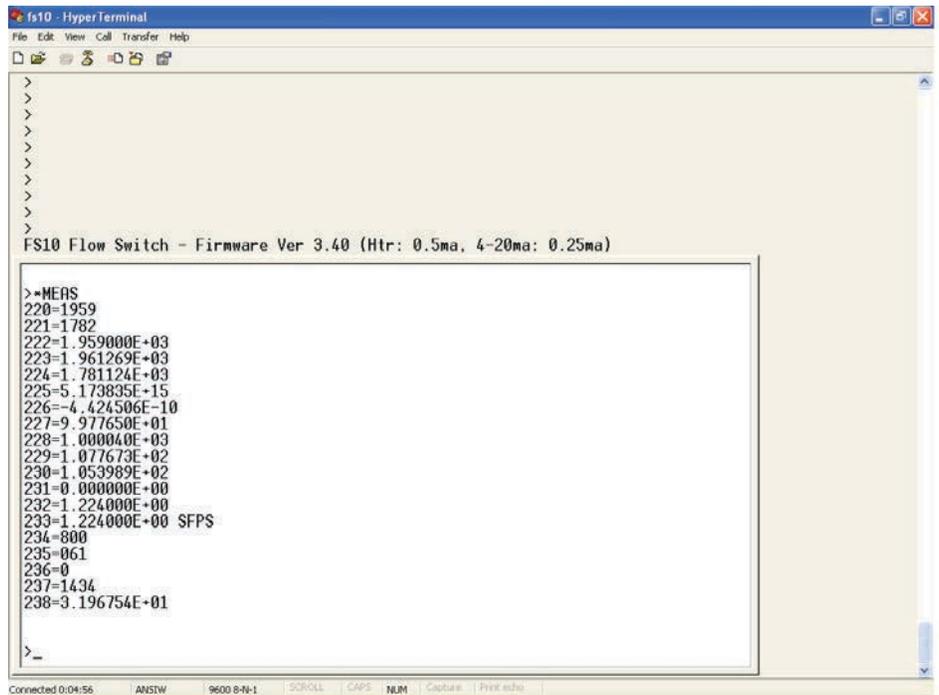
Click OK.



- You now get the HyperTerminal window where you are able to control your modem with commands.

Type *MEAS - you should get these return values from FS10. You're ready to go!

When you end the session, make sure to say YES to save the settings. A new icon will be created in the HyperTerminal folder with your session-name.ht. This is a shortcut on your desktop for easy access, and you never need to repeat these setup steps.



Command Line Interface Commands

INFO	Read version information (Hardware, Firmware, Date code, other values (#1.. #45). [The values in items 1 through 45 are listed]
MEAS	Read most recent flow measurement values (#220..#238). [The values in items 220 through 238 are listed]
RCFG B	Read configuration parameters (#80..#132) from bank B (0..9). [Example: *RCFG 7 (to read bank 7 parameters)]
SAVE B	Save currently active parameters to bank B (0..9) (Level 2 – Field password required). [Example: *SAVE 7]
RCL B	Recall parameters from bank B as the active parameters. (Level 2 – Field password required). [Example: *RCL 7]
PASSWD NNNN	To enter the password for either Level 1 (Factory) or Level 2 (Field). [Example *PASSWD 19113]
EXIT	To exit the current password level (undo having entered a password). The current parameters will automatically be saved to Bank 0 upon exit.
NNN=<value>	Update item #NNN (1..238) in the “active” (RAM) parameters with value. Value may be either integer or floating point (scientific notation). [Example 1: *228=1.100119E+03 enters value 1.100119E+03 into item 228, Example 2: *1=002 enters 002 into item1, Example 3: *110=800 enters 800 into item 110]
B:NNN	Read item #NNN (1..238) in Bank B (0..9). For items #1..#45, and items #220..#238 the Bank is ignored. If no bank is specified, the currently active (RAM) parameters will be accessed. [Example 1: *7:85 returns item 85 from bank 7 in this form: 7:85>5.053665E-02, Example 2: *8:119 returns item 119 from bank 8 in this form: 8:119=030]

Table 7 RS232 Interface Reference Table

Bank	Item #	Item Name	Description	R/W	Type	Size	Default	Password Level
	1	HW_REV	Hardware Version	R	int	1		N/A
	2	FW_REV	Firmware Revision	R	int	1		N/A
	3	YY	Date Code, Year	R	int	1		N/A
	4	MM	Date Code, Month	R	int	1		N/A
	5	DD	Date Code, Date	R	int	1		N/A
	6	S_N	Sequence Number	R	int	2		N/A
	7	RESERVED1	Reserved 1		int	1		
	11	FREQ_MAX_OUT	For output modes 2, 3, 6, & 7 sets the maximum frequency output	R/W	float	4	2000.0	Lev 2
	12	UI_ENABLE	User Interface enable: 0 = "normal" buttons and LEDs active 1 = "LEDs only" 2 = "power indicator LED only" 3 = "all LEDs on" (test mode) 4 = "non" neither buttons nor LEDs active	R/W	int	1	0	Lev 2
	14	BTN_ENTER_TIMEOUT	Keypad lockout time period (sec)	R/W	int	2	3	Lev 2
	35	TAG	Customer Tag Number	R/W	char.	20		Lev 2
	36	UNITS_K	Conversion factor applied to flow_final_out to compute flow_final_units	R/W	float	4	1.0	Lev 2
	37	UNITS_ID	Units identifier associated with UNITS_K conversion factor	R/W	char.	10	SFPS	Lev 2
	38	PIPE_ID	User Field: Pipe identification	R/W	char.	20		Lev 2
	39	USER_ID2	User identification field	R/W	char.	20		Lev 2
	40	USER_ID3	User identification field	R/W	char.	20		Lev 2
	41	USER_ID4	User identification field	R/W	char.	20		Lev 2
	45	RTD_TYPE	Reference sensor RTD type: 1= 1000 ohm, 2= 500 ohm, 3= 100ohm	R/W	int	1	1	Lev 2
	46	NAMUR_ENABLE	Enables/Disables NAMUR_Level (0=disabled; 1= enabled low, <3.6mA ; 2= enabled high, >21mA)	R/W	int	1	0	Lev 2
	50	QSM1_BANK	Quick setup mode bank for button 1	R/W	int	1	.05	Lev 2
	52	QSM1_PERCENT_SPAN	Default trip point level as percent of established span	R/W	float	4	30	Lev 2
	53	QSM2_BANK	Quick setup mode bank for button 2	R/W	int	1	.05	Lev 2

Table 7 RS232 Interface Reference Table *continued*

Bank	Item #	Item Name	Description	R/W	Type	Size	Default	Password Level
	55	QSM2_PERCENT_SPAN	Default trip point level as percent of established span	R/W	float	4	30	Lev 2
	81	BANK_ID	Bank Identification	R/W	char.	20	Bank ID	Lev 2
0..9	107	CUST_FLOW_MIN	Customer Flow_Final Limit Min. in SFPS	R/W	float	4	1.224	Lev 2
0..9	108	CUST_FLOW_MAX	Customer Flow_Final Limit Max in SFPS	R/W	float	4	120.0	Lev 2
0..9	112	RELAY_LIMIT	Relay Limit (FPS)	R/W	float	4	65.0	Lev 2
0..9	113	RELAY_HYSTERESIS	Relay Hysteresis = % of span (#108 [CUST_FLOW_MAX] – #107 [CUST_FLOW_MIN])	R/W	float	4	2.0	Lev 2
0..9	114	RELAY_HYSTERESIS_EFFECT	Hysteresis either above or below set point	R/W	int	1	1 = above	Lev 2
0..9	115	RELAY_POLAR	Relay Polarity (1 - Active High, 0 - Active Low)	R/W	int	1	1	Lev 2
0..9	116	RELAY_TURN_ON_DELAY	Relay Turn-on Delay (secs) 65K secs max. Restricted by #121 value when using buttons	R/W	int	1	0	Lev 2
0..9	117	RELAY_TURN_OFF_DELAY	Relay Turn-off Delay (secs) 65K secs max. Restricted by #121 value when using buttons	R/W	int	1	0	Lev 2
0..9	118	DISPLAY_RANGE_MODE	Display range either static (0): based on zero flow and max flow. Or dynamic (1): based on zero flow, with auto-adjust (peak hold) for max flow	R/W	int	1	0 = static	Lev 2
0..9	119	INPUT_FILTER_PERIOD	Time constant for input filtering (secs)	R/W	int	1	3	Lev 2
0..9	120	MAX_HYSTERESIS	Maximum hysteresis value for buttons as % of #112 (trip-point)	R/W	float	4	10.0	Lev 2
0..9	121	MAX_DELAY	Maximum delay for turn on/ turn off delays (sec); effects button operation only	R/W	int	2	10	Lev 2
0..9	122	FLOW_K1	"K1" factor applied	R/W	float	4	0.0	Lev 2
0..9	123	FLOW_K2	"K2" factor applied	R/W	float	4	1.0	Lev 2
0..9	124	FLOW_K3	"K3" factor applied	R/W	float	4	0.0	Lev 2

