Torque Tool Ethernet Driver

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This help center is the user documentation for Kepware Torque Tool Ethernet Driver. This help center is updated regularly to reflect the latest functionality and information.

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Version 1.088

Overview

The Torque Tool Ethernet Driver provides a reliable way to connect Torque Tool Ethernet devices to OPC Client applications; including HMI, SCADA, Historian, MES, ERP, and countless custom applications. It is intended to work with all devices supporting the Torque Tool Open Protocol.

Setup

Supported Devices

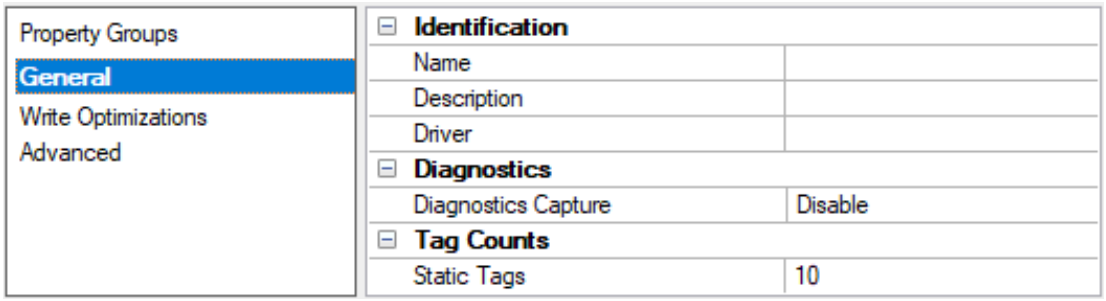
The Torque Tool Ethernet Driver is designed to work with any device that supports the Torque Tool Open Protocol. The driver has been tested with the Stanley QA Alpha Controller and the Atlas Copco Power Focus.

Channel and Device Limits

The maximum number of channels supported by this driver is 1024. The maximum number of devices supported by this driver is 1024 per channel.

Channel Properties – General

This server supports the use of multiple simultaneous communications drivers. Each protocol or driver used in a server project is called a channel. A server project may consist of many channels with the same communications driver or with unique communications drivers. A channel acts as the basic building block of an OPC link. This group is used to specify general channel properties, such as the identification attributes and operating mode.



Identification

Name: Specify the user-defined identity of this channel. In each server project, each channel name must be unique. Although names can be up to 256 characters, some client applications have a limited display window when browsing the OPC server's tag space. The channel name is part of the OPC browser information. The property is required for creating a channel.
For information on reserved characters, refer to "How To... Properly Name a Channel, Device, Tag, and Tag Group" in the server help.

Description: Specify user-defined information about this channel.
Many of these properties, including Description, have an associated system tag.

Driver: Specify the protocol / driver for this channel. Specify the device driver that was selected during channel creation. It is a disabled setting in the channel properties. The property is required for creating a channel.
Note: With the server's online full-time operation, these properties can be changed at any time. This includes changing the channel name to prevent clients from registering data with the server. If a client has already acquired an item from the server before the channel name is changed, the items are unaffected. If, after the channel name has been changed, the client application releases the item and attempts to re-acquire using the old channel name, the item is not accepted. Changes to the properties should not be made once a large client application has been developed. Utilize proper user role and privilege management to prevent operators from changing properties or accessing server features.

Diagnostics

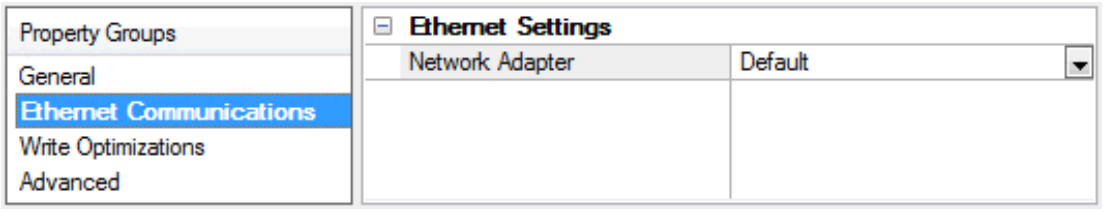
Diagnostics Capture: When enabled, this option makes the channel's diagnostic information available to OPC applications. Because the server's diagnostic features require a minimal amount of overhead processing, it is recommended that they be utilized when needed and disabled when not. The default is disabled.
Note: This property is not available if the driver or operating system does not support diagnostics.
For more information, refer to Communication Diagnostics and Statistics Tags in server help.

Tag Counts

Static Tags: Provides the total number of defined static tags at this level (device or channel). This information can be helpful in troubleshooting and load balancing.

Channel Properties – Ethernet Communications

Ethernet Communication can be used to communicate with devices.

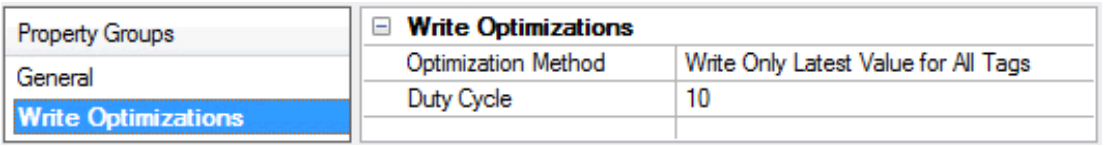


Ethernet Settings

Network Adapter: Specify the network adapter to bind. When left blank or Default is selected, the operating system selects the default adapter.

Channel Properties – Write Optimizations

The server must ensure that the data written from the client application gets to the device on time. Given this goal, the server provides optimization properties to meet specific needs or improve application responsiveness.



Write Optimizations

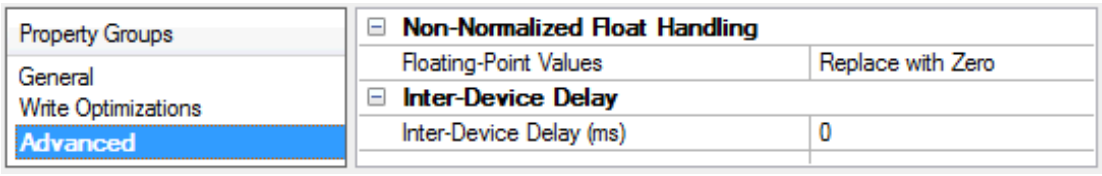
Optimization Method: Controls how write data is passed to the underlying communications driver. The options are:

- **Write All Values for All Tags**: This option forces the server to attempt to write every value to the controller. In this mode, the server continues to gather write requests and add them to the server's internal write queue. The server processes the write queue and attempts to empty it by writing data to the device as quickly as possible. This mode ensures that everything written from the client applications is sent to the target device. This mode should be selected if the write operation order or the write item's content must uniquely be seen at the target device.
- **Write Only Latest Value for Non-Boolean Tags**: Many consecutive writes to the same value can accumulate in the write queue due to the time required to actually send the data to the device. If the server updates a write value that has already been placed in the write queue, far fewer writes are needed to reach the same final output value. In this way, no extra writes accumulate in the server's queue. When the user stops moving the slide switch, the value in the device is at the correct value at virtually the same time. As the mode states, any value that is not a Boolean value is updated in the server's internal write queue and sent to the device at the next possible opportunity. This can greatly improve the application performance.
  Note: This option does not attempt to optimize writes to Boolean values. It allows users to optimize the operation of HMI data without causing problems with Boolean operations, such as a momentary push button.
- **Write Only Latest Value for All Tags**: This option takes the theory behind the second optimization mode and applies it to all tags. It is especially useful if the application only needs to send the latest value to the device. This mode optimizes all writes by updating the tags currently in the write queue before they are sent. This is the default mode.

