Honeywell

Experion PKS
Spirit IT Flow-X Interface Reference

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EPDOC-X297-en-431A	431	0	February 2015

Disclaimer

Contents

Planning considerations for installing and configuring Spirit IT Flow-X controllers

This reference describes how to set up, configure, and test Spirit IT Flow-X controllers.

Revision history

Revision	Date	Description
A	February 2015	Initial release of document.

How to use this guide

Complete each step before commencing the next step.

Step	Go to
Set up the controllers and network	Other documentation for Spirit IT Flow-X
Use Quick Builder to build Spirit IT Flow-X channels	• Spirit IT Flow-X channels and controllers configuration and addressing reference • "Build channels" topic in the *Quick Builder User's Guide*
Use Quick Builder to build Spirit IT Flow-X controllers	• Spirit IT Flow-X channels and controllers configuration and addressing reference • "Build controllers" topic in the *Quick Builder User's Guide*
Download channel and controller definitions to the server	"Downloading items" topic in the *Quick Builder User's Guide*
Use Quick Builder to define points	"Building and configuring points" topic in the *Quick Builder User's Guide*
Optional. If you want to configure EFM meters, use Quick Builder to build Electronic Flow Measurement (EFM) meters	• Main properties for a Spirit IT Flow-X meter template • "Build meters" topic in the *Quick Builder User's Guide*
Test communications	Testing Spirit IT Flow-X to field device communications

Related topics

"About the Spirit IT Flow-X interface" on page 6
"Devices supported by the Spirit IT Flow-X interface" on page 7
"Other documentation for Spirit IT Flow-X" on page 8
"Architectures for Spirit IT Flow-X" on page 9
"Spirit IT Flow-X channel and controller reference" on page 13
"Main properties for a Spirit IT Flow-X meter template" on page 28
"Testing Spirit IT Flow-X to field device communications" on page 40

About the Spirit IT Flow-X interface

The Spirit IT Flow-X interface is based on the standard Modbus protocol.

The Spirit IT Flow-X interface uses the same framing and frame format as standard Modbus. This is described in the Modbus specifications at http://www.modbus.org/specs.php and is not repeated in this reference.

Electronic Flow Measurement (EFM)

The Spirit IT Flow-X interface uses the HTTP/1.1 protocol, in asynchronous mode, to collect archive and log data related to Electronic Flow Measurement. EFM data is requested through the Web Service Interface (HTTP on Port 80).

Devices supported by the Spirit IT Flow-X interface

The server supports the following device:

- *Spirit IT Flow-X flow computer* controller

Other documentation for Spirit IT Flow-X

From Spirit IT

- *Spirit IT Flow-X Operation and Configuration Manual*.
- *Spirit IT Flow-X Web Services Reference Manual*, revision A.8 dated June 2012.

From Honeywell

- *Quick Builder User's Guide*.

Architectures for Spirit IT Flow-X

The server supports both single and redundant communications to Spirit IT Flow-X controllers via a TCP connection.

Spirit IT Flow-X TCP connection

To connect Spirit IT Flow-X controllers to the server communicating using the TCP protocol, you are required to have a *network interface card* (NIC) connected to an Ethernet network on both the Server as well as the controller.

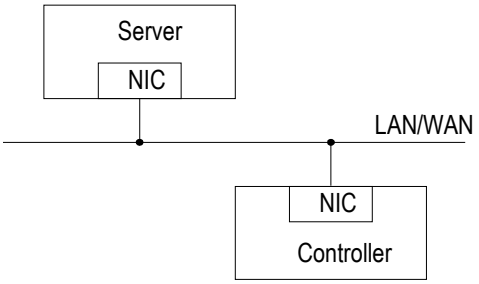

Figure 1: Non-redundant Spirit IT Flow-X TCP network architecture

Redundant communication architecture

If you require redundant communications, you must have two separate *network interface cards* (NICs) on both the Server and the controller, which are connected to separate Ethernet subnets.

It is expected that, during normal operation when both networks are available, the controller can respond to requests on either network connection at any time.

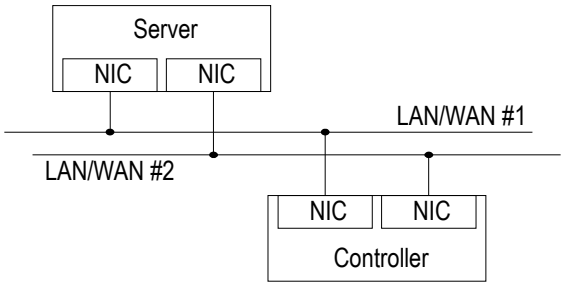

Figure 2: Redundant Spirit IT Flow-X TCP network architecture

Redundant communications on FTE

When connecting Spirit IT Flow-X controllers to an FTE network, there must be two network connections on each server connected via FTE switches to the FTE network. The E1 port on the Spirit IT Flow-X controller must be connected to the FTE Yellow switch.