Table 7 RS232 Interface Reference Table *continued*

Bank	Item #	Item Name	Description	R/W	Type	Size	Default	Password Level
0..9	125	FLOW_K4	"K4" factor applied	R/W	float	4	0.0	Lev 2
0..9	126	CUST_TEMP_MIN	Customer Temperature final Min. limit	R/W	float	4	0.0	Lev 2
0..9	127	CUST_TEMP_MAX	Customer Temperature final Max. limit	R/W	float	4	0.0	Lev 2
	220	FLOW_COUNT_RAW	Raw ADC Counts for Flow Sampling	R	int	2	N/A	N/A
	221	REF_COUNT_RAW	Raw ADC Counts for REFERENCE Sampling	R	int	2	N/A	N/A
	222	FLOW_COUNT_ADJ	Temp. Compensated Flow ADC Counts	R	float	4	N/A	N/A
	223	FLOW_COUNT_FILT	Adjusted, filtered Flow ADC Counts	R	float	4	N/A	N/A
	224	REF_COUNT_FILT	Adjusted, filtered Ref ADC Counts	R	float	4	N/A	N/A
	225	dR_OHM	Delta R in milliOhm	R	float	4	N/A	N/A
	226	REF_OHM	Reference R in milliOhm	R	float	4	N/A	N/A
	227	dR_OHM_NORM	Normalized dR milliOhm	R	float	4	N/A	N/A
	228	refR_OHM_NORM	Normalized refR milliOhm	R	float	4	N/A	N/A
	229	dR_OHM_PCED	Power Corrected dR in milliOhm	R	float	4	N/A	N/A
	230	dR_OHM_TCED	Temp Compensated dR in milliOhm	R	float	4	N/A	N/A
	231	FLOW_FINAL	Temp Comp_ed and N-L Corrected Flow [FPS]	R	float	4	N/A	N/A
	232	FLOW_FINAL_OUT	FLOW_FINAL used for analog output (adjusted for customer limits)	R	float	4	N/A	N/A
	233	FLOW_FINAL_UNITS	FLOW_FINAL_OUT adjusted by UNITS_K	R	float	4	N/A	N/A
	234	A_OUT_DAC_COUNT	Analog Output DAC Count	R	int	2	N/A	N/A
	235	DISPLAY_COUNT	COUNT to Be Displayed on LED Bar Gragh	R	int	1	N/A	N/A
	236	DIO_BIT_PATTERN	LED/Button Bit Pattern	R	int	2	N/A	N/A
	237	BOARD_TEMP_COUNT	Raw ADC Counts for On-Board Temp Sensor Sampling	R	int	2	N/A	N/A
	238	REF_TEMP	Computed Temperature (deg. F)	R	float	4	N/A	N/A

6 SAFETY INSTRUMENTED SYSTEMS REQUIREMENTS (SIS)

The safety-critical output of the FS10 is provided through the 4-20 mA signal representing flow and the SPDT relay or solid state output.

Compliance through FMEDA (Failure Modes, Effects and Diagnostic Analysis)

SIL (Safety Integrity Level):	2 – as a single device
HFT (Hardware Fault Tolerance):	0
Subsystem Type:	B

FS10 Safety Identification

Firmware version 4.02 or greater

To identify firmware version, use Fluid Components Intl PC Interface program

Installation in SIS applications

Installations are to be performed by qualified personnel. No special installation is required in addition to the standard installation practices outlined in this document. Environmental and operational limits are available on page 3, Technical Specifications.

The supplied power should be designed so the terminal voltage does not drop below 21.5 VDC. With the relay output option, current must be limited to 60% of the relay rating (600 mA) and provide transient voltage protection (refer to page 9 for inductive loads).

Use the PC Interface tool to communicate with and verify configuration of the FS10. Use keypad lockout function (ref. page 18) to prevent accidental or deliberate change of configuration data during normal operation. *NOTE:* Firmware version 4.08 or greater faults if either button inadvertently locks in to closed (active) position for greater than 30 seconds.

NOTE: Transmitter output is not safety-rated during configuration changes. Alternative means should be used to ensure process safety during transmitter configuration and maintenance activities.

Alarm Levels

Namur: <3.6mA = Fault or >21mA = Fault

Proof Test

The suggested proof test described below will detect 95% of possible DU failures in the FS10 Flow Switch. The suggested proof test in combination with automatic diagnostics will detect 99% of possible DU failures in the FS10 Flow Switch.

The suggested proof test consists of setting the output to the min and max, and a calibration check.

Suggested Proof Test

Step	Action
1	Bypass the safety function and take appropriate action to avoid a false trip.
2	Send a command through PC interface or function buttons to the FS10A to de-energize the relay or transistor or go to the high alarm current output. Verify that the relay or transistor changes state or that the analog current reaches that value.
3	If the current output is used as the safety critical output, send a command through PC interface or function buttons to the FS10A to go to the low alarm current output and verify that the analog current reaches that value.
4	Perform a two-point calibration of the transmitter over the full working range.
5	Remove the bypass and otherwise restore normal operation.

FMEDA report may be found at: www.fluidcomponents.com/safety

Calculation of average probability of failure on demand (PFD_{AVG})

PFD_{AVG} calculation may be found in the FMEDA report located at: www.fluidcomponents.com/safety.

Product Repair

The FS10 is repairable by major component replacement. All product repair and part replacement should be performed by qualified personnel.

FS10 SIS Reference

The FS10 must be operated in accordance to the functional and performance specifications provided on page 3: Technical Specifications.

Failure Rate Data

The FMEDA report includes failure rates and common cause Beta factor estimates.
The report is available at www.fluidcomponents.com/safety

7 MAINTENANCE AND TROUBLESHOOTING

Maintenance

Typically required for the sensing element. If the process media sticks to the process pipes (or tank) the sensing element should be cleaned in the same manner and frequency as the process pipe (or tank). Occasionally check for moisture in the control circuit housing and wiring connections. Check for proper functionality and response time.

Troubleshooting

If the instrument is not operating, go through the installation and adjustment procedures and verify proper installation. If the instrument fails after some time in service and it has been checked, or if it fails to operate at start up and the installation has been verified, contact your authorized FCI service representative.

If FCI representative cannot be reached, contact FCI Technical Service. If the instrument is to be returned, obtain a Return Authorization. The form contains a declaration of decontamination cleaning information that the instrument must comply with before it is shipped to FCI. The telephone number in the US is **1-800-854-1993 or 1-760-744-6950 or email: techsupport@fluidcomponents.com**

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APPENDIX A APPROVALS**EC DECLARATION OF CONFORMITY Model FS10**

We, *Fluid Components International LLC*, located at 1755 La Costa Meadows Drive, San Marcos, California 92078-5115 USA, declare under our sole responsibility that the **FS10 Flow Switch Flow Monitor Product Family**, to which this declaration relates, are in conformity with the following standards and Directives.

**Directive 94/9/EC ATEX
IECEX Scheme**

Certified by KEMA Quality B.V. (0344): Utrechtweg 310, 6812 AR, Arnhem, The Netherlands

EC-Type Examination Certificates:

KEMA 10ATEX0142X satisfies EN 60079-0:2009, EN 60079-15:2005, EN 60079-31:2009 requirements for use in hazardous areas.

IECEX KEM 10.0067X satisfies IEC 60079-0:2007-10, IEC 60079-15:2005-03, IEC 60079-31:2008 requirements for use in hazardous areas.

Hazardous Areas Approval KEMA 10ATEX0142X and IECEX KEM 10.0067X for:

II 3 G Ex nA IIC T4 Gc
II 3 D Ex tc IIIC T81°C Dc

Directive 2004/108/EC EMC

Immunity specification: EN 61000-6-2: 2005

Emissions specification: EN 61000-6-4: 2007

Directive 97/23/EC Pressure Equipment

The FS10 Model does not have a pressure bearing housing and is therefore not considered as pressure equipment by itself according to article 1, section 2.1. The Model FS10 is in conformity with the sound engineering practices as defined in the Pressure Equipment Directive (PED) 97/23/EC article 3, paragraph 3.