Duty Cycle: is used to control the ratio of write to read operations. The ratio is always based on one read for every one to ten writes. The duty cycle is set to ten by default, meaning that ten writes occur for each read operation. Although the application is performing a large number of continuous writes, it must be ensured that read data is still given time to process. A setting of one results in one read operation for every write operation. If there are no write operations to perform, reads are processed continuously. This allows optimization for applications with continuous writes versus a more balanced back and forth data flow.
Note: It is recommended that the application be characterized for compatibility with the write optimization enhancements before being used in a production environment.

Channel Properties – Advanced

This group is used to specify advanced channel properties. Not all drivers support all properties; so the Advanced group does not appear for those devices.



Non-Normalized Float Handling: A non-normalized value is defined as Infinity, Not-a-Number (NaN), or as a Denormalized Number. The default is Replace with Zero. Drivers that have native float handling may default to Unmodified. Non-normalized float handling allows users to specify how a driver handles non-normalized IEEE-754 floating point data. Descriptions of the options are as follows:

- **Replace with Zero**: This option allows a driver to replace non-normalized IEEE-754 floating point values with zero before being transferred to clients.
- **Unmodified**: This option allows a driver to transfer IEEE-754 denormalized, normalized, non-number, and infinity values to clients without any conversion or changes.

Note: This property is disabled if the driver does not support floating-point values or if it only supports the option that is displayed. According to the channel's float normalization setting, only real-time driver tags (such as values and arrays) are subject to float normalization. For example, EFM data is not affected by this setting.

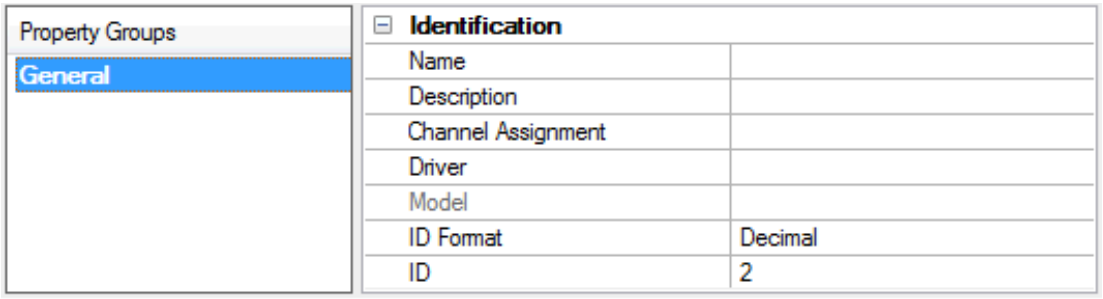
For more information on the floating-point values, refer to "How To ... Work with Non-Normalized Floating-Point Values" in the server help.

Inter-Device Delay: Specify the amount of time the communications channel waits to send new requests to the next device after data is received from the current device on the same channel. Zero (0) disables the delay.

Note: This property is not available for all drivers, models, and dependent settings.

Device Properties – General

A device represents a single target on a communications channel. If the driver supports multiple controllers, users must enter a device ID for each controller.



Identification

Name: Specify the name of the device. It is a logical user-defined name that can be up to 256 characters long and may be used on multiple channels.

Note: Although descriptive names are generally a good idea, some OPC client applications may have a limited display window when browsing the OPC server's tag space. The device name and channel name become part of the browse tree information as well. Within an OPC client, the combination of channel name and device name would appear as "ChannelName.DeviceName".
For more information, refer to "How To... Properly Name a Channel, Device, Tag, and Tag Group" in server help.

Description: Specify the user-defined information about this device.
Many of these properties, including Description, have an associated system tag.

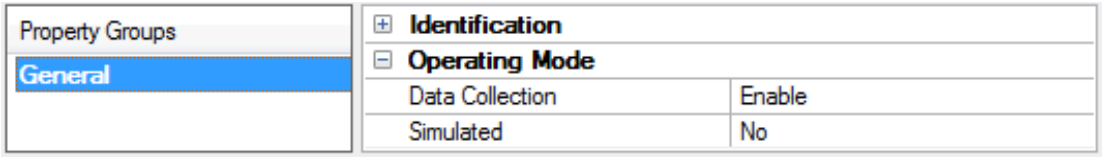
Channel Assignment: Specify the user-defined name of the channel to which this device currently belongs.

Driver: Selected protocol driver for this device.

Model: Specify the type of device that is associated with this ID. The contents of the drop-down menu depend on the type of communications driver being used. Models that are not supported by a driver are disabled. If the communications driver supports multiple device models, the model selection can only be changed when there are no client applications connected to the device.
Note: If the communication driver supports multiple models, users should try to match the model selection to the physical device. If the device is not represented in the drop-down menu, select a model that conforms closest to the target device. Some drivers support a model selection called "Open," which allows users to communicate without knowing the specific details of the target device. *For more information, refer to the driver documentation.*

ID: Specify the device's driver-specific station or node. The type of ID entered depends on the communications driver being used. For many communication drivers, the ID is a numeric value. Drivers that support a Numeric ID provide users with the option to enter a numeric value whose format can be changed to suit the needs of the application or the characteristics of the selected communications driver. The format is set by the driver by default. Options include Decimal, Octal, and Hexadecimal.
Note: If the driver is Ethernet-based or supports an unconventional station or node name, the device's TCP/IP address may be used as the device ID. TCP/IP addresses consist of four values that are separated by periods, with each value in the range of 0 to 255. Some device IDs are string based. There may be additional properties to configure within the ID field, depending on the driver.

Operating Mode



Data Collection: This property controls the device's active state. Although device communications are enabled by default, this property can be used to disable a physical device. Communications are not attempted when a device is disabled. From a client standpoint, the data is marked as invalid and write operations are not accepted. This property can be changed at any time through this property or the device system tags.

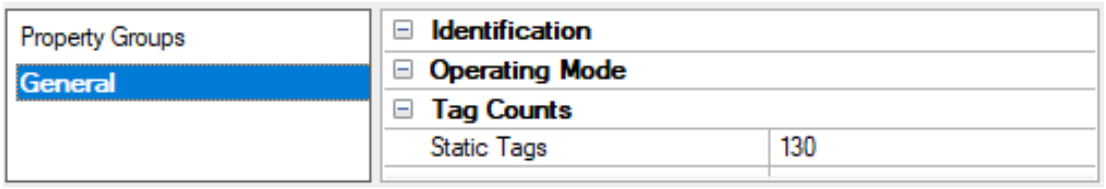
Simulated: Place the device into or out of Simulation Mode. In this mode, the driver does not attempt to communicate with the physical device, but the server continues to return valid OPC data. Simulated stops physical communications with the device, but allows OPC data to be returned to the OPC client as valid data. While in Simulation Mode, the server treats all device data as reflective: whatever is written to the simulated device is read back and each OPC item is treated individually. The data is not saved if the server removes the item (such as when the server is reinitialized). The default is No.