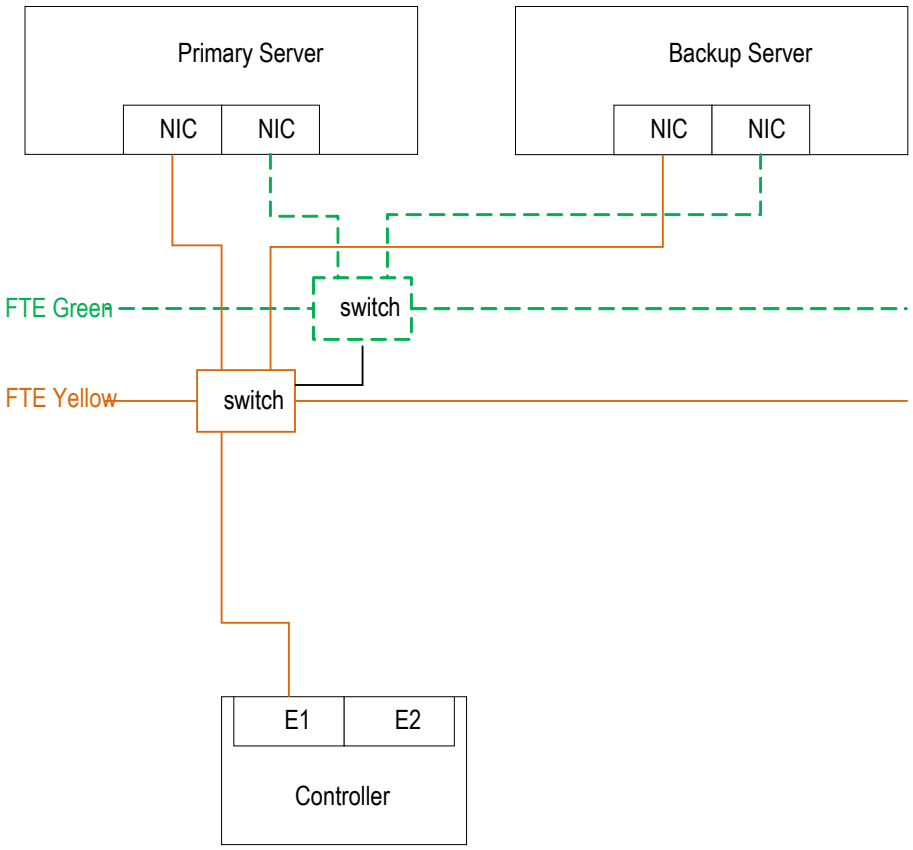

Figure 3: Redundant communications on FTE Spirit IT Flow-X TCP network architecture

Function codes supported by Spirit IT Flow-X

The Modbus function codes used to read from and write to Spirit IT Flow-X Modbus register addresses are:

Function Code (Hexadecimal)	Action	Register Type
01	Read	Boolean variables
03	Read	Numeric variables
05	Write Single	Boolean variables
06	Write Single	Numeric variables
0F	Write Multiple	Boolean variables
10	Write Multiple	Numeric variables

Alarm and Event collection

For Alarm and Event collection, the following Web Service is used:

Web Service	Action
Logs	Event data request using the time span from the last event collected.

Log collection

For the Configuration Record log, Interval log, Daily log, Ultrasonic log, Composition log, and Gas Quality log, the following Web Service is used:

Web Service	Action
Archive	Request archive from last collected time. The archive name is specified on the meter template.

Spirit IT Flow-X register map

The registers listed in the following tables refer to the addresses configured in Quick Builder. The Modbus protocol offsets the address by one in the messages to the device, so the address offset configuration on the controller should be set to *1*.

Default map

Valid address ranges, with their applicable register sizes, are listed below for a default Spirit IT Flow-X register map. The Experion Spirit IT Flow-X Interface will use this register map when the controller Device Type is set to *DEFAULT*.

Data type	Property	Setting
BOOL	Lowest register	1
	Highest register	1000
	Read code	1
	Write code	5
	Multi-write code	15
	Maximum registers per request	1000
WORD	Lowest register	40001
	Highest register	44000
	Read code	3
	Write code	6
	Multi-write code	16
	Maximum registers per request	125

Write access to any register is device—and address—specific. No checks are made at configuration time against write access for any registers configured in a scanned parameter destination address.

Spirit IT Flow-X channel and controller reference

This section describes the configuration and addressing information specific to Spirit IT Flow-X channels and controllers.

In addition to the information contained in this reference, and for help to build channels and controllers, see the section titled "Building controllers or channels" in the *Quick Builder User's Guide*.

Related topics

“Main properties for a Spirit IT Flow-X channel” on page 14

“Alternating behavior of redundant Spirit IT Flow-X controllers” on page 16

“Main properties for an Spirit IT Flow-X controller” on page 18

“About time synchronization on Spirit IT Flow-X controllers” on page 21

“Optimizing Spirit IT Flow-X Modbus scanning performance” on page 22

“Planning considerations for installing and configuring Spirit IT Flow-X controllers” on page 5

Main properties for a Spirit IT Flow-X channel

The Main tab defines the basic properties for an Spirit IT Flow-X channel.

For information about how to create a channel, see the topic titled "Building controllers and channels" in the *Quick Builder User's Guide*.