*Issued at San Marcos, California USA
September 2011*

A handwritten signature in black ink that reads 'Eric Wible'.

Eric Wible, Engineering Manager

Flow/Liquid Level/Temperature Instrumentation

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

1755 La Costa Meadows Drive, San Marcos, California 92078 USA 760-744-6950 • 800-854-1993 • 760-736-6250
European Office: Persephonestraat 3-01 5047 TT Tilburg – The Netherlands – Phone 31-13-5159989 • Fax 31-13-5799036

Doc no. 23EN000021A

**Safety Instructions for the use the FS10 flowmeter in Hazardous Areas
Approval KEMA 10ATEX0142 X / IECEx KEM 10.0067X for:**

**Category II 3 G for Gas protection Ex nA IIC T4
Category II 3 D for Dust protection IP64 Ex tc IIIC T 81°C Dc**

The FS10 series consist of a sensing element and associated integral or remote mounted electronics.

Relation between ambient temperature, process temperature and temperature class is as follows:

- 1) Ambient temperature range (Ta): -40°C ... +71°C
- 2) Maximum process temperature (Tp): 121°C (integral version)
260°C (remote version)
- 3) Electrical data: Power supply - 21.5...30 VDC, 2.5 Watts Max

Dansk	Sikkerhedsforskrifter	Italiano	Normative di sicurezza
Deutsch	Sicherheitshinweise	Nederlands	Veiligheidsinstructies
English	Safety instructions	Português	Normas de segurança
Υπ	Υπ δέι εις ασφαλείας	Español	Instrucciones de seguridad
Suomi	Turvallisuusohjeet	Svenska	Säkerhetsanvisningar
Français	Consignes de sécurité		

DK Dansk- Sikkerhedsforskrifter

Disse sikkerhedsforskrifter gælder for Fluid Components, FS10 EF-typeafprøvningsattest-nr. KEMA 10ATEX0142X/IECEx KEM10.0067 (attestens nummer på typeskiltet) er egnet til at blive benyttet i eksplosiv atmosfære kategori II 3 GD.

- 1) Ex-anlæg skal principielt opstilles af specialiseret personale.
- 2) FS10 skal jordforbindes.

DA Deutsch-Sicherheitshinweise

Diese Sicherheitshinweise gelten für die Fluid Components, FS10 flowmeter gemäß der EG-Baumusterprüfbescheinigung Nr. KEMA 10ATEX0142X/IECEx KEM10.0067 (Bescheinigungsnummer auf dem Typschild) der Kategorie II 3 GD.

- 1) Die Errichtung von Ex-Anlagen muss grundsätzlich durch Fachpersonal vorgenommen werden.
- 2) Der FS10 muß geerdet werden.

GB IRL English- Safety instructions

These safety instructions are valid for the Fluid Components, FS10 flowmeter to the EC type approval certificate no KEMA 10ATEX0142X/IECEx KEM10.0067 (certificate number on the type label) for use in potentially explosive atmospheres in Category II 3 GD.

- 1) The installation of Ex-instruments must be made by trained personnel.
- 2) The FS10 must be grounded.

GR Υπ δέι εις ασφαλείας

Αυτές οι οδηγίες ασφαλείας ισχύουν για τα Ροόμετρα της Fluid Components τύπου FS10 που φέρουν Πιστοποιητικό Εγκρίσεως Ευρωπαϊκής Ένωσης, με αριθμό πιστοποίησης KEMA 10ATEX0142X/IECEx KEM10.0067 (ο αριθμός πιστοποίησης βρίσκεται πάνω στην ετικέτα τύπου του οργάνου) για χρήση σε εκρηκτικές ατμόσφαιρες της κατηγορίας II 3 GD.

- 1) Η εγκατάσταση των οργάνων με αντιεκρηκτική προστασία πρέπει να γίνει από εξειδικευμένο προσωπικό.
- 2) Το όργανο τύπου FS10 πρέπει να είναι γειωμένο.

FIN Suomi - Turvallisuusohjeet

Nämä turvallisuusohjeet koskevat Fluid Components, FS10 EY-tyyppitarkastustodistuksen nro. KEMA 10ATEX0142X/IECEX KEM10.0067 (todistuksen numero näkyy tyyppikilvestä) käytettäessä räjähdysvaarallisissa tiloissa luokassa II 3 GD.

- 1) Ex-laitteet on aina asennettava ammattihenkilökunnan toimesta.
- 2) FS10 on maadoitettava.

F B L Consignes de sécurité

Ces consignes de sécurité sont valables pour le modèle FS10 de la société Fluid Components (FCI) conforme au certificat d'épreuves de type KEMA 10ATEX0142X/IECEX KEM10.0067 (numéro du certificat sur l'étiquette signalétique) conçu pour les applications dans lesquelles un matériel de la catégorie II3GD est nécessaire.

- 1) Seul un personnel spécialisé et qualifié est autorisé à installer le matériel Ex.
- 2) Les FS10 doivent être reliés à la terre.

I Italiano - Normative di sicurezza

Queste normative di sicurezza si riferiscono ai Fluid Components, FS10 secondo il certificato CE di prova di omologazione n° KEMA 10ATEX0142X/IECEX KEM10.0067 (numero del certificato sulla targhetta d'identificazione) sono idonei all'impiego in atmosfere esplosive applicazioni che richiedono apparecchiature elettriche della Categoria II 3 GD.

- 1) L'installazione di sistemi Ex deve essere eseguita esclusivamente da personale specializzato.
- 2) I FS10 devono essere collegati a terra.

NL B Nederlands - Veiligheidsinstructies

Deze veiligheidsinstructies gelden voor de Fluid Components, FS10 overeenkomstig de EG-typeverklaring nr. KEMA 10ATEX0142X/IECEX KEM10.0067 (nummer van de verklaring op het typeplaatje) voor gebruik in een explosieve atmosfeer volgens Categorie II 3GD.

- 1) Installatie van Ex-instrumenten dient altijd te geschieden door geschoold personeel.
- 2) De FS10 moet geaard worden.

P Português - Normas de segurança

Estas normas de segurança são válidas para os Fluid Components, FS10 conforme o certificado de teste de modelo N.º KEMA 10ATEX0142X/IECEX KEM10.0067 (número do certificado na plaqueta com os dados do equipamento) são apropriados para utilização em atmosferas explosivas categoria II 3 GD.

- 1) A instalação de equipamentos em zonas sujeitas a explosão deve, por princípio, ser executada por técnicos qualificados.
- 2) Os FS10 Flexmasster precisam ser ligados à terra.

E Español - Instrucciones de seguridad

Estas indicaciones de seguridad son de aplicación para el modelo FS10 de Fluid Components, según la certificación CE de modelo N° KEMA 10ATEX0142X/IECEX KEM10.0067 para aplicaciones en atmósferas potencialmente explosivas según la categoría II 3 GD (el número de certificación se indica sobre la placa informativa del equipo).

- 1) La instalación de equipos Ex tiene que ser realizada por personal especializado.
- 2) Los FS10 tienen que ser conectados a tierra.