Notes:

1. Updates are not applied until clients disconnect and reconnect.
2. The System tag (_Simulated) is read only and cannot be written to for runtime protection. The System tag allows this property to be monitored from the client.
3. In Simulation mode, the item's memory map is based on client update rate(s) (Group Update Rate for OPC clients or Scan Rate for native and DDE interfaces). This means that two clients that reference the same item with different update rates return different data.
4. When a device is simulated, updates may not appear faster than one (1) second in the client.

Simulation Mode is for test and simulation purposes only. It should never be used in a production environment.

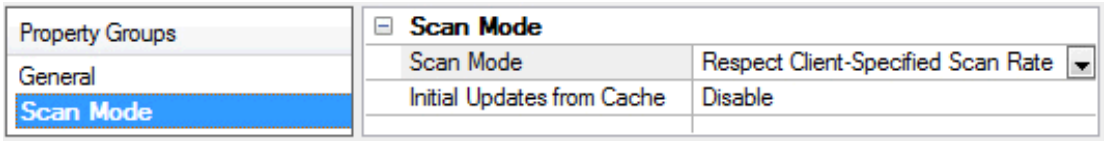
Tag Counts



Static Tags: Provides the total number of defined static tags at this level (device or channel). This information can be helpful in troubleshooting and load balancing.

Device Properties – Scan Mode

The Scan Mode specifies the subscribed-client requested scan rate for tags that require device communications. Synchronous and asynchronous device reads and writes are processed as soon as possible; unaffected by the Scan Mode properties.



Scan Mode: Specify how tags in the device are scanned for updates sent to subscribing clients. Descriptions of the options are:

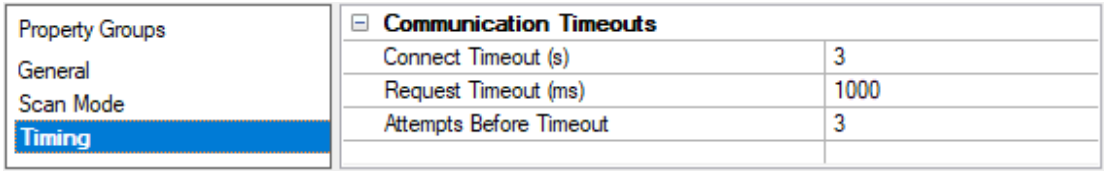
- **Respect Client-Specified Scan Rate**: This mode uses the scan rate requested by the client.
- **Request Data No Faster than Scan Rate**: This mode specifies the value set as the maximum scan rate. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.
  Note: When the server has an active client and items for the device and the scan rate value is increased, the changes take effect immediately. When the scan rate value is decreased, the changes do not take effect until all client applications have been disconnected.
- **Request All Data at Scan Rate**: This mode forces tags to be scanned at the specified rate for subscribed clients. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.

- **Do Not Scan, Demand Poll Only**: This mode does not periodically poll tags that belong to the device nor perform a read to get an item's initial value once it becomes active. It is the OPC client's responsibility to poll for updates, either by writing to the _DemandPoll tag or by issuing explicit device reads for individual items. *For more information, refer to "Device Demand Poll" in server help.*
- **Respect Tag-Specified Scan Rate**: This mode forces static tags to be scanned at the rate specified in their static configuration tag properties. Dynamic tags are scanned at the client-specified scan rate.

Initial Updates from Cache: When enabled, this option allows the server to provide the first updates for newly activated tag references from stored (cached) data. Cache updates can only be provided when the new item reference shares the same address, scan rate, data type, client access, and scaling properties. A device read is used for the initial update for the first client reference only. The default is disabled; any time a client activates a tag reference the server attempts to read the initial value from the device.

Device Properties – Timing

The device Timing properties allow the driver's response to error conditions to be tailored to fit the application's needs. In many cases, the environment requires changes to these properties for optimum performance. Factors such as electrically generated noise, modem delays, and poor physical connections can influence how many errors or timeouts a communications driver encounters. Timing properties are specific to each configured device.



Communications Timeouts

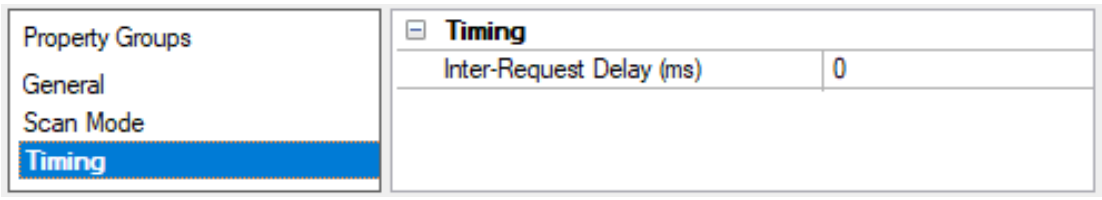
Connect Timeout: This property (which is used primarily by Ethernet based drivers) controls the amount of time required to establish a socket connection to a remote device. The device's connection time often takes longer than normal communications requests to that same device. The valid range is 1 to 30 seconds. The default is typically 3 seconds, but can vary depending on the driver's specific nature. If this setting is not supported by the driver, it is disabled.
Note: Due to the nature of UDP connections, the connection timeout setting is not applicable when communicating via UDP.

Request Timeout: Specify an interval used by all drivers to determine how long the driver waits for a response from the target device to complete. The valid range is 50 to 9999999 milliseconds (167 minutes). The default is usually 1000 milliseconds, but can vary depending on the driver. The default timeout for most serial drivers is based on a baud rate of 9600 baud or better. When using a driver at lower baud rates, increase the timeout to compensate for the increased time required to acquire data.

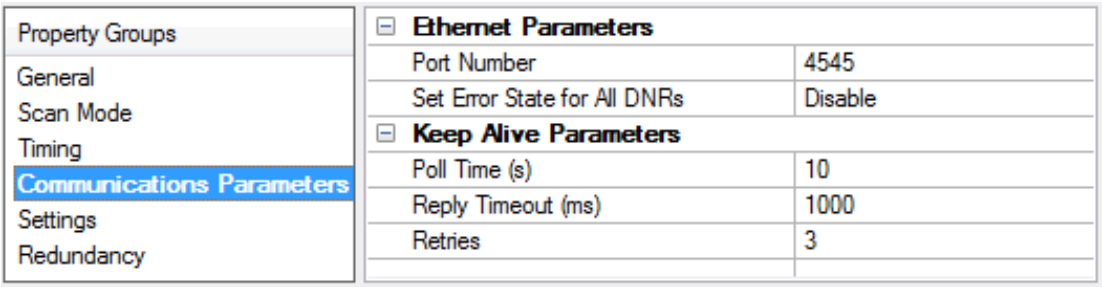
Attempts Before Timeout: Specify how many times the driver issues a communications request before considering the request to have failed and the device to be in error. The valid range is 1 to 10. The default is typically 3, but can vary depending on the driver's specific nature. The number of attempts configured for an application depends largely on the communications environment. This property applies to both connection attempts and request attempts.

