

MTL F809F

FOUNDATION™ fieldbus diagnostics module



DECLARATION OF CONFORMITY

A printed version of the Declaration of Conformity has been provided separately within the original shipment of goods. However, you can find a copy of the latest version at <http://www.mtl-inst.com/certificates>

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GENERAL INFORMATION

Warning information

Warnings are occasionally provided in these operating instructions. They are always identified by the signalling word "**WARNING**" or a warning symbol - .

Safety instructions for installation and operating personnel

These operating instructions contain basic safety instructions for installation, operation and maintenance and servicing. Failure to comply with these instructions can endanger personnel, the plant and the environment.

Before installation/commissioning:

- ▶ Read the operating instructions.
- ▶ Give adequate training to the installation and operating personnel.
- ▶ Ensure that the contents of the operating instructions are fully understood by responsible personnel.
- ▶ The national installation and mounting regulations (e.g. EN 60079-14) apply.

When operating the devices:

- ▶ Make the operating instructions available at the installation area (at all times).
- ▶ Observe safety instructions.
- ▶ Observe national safety and accident prevention regulations.
- ▶ Operate the equipment within its published specification.
- ▶ Servicing/maintenance work or repairs which are not described in the operating instructions must not be performed without prior agreement with the manufacturer.
- ▶ Any damage may render hazardous-area protection null and void.
- ▶ No changes to the devices or components impairing their hazardous-area protection are permitted.
- ▶ The device may only be fitted and used if it is in an undamaged, dry and clean state.

If there are any points that remain unclear:

- ▶ Contact your local Eaton Office
- ▶ Product and contact details are also available from the company website: <http://www.mtl-inst.com>



1 OVERVIEW

The F809F Fieldbus Diagnostic Module is available as an option for use with F800 Series and some F600 Series fieldbus power supplies. It plugs into an F8xx or F6x8 Series power supply carrier and continuously monitors the performance of each of the eight fieldbus segments, providing information on the network health and capturing retransmissions between the fieldbus devices and control system.

The parameters measured include the bulk power supply input voltage, temperature, segment voltages and signal levels of all devices. Average and peak noise are measured in each of three frequency bands. Additionally the monitor checks for correct bus termination and for short-circuits between the fieldbus signal wires and cable shields. The measured physical layer parameters are used to predict the corrective action required. This allows problems to be rectified before poor network health results in devices being removed from the 'live list', which could affect the operation of the plant. Measurements may alternatively be captured and sent to off-site experts for interpretation.

The F809F is a FOUNDATION fieldbus™ device, and communicates with the host control system via a fieldbus segment. This allows the network status and measured parameters to be displayed in the instrument management software on the host control system.

1.1 Manual

This manual is designed to assist in the installation, configuration and maintenance of the F809F Fieldbus Diagnostic Module.

For product specification see the EPS F809F data sheet.

1.2 Safety Messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- ◆ Make sure only qualified personnel perform the installation.

2 INSTALLATION

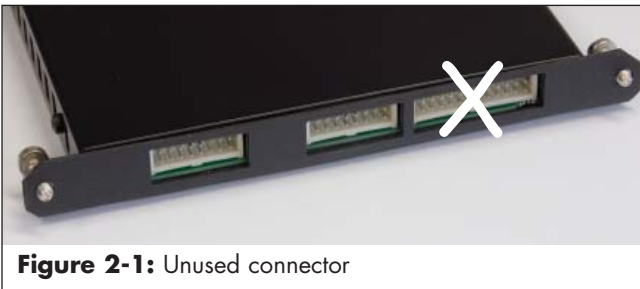
The F809F is designed for carrier mounting and may be mounted on any MTL F8xx or F6x8 series carrier. See the MTL F8xx or F6x8 series power supply or F8x8 carrier installation manual for details of how these carriers are installed.

The F809F Fieldbus Diagnostic Monitor receives redundant power feeds and connections to the eight monitored fieldbus segments via the carrier. The diagnostic information is conveyed to the controlling host via a fieldbus segment and the user has the choice of segment 1 or 8 (of the segments being monitored), or a totally separate segment of their choosing. The segment chosen for communication is configured using a plug-in connector located on the front edge of the module.

2.1 Mounting

Secure the F809F to the carrier using the module's two captive screws. Align the module with the two* multi-pin connectors on the carrier and hold it in place while tightening the two retaining screws. To remove the F809F, support the module while unscrewing the two retaining screws at its base. Lift the module off the carrier connector.

* A third connector is provided on the module for factory testing and firmware upgrade. This connector, the largest of the three, is not used on the carrier and is identified on the F809F side label. See Figure 2-1.



2.2 Power requirements

An F809F module draws approximately 15mA from the communicating fieldbus segment. This needs to be included when calculating the total design current requirement for that segment.



2.3 Configuration of fieldbus communication segment

The communications segment that will be used is determined by configuring the connector on the front face of the module. A 6-pin "comb", supplied with the module, is used to define the communication segment by inserting it one of two ways into the connector (see Figure 2-2), or omitting it altogether.

The F809F can also be ordered pre-configured for the required fieldbus communication segment by requesting the part number shown here.

Part No Configuration

F809F Communicates on segment 8 (eight) of the monitored fieldbus segments

F809F-1 Communicates on segment 1 (one) of the monitored fieldbus segments

F809F-9 Communicates on a separate fieldbus segment



The communication segment can be changed "in the field" by a simple change to the connector on the front face.

1. Remove the protective cap from the top of the fieldbus module by squeezing the ends. See Figure 2-3.
2. Loosen the six screws in the connector.
3. Remove the "comb" from the connector (F809F or F809F-1), or obtain the connector "comb" from the packaging (F809F-9).
4. (a) **For communication on segment 8**
Place the "comb" in the connector, as shown (Figure 2-2), so that the number "8" is visible on the top (right) surface.
(b) **For communication on segment 1**
Place the "comb" in the connector so that the number "1" is visible on top (right) surface.
(c) **For communication on a separate segment**
No comb is required.
5. If the comb is being used, tighten the six screws to retain it.
6. Replace the protective cap.