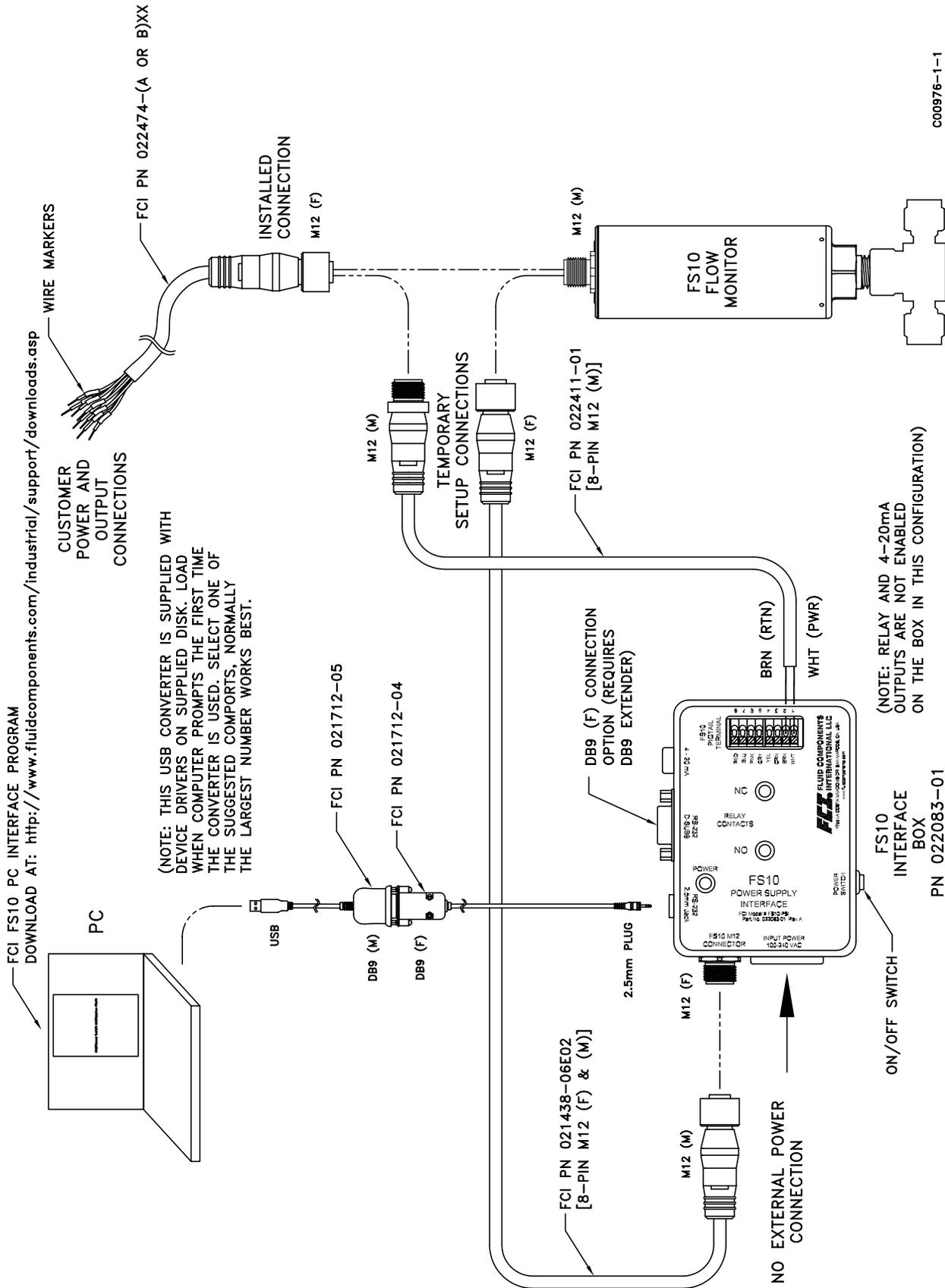
S Svenska - Säkerhetsanvisningar

Säkerhetsanvisningarna gäller för Fluid Components, Flödesmätare typ FS10 enligt EG-typkontrollintyg nr KEMA 10ATEX0142X/IECEX KEM10.0067 (intygsnumret återfinns på typskylten) är lämpad för användning i explosiv gasblandning i kategori II 3 GD.

- 1) Installation av Ex- klassade instrument måste alltid utföras av fackpersonal.
- 2) FS10 måste jordas.

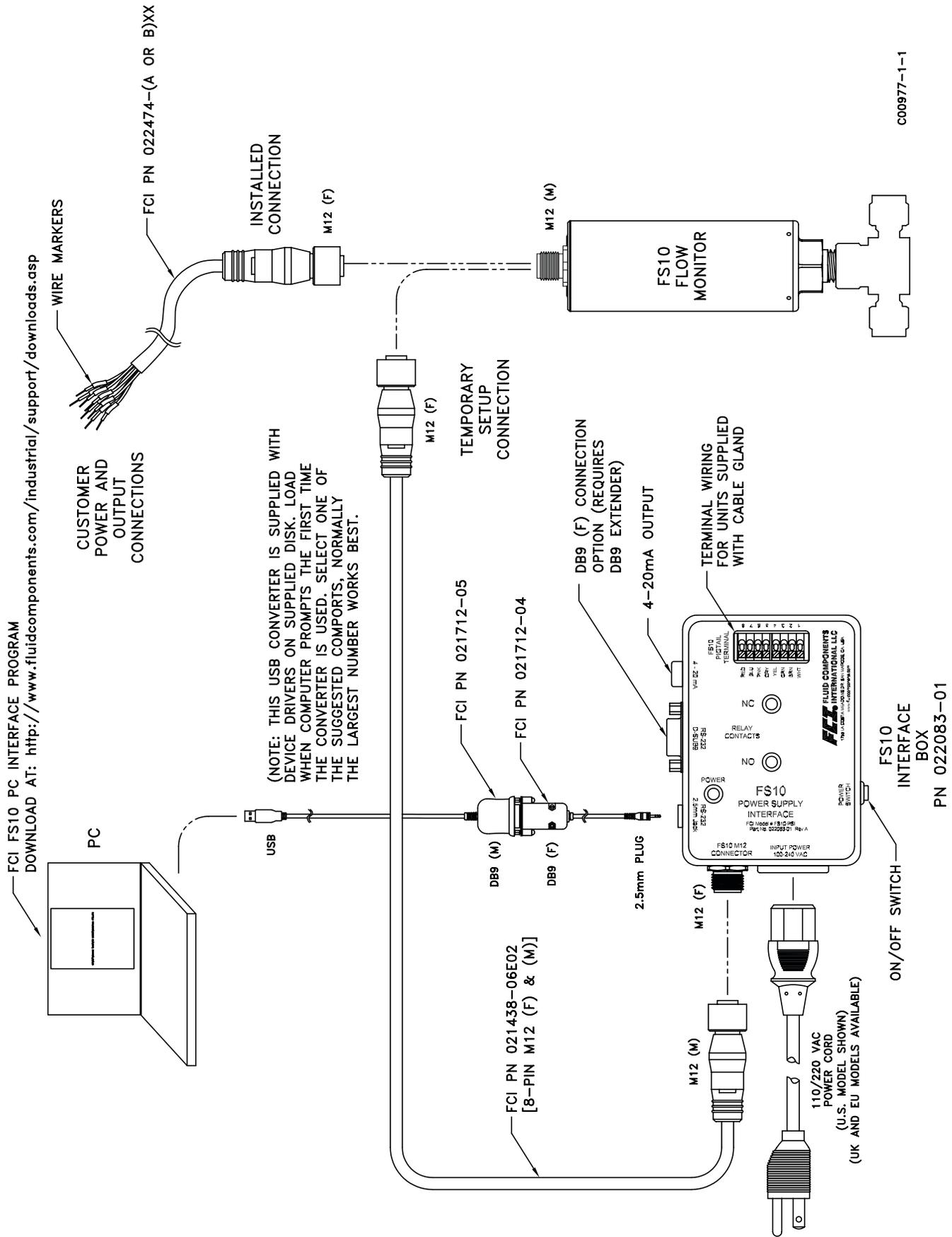
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APPENDIX B AUXILIARY DRAWINGS