Property	Description
Name	The unique name of the channel. A maximum of *10* alphanumeric characters (no spaces or double quotes). Note: In Station displays, underscore characters (_) appear as spaces.
Description	(Optional) A description of the channel. A maximum of *132* alphanumeric characters, including spaces.
Associated Asset	The Tag Name of the Asset to be associated with the alarm group.
Marginal Alarm Limit	The communications alarm marginal limit at which the channel is declared to be marginal. When this limit is reached, a high priority alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the *Server and Client Configuration Guide*. To change the priority of the alarm for one channel, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the *Server and Client Configuration Guide*. A channel barometer monitors the total number of requests and the number of times the controller did not respond or response was incorrect. The barometer increments by two or more, depending on the error, and decrements for each good call. To calculate an acceptable marginal alarm limit, use the formula: Square root of the number of controllers on the channel × Marginal Alarm Limit defined on those controllers (Normally, you specify the same value for all controllers on a channel). For example, if there are 9 controllers on the channel and their Marginal Alarm Limit is set to *25*, the value would be *3* (which is the square root of 9) *x 25 = 75*.
Fail Alarm Limit	The communications alarm fail limit at which the channel is declared to have failed. When this barometer limit is reached, an urgent alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the *Server and Client Configuration Guide*. To change the priority of the alarm for one channel, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the *Server and Client Configuration Guide*. Set this to double the value specified for the channel Marginal Alarm Limit.
Diagnostic Scan Rate	For Spirit IT Flow-X channels, the diagnostic is only on the Modbus interface. The period, in seconds, between diagnostic scans that verify communications integrity with the controller. The default value is *60* seconds. The diagnostic scans continue even if a controller is marked as failed, thus enabling the system to detect return-to-normal communications. If there are multiple controllers configured on a channel, the diagnostic scan rate should be set to *60* seconds multiplied by the number of controllers on that channel. For example, if there are five controllers configured on the channel, the diagnostic scan rate should be set to *300* seconds. Diagnostic scans occur at the set scan rate per controller. Therefore, with five controllers and a default value of *60* seconds, the diagnostic scans will occur every *12* seconds.
Modbus Connect Timeout	The time, in seconds, the server attempts to connect to a controller before giving up. For Modbus TCP protocol, it is recommended to use a timeout of *1* or *2* seconds, unless a high-latency and/or low-bandwidth Ethernet network necessitates a higher timeout value. The default value is *10* seconds.

Property	Description
Modbus Read Timeout	The time, in seconds, the server attempts to read data from a controller before giving up. The default value is *2* seconds. For Modbus TCP protocol, it is recommended to use a timeout of *1* second, unless a high-latency and/or low-bandwidth Ethernet network necessitates a higher timeout value.
HTTP Name Resolution Timeout	Sets timeout, in ms, for HTTP name resolution. The range is *1–30,000* ms. The default value is *1,000* ms.
HTTP Connect Timeout	Sets timeout, in ms, for HTTP connection. The range is *1–30,000* ms. The default value is *1,000* ms.
HTTP Send Timeout	Sets timeout, in ms, for sending the HTTP request. The range is *1–30,000* ms. The default value is *1,000* ms.
HTTP Receive Timeout	Sets timeout, in ms, for receiving the HTTP request. The range is *1–30,000* ms. The default value is *2,000* ms.
Asynchronous Option	Defines what level of asynchronous communications can be used on the channel. This will depend on the communications architecture and end device support. • *Asynchronous* (Default) Full asynchronous communications. There may be multiple open transactions to any or all RTUs across both links. This is applicable only to Modbus TCP connections direct to the end devices. • *Synchronous on RTU* Synchronous communication for requests to an RTU. Only one request can be open on each RTU. The communications remains asynchronous across channel and link. • *Synchronous on Link* Synchronous communications for requests down each link. A total of two requests can be open on the channel, and they must be to different RTUs with one open request on each link. • *Synchronous on Channel* Synchronous communications for all requests across the entire channel. Only one transaction can be open at a time. The default is *Asynchronous*.
Redundant Port	Defines if the channel uses a redundant port.
Item Type	The type of channel specified when this item was created.
Last Modified	The date and time the channel properties were modified.
Last Downloaded	The date and time the channel was last downloaded to the server.
Item Number	The unique item number currently assigned to this channel, in the format *CHNcc*, where *cc* is the channel number. You can change the item number if you need to match your current server database configuration. The number must be between *01* and the maximum number of channels allowed for your system. For more information about setting the maximum value, see the topic titled "Adjusting sizing of non-licensed items" in the *Supplementary Installation Tasks Guide*.

Alternating behavior of redundant Spirit IT Flow-X controllers

The alternating behavior of redundant Spirit IT Flow-X controllers is defined on the controller's **Main** tab in Quick Builder. Note that the active link on the channel or controller has to fail for the other link to be used. You can force a controller to use the other link by disabling the currently active link.

The alternating behavior of the Web Services Interface is that the last successfully used link will be used first. If the request fails, the alternate link will be used on the next request.

Attention
The descriptions below describe the Modbus interface and are not applicable for EFM data collection using the Web Services Interface.

If alternate links are enabled

If the **Disable Alternate Polling** check box is not selected (the default), requests will alternate between link A and B. Whenever a control is performed to a parameter (for example, changing the Set Point in Station), a write request will be performed to one link, followed by a read request for the same address on the alternate link. If the user is not performing any controls, then the read requests will be made at the requested update period and will alternate between links.

For example:

User changes Set Point in Station.

Write the value on link A.

Read the same address for confirmation on link B.

User changes Set Point in Station.

Write the value on link A.

Read the same address for confirmation on link B.

…

Server does a periodic scan:

Read the address on link A.

Server does a periodic scan:

Read the address on link B.

Server does a periodic scan:

Read the address on link A.

…

User changes Set Point in Station.