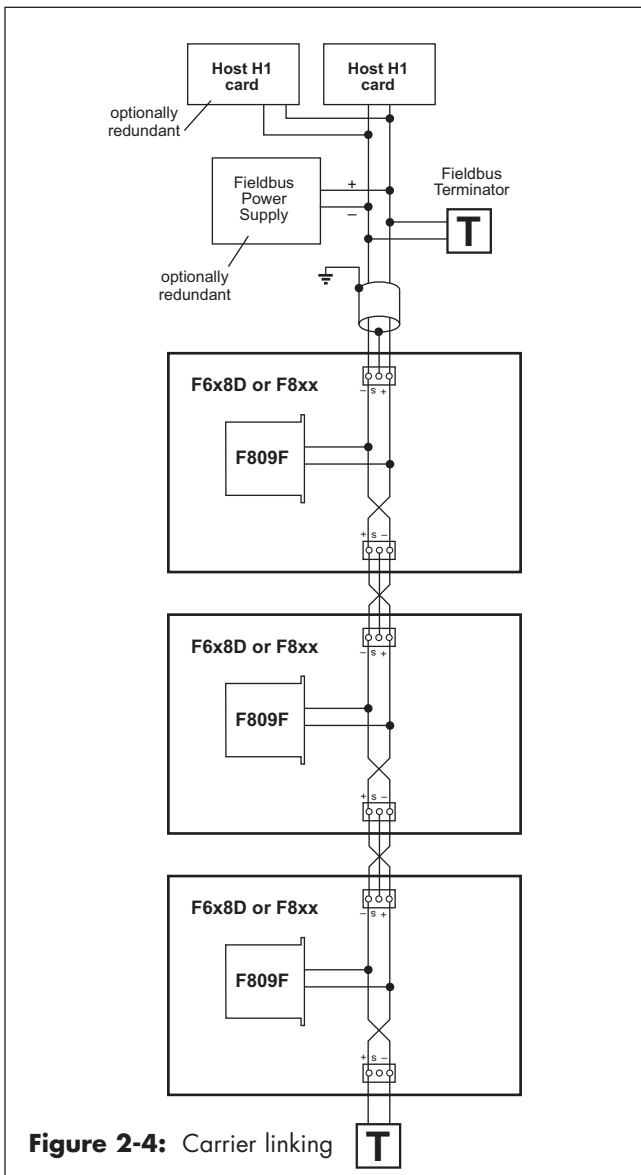
2.4 Installation for communication on separate fieldbus segment

If a separate fieldbus segment is the chosen option, then it can communicate the diagnostic data via the top connector on the F809F or, in some cases, through dedicated connectors on the carrier. The table below shows which carriers (by batch code) provide this option.

Carrier type	Diagnostic data connection options	
	via carrier	via top connector
F618D-CL	All	All
F860-CA	None	All
F880-CR-xx	None	All
F880-CL-xx	None	All
F880-CA-xx	0727 or later	All
F888-CA-xx	All	All
F890-CA-xx	0727 or later	All
F892-CA-xx	0727 or later	All
F898-CA-xx	All	All

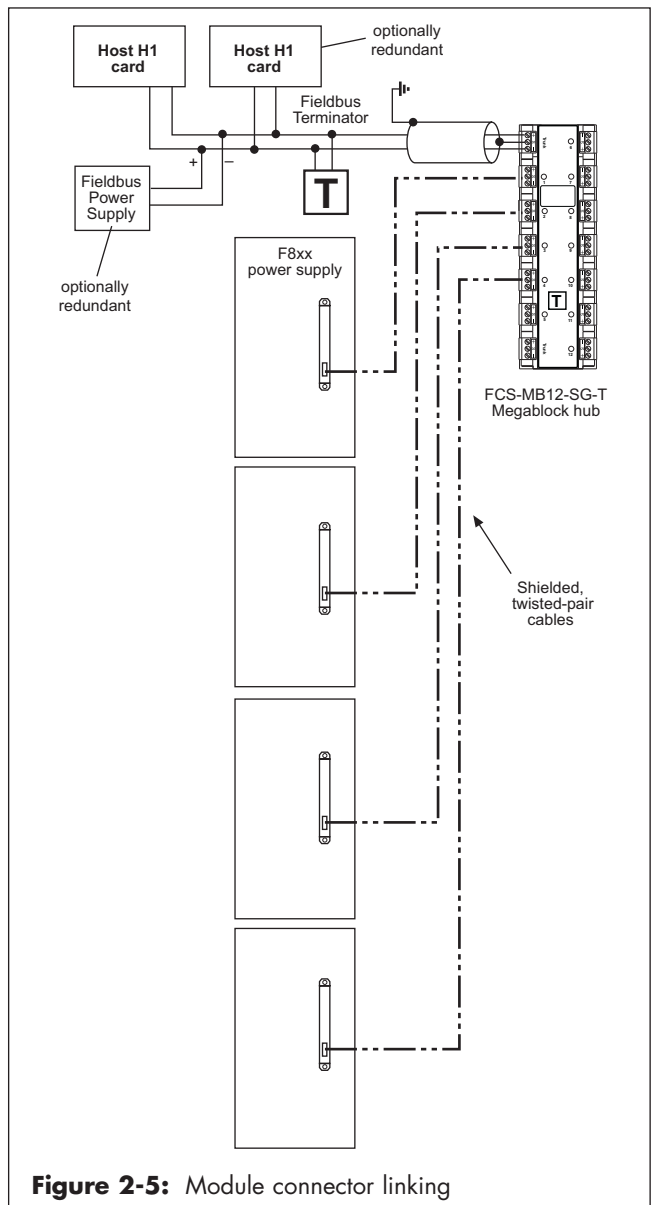
2.4.1 Interconnection via carrier

Figure 2-4 shows how a dedicated diagnostic segment, comprising multiple F6x8 or F8xx carriers, is interlinked, powered and terminated. Where carriers are installed in vertical columns, connect the H1+, H1- and S terminals of adjacent carriers as shown.



2.4.2 Interconnection via top connector

Figure 2-5 shows how a dedicated diagnostic segment comprising multiple F8xx carriers is interlinked and terminated. The fieldbus spur is connected to the two middle terminals in the top connector - see Figures 2-2 and 2-6.



2.4.3 Fieldbus segment design rules

A segment may support a number of F809F modules. The actual number is based on a number of factors:

- the logical device limit of the host,
- the fieldbus power supply capacity,
- operational constraints such as bandwidth
- the overall impact on the system if that diagnostic segment should be lost.

Shielded, twisted-pair cable, complying with FOUNDATION FIELDBUS 'Type A' construction is recommended for the diagnostic segment. Unshielded instrument cable is suitable for interconnections between adjacent carriers.

2.4.4 Diagnostics module power supply

The diagnostic segment must be powered by a conditioned fieldbus power supply (see Figure 2-4 & 2-5) that will provide a voltage in the range 9–32V DC at each F809F fieldbus diagnostic module. This power supply may be either simplex or redundant, depending on the application, and be capable of providing sufficient current for the entire diagnostic segment.

Each F809F module draws approximately 15mA, so a segment comprising 10 modules, for example, will require an output current of at least 150mA. Suitable redundant fieldbus power supplies could be MTL-Relcom type F800 or FPS-I, either of which can provide 350mA at 21.5V to 28V DC depending on model. Alternatively, type FPS-DT will provide enough for two segments of non-redundant power.

2.4.5 Diagnostics module segment termination

As with all Fieldbus segments, the one used for the diagnostic data must be terminated at both ends to maintain the bus impedance within FOUNDATION fieldbus™ limits. When interconnections are via the carrier, a terminator must be connected between the H1+ and H1- terminals of the diagnostic bus connector at the far end of the segment (see Figure 2-4). Suitable terminators for this are MTL type FBT1-IS or F100.