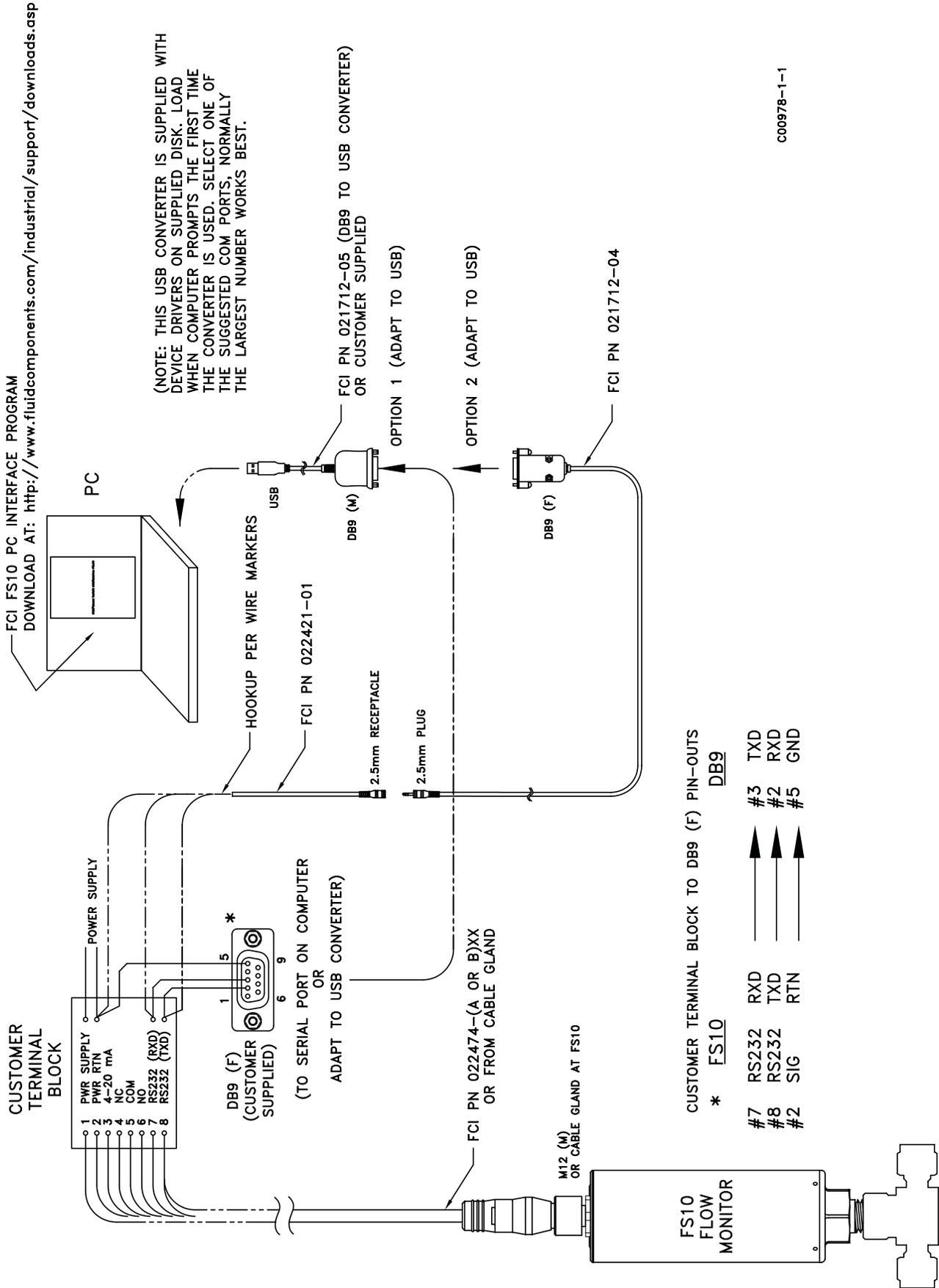
C00976-1-1

RS232 Interface Box Hookup - Using Installed DC Power to FS10A



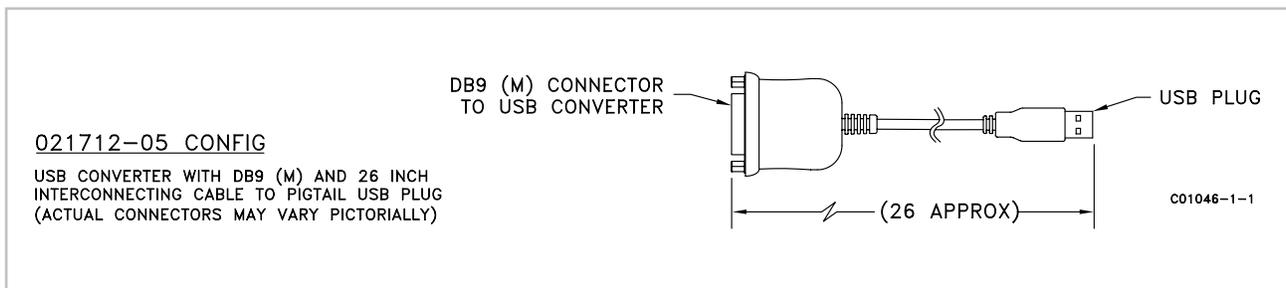
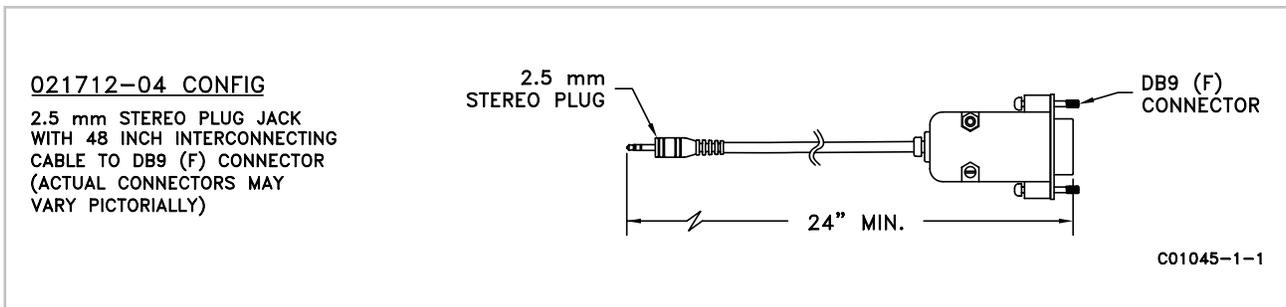
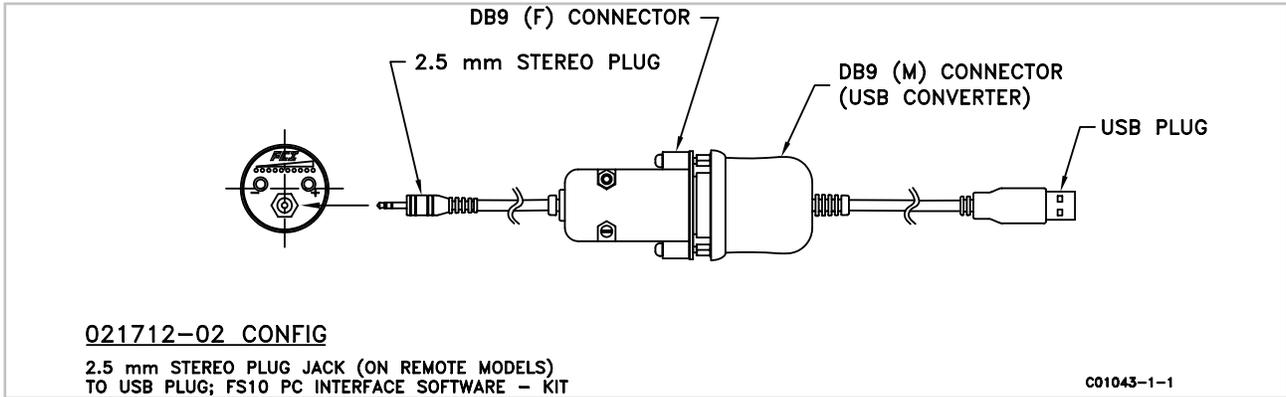
C00977-1-1

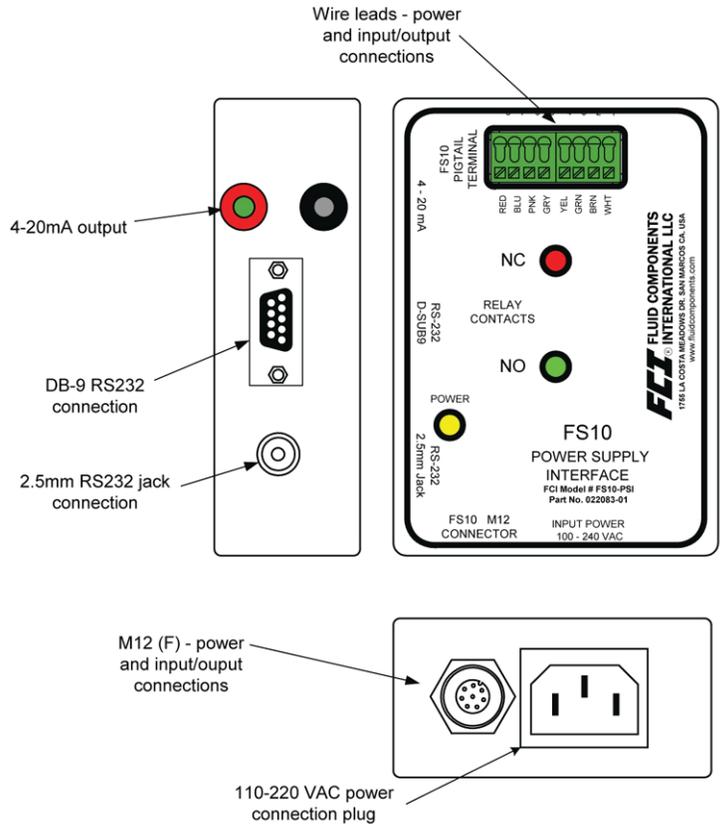
RS232 Interface Box Hookup - External AC Power Available