Write the value on link B.

Read the same address for confirmation on link A.

If alternate links are disabled

If the **Disable Alternate Polling** check box is selected, then all requests will be made on the same link until the link fails.

For example:

User changes Set Point in Station.

Write the value on link A.

Read the same address for confirmation on link A.

User changes Set Point in Station.

Write the value on link A.

Read the same address for confirmation on link A.

…

Server does a periodic scan:

Read the address on link A.

Server does a periodic scan:

Read the address on link A.

Server does a periodic scan:

Read the address on link A.

…

Link A is marked as failed.

…

User changes Set Point in Station.

Write the value on link B.

Read the same address for confirmation on link B.

User changes Set Point in Station.

Write the value on link B.

Read the same address for confirmation on link B.

…

Server does a periodic scan:

Read the address on link B.

Server does a periodic scan:

Read the address on link B.

Server does a periodic scan:

Read the address on link B.

Related topics

“Main properties for an Spirit IT Flow-X controller” on page 18

Main properties for an Spirit IT Flow-X controller

The **Main** tab defines the basic properties for an Spirit IT Flow-X controller.

For information about how to create a controller, see the topic titled "Building controllers and channels" in the *Quick Builder User's Guide*.

Attention

When Electronic Flow Measurement (EFM) is collecting configuration logs for meters associated to the controller, dynamic scanning must be enabled on the controller.

When Experion collects data from a Spirit IT Flow-X meter, only records from the last 31 days are collected. Records older than 31 days are not collected.

Property	Description
Name	The unique name of the controller. A maximum of 10 alphanumeric characters (no spaces or double quotes). For LAN-connected controllers, the name must not contain underscore characters (_). This name is used to look up the IP Address in the Hosts file or DNS if you do not specify an **IP Address** property. In the case of communications redundancy when the IP Addresses are not defined in Quick Builder, the IP Address 1 and 2 must be specified in the Server hosts file. The host name for IP Address 1 is then the Name property with an "A" appended to it and the host name for IP Address 2 is the Name property with a "B" appended to it.
Description	(Optional) A description of the controller. A maximum of *132* alphanumeric characters, including spaces.
Associated Asset	The Tag Name of the Asset to be associated with the alarm group.
Channel Name	The name of the channel on which the controller communicates with the server. (You must have already defined a channel for it to appear in this list.)
Marginal Alarm Limit	The communications alarm marginal limit at which the controller is declared to be marginal. When this limit is reached, a high priority alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the *Server and Client Configuration Guide*. To change the priority of the alarm for one controller, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the *Server and Client Configuration Guide*. A controller barometer monitors the total number of requests and the number of times the controller did not respond or response was incorrect. The barometer increments by two or more, depending on the error, and decrements for each good call. The default value is *25*.
Fail Alarm Limit	The communications alarm fail limit at which the controller is declared to have failed. When this barometer limit is reached, an urgent alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the *Server and Client Configuration Guide*. To change the priority of the alarm for one controller, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the *Server and Client Configuration Guide*. Set this to double the value specified for the controller Marginal Alarm Limit. The default is *50*.

Property	Description
Dynamic Scanning Fastest Scan Period	Select the **Dynamic Scanning** check box to enable dynamic scanning of all point parameters on this controller. The default setting for this check box is selected. Define the fastest possible scan period (in seconds) that dynamic scanning will scan point parameters on this controller. The default is *15* seconds. The dynamic scanning period does not affect the static scanning rate for a parameter. For example, if the scanning rate for a parameter is 10 seconds, and the dynamic scanning rate for the controller is 15 seconds, the parameter will still be scanned at a period of 10 seconds.
IP Address 1 and 2	**IP Address 1** and **Port No.** are visible only when the port type of the associated channel is *LANVendor*. **IP Address 2** and **Port No.** are visible only when the redundant port type of the associated channel is *RedundantLANVendor*. Network address of the controller. IP Address 2 is used only when the controller has a redundant network adapter card and the associated channel has been defined as a redundant channel. If the IP Address is not specified, the controller name is used as the TCP host name. For further information, see the **Name** property.
Port No. 1 and 2	The TCP port numbers for communicating with the Modbus TCP server port on the Spirit IT Flow-X controller. The default Modbus TCP port number is *502*.
Disable Alternate Polling	Visible only when the associated channel's **Redundant Port** check box is selected. If selected, the failover from active link will only occur when the active link has failed or been disabled. If not selected (default), the scans are alternated between the links. In a redundant controller configuration, it is recommended that you clear this check box so as to enable faster recovery of the master controller connection. Note that a channel or controller has to fail in order for a non-alternating channel to use the other link. You can also force a channel to use the other link by disabling the currently active link. See the topic titled "Alternating behavior of redundant Spirit IT Flow-X controllers" for more information.
Slave ID	Modbus slave (unit) ID of the controller, specified when the controller was configured. The default value is *1*.
Diagnostic Address	The valid Modbus address in the controller to read for the diagnostic scan.
Register Map	The register map that will be used. • DEFAULT – This is the default value, applicable for most controllers. • APL_FC. – Applicable to controllers for EFM collection with Modbus used only for diagnostic. • OTHER – Support for future register maps. (Experion documentation will instruct you when to select this option.) When selected, type the keyword for the register map in the **Other** box. (Maximum 20 characters. No spaces or '=' characters.) Before you can change the register map, you must first delete any points that are built on the controller. See the topic titled "Spirit IT Flow-X register map" for more information.
Address Offset	Optional. Type an offset between the address configured for the points (or EFM addresses) and the address that is sent to the device in the Modbus message. Valid range is range *-65535* to *+65535*. For Spirit IT Flow-X configuration using standard Modbus control, an address offset value of *1* is required.
Time Synchronization Schedule Enable at	When selected, allows entry of time for synchronization in *HH:MM* 24–hour clock format.