Timing

Inter-Request Delay: Specify how long the driver waits before sending the next request to the target device after receiving the response to the previous request. It overrides the normal polling frequency of tags associated with the device, as well as one-time reads and writes. This delay can be useful when dealing with devices with slow turnaround times and in cases where network load is a concern. Configuring a delay for a device affects communications with all other devices on the channel. It is recommended that users separate any device that requires an inter-request delay to a separate channel if possible. Other communications properties (such as communication serialization) can extend this delay. The valid range is 0 to 300,000 milliseconds; however, some drivers may limit the maximum value due to a function of their particular design. The default is 0, which indicates no delay between requests with the target device.
Note: Not all drivers support Inter-Request Delay. This setting does not appear if it is not available.



Device Properties – Communications Parameters



Ethernet Parameters

Port Number: Specify the port number that the driver will use when connecting to the device. The valid range is 0 to 65535. For Open Protocol, the default setting is 4545. For FEP, the default setting is 9001.

Set Error State for All DNRs: When enabled, the driver will set the error state if the device does not respond (DNR) to writes or subscription requests. The driver will always set the error state if the device does not respond to reads. The default setting is disabled.

Keep-Alive Parameters

Poll Time: Specify the amount of time of inactivity before the driver will send a Keep Alive message to the device. The valid range is 1 to 15 seconds. The default setting is 10 seconds.
Caution: If the Keep Alive interval is set to a value greater than 10 seconds, the driver may post "Device Not Responding" messages to the Event Log. This is because the device closes the connection.

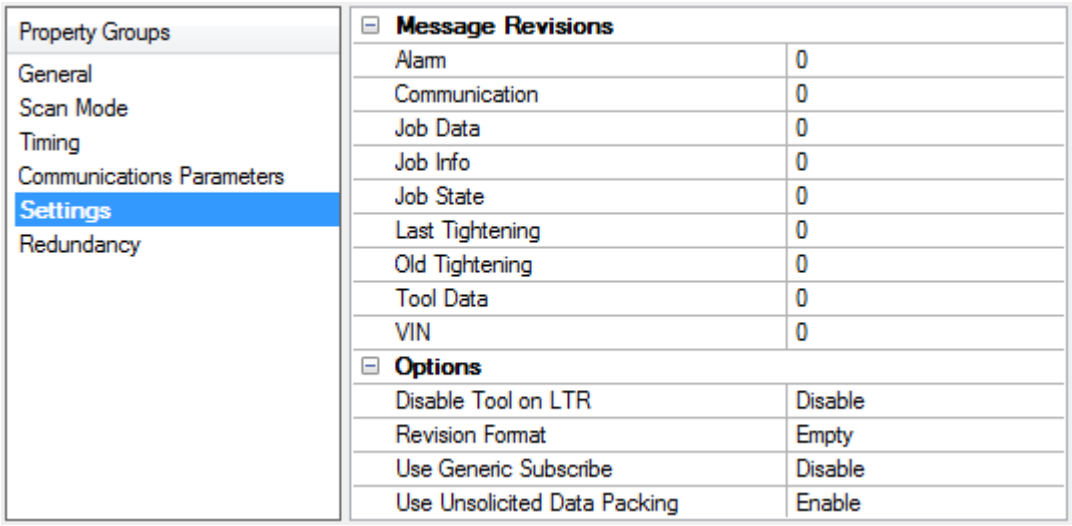
Reply Timeout: Specify the amount of time that the driver will wait for a response from a Keep Alive message. The valid range is 100 to 30000 milliseconds. The default setting is 1000 milliseconds (1 second).

Fail After: Specify the number of times that the driver will attempt to send a Keep Alive message before considering it to have failed. The valid range is 1 to 10. The default setting is 3.

Device Properties – Settings

The Settings properties are used to request different revisions of messages from the device. To request a specific message revision, enter the message revision number for that message. If the device does not support revisions, enter 0.

Note: The FEP model does not support message revisions, and will disable these options.



Message Revisions

Alarm: Specify the revision number for alarm messages. Supported values are 0 to 3, with 0 as the default. This affects MIDs 0070 through 0078.

Communication: Specify the revision number for communication messages. Supported values are 0 to 6, with 0 as the default. This affects MIDs 0001 and 0002.

Job Data: Specify the revision number for job data messages. Supported values are 0 to 3, with 0 as the default. This affects MIDs 0032 and 0033.

Job Info: Specify the revision number for job info messages. Supported values are 0 to 4, with 0 as the default. This affects MIDs 0034 through 0037.

Job State: Specify the revision number for job ID upload, job select, and job restart messages. Supported values are 0 to 2, with 0 as the default. This affects MIDs 0030, 0031, 0038, and 0039.

Last Tightening: Specify the revision number for the last tightening results messages. Supported values are 0 to 5 and 999 (for low-bandwidth version), with 0 as the default. This affects MIDs 0060 through 0063.

Old Tightening: Specify the revision number for the old tightening results messages. Supported values are 0 to 7, with 0 as the default. This affects MIDs 0064 and 0065.

Selector Lights: Specify the revision number for the selector control light messages. Supported values are 0 to 2, with 0 as the default. This affects MIDs 0254 and 0255.

Tool Data: Specify the revision number for the tool data results messages. Supported values are 0 to 5, with 0 as the default. This affects MIDs 0040 and 0041.

VIN: Specify the revision number for the vehicle identification number (VIN) messages. Supported values are 0 to 2, with 0 as the default. This affects MIDs 0051 through 0054.

Options

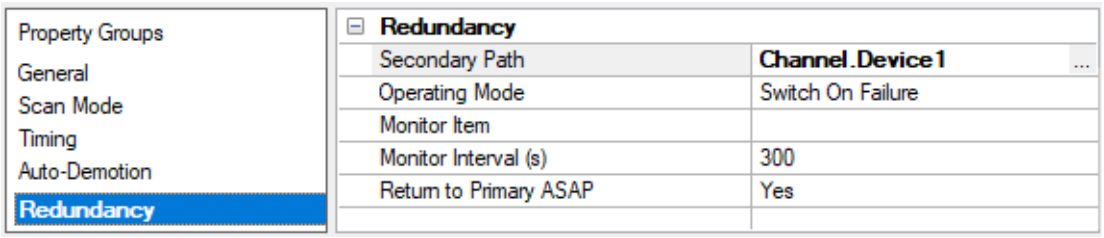
Disable Tool On LTR: When enabled, the driver will disable the tool whenever a last tightening results (LTR) message is received. This ensures that no LTR data is overwritten before the system has had time to process it. The default setting is disabled.

Revision Format: Specify how the driver should format the revision number for commands that use the default revision (revision 0). By default, when the driver sends a revision 0 message it leaves the revision number blank. Some devices do not support this and require the revision number to be explicitly set. Setting this to Zero or One forces the driver to use 0 or 1 for the revision number in the message.

Use Generic Subscribe: Newer devices may only support subscribing using the Generic Subscribe MID 8. Enabling this property changes the driver to use MID 8 when subscribing data updates.

Use Unsolicited Data Packing: Specify if the driver should update all tags for a given command set at once or update those tags individually at their specified scan rate.

Device Properties – Redundancy

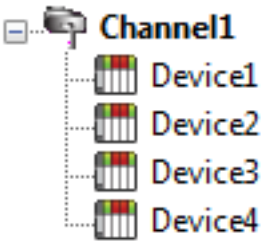


Redundancy is available with the Media-Level Redundancy Plug-In.
Consult the website, a sales representative, or the user manual for more information.