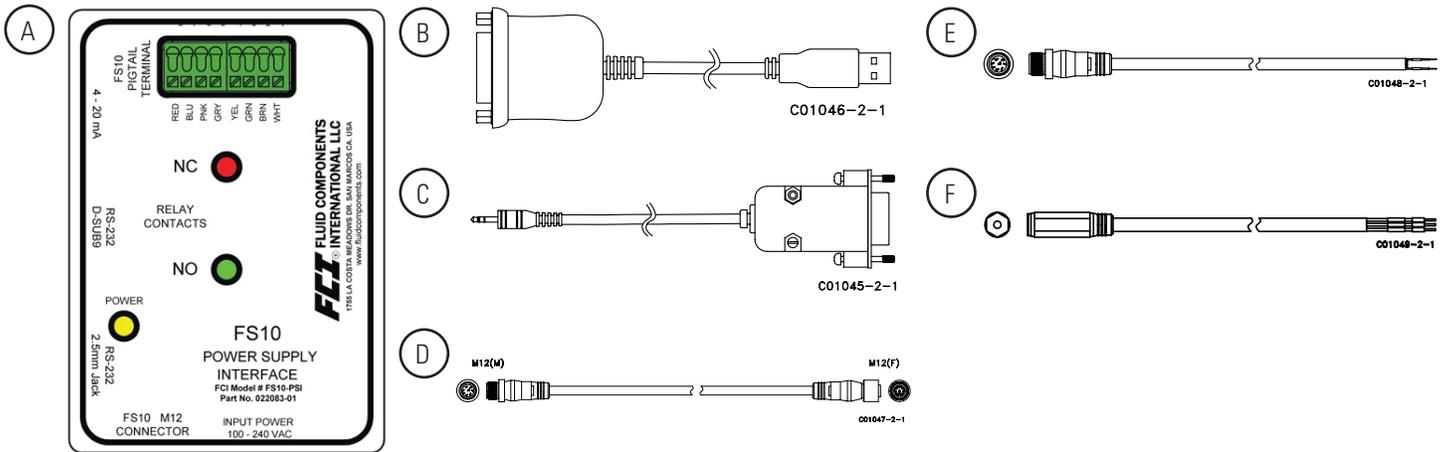
C00978-1-1

PC Interface Kits





Q22083-01 Power Supply/Interface Box

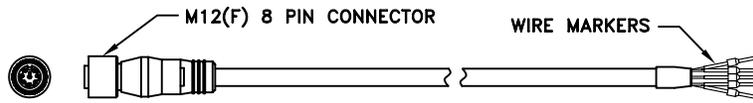


Q22083-02 Power Supply/Interface Box Kit

- A PN 022083-01 Power Supply/Interface Box
- B PN 021712-05 DB9 to USB Converter with USB PC driver disk
- C PN 021712-04 2.5mm plug to DB9
- D PN 021438-06E02 interconnecting cable, 2 meters, M12(m) and M12(f) end connections
- E PN 022411-01 M12 (M) to power leads #1 PWR and #2 RTN
- F PN 022421-01 RS232 wire leads to 2.5mm receptacle
- G PN 013369-01 Power Cord (N. America)

FS10 PC interface software 09EN000209 available at <http://www.fluidcomponents.com/>

PC Interface Components



C01051-1-1

Relay Output

- 022474-A02 - 8 pin M12(F) connector with 6 feet [2 meter] pigtail and wire markers
- 022474-A05 - 8 pin M12(F) connector with 15 feet [5 meter] pigtail and wire markers
- 022474-A10 - 8 pin M12(F) connector with 30 feet [10 meter] pigtail and wire markers

N-Channel MOSFET Output

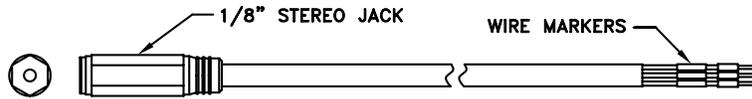
- 022474-B02 - 8 pin M12(F) connector with 6 feet [2 meter] pigtail and wire markers
- 022474-B05 - 8 pin M12(F) connector with 15 feet [5 meter] pigtail and wire markers
- 022474-B10 - 8 pin M12(F) connector with 30 feet [10 meter] pigtail and wire markers



022411-01 CABLE ASSEMBLY, M12, 2 CONDUCTOR PIGTAIL

C01048-1-1

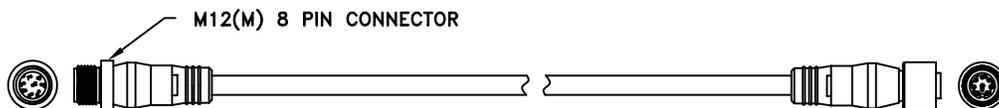
Power Only to customer M12 installed connector
(Reference auxiliary drawing C00976 - page 33)



022421-01 CABLE ASSEMBLY, RS232 WIRE LEADS TO 2.5MM RECEPTACLE

C01049-1-1

(Reference auxiliary drawing C00978 - page 35)

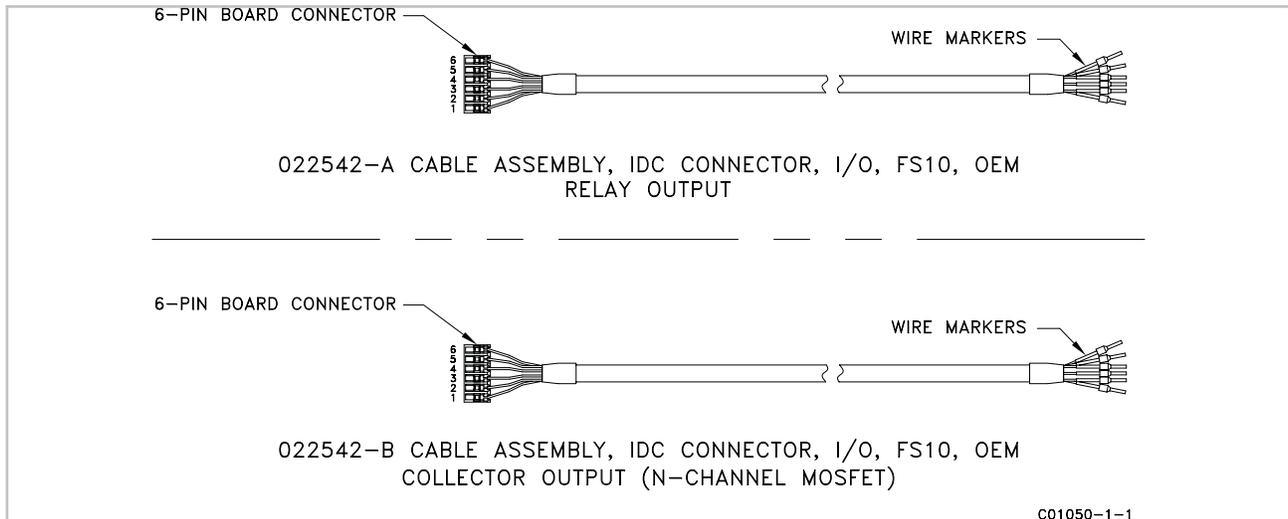
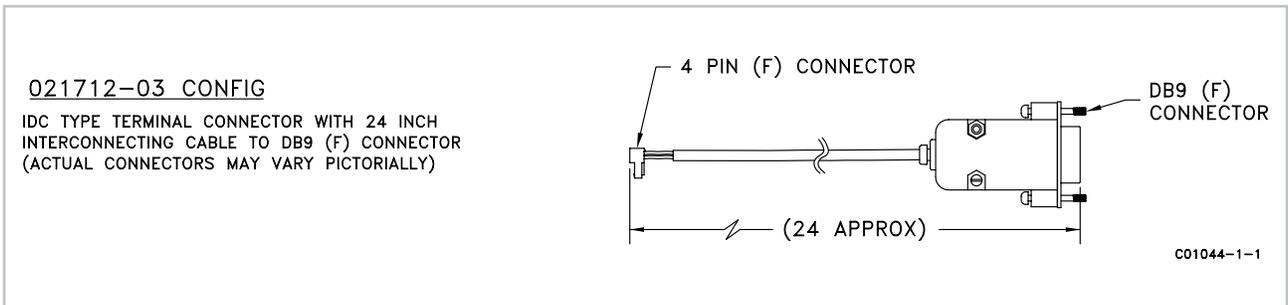
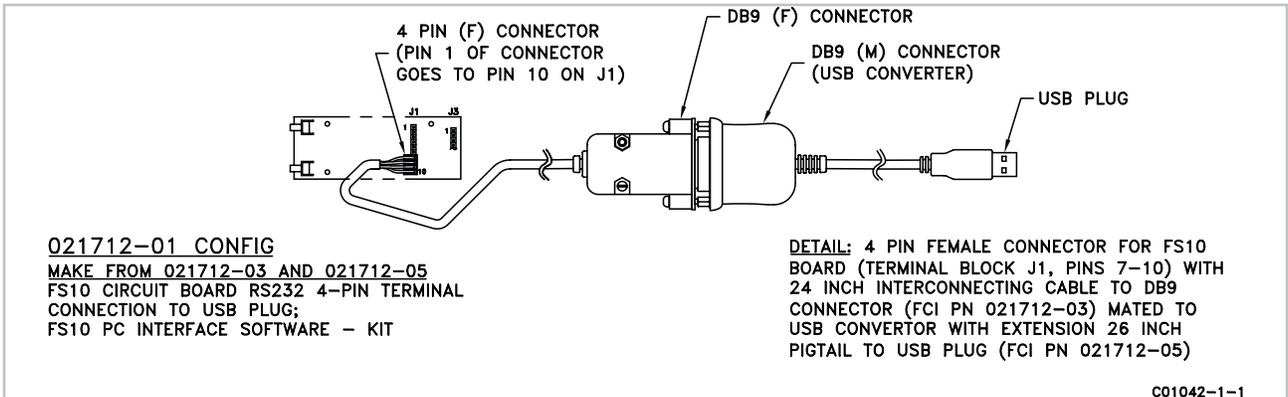