Property	Description
Time Address	The lowest address to which the time synchronization is written.
Time Selection	The time that is written to the device can be either Local Server Time, or UTC with an applied offset.
Time UTC Offset	The UTC offset applied to the time written to the device when **Time selection** is *Offset from UTC*.
HTTP Port	The HTTP port for collection of EFM data via the Web Server on the device. The default port is *80*.
Item Type	The type of controller specified when this item was created.
Last Modified	The date and time the controller properties were modified.
Last Downloaded	The date and time the controller was last downloaded to the server.
Item Number	The unique item number currently assigned to this controller, in the format *RTUnnnnn*. You can change the item number if you need to match your current server database configuration. The number must be between *01* and the maximum number of controllers allowed for your system. For more information about setting the maximum value, see the topic titled "Adjusting sizing of non-licensed items" in the *Supplementary Installation Tasks Guide*.

Related topics

“Alternating behavior of redundant Spirit IT Flow-X controllers” on page 16

About time synchronization on Spirit IT Flow-X controllers

Time synchronization on Spirit IT Flow-X controllers is an optional setting that once a day synchronizes the time on the controller with the time on the Experion server. This is beneficial whenever multiple controllers are connected to the same server because it insures that all controllers are using the same clock to collect data and record events.

When enabled, you can specify the time each day that the synchronization occurs, the base address in the controller to which the server time is written, and the UTC time offset (if any).

The time synchronization will write consecutive word registers from the configured time address in the following order:

Word register	Configured time address
Time Address	Year %100 (0–99)
Time Address + 1	Month (1–12)
Time Address + 2	Day (1–31)
Time Address + 3	Hour (0–24)
Time Address + 4	Minute (0–59)
Time Address + 5	Second (0–59)

Optimizing Spirit IT Flow-X Modbus scanning performance

A Spirit IT Flow-X scan packet:

- Can contain a maximum number of addresses using the following rule: *Number of addresses x Register width <= 250 bytes*.
- Cannot contain addresses with different register widths.
- Must have addresses with the same scan period, unless *dynamic scanning* is enabled.

Two types of scan packet are built for Spirit IT Flow-X:

- **Hardware Diagnostic**. One scan per controller at a defined regular interval (the default is 60 seconds) to verify communications integrity with the controller. This scan packet is automatically created to scan the diagnostic address configured for the controller.
- **Periodic Data Acquisition**. A defined regular interval in which the server database acquires information from the addressed registers in the controller and processes the values as point parameters.

  You need to define the scan period for each point parameter source address. The scan period should reflect both the rate at which the value held in memory changes and its importance to the process (critical or non-critical).

  There is one periodic data acquisition scan per scan packet.

Reducing the number of scan packets for Spirit IT Flow-X controllers

Attention
This topic is applicable only when *dynamic scanning* is disabled.

If the number of scan packets becomes too great, scanning performance is impaired.

To minimize the number of scan packets, use a small number of available scan periods for all your point definitions.

Closely block the registers read by the server and ensure that all addresses within a block have the same scan period.

Make each scan packet as close to the maximum size as possible and ensure there are no small packets being scanned at fast rates.

You verify your scanning strategy by using the List Scan utility, **lisscn**, to list the scan packets the system has built, based on the scan periods and addresses you have configured.

Spirit IT Flow-X points reference

This section describes how to configure points for a Spirit IT Flow-X controller using Quick Builder.

In addition to the information contained in this reference, and for help to build points, see the section titled "Building and configuring points" in the *Quick Builder User's Guide*.

Related topics

“Defining a Spirit IT Flow-X address for a point parameter” on page 24

Defining a Spirit IT Flow-X address for a point parameter

For **PV Source Address**, **Source Address**, and **Destination Address** the format for an Spirit IT Flow-X controller address is:

ControllerName FullAddress

Part	Description
ControllerName	The name of the Spirit IT Flow-X controller.
FullAddress	The address within the controller where the value is stored. See the topic titled "Address syntax for Spirit IT Flow-X controllers" for more information.

For help when defining an address, click ... next to **Address** to display Address Builder.

Address syntax for Spirit IT Flow-X controllers

The format for the address is:

Address [W:*nn* | B:*nn* | *DataFormat*]

Part	Description
Address	The address (decimal) for the register.
W:nn	*W:nn* (Optional) Width specifier for bit or partial word data format. The *nn* specifies the number of bits from the *B:nn* specifier, which is then used to read the bit or partial word value. If omitted, the default is assumed to be width of the register for the given address.
B:nn	*B:nn*. (Optional) Bit specifier for bit, or partial word, data format. The *nn* specifies the bit number (0 based) within a word at the start of the partial word. If omitted, the default is assumed to be *B:0*.
DataFormat	The data format acronym, depending on how you want the value to be read: • Data format for scaling 16-bit integers. • Data format for reading floating point values. • Data format for reading raw values without scaling. See the sections below titled "Data format support," "Unscaled data formats," and "Data formats for scaling." If you want to use a user-defined data format, you must define the format on the server. See the section titled "About user-defined data formats" in the *Server and Client Configuration Guide* for more information.