Optimizing Communications

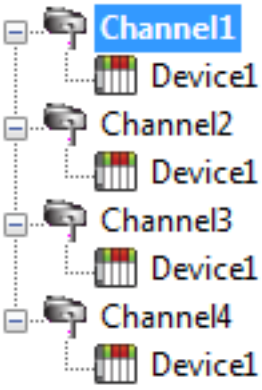
The Torque Tool Ethernet Driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. While the driver is fast, there are a couple of guidelines that can be used to control and optimize the application and gain maximum performance.

This server refers to communications protocols like Torque Tool Ethernet as a channel. Each channel defined in the application represents a separate path of execution in the server. Once a channel has been defined, a series of devices must then be defined under that channel. Each of these devices represents a single Torque Tool controller from which data will be collected. While this approach to defining the application will provide a high level of performance, it won't take full advantage of the Torque Tool Ethernet Driver or the network. An example of how the application may appear when configured using a single channel is shown below.



Each device appears under a single channel. In this configuration, the driver must move from one device to the next as quickly as possible to gather information at an effective rate. As more devices are added or more information is requested from a single device, the overall update rate begins to suffer.

If the Torque Tool Ethernet Driver could only define one single channel, the example shown above would be the only option available; however, the driver can define up to 1024 channels. Using multiple channels distributes the data collection workload by simultaneously issuing multiple requests to the network. An example of how the same application may appear when configured using multiple channels to improve performance is shown below.



Each device has now been defined under its own channel. In this configuration, a single path of execution is dedicated to the task of gathering data from each device. If the application has 1024 or fewer devices, it can be optimized exactly how it is shown here. The performance will improve even if the application has more devices. While fewer devices may be ideal, the application will still benefit from additional channels. Although by spreading the device load across all channels will cause the server to move from device to device again, it can now do so with far less devices to process on a single channel.

Note: Some devices support only one Ethernet connection. For these devices, only one channel and device should be configured.

Data Types Description

The Torque Tool Ethernet Driver supports the following data types.

Data Type	Description
Boolean	Single bit
Word	Unsigned 16-bit integer
Short*	Signed 16-bit integer
DWord	Unsigned 32-bit integer
Long*	Signed 32-bit integer
String	ASCII text string
Float	32-bit floating point value
Date*	64 bit date and time value
Double*	64-bit floating point value

*These types are not used natively, but are supported through conversion.

Note: All non-variable tags used in the driver have a fixed data type. Therefore, it is recommended that users allow the driver to use the default data type for the point.

Address Descriptions

The Torque Tool Ethernet Driver specifies addresses by the name of the item that will be addressed. It may be optionally followed by a bit or index number. The syntax is *ITEMNAME<.BIT/INDEX>*, where:

- **ITEMNAME**: The name of the item that will be addressed.
- **BIT/INDEX**: The bit number for items using bit fields, or index for arrayed items. The bit/index is only used for certain address items.

Important: Bits are 0-based, with 0 being the LSB. Array indices are 1-based, with 1 being the first item.

Unsolicited Data

Some of the command sets are sent unsolicited by the device. These command sets will not have data available until the device sends the data to the driver. All unsolicited command sets have a NEWDATA item, which will be set to 1 when new data arrives. Users may then clear this flag back to 0 by writing any value to it.

Message Revisions

Some commands have multiple message revisions which hardware may support. Some items are only available for certain message revisions. These items have been marked as being available in a certain message revision. For example, an item marked with (Rev 2) is only available in message revision 2 or later. Some messages also have a low-bandwidth version available and will be marked appropriately.

Variable Data

Instead of adding revisions to allow for more information to be sent, the Open Protocol specification supports Variable Data fields. These are dynamic results where any number of values are returned. Each Variable Data field contains the information needed to describe that piece of data and can be uniquely identified by specifying the Message ID (MID), the Parameter ID (PID), and the Step number. To allow access to these values, the format of the tag addresses needs to be “MID”.”PID”.”Step”.Unit; where Step and Unit are optional. If Unit is specified, the Unit value is returned as a numeric value that corresponds to different unit types (as defined in the Open Protocol specification). For example, to get the Final Torque on a MT Focus 6000, the tag address might be ‘1202.30237’. To get the units of that value, use this tag address: ‘1202.30237.Unit’. MID901 variable data tags (such as 901.30424) contain graph markers and their respective values for plotting within the curve data returned in MID900 messages. There are common PID values and there are PID values that are specific to the device. *Refer to the Open Protocol specification and the device specific specification for more information.*

Protocols

The Torque Tool Ethernet Driver supports the Open Protocol model and the Ford Ethernet Protocol (FEP) model. Each protocol supports a set of commands that have one or more items available for addressing. Not all command sets are supported for each model. For more information, select a link from the list below.

Message IDs

For more information on the Message IDs (MIDs) supported by each device model, refer to the table below.

Message ID	Description	Supported Models
0001	Start communication	Open, FEP
0002	Start communication acknowledge	Open, FEP
0003	Stop communication	Open, FEP
0004	Command error	Open, FEP
0005	Command accepted	Open, FEP
0008	Generic Subscription	Open
0010	Pset number upload request	Open, FEP
0011	Pset number upload reply	Open, FEP
0012	Pset data upload request	Open, FEP
0013	Pset data upload reply	Open, FEP
0014	Pset selected subscribe	Open, FEP
0015	Pset selected telegram	Open, FEP
0016	Pset selected telegram acknowledge	Open, FEP
0017	Pset selected unsubscribe	Open, FEP
0018	Selected Pset	Open, FEP
0019	Set Pset batch size	Open, FEP
0020	Reset Pset batch size	Open, FEP
0030	Job numbers upload request	Open, FEP
0031	Job numbers upload reply	Open, FEP
0032	Job data upload request	Open
0033	Job data upload response	Open
0034	Job selected/info subscribe	Open, FEP

Message ID	Description	Supported Models
0035	Job selected/info	Open, FEP
0036	Job selected/info acknowledge	Open, FEP
0037	Job selected/info unsubscribe	Open, FEP
0038	Job selected in PF3000	Open, FEP
0039	Job restart	Open, FEP
0040	Tool data upload request	Open, FEP
0041	Tool data upload reply	Open, FEP
0042	Disable tool	Open, FEP
0043	Enable tool	Open, FEP
0050	VIN download request	Open, FEP
0051	VIN upload subscribe	Open, FEP
0052	VIN number upload	Open, FEP*
0053	VIN upload acknowledge	Open, FEP
0054	VIN upload subscribe	Open, FEP
0060	Last Tightening Result (LTR) subscribe	Open, FEP
0061	LTR upload	Open, FEP*
0062	LTR upload acknowledge	Open, FEP
0063	LTR unsubscribe	Open, FEP
0064	Old Tightening Results (OTR) upload request	Open, FEP
0065	OTR upload reply	Open, FEP*
0070	Alarm subscribe	Open, FEP
0071	Alarm upload reply	Open, FEP
0072	Alarm upload acknowledge	Open, FEP
0073	Alarm unsubscribe	Open, FEP
0074	Alarm acknowledge on Torque controller	Open, FEP
0075	Alarm acknowledge on Torque controller acknowledge	Open, FEP
0076	Alarm status	Open, FEP
0077	Alarm status acknowledge	Open, FEP
0080	Time upload request	Open, FEP
0081	Time upload	Open, FEP
0082	Set time in torque controller	Open, FEP
0100	Multi-spindle result subscribe	Open, FEP
0101	Multi-spindle result upload	Open, FEP**
0102	Multi-spindle result upload acknowledge	Open, FEP
0103	Multi-spindle result unsubscribe	Open, FEP
0113	Flash green light tool	Open, FEP
0127	Job Cancel	Open, FEP
0128	Batch increment	Open
0140	Dynamic Job Request	Open
0200	Set external controlled relays	Open
0210	Status externally monitored inputs subscribe	Open
0211	Status externally monitored inputs upload	Open
0212	Status externally monitored inputs upload acknowledge.	Open
0213	Status externally monitored inputs unsubscribe	Open
0216	Relay function subscribe	Open