021438-06E02 CABLE, M12, END

C01047-1-1

(Reference auxiliary drawings C00976 and C00977 - pages 33 and 34)

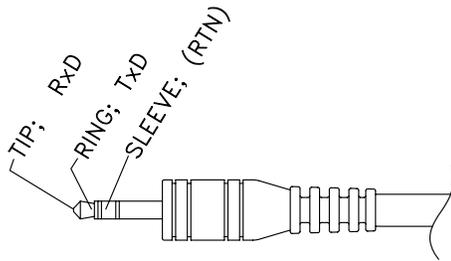
Board Connectors - OEM



DB9 Connection Schematic

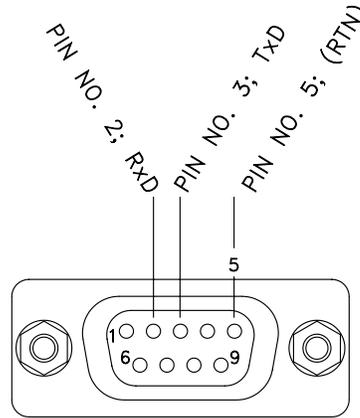
Wiring Schematic
RS232 from Cable Pigtail to DB9 Female Connector

FS10 M12 PINOUT OR WIRE PIGTAIL		DB9 PIN NO.	
#7 RxD	→	#3	TxD
#8 TxD	→	#2	RxD
#2 RTN	→	#5	RTN



2.5mm STEREO PLUG

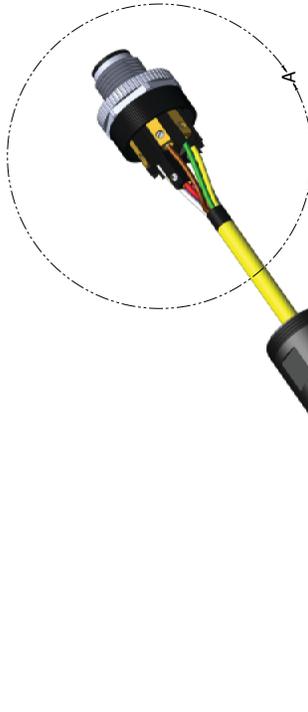
Wiring Schematic
RS232 through 2.5mm Stereo Plug
to DB9 Female Connector



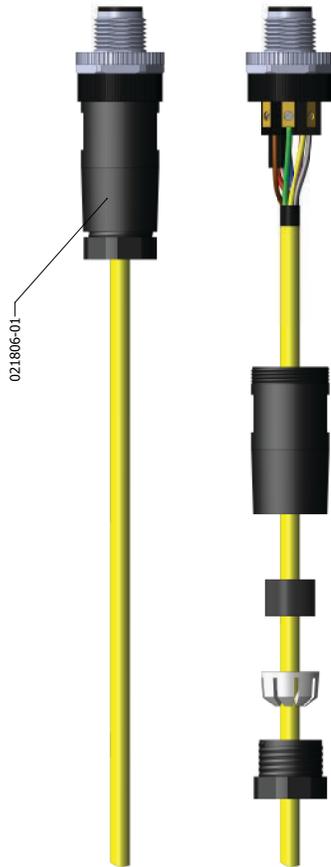
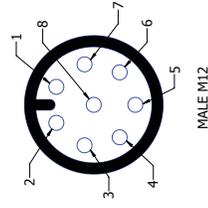
DB9 (F)
DB9 Female Connector

C01036-1-1

Field Wireable Connector, M12, 8-Pin Male, FS10



PIN & DESCRIPTION	WIRE COLOR
1. POWER, +21.5 to +30 VDC	WHITE
2. POWER/SIGNAL RETURN	BROWN
3. 4-20 mA OUTPUT	GREEN
4. RELAY NC	YELLOW
5. RELAY COMMON	GRAY
6. RELAY NO	PINK
7. RS232 RXD	BLUE
8. RS232 TXD	RED



DETAIL A
ROTATED 125°

DETAIL A
ROTATED 60°

DETAIL A

3. PICTORIAL OF HOW CONNECTOR 021806-01 IS WIRED.
2. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. DIMENSIONS IN SQUARE BRACKETS ARE IN [MILLIMETERS].
1. INTERPRET DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5 - 2009.

NOTES: UNLESS OTHERWISE SPECIFIED

C01200-1-1

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APPENDIX C CUSTOMER SERVICE

Customer Service/Technical Support

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

By Mail

Fluid Components International LLC
1755 La Costa Meadows Dr.
San Marcos, CA 92078-5115 USA
Attn: Customer Service Department

By Phone

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

By Fax

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

By E-Mail

FCI Customer Service can be contacted by e-mail at: techsupport@fluidcomponents.com.

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

International Support

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

After Hours Support

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

Point of Contact

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

Warranty Repairs or Returns

FCI prepays ground transportation charges for return of freight to the customer's door. FCI reserves the right to return equipment by the carrier of our choice.

International freight, handling charges, duty/entry fees for return of equipment are paid by the customer.

Non-Warranty Repairs or Returns

FCI returns repaired equipment to the customer either collect or prepaid and adds freight charges to the customer invoice.

Extended Warranty

An extended warranty is available. Please contact the factory for information.

Return to Stock Equipment

The customer is responsible for all shipping and freight charges for equipment that is returned to FCI stock from the customer site. These items will not be credited to the customer's account until all freight charges are cleared, along with applicable return to stock charges, from the credit invoice. (Exceptions are made for duplicate shipments made by FCI.)

If any repair or return equipment is received at FCI, freight collect, without prior factory consent, FCI bills the sender for these charges.

Field Service Procedures

Contact an FCI field representative to request field service.

A field service technician is dispatched to the site from either the FCI factory or one of the FCI representative offices. After the work is complete, the technician completes a preliminary field service report at the customer site and leaves a copy with the customer.

Following the service call, the technician completes a formal, detailed service report. The formal report is mailed to the customer after the technician's return to the factory or office.

Field Service Rates

All field service calls are billed at the prevailing rates as listed in the FCI Price Book unless previous arrangements have been made with the FCI Customer Service Manager.

Customers are charged for all travel expenses including airfare, auto rental, meals and lodging. In addition, the customer shall pay all costs of transporting parts, tools or goods to and from the job site. Invoicing travel time, field service work and other expenses will be performed by FCI's Accounting Department.