Examples

Analog point

PV source: *40001 U4095*

SP destination: *40002 U4095*

Mode destination: *40003 W:1 B:1*

Status point

PV source: *1*

Accumulator point

PV source: *40005 U32B*

Data format support

The following data types are supported for registers of given size as described below:

- Single-bit, multi-bit (consecutive), and non-consecutive-bit data format for Boolean registers, and for nominated bit(s) within Short Integer and Long Integer registers.
- Word (16-bit) integer scaled and unscaled data formats for Short Integer registers.
- DWord (32-bit) integer scaled and unscaled data formats for Short Integer (2 consecutive 16-bit registers).
- 32-bit Floating Point for two consecutive Short Integer registers.

If no data format is supplied for the address, the default data format as listed in the topic titled "Spirit IT Flow-X register map" will be applied.

Unscaled data formats

Data Format	Description
WORD	Whole word
HALFWD	Upper half word
REAL	Native real (float)
INT4	Native int4 (signed int)
DBLE	Native dble (double)
C16	16-bit counter
C3BCD	3-digit BCD 0–999 counts
C4BCD	4-digit BCD 0–9,999 counts
C8BCD	8-digit BCD 0–99,999,999 counts
IEEEFP	IEEE Floating Point (Big Endian)
IEEEFPL	IEEE Floating Point (Little Endian)
INT2	Native int2 (signed short)
IEEEFPBB	Byte-swapped Big Endian float
IEEEFPLB	Byte-swapped Little Endian float
S32BB	32-bit signed binary Big Endian
U32BB	32-bit unsigned binary Big Endian
S32B	32-bit signed binary
U32B	32-bit unsigned binary
FENUM	Enumerated integer
REVWD	Reverse word

Data formats for scaling

You can scale point parameter values to the range of the PV with a scaled data format. Select the format that corresponds to the counts that have been set in the controller register.

Data Format[1]	Counts in Controller Register
U1023	0–1,023 (U=unsigned)
U4095	0–4,095

[1] **S = Signed**

U = Unsigned

Data Format[1]	Counts in Controller Register
U9999	0–9,999
S9999	–9,999–9,999 (S=signed)
U999	0–999
U3BCD	3 digit BCD 0–999
U4BCD	4 digit BCD 0–9999
U6BCD	6 digit BCD 0–999,999
U8BCD	8 digit BCD 0–99,999,999
UBCD16	4 digit BCD 0–4,095
UBCD12	3 digit BCD 0–410
U16B	16 bit unsigned binary
S16B	16 bit signed binary
E3BCD	3 digit BCD with error status
U100	0 to 100 percent
U15B	15 bit unsigned binary
U14B	14 bit unsigned binary
SLC_AI	A-B SLC Analog Input 3,277–16,384
SLC_AO	A-B SLC Analog Output 6,242–31,208
U9998	0–9,998 for Square D AI
S8B	8 bit signed binary
U8B	8 bit unsigned binary
D9999	double integer for A-B QCL
S32BS	32 bit signed binary
U32BS	32 bit unsigned binary
S32BSB	32 bit signed binary Big Endian
U32BSB	32 bit unsigned binary Big Endian

Attention

If auxiliary parameters have a data format type that requires scaling (U4095, U999, and so on), they take the same range as the PV.

[1] **S = Signed**

U = Unsigned

Spirit IT Flow-X EFM meter templates reference

This section describes the configuration information specific to meter templates on Spirit IT Flow-X controllers. See the "Building Electronic Flow Measurement (EFM)" section of the Quick Builder User's Guide for information about how to build EFM meter templates and equipment.

Attention

When collecting data from a Spirit IT Flow-X meter, only records from the last 31 days are collected. Records older than 31 days are not collected.

Related topics

"Main properties for a Spirit IT Flow-X meter template" on page 28
"Configuration Log properties for a Spirit IT Flow-X meter template" on page 29
"Configuration Record Log properties for a Spirit IT Flow-X meter template" on page 30
"Interval Log properties for a Spirit IT Flow-X meter template" on page 31
"Daily Log properties for a Spirit IT Flow-X meter template" on page 32
"Alarm and Event properties for a Spirit IT Flow-X meter template" on page 33
"Ultrasonic Log properties for a Spirit IT Flow-X meter template" on page 34
"Composition Log properties for a Spirit IT Flow-X meter template" on page 35
"Gas Quality Log properties for a Spirit IT Flow-X meter template" on page 36
"Data Export properties for a Spirit IT Flow-X meter template" on page 37

Main properties for a Spirit IT Flow-X meter template

This topic lists the Main tab settings for a meter template on a Spirit IT Flow-X controller. Different flow computers require different settings. The **Interval Log**, **Daily Log**, **Alarm and Event Log**, **Configuration Record Log**, **Ultrasonic Log**, **Composition Log**, and **Gas Quality Log** logs are all optional. However, you would configure at least one of them. The flow computer vendor documentation should provide addressing information for addressing the logs, with following information provided for immediate reference for Spirit IT Flow-X flow computers.

See the topic titled "Main properties for an EFM meter template" in the *Quick Builder User's Guide* for information about each field on this tab.