When interconnection is via the top connector, the recommended method is to use a Megablock with a built-in terminator to interconnect the fieldbus spurs and terminate the bus (see Figure 2-5). Termination of the bus at the host end may be provided either by an integrated terminator within the power supply (such as exists within the FPS-I, FPS-DT and F800 types) or by means of a separate terminator.

3 CONFIGURATION

3.1 Standard

Each FOUNDATION fieldbus™ configuration tool or host system has a different way of displaying and performing configurations. Some will use Device Descriptions (DDs) and DD Methods to make configuration and displaying of data consistent across host platforms.

Refer to the fieldbus control system's documentation to perform configuration changes using a Foundation fieldbus host or configuration tool.

The function of the F809F is to provide diagnostic data, so the only way to make configuration changes is with the MODE_BLK.ACTUAL in AUTO mode.

NOTE: Fieldbus devices used in process applications usually have to be set to OOS mode before making configuration changes.

3.2 F809F Configuration

The F809F is available with the standard configuration setting. The configuration settings and block configuration may be changed in the field with the FOUNDATION fieldbus host or a configuration tool.

4 BLOCK CONFIGURATION

4.1 Resource Block

The resource block defines the physical resources of the device including type of measurement, memory, etc. The resource block also defines functionality, such as shed times, that is common across multiple blocks. The block has no linkable inputs or outputs and it performs memory-level diagnostics.

Table 4-1. Resource Block Parameters

Number	Parameter	Description
00	BLOCK	
01	ST_REV	
02	TAG_DESC	The revision level of the static data associated with the function block.
03	STRATEGY	The strategy field can be used to identify grouping of blocks.
04	ALERT_KEY	The identification number of the plant unit.
05	MODE_BLK	The ACTUAL, TARGET, PERMITTED, and NORMAL modes of the block. For further description, see the Mode parameter formal model in FF-890.
06	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. Multiple errors may be shown. For a list of enumeration values, see FF-890, Block_Err formal model.
07	RS_STATE	State of the function block application state machine. For a list of enumeration values, see FF-890.
08	TEST_RW	Read/write test parameter - used only for conformance testing.
09	DD_RESOURCE	String identifying the tag of the resource which contains the Device Description for the resource.
10	MANUFAC_ID	Manufacturer identification number - used by an interface device to locate the DD file for the resource.
11	DEV_TYPE	Manufacturer's model number associated with the resource - used by interface devices to locate the DD file for the resource.
12	DEV_REV	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource.
13	DD_REV	Revision of the DD associated with the resource - used by the interface device to locate the DD file for the resource.
14	GRANT_DENY	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
15	HARD_TYPES	The types of hardware available as channel numbers. The supported hardware type is: SCALAR_INPUT
16	RESTART	Allows a manual restart to be initiated. See also Section 5.4.2
17	FEATURES	Used to show supported resource block options. The supported features are: SOFT_WRITE_LOCK_SUPPORT and REPORTS.
18	FEATURE_SEL	Used to select resource block options.
19	CYCLE_TYPE	Identifies the block execution methods available for this resource. The supported cycle types are: SCHEDULED, and COMPLETION_OF_BLOCK_EXECUTION.
20	CYCLE_SEL	Used to select the block execution method for this resource.
21	MIN_CYCLE_T	Time duration of the shortest cycle interval of which the resource is capable.
22	MEMORY_SIZE	Available configuration memory in the empty resource. To be checked before attempting a download.
23	NV_CYCLE_T	Minimum time interval specified by the manufacturer for writing copies of NV parameters to non-volatile memory. Zero means it will never be automatically copied. At the end of NV_CYCLE_T, only those parameters which have changed need to be updated in NVRAM.
24	FREE_SPACE	Percent of memory available for further configuration. Zero in preconfigured resource.
25	FREE_TIME	Percent of the block processing time that is free to process additional blocks.
26	SHED_RCAS	Time duration at which to give up on computer writes to function block RCas locations. Shed from RCas will never happen when SHED_RCAS = 0.
27	SHED_ROUT	Time duration at which to give up on computer writes to function block ROut locations. Shed from ROut will never happen when SHED_ROUT = 0.
28	FAULT_STATE	Condition set by loss of communication to an output block, fault promoted to an output block or physical contact. When faultstate condition is set, then output function blocks will perform their FSTATE actions.

Number	Parameter	Description
29	SET_FSTATE	Allows the FAIL_SAFE condition to be manually initiated by selecting Set.
30	CLR_FSTATE	Writing a Clear to this parameter will clear the device FAIL_SAFE if the field condition has cleared.
31	MAX_NOTIFY	Maximum number of unconfirmed notify messages possible.
32	LIM_NOTIFY	Maximum number of unconfirmed alert notify messages allowed.
33	CONFIRM_TIME	The time the resource will wait for confirmation of receipt of a report before trying again. Retry will not happen when CONFIRM_TIME=0.
34	WRITE_LOCK	If set, all writes to static and non-volatile parameters are prohibited, except to clear WRITE_LOCK. Block inputs will continue to be updated.
35	UPDATE_EVT	This alert is generated by any change to the static data.
36	BLOCK_ALM	The BLOCK_ALM is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
37	ALARM_SUM	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
38	ACK_OPTION	Selection of whether alarms oscillated with the block will be automatically acknowledged.
39	WRITE_PRI	Priority of the alarm generated by clearing the write lock.
40	WRITE_ALM	This alert is generated if the write lock parameter is cleared.
41	ITK_VER	Major revision number of the interoperability test case used in certifying this device as interoperable. The format and range are controlled by the Fieldbus Foundation.
42	IDENTIFICATION_MEASUREMENT	(SERIAL_NUMBER, HW_REVISION, SOFTWARE_VERSION, FIRMWARE_CRC) Measurement serial number, hardware revision and software version. View as hexadecimal number.
43	IDENTIFICATION_FIELDBUS	(SERIAL_NUMBER, HW_REVISION, SOFTWARE_VERSION, FIRMWARE_CRC) Fieldbus serial number, hardware revision and software version. View as decimal number.

4.1.1 Block Errors

Table 4-2 lists all conditions in the BLOCK_ERR parameter, with conditions in **bold** supported by the F809F.

Table 4-2. BLOCK_ERR Conditions

Number	Name and Description
0	Other
1	Block Configuration Error
2	Link Configuration Error
3	Simulate Active
4	Local Override
5	Device Fault State Set
6	Device Needs Maintenance Soon
7	Input failure/process variable has bad status
8	Output Failure
9	Memory Failure
10	Lost Static Data: Static data that is stored in non-volatile memory has been lost.
11	Lost NV Data
12	Readback Check Failed
13	Device Needs Maintenance Now
14	Power Up: The device was just powered-up.
15	OOS: The actual mode is out of service.

4.1.2 Modes

The resource block supports two modes of operation as defined by the MODE_BLK parameter:

Automatic (Auto)

The block is processing its normal background memory checks. In this mode, changes can be made to all configurable parameters.