Message ID	Description	Supported Models
0217	Relay function data	Open
0218	Relay function acknowledge	Open
0219	Relay function unsubscribe	Open
0224	Set digital input function	Open
0225	Reset digital input function	Open
0240	User Data Download	Open
0241	User Data Subscribe	Open
0242	User Data Message	Open
0254	Selector control green lights	Open
0255	Selector control red lights	Open
0400	Auto/man mode subscribe	FEP
0401	Auto/man mode upload	FEP
0402	Auto/man mode acknowledge	FEP
0403	Auto/man mode unsubscribe	FEP
0410	Auto disable setting request	FEP
0411	Auto disable setting reply	FEP
0900	Trace Curve Data Message	Open
0901	Trace Plot Parameters	Open
1201	Operation result overall data	Open
1202	Operation result object data	Open
2500	Tightening program message download	Open
2501	Tightening program message upload	Open
9999	Keep alive	Open, FEP

*Only supports MID Revision 1 as indicated in Revision 4.62 of the FEP specification.
**Unlike Open protocol, FEP does not use batch size, batch counter, and batch status parameters.

Command Set: Alarm

The Alarm command set is used to receive alarm data. All items belonging to this command set use MID 70 (Alarm subscribe) for the subscription request. The device sends the data through MID 71 and MID 76, which are acknowledged with MID 72 and MID 77, respectively.

Item	Data Type	Access	Description	Data Range
ALARM_STATUS	Boolean	Read Only	0 if no alarm is active, 1 if an alarm is currently active*	0-1
ALARM_ERROR	String	Read Only	Error code	4 characters, 5 characters (Rev 2)
ALARM_C_READY	Boolean	Read Only	Controller ready status: 1 = OK 0 = NOK	0-1
ALARM_T_READY	Boolean	Read Only	Tool ready status: 1 = OK 0 = NOK	0-1
ALARM_TIME	String	Read Only	Timestamp	19 characters
ALARM_ NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	0-1

Item	Data Type	Access	Description	Data Range
ALARM_T_ HEALTH	Word, Short	Read Only	(Rev 3) Reports the tool status: 0 = Not Applicable 1 = OK 2 = NOK	0-2
ALARM_TEXT	String	Read Only	(Rev 3) The text assigned to the alarm.	50 characters

*The ALARM_STATUS flag is valid on an initial connection to the device. Any subsequent alarm messages after the initial update set the quality of the tag to "Bad" because the status is no longer provided by the device.

Command Set: Auto-Disable Settings

The Auto-Disable Settings command set is only supported by the FEP model.

Item	Data Type	Access	Description	Data Range
AD_SETTING	Word, Short	Read Only	Auto-Disable setting. AD_SETTING and AD_BATCH data is retrieved using MID 410 (AutoDisable settings request) for the request, which is replied to with MID 411 (AutoDisable settings reply)	0-99
AD_BATCH	Word, Short	Read Only	Current batch	0-99
AM_MODE	Boolean	Read Only	Automatic/Manual mode. AM_MODE uses MID 400 (Automatic/Manual mode subscribe) for the subscription request. The device sends the data through MID 401 (Automatic/Manual mode), which is replied to by MID 402 (Automatic/Manual mode acknowledge). 0 = Automatic Mode 1 = Manual Mode	2-10
AM_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	0-1

Command Set: Communication

The Communication command set is used to get information about the controller.

Item	Data Type	Access	Description	Data Range
COMM_CELL_ID	Word, Short	Read Only	The cell ID of the controller	0-9999
COMM_CHANNEL_ ID	Word, Short	Read Only	The channel ID of the controller	0-20
COMM_CLIENT_ID	Word, Short	Read Only	(Rev 2) The client ID	0-9
COMM_CONTROL_ NAME	String	Read Only	The name of the controller	25 characters
COMM_CONTROL_ SER_NUM	String	Read Only	(Rev 4) The serial number of the controller	10 characters
COMM_CONTROL_ SOFT_VER	String	Read Only	(Rev 3) The controller software version	19 characters
COMM_LINK_	Word,	Read	(Rev 6) Specifies that linking handling is	1

Item	Data Type	Access	Description	Data Range
SUPPORT	Short	Only	supported if 1	
COMM_ PROTOCOL_ VERSION	String	Read Only	(Rev 3) The Open Protocol version supported by the controller's current firmware	19 characters
COMM_RBU_TYPE	String	Read Only	(Rev 4) The rapid backup unit (RBU) type	24 characters
COMM_SEO_NUM_ SUPPORT	Word, Short	Read Only	(Rev 6) Specifies that sequence number handling is supported if 1	1
COMM_STATION_ ID	DWord, Long	Read Only	(Rev 6) The station ID or cell ID of the controller	0-4294967295
COMM_STATION_ NAME	String	Read Only	(Rev 6) The station name of cell name of the controller	25 characters
COMM_SUPPLIER_ CODE	String	Read Only	(Rev 2) The 3-character supplier code for the controller	3 characters
COMM_SYS_ SUBTYPE	Word, Short	Read Only	(Rev 5) The system subtype of the controller	0-2
COMM_SYS_TYPE	Word, Short	Read Only	(Rev 5) The system type of the controller: 0 = System type not set 1 = Power Focus 4000 2 = Power MACS 4000 3 = Power Focus 6000	0-999
COMM_TOOL_ SOFT_VER	String	Read Only	(Rev 3) The tool software version	19 characters

Command Set: Dynamic Job Request

The dynamic job request command set requests a dynamic job to be executed, which is immediately executed (if possible) by the controller but not saved in the controller memory. A dynamic job lifetime is the time for the job to be executed. If the controller is powered off before the completion of the job, the dynamic job is lost. The message is sent using MID 140.

Item	Data Type	Access	Description
DYNAMIC_JOB_REQUEST	String	Write Only	Passes the message to the device with the string written as a message payload

***See Also**: Appendix – Dynamic Job Request, Reference the Torque Tool Open Protocol Specification for further information.*

Command Set: Flash

The Flash command set is used to cause the tool's green light to flash.

Item	Data Type	Access	Description	Data Range
FLASH	Boolean	Write Only	Write any value to this item to cause the green light on the tool to flash until an operator pushes the tool trigger. FLASH uses MID 113 (Flash green light on tool).	N/A

Command Set: Identifiers

The Identifiers command set is used to manage the multiple identifiers in the controller. It is only supported by the Open Protocol model. All tags prefixed by MID_ are subscription based and use MID 151 (Multiple identifiers work

order subscribe) for the subscription request. The device sends the item data to the server through MID 152 (Multiple Identifiers work order), which the server responds to with MID 153 (Multiple Identifiers work order acknowledge).