To make configuring meter templates an easier task, samples of Spirit IT Flow-X meter templates are included in Experion. See the topic titled "Managing EFM meter templates" in the *Quick Builder User's Guide* for information about how to import sample Spirit IT Flow-X meter templates.

Spirit IT Flow-X flow computer

The following settings provide an example configuration for a meter template, noting that the names of the archives are user-configurable in the Spirit IT Flow-X controller.

Table 1: Example configuration settings

Property	Run 1
Interval Log	
Archive	*Minute_15*
Daily Log	
Archive	Not used
Alarm and Event Log	
Archive	*logs*
Module	
Configuration Record Log	
Archive	*RunConfig*
Ultrasonic Log	
Archive	*USM_15*
Composition Log	
Archive	*GC_ABB1_STRM1* (example)
Gas Quality Log	
Archive	*GC_ABB1_RF* (example)

Related topics

“Planning considerations for installing and configuring Spirit IT Flow-X controllers” on page 5

Configuration Log properties for a Spirit IT Flow-X meter template

When creating meter templates for flow computers on Spirit IT Flow-X controllers, configuration log properties are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

If the configuration log requires compliance with API21.1 then the configuration log properties configured here need to include at least those listed in the API21.1 standard.

'Controller' configured properties must provide a valid Modbus address as defined in the topic titled "Address syntax for Spirit IT Flow-X controllers" and must be within the controller register map.

If the configuration record log is used to collect data, then typically the configuration log would only contain constant configuration values not obtained from the configuration record log.

See the topic titled "Configuration Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add configuration properties to this tab.

Configuration Record Log properties for a Spirit IT Flow-X meter template

The **Configuration Record Log** tab appears only when the configuration record log is enabled on the **Main** tab.

When creating meter templates for flow computers on Spirit IT Flow-X controllers, configuration record log properties are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

The first entry should always be the *DateAndTime* as VARTEXT. After that, every column of data in the archive needs to be specified as a log field in the same order they are provided in the archive definition in the controller.

The EFM system converts the values from the text (CSV) format they are retrieved in through the HTTP interface to the data type specified in the log configuration.

See the topic titled "Configuration Record Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add configuration properties to this tab.

Interval Log properties for a Spirit IT Flow-X meter template

The **Interval Log** tab appears only when the interval log is enabled on the **Main** tab.

When creating meter templates for flow computers on Spirit IT Flow-X controllers, the properties you collect for the interval log are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

The first entry should always be the *DateAndTime* as VARTEXT. After that, every column of data in the archive needs to be specified as a log field in the same order they are provided in the archive definition in the controller.

The EFM system converts the values from the text (CSV) format they are retrieved in through the HTTP interface to the data type specified in the log configuration.

See the topic titled "Interval Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add interval properties to this tab.

Daily Log properties for a Spirit IT Flow-X meter template

The **Daily Log** tab appears only when the daily log is enabled on the **Main** tab.

When creating meter templates for flow computers on Spirit IT Flow-X controllers, the properties you collect for the daily log are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

The first entry should always be the *DateAndTime* as VARTEXT. After that, every column of data in the archive needs to be specified as a log field in the same order they are provided in the archive definition in the controller.

The EFM system converts the values from the text (CSV) format they are retrieved in through the HTTP interface to the data type specified in the log configuration.

See the topic titled "Daily Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add properties to this tab.

Alarm and Event properties for a Spirit IT Flow-X meter template

Attention

When the data export format for a Spirit IT Flow-X controller on the meter template includes CFX, the Alarm and Event log is exported as a tab delimited *.tsv* file with the same name and at the same location as the *.cfx* file. This is because the field length of alarm and event data is too long to fit the CFX format.

The **Alarm and Event** tab appears only when the alarm and event log is enabled on the **Main** tab.

The audit file collection is a fixed format for all Spirit IT Flow-X controllers. Use the following table to configure the Alarm and Event log.

Field Name	Data Type	CFX 5 and CFX 7 Mapping
Time Stamp	VARTEXT	Time Stamp
EventText	VARTEXT	Event Text

See the topic titled "Alarm and Event properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add properties to this tab.

Ultrasonic Log properties for a Spirit IT Flow-X meter template

The **Ultrasonic Log** tab appears only when the ultrasonic log is enabled on the **Main** tab.

When creating meter templates for flow computers on Spirit IT Flow-X controllers, the properties you collect for the ultrasonic log are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

The first entry should always be the *DateAndTime* as VARTEXT. After that, every column of data in the archive needs to be specified as a log field in the same order they are provided in the archive definition in the controller.

The EFM system converts the values from the text (CSV) format they are retrieved in through the HTTP interface to the data type specified in the log configuration.

See the topic titled "Ultrasonic Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add interval properties to this tab.

Composition Log properties for a Spirit IT Flow-X meter template

The **Composition Log** tab appears only when the composition log is enabled on the **Main** tab.

When creating meter templates for flow computers on Spirit IT Flow-X controllers, the properties you collect for the composition log are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

The first entry should always be the *DateAndTime* as VARTEXT. After that, every column of data in the archive needs to be specified as a log field in the same order they are provided in the archive definition in the controller.

The EFM system converts the values from the text (CSV) format they are retrieved in through the HTTP interface to the data type specified in the log configuration.

See the topic titled "Composition Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add interval properties to this tab.