Out of Service (OOS)

The block is not processing its tasks. The BLOCK_ERR parameter shows Out of Service. In this mode, changes can not be made to any configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

4.2 Transducer Blocks

There are two types of transducer blocks that allow the user to view and manage the channel information. These blocks are:

- System Transducer Block (SysTB) – see “System Transducer Block (SysTB)” in Section 4.2.4.
- Segment Transducer Block (SegTB), one for each of the eight segments – see “Segment Transducer Block (SegTB)” in Section 4.2.5.

These Transducer blocks contain specific diagnostic data.

4.2.1 Transducer Block Errors

The following conditions are reported in the BLOCK_ERR parameters. Conditions in **bold** are supported in the transducer blocks.

Table 4-3. Block/Transducer Error

BLOCK_ERR

Condition Number, Name and Description

0	Other
1	Block configuration error
2	Link configuration error
3	Simulate active
4	Local override
5	Device fault state set
6	Device needs maintenance soon
7	Input failure
8	Output failure
9	Memory failure
10	Lost static data
11	Lost NV data
12	Readback check failed
13	Device needs maintenance now
14	Power up: The device was just powered up
15	Out of service: The actual mode is out of service

4.2.2 Transducer Block Modes

The transducer block supports two modes of operation as defined by the MODE_BLK parameter:

Automatic (Auto)

The block outputs reflect the diagnostic measurement board inputs. In this mode, changes can be made to all configurable parameters.

Out of Service (OOS)

The block is not processed. Channel outputs are not updated and the status is set to Bad: Out of Service for each channel. The BLOCK_ERR parameter shows Out of Service. In this mode, changes can not be made to any configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

4.2.3 Transducer Block Alarm Detection

If any alarm (except the new and removed device alerts) is set within the Transducer Block then the Needs Maintenance Soon Bit is set in the BLOCK_ERR parameter. The regular monitoring by the control system of the BLOCK_ERR parameter can be used to inform the right person of the alarm condition. Typically this will be the instrument technician responsible for fieldbus network maintenance.

Additionally if any alarm is set in the Transducer Block then the Segment Alarm DI Block PV_D will be set to 1. By configuring the DI block in the fieldbus cyclic messaging the right person can be informed of the alarm condition.

It is recommended to select only one of these options for alarm handling.

4.2.4 System Transducer Block (SysTB)

There is one SysTB in the F809F, which allows the user to view system and self-test alarms together with the system power feed voltages and temperature. The SysTB allows configuration of the time, the date and the segments monitored. Additionally, for each device on each of the 8 monitored fieldbus segments, the re-transmission counter can be reset and device history data can be deleted from within this block.

Table 4-4. Measurement Transducer Block Parameters

Rel-Index	Parameter Name	Description	Help Text	Default alarm limit
0	BLOCK_HEADER	In the BLOCK_HEADER record of a transducer block only the element BLOCK_TAG is writable.		
1	ST_REV	The revision level of the static data associated with the function block.		
2	TAG_DESC	The user description of the intended application of the block.		
3	STRATEGY	The strategy field can be used to identify grouping of blocks.		
4	ALERT_KEY	The identification number of the plant unit.		
5	MODE_BLK	The ACTUAL, TARGET, PERMITTED, and NORMAL modes of the block. For further description, see the Mode parameter formal model in FF-890.		
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. Multiple errors may be shown. For a list of enumeration values, see FF-890, Block_Err formal model.		
7	UPDATE_EVT	Update Event		
8	BLOCK_ALM	Block Alarm		
9	TRANSDUCER_DIRECTORY	Transducer Directory		
10	TRANSDUCER_TYPE	Transducer Type		
11	XD_ERROR	XD Error		
12	COLLECTION_DIRECTORY	Collection Directory		
13	PRIMARY_VALUE_D			
14	POWER_FEED_A_VOLTAGE	Power Feed A Voltage		

Rel- Index	Parameter Name	Description	Help Text	Default alarm limit
15	POWER_FEED_B_VOLTAGE	Power Feed B Voltage		
16	MODULE_TEMPERATURE	Module Temperature		
17	SYSTEM_ALARMS	System Alarms		
18	SELF_TEST_FAULT_ALARMS	Self Test Fault Alarms		
19	POWER_FEED_A_VOLTAGE_LIMITS	Power Feed A Voltage Limits	The default values are limits for MTL fieldbus power supply input voltages. The user may reset to output limits of bulk power supply taking into account voltage drop in wiring at minimum and maximum load.	Low = 19.2V High = 30V
20	POWER_FEED_B_VOLTAGE_LIMITS	Power Feed B Voltage Limits	The default values are limits for MTL fieldbus power supply input voltages. The user may reset to output limits of bulk power supply taking into account voltage drop in wiring at minimum and maximum load.	Low = 19.2V High = 30V
21	MODULE_TEMPERATURE_HIGH_LIMIT	Module Temperature High Limit	The default values are limits for the F801 fieldbus power supply maximum operating temperature of 65°C. The user may reset this to the maximum operating temperature of the power supply used or select a lower limit based on normal operating temperature of the cabinet. Setting the limit at the lower of the maximum operating temperature of the power supply or 10°C above the normal operating temperature is recommended.	65°C
22	PROCESSOR_RESET	Processor Reset	Measurement board processor reset indicator. Cleared when time and date is set. Normally done automatically by the host.	
23	SET_DATE_TIME	Set Date Time	Set the time manually if the Host does not support an automatic update. If the 'Processor reset' flag is active then the time has not been set.	
24	SET_MONITORED_SEGMENTS	Set Monitored Segments	The default value is to monitor all 8 segments. If any segments are not in use these may be omitted from the scan. Whilst investigating an issue on a segment, select only that segment number to scan only that segment. After resolving the issue scanning should be reset to all active segments.	
25	RESET_RETRANSMIT_COUNTERS	Reset Transmission Counters	Reset Retransmit Counters (Select Bitmap, Segment Nr, Device Nr)Delete selected retransmission counters.	
26	DELETE_DATA	Delete data	Delete Data (Select Bitmap, Segment Nr, Device Nr). Warning! This will delete all history data for the selected device. Device data is stored with the device address assigned by the host system. Only delete data if a device address will be no longer used on a segment or a device address is to be assigned to a different device type.	

4.2.4.1 System alarms

Value	Name and Description	Help Text
0x01	Power Feed A Voltage High Alarm	check bulk power supply operation
0x02	Power Feed A Voltage Low Alarm	check bulk power supply operation
0x04	Power Feed B Voltage High Alarm	check bulk power supply operation
0x08	Power Feed B Voltage Low Alarm	check bulk power supply operation
0x10	Module Temperature High Alarm	check cooling in power supply cabinet

4.2.4.2 Self test alarms

Value	Name and Description
0x01	Measurement processor in Fault State
0x02	EEPROM not programmed
0x04	EEPROM data corrupt
0x08	Relay stuck
0x10	RAM error
0x20	FLASH corrupt
0x40	Watchdog failure

4.2.4.3 Methods

For FOUNDATION fieldbus hosts or configuration tools that support DD methods, there are 3 configuration methods available in the Systems Transducer block. These methods are included with the device description (DD) software.