RA # _____

1755 La Costa Meadows Drive, San Marcos, CA 92078-5115 USA
760-744-6950 / 800-854-1993 / Fax: 760-736-6250
Web Site: www.fluidcomponents.com
E-mail: techsupport@fluidcomponents.com

Return Authorization Request

1. Return Customer Information

Returning Company's Name: _____ Phone# _____

Return Contact Name: _____ Fax # _____

Email Address: _____

2. Return Address

Bill To: _____ Ship To: _____

3. Mandatory End User Information

Contact: _____ Company: _____ Country: _____

4. Return Product Information

Model No: _____ Serial No(s): _____

Failure Symptoms (Detailed Description Required): _____

What Trouble Shooting Was Done Via Phone or Field Visit by FCI: _____

FCI Factory Technical Service Contact: _____

5. Reason For Return
- | | | | |
|---|---|---|---------------------------------|
| <input type="checkbox"/> Sensor Element | <input type="checkbox"/> Electronics | <input type="checkbox"/> As Found Testing | <input type="checkbox"/> Credit |
| <input type="checkbox"/> Recalibrate (New Data) | <input type="checkbox"/> Recalibrate (Most Recent Data) | <input type="checkbox"/> Other | |

(Note: A new Application Data Sheet (ADS) must be submitted for all recalibrations and re-certifications)

6. Payment Via
- | | | |
|---|--------------------------|--------------------------|
| <input type="checkbox"/> Faxed Purchase Order | <input type="checkbox"/> | <input type="checkbox"/> |
|---|--------------------------|--------------------------|

(Note: A priced quotation is provided for all Non-Warranty repairs after equipment has been evaluated. All Non-Warranty repairs are subject to a minimum evaluation charge of \$250.00)

Factory Return Shipping Address:

Fluid Components International LLC
1755 La Costa Meadows Drive
San Marcos, CA 92078-5115
Attn: Repair Department
RA # _____



The following Return Authorization Request form and Decontamination Statement **MUST be completed, signed and faxed back to FCI before** a Return Authorization Number will be issued. The signed Decontamination Statement and applicable MSDS Sheets **must be included with the shipment**. FCI will either fax, email or telephone you with the Return Authorization Number upon receipt of the signed forms.

Packing Procedures

1. **Electronics** should be wrapped in an **anti-static** or **static-resistant** bag, then wrapped in protective bubble wrap and surrounded with appropriate dunnage* in a box. Instruments weighing **more than 50 lbs., or extending more than four feet**, should be secured in wooden crates by bolting the assemblies in place.
2. **The sensor head must be protected** with pvc tubing, or retracted the full length of the probe, locked and secured into the Packing Gland Assembly (cap screws tightened down).
3. FCI can supply crates for a nominal fee.
4. No more than **four (4)** small units packaged in each carton.
5. **FCI will not be held liable for damage caused during shipping.**
6. To ensure immediate processing **mark** the RA number on the outside of the box. Items without an RA number marked on the box or crate may be delayed.
7. Freight **must be "PrePaid"** to FCI receiving door.

* Appropriate dunnage as defined by UPS, will protect package contents from a drop of 3 feet.

***** Decontamination Statement *** This Section Must Be Completed *****

Exposure to hazardous materials is regulated by Federal, State, County and City laws and regulations. These laws provide FCI's employees with the "Right to Know" the hazardous or toxic materials or substances in which they may come in contact while handling returned products. Consequently, FCI's employees must have access to data regarding the hazardous or toxic materials or substances the equipment has been exposed to while in a customer's possession. Prior to returning the instrument for evaluation/repair, FCI requires thorough compliance with these instructions. The signer of the Certificate must be either a knowledgeable Engineer, Safety Manager, Industrial Hygenist or of similar knowledge or training and responsible for the safe handling of the material to which the unit has been exposed. **Returns without a legitimate Certification of Decontamination, and/or MSDS when required, are unacceptable and shall be returned at the customer's expense and risk.** Properly executed Certifications of Decontamination must be provided before a repair authorization (RA) number will be issued.

Certification Of Decontamination

I certify that the returned item(s) has(have) been thoroughly and completely cleaned. If the returned item(s) has(have) been exposed to hazardous or toxic materials or substances, even though it (they) has (have) been thoroughly cleaned and decontaminated, the undersigned attests that the attached Material Data Safety Sheet(s) (MSDS) covers said materials or substances completely. Furthermore, I understand that this Certificate, and providing the MSDS, shall not waive our responsibility to provide a neutralized, decontaminated, and clean product for evaluation/repair at FCI. Cleanliness of a returned item or acceptability of the MSDS shall be at the sole discretion of FCI. **Any item returned which does not comply with this certification shall be returned to your location Freight Collect and at your risk.**

This certification must be signed by knowledgeable personnel responsible for maintaining or managing the safety program at your facility.

Process Flow Media _____

Product was or may have been exposed to the following substances: _____

Print Name _____

Authorized Signature _____ Date _____

Company Title _____

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

1755 La Costa Meadows Drive, San Marcos, California 92078-5115 USA † Phone: 760-744-6950 † 800-854-1993 † Fax: 760-736-6250

FCI Document No. 05CS000004D [U]

WARRANTIES

Goods furnished by the Seller are to be within the limits and of the sizes published by the Seller and subject to the Seller's standard tolerances for variations. All items made by the Seller are inspected before shipment, and should any of said items prove defective due to faults in manufacture or performance under Seller approved applications, or fail to meet the written specifications accepted by the Seller, they will be replaced or repaired by Seller at no charge to Buyer provided return or notice of rejection of such material is made within a reasonable period but in no event longer than one (1) year from date of shipment to Buyer, and provided further, that an examination by Seller discloses to Seller's reasonable satisfaction that the defect is covered by this warranty and that the Buyer has not returned the equipment in a damaged condition due to Buyer's or Buyer's employees', agents', or representatives' negligence and Buyer has not tampered, modified, redesigned, misapplied, abused, or misused the goods as to cause the goods to fail. In addition, this warranty shall not cover damage caused by Buyer's exposure of the goods to corrosive or abrasive environments. Moreover, Seller shall in no event be responsible for (1) the cost or repair of any work done by Buyer on material furnished hereunder (unless specifically authorized in writing in each instance by Seller), (2) the cost or repair of any modifications added by a Distributor or a third party, (3) any consequential or incidental damages, losses, or expenses in connection with or by reason of the use of or inability to use goods purchased for any purpose, and Seller's liability shall be specifically limited to free replacement, or refund of the purchase price, at Seller's option, provided return or rejection of the goods is made consistent with this paragraph, and the Seller shall in no event be liable for transportation, installation, adjustment, loss of good will or profits, or other expenses which may arise in connection with such returned goods, or (4) the design of products or their suitability for the purpose for which they are intended or used. Should the Buyer receive defective goods as defined by this paragraph, the Buyer shall notify the Seller immediately, stating full particulars in support of his claim, and should the Seller agree to a return of the goods, the Buyer shall follow Seller's packaging and transportation directions explicitly. In no case are the goods to be returned without first obtaining a return authorization from the Seller. Any repair or replacement shall be at Seller's factory, unless otherwise directed, and shall be returned to Seller transportation prepaid by Buyer. If the returned goods shall prove defective under this clause they will be replaced or repaired by Seller at no charge to Buyer provided the return or rejection of such material is made within a reasonable period, but in no event longer than (1) year from the date of shipment of the returned goods or the unexpired terms of the original warranty period whichever is later. If the goods prove to be defective under this paragraph, the Buyer shall remove the goods immediately from the process and prepare the goods for shipment to Seller. Continued use or operation of defective goods is not warranted by Seller and damage occurring due to continued use or operation shall be for Buyer's account. Any description of the goods contained in this offer is for the sole purpose of identifying them, and any such description is not part of the basis of the bargain, and does not constitute a warranty that the goods will conform to that description. The use of any sample or model in connection with this offer is for illustrative purposes only, is not part of the basis of the bargain, and is not to be construed as a warranty that the goods will conform to the sample or model. No affirmation of that fact or promise made by the Seller, whether or not in this offer, will constitute a warranty that the goods will conform to the affirmation or promise. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES WITH RESPECT TO THE GOODS OR THEIR INSTALLATION, USE, OPERATION, REPLACEMENT OR REPAIR, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS OF PURPOSE; AND THE GOODS ARE BEING PURCHASED BY BUYER "AS IS". SELLER WILL NOT BE LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGE RESULTING FROM THE USE OR LOSS OF USE OF THE GOODS.



*Flow & Level Instrumentation
Solutions for Industrial Processes*

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

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FCI World Headquarters

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

FCI Europe

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

FCI Measurement and Control Technology (Beijing) Co., LTD | www.fluidcomponents.cn

Room 107, Xianfeng Building II, No.7 Kaituo Road, Shangdi IT Industry Base, Haidian District | Beijing 100085, P. R. China
Phone: 86-10-82782381 Fax: 86-10-58851152

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