Gas Quality Log properties for a Spirit IT Flow-X meter template

The **Gas Quality Log** tab appears only when the gas quality log is enabled on the **Main** tab.

When creating meter templates for flow computers on Spirit IT Flow-X controllers, the properties you collect for the gas quality log are specific to the flow computer. See the vendor documentation for the properties supported by the flow computer.

The first entry should always be the *DateAndTime* as VARTEXT. After that, every column of data in the archive needs to be specified as a log field in the same order they are provided in the archive definition in the controller.

The EFM system converts the values from the text (CSV) format they are retrieved in through the HTTP interface to the data type specified in the log configuration.

See the topic titled "Gas Quality Log properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to add interval properties to this tab.

Data Export properties for a Spirit IT Flow-X meter template

When creating meter templates for flow computers on Spirit IT Flow-X controllers, the data export formats you specify depend on the gas measurement system receiving the exported EFM data.

See the topic titled "Data Export properties for an EFM meter template" in the *Quick Builder User's Guide* for information on how to configure data export formats on this tab.

Troubleshooting Spirit IT Flow-X issues

This section describes troubleshooting tasks for Spirit IT Flow-X that you can perform either on the server or from any Station.

Related topics

“Testing Spirit IT Flow-X to field device communications” on page 40
“Troubleshooting Spirit IT Flow-X point configuration errors” on page 42

Testing Spirit IT Flow-X to field device communications

The first indication of an issue with communications to a field device using the Spirit IT Flow-X interface is that the error count on the controller (and channel) detail display will begin rising with the request count.

Use the following tips to help diagnose the cause of the errors:

1. Confirm that the diagnostic address configured on the controller is a valid address that can be read as a single register from the device.
2. View the Experion PKS Server Log (using the Honeywell Log Viewer (HLV) program) for errors being logged on the channel.

   Adding an include filter for *pascn*rtu*N* where *N* is the controller of interest will filter the diagnostic log for error messages related to the controller of interest.

The following sections contain common examples of messages and their root cause.

Modbus TCP connection being attempted to a device which cannot be reached on the network

```
11-Jul-13  22:58:08.6162 ( -1  8484  5480 T00000000) pascn.exe:eth_open.c:812:
    select fail - timeout connecting to socket 672 port 53694 for rtu 14, link 1, lrn 77
11-Jul-13  22:58:08.6162 Errno 0x110:  Timeout on connect
11-Jul-13  22:58:08.6162 ( -1  8484  5480 T00000000) pascn.exe:scanio.h:364: CScanIO::
    Open(from rtu con).. hsc_eth_open(rtu=14, link=1, lrn=77, port=502) failed, error 0x110
```

To resolve:

1. Confirm that IP address and port configuration on the controller are configured correctly. Note that default Modbus TCP port for most devices is *502*.
2. Confirm that device is powered on, with network configuration matching IP and Port configured on the Experion controller, and any required gateway address is configured.
3. Use the 'ping' command on the server to verify the device is responding on the network.

Wrongly configured Asynchronous option

```
ERROR: Response Length [4] not as expected [66]
```

To resolve:

1. Ensure that for the architecture and protocol in use the Asynchronous option has been set correctly. Unexpected response length errors may be a symptom of selecting for example asynchronous option for a terminal server Modbus RTU configuration. If there is any uncertainty about use of the Asynchronous option, select *Synchronous on Channel* to see if the errors clear.

Time in device is not being synchronized

If time synchronization has been configured for the controller, but the time is not being synchronized as expected check the following:

1. Confirm correct Time Format, which defines the register and time format being written, are correct for the device.
2. Ensure that the device is configured to accept writes to the register specified by the time format.
3. Ensure that the time zone offset has been set correctly for the controller.

Device is slow to respond (request timeout)

Log messages similar to the following example indicate that no response was received from the device within the READ timeout configured for the channel.

```
... timed out waiting for response
```

To resolve:

1. Set the READ timeout to a longer period and use time data in the trace to determine a more appropriate configuration for the latency in the communications network.
2. Confirm that all addresses configured on points are valid for the device. *Lisscn* output for the controller can help by showing the requests that are going to be made to the device.

Advanced troubleshooting using trace

Any Spirit IT Flow-X channel can be traced to provide the raw data being written to and read from the device, including timing of the writes and reads. See trace documentation for use of trace. See Modbus.org documentation for format of Modbus messages.

Diagnostic Address Errors

If the diagnostic address is configured for an address to which the device does not respond, the following message may appear in the server diagnostic log.

```
11-Jul-13  23:10:03.1171 ( -1  8484  5480 T00000000) pascn.exe:patransaction.cpp:671:
    CPATransaction::ProcessResponse(acqreq<4:SCNTYP_DIAG rtu 14 lrn
    0x803c adr 0x0 num 0 fmt 0x0 inital>) .. pProtocolAdapter->ProcessResponse()
    failed with PAStatus=0xffffffff, fatal error
```

Related topics

“Planning considerations for installing and configuring Spirit IT Flow-X controllers” on page 5

Troubleshooting Spirit IT Flow-X point configuration errors

Point configuration errors appear when you download them from Quick Builder to the server. Most typically, the cause of these errors will be an invalid address.

Confirm that the register map for the chosen device type is correct for the field device. Note that some devices may not accept requests for all addresses in the range, and the controller vendor documentation should be consulted for valid addresses.

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Index

P

R

S

T

U

W