- Setting Date and Time
- Resetting retransmission counter
- Deleting device data

4.2.5 Segment Transducer Block (SegTB)

Each of the eight monitored fieldbus segments is supported by a SegTB that provides all the measured parameters and associated alarms for the fieldbus segment and devices. The user can assign segment and device tags within this block. Additionally the segment and device alarm limits may be changed by the user..

WARNING: the device tags are held in volatile memory. The F809F is designed to be powered by redundant reliable power feeds. If both power feeds fail at the same time, or the the F809F is removed from the carrier, then the segment and device tag data will be lost. It is recommended to retain this data in the systems Instrument Management Software, so if an F809F module is replaced, the data can be downloaded to the new module.

Table 4-5. Segment Transducer Block Parameters

Rel-Index	Parameter Name	Description	Help Text	Default alarm limit
0	BLOCK			
1	ST_REV	The revision level of the static data associated with the function block.		
2	TAG_DESC	The user description of the intended application of the block.		
3	STRATEGY	The strategy field can be used to identify grouping of blocks.		
4	ALERT_KEY	The identification number of the plant unit.		
5	MODE_BLK	The actual, target, permitted, and normal modes of the block. For further description, see the Mode parameter formal model in FF-890.		
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. Multiple errors may be shown. For a list of enumeration values, see FF-890, Block_Err formal model.		
7	UPDATE_EVT	Update Event		
8	BLOCK_ALM	Block Alarm		

Rel-Index	Parameter Name	Description	Help Text	Default alarm limit
9	TRANSDUCER_DIRECTORY	Transducer Directory		
10	TRANSDUCER_TYPE	Transducer Type		
11	XD_ERROR	XD Error		
12	COLLECTION_DIRECTORY	Collection Directory		
13	PRIMARY_VALUE_D			
14	SEGMENT_TAG	The user description of the segment		
15	SEGMENT_VOLTAGE	Segment Voltage		
16	AVG_LF_NOISE	Average Low Frequency Noise	Average low frequency noise (25 Hz - 3.8 kHz)	
17	AVG_IF_NOISE	Average In-Band Frequency Noise	Average in-band or fieldbus frequency noise (5 kHz - 55 kHz)	
18	AVG_HF_NOISE	Average High Frequency Noise	Average high frequency noise (90 kHz - 350 kHz)	
19	PEAK_LF_NOISE	Peak Low Frequency Noise	Peak low frequency noise (25 Hz - 3.8 kHz) detected by the diagnostic module over the last hour.	
20	PEAK_IF_NOISE	Peak In-Band Frequency Noise	Peak in-band or fieldbus frequency noise (5 kHz - 55 kHz) detected by the diagnostic module over the last hour.	
21	PEAK_HF_NOISE	Peak High Frequency Noise	Peak high frequency noise (90 kHz - 250 kHz) detected by the diagnostic module over the last hour.	
22	LIVE_DEVICE_COUNT	Live Device Count	Number of fieldbus devices communicating on the network segment.	
23	LAS_DEVICE_TAG	LAS Device Tag		
24	LAS_DEVICE_ADDRESS	LAS Device Address	Hexadecimal address of the Link Active Scheduler on the network segment.	
25	LAS_SIGNAL_LEVEL	LAS Signal Level	Peak-to-peak signal level of the Link Active Scheduler transmissions on the network segment.	
26	LOWEST_SIGNAL_DEVICE_TAG	Lowest Signal Device Tag		
27	LOWEST_SIGNAL_DEVICE_ADDRESS	Lowest Signal Device Address	Hexadecimal address of the device on the network segment with the lowest detected signal level.	
28	LOWEST_SIGNAL_LEVEL	Lowest Signal Level	The lowest detected signal level at which a device transmitted.	
29	RETRANSMISSIONS	Retransmissions	Total retransmissions monitored by diagnostic module of all devices on this segment since last reset.	
30	RETRANSMISSION_RATE	Retransmission Rate	Retransmission rate = Total Re-transmissions / Total pass token requests from LAS of all devices on this segment over the last calendar month. See Note 1 .	

Rel- Index	Parameter Name	Description	Help Text	Default alarm limit
31	DEVICE_DATA_1	Device Data 1		
	DEVICE_ADDRESS	Device Address	Device address displayed in Hexadecimal. Some fieldbus control systems display addresses as decimal so care should be taken when comparing data in the diagnostic module and the control system.	
	DEVICE_TAG	Device Tag	User assigned device tag. Stored in volatile memory.	
	DEVICE_SIGNAL_LEVEL	Device Signal Level		
	RETRANSMISSIONS	Retransmissions,	Retransmissions detected by diagnostic module for this device since last reset.	
	RETRANSMISSION_RATE	Retransmission Rate	Retransmission rate = Re-transmissions/Total pass token requests from LAS over the last calendar month. See Note 1 .	
	RESERVED	Reserved		
	INVERTED_SIGNAL	Inverted Signal	Indicates this device is connected with the wrong polarity. Reverse wiring connections at this device.	
	DEVICE LIVE	Device live status	Live device flag. The device is currently live if this is set to 1. The device is no longer live if 0.	
	<hr/>			
32 - 62	As 31 for Devices 2 - 32			
63	SEGMENT_ALARMS	See Section 4.2.5.1		
64	DEVICE_ALARMS	See Section 4.2.5.2		
65	SEGMENT_VOLTAGE_LIMITS	Segment voltage limits	Default high limit set to 32V and low limit set to 20v for F801 power supply. Set to 25V for FPS power supply and 28V for F802 power supply.	Low = 20V High = 32V
66	AVG_LF_NOISE_HIGH_LIMIT	Average Low Freq. Noise High Limit	Default set to 150mV	150mV
67	AVG_IF_NOISE_HIGH_LIMIT	Average In-Band Freq. Noise High Limit	Default set to 75mV	75mV
68	AVG_HF_NOISE_HIGH_LIMIT	Average High Frequency Noise High Limit	Default set to 150mV	150mV
69	PEAK_LF_NOISE_HIGH_LIMIT	Peak Low Frequency Noise High Limit	Default set to 65535mV	65535mV See Note 2 (Alarm disabled)
70	PEAK_IF_NOISE_HIGH_LIMIT	Peak In-Band Frequency Noise High Limit	Default set to 65535mV	65535mV See Note 2 (Alarm disabled)
71	PEAK_HF_NOISE_HIGH_LIMIT	Peak High Frequency Noise High Limit	Default set to 65535mV	65535mV See Note 2 (Alarm disabled)
72	LIVE_DEVICE_COUNT_LIMITS	Live Device Count Limits	Default high limit set to 32 devices and low limit set to 0	Low = 0 High = 32
73	DEVICE_SIGNAL_LEVEL_LIMITS_1	Device Signal Level Limits 1	After successful commissioning the device low limit may be set to 75% of current value and device high limit to 125% of current value.	Low = 150mV High = 1200mV See Note 2
74	RETRANSMISSIONS_LIMIT_1	Retransmissions Limit 1	Default set to 65535	65535

Rel- Index	Parameter Name	Description	Help Text	Default alarm limit
75	RETRANSMISSION_ RATE_LIMIT_1	Retransmission Rate Limit 1	Default set to 0.1%	0.1%
...	As 73, 74 and 75 for Devices 2 to 31		...	
166	DEVICE_SIGNAL_ LEVEL_LIMITS_32	Device Signal Level Limits 32		Low = 150mV High = 1200mV
167	RETRANSMISSIONS_ LIMIT_32	Retransmissions Limit 32	Default set to 65535	65535
168	RETRANSMISSION_RATE_ LIMIT_32	Retransmission Rate Limit 32	Default set to 0.1%	0.1%

Information on alarms is provided by SEGMENT_ALARMS and DEVICE_ALARMS.