Item	Data Type	Access	Description	Data Range
ID_DOWNLOAD	String	Write Only	Write the identifiers to this item to send the identifiers to the controller. ID_ DOWNLOAD uses MID 150 (Identifier download request) to send the identifier that was written to the item to the controller.	100 characters
ID_BYPASS	Boolean	Write Only	Write any value to this item to bypass the next identifier expected in the work order. ID_BYPASS uses MID 155 (Bypass Identifier) to bypass the next identifier expected in the work order.	N/A
ID_RESET	Boolean	Write Only	Write any value to this item to reset the latest identifier or bypassed identifier in the work order. ID_RESET uses MID 156 (Reset latest Identifier) to reset the latest identifier or bypassed identifier in the work order.	N/A
ID_RESETALL	Boolean	Write Only	Write any value to this item to reset all identifiers in the work order. ID_RESETALL uses MID 157 (Reset all Identifiers) to reset all identifiers in the current work order.	N/A
MID_TYPE	Word, Short	Read Only	Identifier type number*	1-4
MID_IN_ORDER	Boolean	Read Only	Included in work order* 0 = No 1 = Yes	0-1
MID_STATUS	Word, Short	Read Only	Status in work order* 0 = Not accepted 1 = Accepted 2 = Bypassed 3 = Reset	0-3
MID_ID	String	Read Only	Identifier*	25 characters
MID_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	N/A

*These items require an array index (1..4).

Command Set: IO Interface

The IO Interface command set is used to control external IO devices connected to the Torque Tool device. The driver sends the Relay Function data subscription request through MID 216. After subscription, the device sends item data to the driver using MID 217 and the driver acknowledges receipt of the item data using MID 218. MID 219 is used by the driver to unsubscribe to Relay Function data, typically as client references to Relay Function tags are removed from the server.

Item	Data Type	Access	Description	Data Range
RESET_DIGITAL_ INPUT	Word, Short	Write Only	Resets the digital input function with the entered digital input value using MID 225. These values are device specific.	0-999

Item	Data Type	Access	Description	Data Range
			Refer to the device documentation for more information.	
RELAY_ FUNCTION.#	Word, Short	Read Only	Allows the user to get relay information for the first 500 (0-499) functions defined on the controller. *Refer to the controller documentation to determine which relay number corresponds to what relay function.* Values received are: 0 = Not Active 1 = Active **Note**: The server only supports relays that are Tracking Events; events where the value changes based on a condition.	0, 1
SET_DIGITAL_ INPUT	Word, Short	Write Only	Sets the digital input function with the entered digital input value using MID 224. These values are device specific. *Refer to the device documentation for more information.*	0-999
STATUS_RELAY_#	Word, Short	Write Only	Set "external controlled" relays Write to this item to set the status of the corresponding external relay number. All other relays are sent a '3'. 0 = Off 1 = On (fast) 2 = Flashing 3 = Keep the same results STATUS_RELAY_# tags use MID 200 (Set externally controlled relays) to set individual relay statuses.	0-3
STATUS_DIGIN_#	Boolean	Read Only	Get "external controlled" digital input statuses This item uses an unsolicited command set to get the current status of all digital inputs whenever one of them change. The valid DigIn range is 1-8. 0 = Off 1 = On STATUS_DIGIN_# tags use MID 210 (Status externally monitored inputs subscribe) to subscribe to individual digital input statuses, the data is sent from the device to the server using MID 211 (Status externally monitored inputs).	0, 1

Command Set: Job Info

The Job Info command set is used to receive data on the selected job, to allow the user to select a different job, and to control job execution.

JOB_JOBNUM uses MID 38 (Select Job) to set the current job, JOB_RESTART uses MID 39 (Job restart) to restart a job, JOB_ABORT uses MID 127 (cancel job) to terminate the current job. All other tags use MID 34 (Job info subscribe) to subscribe to job info. The device sends job info to the server using MID 35 (Job info), which is responded to with MID 36 (Job info acknowledge). If the device supports 4-digit Job IDs, revision 2 or higher must be used.

Note: Some command set items also have alias names. In the table below, the alias name will be listed beneath the item where applicable.

Item	Data Type	Access	Description	Data Range
JOB_JOBNUM LINK_LINKNUM	Word, Short	Read/Write	The selected job number. To select a different job, write a job number to this item.	0-99 (Rev 1) 0-9999 (Rev 2+)
JOB_STATUS* LINK_STATUS*	Word, Short	Read Only	Job batch status 0 = Job batch not completed 1 = Job batch OK 2 = Job batch NOK	0-2
JOB_BMODE* LINK_BMODE*	Word, Short	Read Only	Job batch mode 0 = Only the OK bolts are counted 1 = Both the OK and the NOK bolts are counted	0-1
JOB_BSIZE* LINK_BSIZE*	Word, Short	Read Only	Job batch size	0-9999
JOB_BCOUNT* LINK_BCOUNT*	Word, Short	Read Only	Job batch counter	0-9999
JOB_TIME* LINK_TIME*	String	Read Only	Timestamp for the job info	19 characters
JOB_STEP*	Word, Short	Read Only	The current step the job is on.	0-999 (Rev 3 and 4**)
JOB_SCOUNT*	Word, Short	Read Only	The number of steps in the job.	0-999 (Rev 3 and 4**)
JOB_STYPE*	Word, Short	Read Only	The step type 1 = Batch Step 2-6 = Reserved	0-99 (Rev 3 and 4**)
JOB_TSTATUS*	Word, Short	Read Only	The status of the job tightening: 0 = JobTight OFF 1 = JobTight OK 2 = JobTight NOK 3 = JobTight Terminated 4 = JobTight Incremented 5 = JobTight Decremented 6 = JobTight Bypassed 7 = JobTight Reset Batch 8 = JobTight Loosening 9 = JobTight Free Batch 10 = JobTight Job Terminated	0-10 (Rev 4)
JOB_NEWDATA LINK_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	0-1

Item	Data Type	Access	Description	Data Range
JOB_RESTART LINK_RESTART	Word, Short	Write Only	Write a job number to this item to restart that job.	0-99 (Rev 1) 0-9999 (Rev 2)
JOB_ABORT LINK_ABORT	Boolean	Write Only	Write any value to this item to terminate the current job.	N/A
JOB_BATCH_ INCREMENT*	Boolean	Write Only	Write any value to this item to increment the batch number.	N/A

*This item is only supported by the Open Protocol model.
** This tag may not be valid for some devices when using revision 4.
Consult device documentation for supported MIDs and data fields.

Command Set: Job Data

The Job Data command set is used to request the configuration of a specific job. To request a job, write the Job ID to JOBDATA_JOBID. All items belonging to this comment set use MID 32 (Job Data Upload Request) to request the data, which is replied to with MID 33 (Job Data Upload Reply). If the device supports 4 digits Job IDs, revision 2 or higher must be used.