Note 1. Updated on the first day of the month. During the first calendar month, after any device communication is identified, the value '0' will be displayed to allow sufficient pass-token requests to be monitored.

Note 2. The device signal level high limits and peak noise high alarm limits with fieldbus software version 1.10 or earlier are:

Device Signal Level Limits - High	1000mV
Peak Low Frequency Noise	300mV
Peak In-band Frequency Noise	150mV
Peak High Frequency Noise	300mV

4.2.5.1 SEGMENT_ALARMS - Descriptions and Corrective Actions

Value	Name and Description	Help Text
0x0001	Segment voltage high alarm:	check fieldbus power supply operation
0x0002	Segment voltage low alarm	check for segment short circuit and fieldbus power supply operation
0x0004	Average low frequency noise high alarm	check: fieldbus screen grounding, AC cabling close to fieldbus cabling, wire terminations are properly secured.
0x0008	Average in-band frequency noise high alarm	check: fieldbus screen grounding, AC cabling close to fieldbus cabling, the wire terminations are properly secured, for welding on plant, poor grounding of frequency controlled drives,check wire terminations are properly secured
0x0010	Average high frequency noise high alarm	check: for sources of high frequency noise such as welding on plant, poor grounding of frequency controlled drives..
0x0020	Peak low frequency noise high alarm	if frequent alarms check: fieldbus screen grounding, AC cabling close to fieldbus cabling, wire terminations are properly secured.
0x0040	Peak in-band frequency noise high alarm	if frequent alarms check: fieldbus screen grounding, AC cabling close to fieldbus cabling, the wire terminations are properly secured, for welding on plant, poor grounding of frequency controlled drives,
0x0080	Peak high frequency noise high alarm	if frequent alarms check: for sources of high frequency noise such as welding on plant, poor grounding of frequency controlled drives.
0x0100	Live device count high alarm	check if additional device has been added to segment, if new device is approved and segment documentation has been updated, reset live device count limits;
0x0200	Live device count low alarm	check for device failed or removed for maintenance.
0x0400	Short to shield	Check for shield connections to the fieldbus cable including stray strands of wire at wire terminations or un-insulated shield wire loose at the device. Disconnect portions of cable and check if the short goes away. Verify the fieldbus power supply is isolated from ground. Check for damaged or waterlogged cable, junction box or device.
0x0800	32 device addresses used	

4.2.5.2 DEVICE_ALARMS - Descriptions and Corrective Actions

Value	Name and Description	Corrective Action
0x01	Device signal level high alarm	If only one device high: check alarm limits have not been wrongly set, check device operation. If several/all devices on segment check for only one terminator on segment or failed terminator
0x02	Device signal level low alarm	If only one device low: check alarm limits have not been wrongly set, check spur cabling, spur and device connections are tight, water in spur cable or device, check device operation. If several/all devices on segment low check for more than two terminators on segment, check for water in devices, junction boxes and cabling..
0x04	Retransmissions high alarm	Check retransmission limit has not been wrongly set. Check retransmission rate. Check for changes in parameter levels compared to values at commissioning and with history. Investigate any significant changes.
0x08	Retransmission rate high alarm	This is an excellent key performance indicator of device communication health. Check retransmission rate limit has not been wrongly set. Check for changes in parameter levels compared to values at commissioning and with history. Investigate any significant changes. If only one device check spur cabling, spur and device connections are tight, check for water in spur cable or device, check device operation. If all/several devices on segment check trunk cabling, host and trunk JB connections are tight, check for water in trunk or spur cable, junction boxes or all devices, check host operation.

4.2.5.3 DEVICE_ALERTS - Descriptions

These alerts are useful during commissioning and maintenance. To avoid high levels of alarms, these alerts do not set the "BLOCK_ERR needs maintenance soon" bit, the "DI block alarm" or the segment LED to "flashing". On an operational fieldbus segment, these events can be set to generate alarms - if required, by configuring "segment device count" low and high alarms.

Value	Name	Description
0x10	New device	Set when a device is added to the LAS live list. Cleared after 1 hour.
0x20	Device removed	Set when a device is removed from the LAS live list. Cleared after 1 hour.

4.3 Discrete Input Block

The discrete input blocks calculate their PV_D value from the current values of the alarm parameters of the transducer blocks and calculate the OUT_D value according to the Discrete Input Block algorithm.

Alarm DI Block: PV_D will be set to 1 if any of the System Alarm, Segment / Device Alarm or Self Test Fault Alarm bits is set. Selected by channel value 12.

System Alarm DI Block: PV_D will be set to 1 if any System Alarm and Self Test Fault Alarm bits are set. Selected by channel value 13.

Segment Alarm DI Block 1 – 8: PV_D will be set to 1 if any of the Segment / Device Alarm bits is set for the rsp. segment. Selected by channel values 14 – 21 for segments 1 – 8.

The selection, which summarized alarm is displayed in which DI function block is adjustable through the CHANNEL parameter of the function block. The default value of the CHANNEL parameter (valid values are 12 to 21) pre-selects the various types of alarms as described above.

Channels Summary:	Channel	Description
	12	Alarm DI Block
	13	System Alarm DI Block
	14	Segment 1 Alarm DI Block
	15	Segment 2 Alarm DI Block
	16	Segment 3 Alarm DI Block
	17	Segment 4 Alarm DI Block
	18	Segment 5 Alarm DI Block
	19	Segment 6 Alarm DI Block
	20	Segment 7 Alarm DI Block
	21	Segment 8 Alarm DI Block

For applications using DI Blocks to communicate alarms to the host system, configure the links between the function blocks and schedule the order of their execution.

4.3.1 Discrete Input Block Errors

The following conditions are reported in the BLOCK_ERR parameters. Conditions in **bold** are supported in the DI blocks.

Table 4-6. Block/Transducer Error

BLOCK_ERR

Condition Number, Name and Description

0	Other
1	Block configuration error
2	Link configuration error
3	Simulate active
4	Local override
5	Device fault state set
6	Device needs maintenance soon
7	Input failure
8	Output failure
9	Memory failure
10	Lost static data
11	Lost NV data
12	Readback check failed
13	Device needs maintenance now
14	Power up: The device was just powered up
15	Out of service: The actual mode is out of service

5 OPERATION AND MAINTENANCE

5.1 Safety Messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- ◆ Make sure only qualified personnel perform the installation.

5.2 LED indicators

Power status (green)

- ON** power on
- OFF** power fail

Segment status (amber)

- ON** segment monitored
- OFF** segment not monitored
- FLASHING** active segment alarm

5.3 FOUNDATION Fieldbus Information

FOUNDATION fieldbus™ is an all-digital, serial, two-way, multidrop communication protocol that interconnects devices such as transmitters and valve controllers. It is a local area network (LAN) for instruments that enables basic control and I/O to be moved to the field devices. The model F809F uses FOUNDATION fieldbus technology developed and supported by Eaton and the other members of the independent Fieldbus Foundation.

5.3.1 Commissioning (Addressing)

To be able to setup, configure, and have it communicate with other devices on a segment, a device must be assigned a permanent address. Unless requested otherwise, it is assigned a temporary address when shipped from the factory.

If there are two or more devices on a segment with the same address, the first device to start up will use the assigned address (ex. Address 20). Each of the other devices will be given one of the four available temporary addresses. If a temporary address is not available, the device will be unavailable until a temporary address becomes available.

Use the host system documentation to commission a device and assign a permanent address.

5.4 Hardware Maintenance

The F809F has no moving parts and requires a minimal amount of scheduled maintenance. If a malfunction is suspected, check for an external cause before performing the diagnostics presented below.

5.4.1 Communication/Power Check

If the Fieldbus Diagnostic Module does not communicate, or provides an erratic output, check for adequate voltage to it. The F809F requires between 9.0 and 32.0V DC on the communicating fieldbus segment. This is selected as Segment 1 or 8 of the monitored segment or a separate fieldbus segment. Check for wire shorts, open circuits, and multiple grounds on the communicating fieldbus segment.

5.4.2 Resetting the Configuration (RESTART)

The Restart Processor parameter in the Resource Block offers the choice of:

- an uninitialised restart that restarts the processor with the current configuration, or
 - a default restart that restores the default configuration.
- Following a default restart the block is in OOS Mode. To return block to Auto carry out a Processor Restart.
- Restart resource, is accepted, but no function executed.
 - Run is the normal state for the block. To clear field after a Processor restart the parameter should be manually set to Run with some systems.
 - Restart processor will trigger an immediate reset of the processor. As the F809F does not acknowledge the request this may cause an error message with some systems.

5.5 Troubleshooting

5.5.1 Foundation Fieldbus

Symptom	Possible Cause	Corrective Action
Device does not show up in the live list	Network configuration parameters are incorrect	Set the network parameters of the LAS (host system) according to the FF Communications Profile: ST: 8 MRD: 10 DLPDU PhLO: 4 MID: 7 TSC: 4 (1 ms) T1: 1920000 (60 s) T2: 5760000 (180 s) T3: 480000 (15 s)
	Network address is not in polled range.	Set first Unpolled Node and Number of UnPolled Nodes so that the device address is within range.
	Power to the device is below the 9 VDC minimum.	Increase the power to at least 9V.
	Noise on the power / communication is too high.	Verify terminators and power conditioners are within specification Verify that the shield is properly terminated and not grounded at both ends. It is best to ground the shield at the power conditioner.
Device that is acting as a LAS does not send out CD	LAS Scheduler was not downloaded to the Backup LAS device	Ensure that all of the devices that are intended to be a Backup LAS are marked to receive the LAS schedule
All devices go off live list and then return	Live list must be reconstructed by Backup LAS device	Current link setting and configured links settings are different. Set the current link setting equal to the configured settings.

5.5.2 Resource Block

Symptom	Possible Cause	Corrective Action
Mode will not leave OOS	Target mode not set Memory Failure	Set target mode to something other than OOS. BLOCK_ERR will show the lost NV Data or Lost Static Data bit set. Restart the device by setting RESTART to Processor. If the block error does not clear, call the factory.
Block Alarms Will not work	Features Notification	FEATURES_SEL does not have Alerts enabled. Enable the report bit. LIM_NOTIFY is not high enough. Set equal to MAX_NOTIFY.

5.5.3 System and Segment Transducer Block Troubleshooting

Symptom	Possible Cause	Corrective Action
Mode will not leave OOS	Target mode not set Resource block	Set target mode to AUTO The actual mode of the Resource block in OOS. See Resource Block Diagnostics for corrective action

APPENDIX A: TROUBLESHOOTING TABLE

Symptom	Possible Causes
High peak or average noise	Water/condensation in wiring, improperly connected shield, bad fieldbus device, bad physical layer component (power supply, terminator, wiring block), segment is not isolated from ground, fieldbus cable is located near noise producing cable, loose wire termination.
Recommendations: Inspect the network cable and connections. Tighten screw terminals and connector hold-down screws. Look for waterlogged cables, condensation in junction boxes, loose wires, FF cable routed near other signaling cables or AC power cables, loose strands of wire shorting to other wires/conductive objects. Check if fieldbus to shield short is present and if so follow recommendations below. Verify the segment is powered by an isolated fieldbus power supply or that the bulk supply for the fieldbus power supply is isolated and only powers one segment. Take noise measurements at multiple locations on the network to identify where noise is highest and most likely located. Measure resistance from shield to ground with a DMM and verify it is <100Ω. Disconnect devices one at a time to see if noise disappears. Replace terminators, fieldbus power supplies, and wiring blocks.	
Symptom	Possible Causes
Excessive retransmissions rate (on one device)	Bad spur wiring connection to device, not enough power to the device, bad device, bad port on the wiring block, noise on the spur.
Recommendations: Check if high noise levels are present and if so follow recommendations above. If the wiring block has a current limiting (SpurGuard) feature, check the associated LED to make sure it isn't constantly or intermittently lit. Inspect the wiring and connections from the wiring block to the device looking for waterlogged cables, condensation in junction boxes, loose wires, FF cable routed near other signaling cables or AC power cables, loose strands of wire shorting to other wires/conductive objects. Try putting the device on a different spur from the wiring block. Replace the device.	
Symptom	Possible Causes
Excessive retransmissions rate (on all or multiple devices)	Wiring problem, not enough power to the devices, bad physical layer device (power supply, terminator, wiring block), noise on the bus
Recommendations: Determine if the entire network is affected or just part of it. Focus on the part of the network with problems. Check if high noise levels are present and if so follow recommendations above. Use the FBT-3/6 to check for high noise levels at the device and check the bus voltage is >9VDC at the device furthest from the power supply. Inspect the network looking for waterlogged cables, condensation in junction boxes, loose wires, FF cable routed near other signaling cables or AC power cables, loose strands of wire shorting to other wires/conductive objects. Replace the terminators, power supply/conditioner.	
Symptom	Possible Causes
Low device signal level (one device)	Bad spur wiring connection to device, not enough power to the device, bad device, bad port on the wiring block
Recommendations: Use FBT-3/6 to check the voltage at the device is >9VDC. If the wiring block has a current limiting (SpurGuard) feature, check the associated LED to make sure it isn't constantly or intermittently triggered. Inspect the wiring and connections from the wiring block to the device looking for waterlogged cable, condensation, loose wires, loose strands of wire shorting to other wires/conductive objects. Verify the maximum length of cable between any 2 devices does not exceed 1900m and spur length does not exceed 120m. Try connecting the device on a different spur from the wiring block. Replace the device.	
Symptom	Possible Causes
Low device signal level (all devices)	Wiring problem, not enough power to the devices, bad physical layer device (power supply, terminator, wiring block)
Recommendations: Use FBT-3/6 to check the voltage at the device furthest from it is >9VDC. Check the power LEDs on the wiring blocks are steadily lit. Inspect the wiring and connections (especially at the parts common to all devices such as power supply/conditioner, terminators, trunk cable, etc.) looking for waterlogged cable, condensation, loose wires, loose strands of wire shorting to other wires/conductive objects. Replace suspect physical layer components (power supply/conditioner, terminators, wiring blocks).	
Symptom	Possible Causes
High device signal level (one device)	Bad device
Recommendations: Replace the device.	
Symptom	Possible Causes
High device signal level (all devices)	Missing terminator, failed terminator, improperly connected terminator, failed fieldbus power supply
Recommendations: Verify two terminators are installed (note that some terminators are built-in to power supplies/conditioners and wiring blocks, some are turned on/off with a switch and some are automatic). Check wiring to the terminators. Replace suspect terminators or the products that contain them. Replace the fieldbus power supply.	

Symptom**Possible Causes****Shield short to fieldbus**

Wiring problem, un-isolated device connected to the fieldbus, water in a cable/device/wiring block

Recommendations: Check for damaged cable, make sure all devices are properly connected. Verify that fieldbus is not connected to a ground at the power supply or to a device case. Look for shield connections to the fieldbus cable including stray strands of wire at wire terminations or un-insulated shield wire loose at the device. Disconnect portions of cable and check if the short goes away. Verify the fieldbus power supply is isolated from ground.

Symptom**Possible Causes****Device is not "seen" on the bus/not communicating**

Bad spur wiring connection to device, not enough power to the device, bad device, bad port on the wiring block

Recommendations: Check DC voltage at the device is >9VDC. If the wiring block the device is connected to has a current limiting (SpurGuard) feature, check the associated LED to make sure it isn't constantly or intermittently triggered. Inspect the wiring and connections from the wiring block to the device looking for waterlogged cable, condensation, loose wires, loose strands of wire shorting to other wires/conductive objects. Try putting the device on a different spur from the wiring block. Replace the device.

AUSTRALIA

MTL Instruments Pty Ltd,
10 Kent Road, Mascot, New South Wales, 2020, Australia
Tel: +61 1300 308 374 Fax: +61 1300 308 463
E-mail: mtl-salesanz@eaton.com

BeNeLux

MTL Instruments BV
Ambacht 6, 5301 KW Zaltbommel
The Netherlands
Tel: +31 (0)418 570290 Fax: +31 (0)418 541044
E-mail: mtl.benelux@eaton.com

CHINA

Cooper Electric (Shanghai) Co. Ltd
955 Shengli Road, Heqing Industrial Park
Pudong New Area, Shanghai 201201
Tel: +86 21 2899 3817 Fax: +86 21 2899 3992
E-mail: mtl-cn@eaton.com

FRANCE

MTL Instruments sarl,
7 rue des Rosiéristes, 69410 Champagne au Mont d'Or
France
Tel: +33 (0)4 37 46 16 53 Fax: +33 (0)4 37 46 17 20
E-mail: mtlfrance@eaton.com

GERMANY

MTL Instruments GmbH,
Heinrich-Hertz-Str. 12, 50170 Kerpen, Germany
Tel: +49 (0)22 73 98 12-0 Fax: +49 (0)22 73 98 12-2 00
E-mail: mtlgmbh@eaton.com

INDIA

MTL India,
No.36, Nehru Street, Off Old Mahabalipuram Road
Sholinganallur, Chennai- 600 119, India
Tel: +91 (0) 44 24501660 /24501857 Fax: +91 (0) 44 24501463
E-mail: mtlindiasales@eaton.com

ITALY

MTL Italia srl,
Via San Bovio, 3, 20090 Segrate, Milano, Italy
Tel: +39 02 959501 Fax: +39 02 95950759
E-mail: chmninfo@eaton.com

JAPAN

Cooper Crouse-Hinds Japan KK,
MT Building 3F, 2-7-5 Shiba Daimon, Minato-ku,
Tokyo, Japan 105-0012
Tel: +81 (0)3 6430 3128 Fax: +81 (0)3 6430 3129
E-mail: mtl-jp@eaton.com

NORWAY

Norex AS
Fekjan 7c, Postboks 147,
N-1378 Nesbru, Norway
Tel: +47 66 77 43 80 Fax: +47 66 84 55 33
E-mail: info@norex.no

RUSSIA

Cooper Industries Russia LLC
Elektrozavodskaya Str 33
Building 4
Moscow 107076, Russia
Tel: +7 (495) 981 3770 Fax: +7 (495) 981 3771
E-mail: mtlrussia@eaton.com

SINGAPORE

Cooper Crouse-Hinds Pte Ltd
No 2 Serangoon North Avenue 5, #06-01 Fu Yu Building
Singapore 554911
Tel: +65 6 645 9888 Fax: +65 6 487 7997
E-mail: sales.mtlsing@eaton.com

SOUTH KOREA

Cooper Crouse-Hinds Korea
7F, Parkland Building 237-11 Nonhyun-dong Gangnam-gu,
Seoul 135-546, South Korea.
Tel: +82 6380 4805 Fax: +82 6380 4839
E-mail: mtl-korea@eaton.com

UNITED ARAB EMIRATES

Cooper Industries/Eaton Corporation
Office 205/206, 2nd Floor SJ Towers, off. Old Airport Road,
Abu Dhabi, United Arab Emirates
Tel: +971 2 44 66 840 Fax: +971 2 44 66 841
E-mail: mtlgulf@eaton.com

UNITED KINGDOM

Eaton Electric Ltd,
Great Marlings, Butterfield, Luto
Beds LU2 8DL
Tel: +44 (0)1582 723633 Fax: +44 (0)1582 422283
E-mail: mtlenquiry@eaton.com

AMERICAS

Cooper Crouse-Hinds MTL Inc.
3413 N. Sam Houston Parkway W.
Suite 200, Houston TX 77086, USA
Tel: +1 281-571-8065 Fax: +1 281-571-8069
E-mail: mtl-us-info@eaton.com