Item	Data Type	Access	Description	Data Range
JOBDATA_JOBID	Word, Short	Read/Write	Write a Job ID to this item to request the job's configuration	0-9999
JOBDATA_NAME	String	Read Only	The name of job	25 characters
JOBDATA_ FORCED_ORDER	Word, Short	Read Only	Forced Order 0 = Free Order 1 = Forced Order 2 = Free and Forced	0-2
JOBDATA_MAX_ FIRST_ TIGHTENING_TIME	Word, Short	Read Only	Maximum time for first tightening	0-9999
JOBDATA_MAX_ COMPLETION_ TIME	DWord, Long	Read Only	Maximum time to complete the job	0-99999
JOBDATA_BATCH_ MODE	Word, Short	Read Only	Job batch mode/batch count type 0 = Only the OK tightenings are counted 1 = Both OK and NOK tightenings are counted	0-1
JOBDATA_LOCK_ ON_DONE	Boolean	Read Only	Lock at Job done True = Yes False = No	True/False
JOBDATA_LINE_ CONTROL	Boolean	Read Only	Use line control True = Yes False = No	True/False
JOBDATA_ REPEAT_JOB	Boolean	Read Only	Repeat Job True = Yes False = No	True/False
JOBDATA_TOOL_ LOOSENING	Word, Short	Read Only	Tool loosening 0 = Enable 1 = Disable 2 = Enable only on NOK tightening	0-2
JOBDATA_TOOL_	Word,	Read Only	Reserved for Job repair	0-1

Item	Data Type	Access	Description	Data Range
RESERVED	Short			
JOBDATA_ PARAMETER_ CHANNEL_ID	Word, Short*	Read Only	The parameter's Channel ID	0-99
JOBDATA_ PARAMETER_ TYPE_ID	Word, Short*	Read Only	The parameter's Type ID	0-999
JOBDATA_ PARAMETER_ AUTO_VALUE	Boolean*	Read Only	The parameter's Auto Value	True/False
JOBDATA_ PARAMETER_ BATCH_SIZE	Word, Short*	Read Only	The parameter's batch size	0-99
JOBDATA_ PARAMETER_ COUNT	Word, Short	Read Only	The number of parameters in the job	0-99 (Rev 3)
JOBDATA_ PARAMETER_ SOCKET	Word, Short*	Read Only	The parameter's socket number	0-99 (Rev 3)
JOBDATA_ PARAMETER_ STEP_NAME	String*	Read Only	The parameter's step name	25 characters (Rev 3)
JOBDATA_ PARAMETER_ STEP_TYPE	Word, Short*	Read Only	The parameter's step type	0-99 (Rev 3)

*This item requires an array index or bit index. The valid array / bit index range is 1 to 99.

Command Set: Job Number Data

The Job Number Data command set is used to request generic job data on the controller. Some command set items also have alias names. In the table below, the alias name will be listed beneath the item where applicable. All items belonging to this command set use MID 30 (Job ID upload request) for requesting the item data, which is replied to with MID 31 (Job ID upload reply). If the device supports 4-digit Job IDs, revision 2 or higher must be used.

Item	Data Type	Access	Description	Data Range
JOBN_COUNT LINKN_COUNT	Word, Short	Read Only	Count of the number of valid jobs	0-99 (Rev 1) 0-9999 (Rev 2)
JOBN_ID LINKN_ID	Word, Short*	Read Only	Valid job numbers (the number available is specified by JOBN_COUNT)	0-99 (Rev 1) 0-9999 (Rev 2)

*This item requires an array index or bit index. The valid array / bit index range is 1 to 9999.

Command Set: Last Tightening Results

The Last Tightening Results command set is used to receive data for the last tightening. All items belonging to this command set use MID 60 (Last tightening result data subscribe) for the subscription request. The device sends the data through MID 61 (Last tightening result data), which is replied to by MID 62 (Last tightening result acknowledge).

Item	Data Type	Access	Description	Data Range
LTR_CELL_ID	Word, Short	Read Only	Cell ID	0-9999
LTR_CHAN_ID	Word, Short	Read Only	Channel ID	0-99
LTR_TC_NAME	String	Read Only	Torque controller name	25 characters
LTR_VIN	String	Read Only	Vehicle ID number*	25 characters
LTR_JOB	Word, Short	Read Only	Job number*	0-99 (Rev 1) 0-9999 (Rev 2+)
LTR_PSET	Word, Short	Read Only	PSet number*	0-999
LTR_BATCH_SIZE	Word, Short	Read Only	Batch size*	0-9999
LTR_BATCH_ COUNTER	Word, Short	Read Only	Batch counter*	0-9999
LTR_TIGHT_ STATUS	Word, Short	Read Only	Tightening status* 0 = NOK 1 = OK	0-1
LTR_TORQUE_ STATUS	Word, Short	Read Only	Torque status* 0 = Low 1 = OK 2 = High	0-2
LTR_ANGLE_ STATUS	Word, Short	Read Only	Angle status* 0 = Low 1 = OK 2 = High	0-2
LTR_TORQUE_ MIN	Float	Read Only	Torque minimum limit	0-9999.99

Item	Data Type	Access	Description	Data Range
LTR_TORQUE_ MAX	Float	Read Only	Torque maximum limit	0-9999.99
LTR_TORQUE_ TARGET	Float	Read Only	Torque final target	0-9999.99
LTR_TORQUE_ VALUE	Float	Read Only	Torque value*	0-9999.99
LTR_ANGLE_MIN	DWord	Read Only	Angle minimum value, in degrees	0-99999
LTR_ANGLE_MAX	DWord	Read Only	Angle maximum value, in degrees	0-99999
LTR_ANGLE_ TARGET	DWord, Long	Read Only	Target angle value, in degrees	0-99999
LTR_ANGLE_ VALUE	DWord, Long	Read Only	Turning angle value, in degrees*	0-99999
LTR_TIMESTAMP	String	Read Only	Timestamp*	19 characters
LTR_ CHANGETIME	String	Read Only	Last change in PSet settings*	19 characters
LTR_BATCH_ STATUS	Word, Short	Read Only	Batch status* 0 = NOK 1 = OK 2 = Batch not used	0-2
LTR_ID	DWord, Long	Read/Write**	Tightening ID*	0-4294967295
LTR_STRATEGY	Word, Short	Read Only	(Rev 2) Strategy 1 = Torque control 2 = Torque control / angle monitoring 3 = Torque control / angle control AND 4 = Angle control / torque monitoring 5 = DS control 6 = DS control torque monitoring 7 = Reverse angle 8 = Reverse torque 9 = Click wrench 10 = Rotate spindle forward 11 = Torque control angle control OR 12 = Rotate spindle reverse 99 = No strategy	0-99
LTR_STRAT_OPT	Boolean	Read Only	(Rev 2) Strategy options This item requires a bit number (0-15) Bit 0 = Torque Bit 1 = Angle Bit 2 = Batch Bit 3 = PVT monitoring Bit 4 = PVT compensate Bit 5 = Selftap Bit 6 = Rundown Bit 7 = CM Bit 8 = DS control Bit 9 = Click wrench Bit 10 = RBW monitoring	0-1
LTR_RDA_	Word,	Read Only	(Rev 2) Rundown angle status	0-2

Item	Data Type	Access	Description	Data Range
STATUS	Short		0 = NOK 1 = OK 2 = High	
LTR_CMON_ STATUS	Word, Short	Read Only	(Rev 2) Current monitoring status 0 = NOK 1 = OK 2 = High	0-2
LTR_ST_STATUS	Word, Short	Read Only	(Rev 2) Selftap status 0 = NOK 1 = OK 2 = High	0-2
LTR_PTM_ STATUS	Word, Short	Read Only	(Rev 2) Prevail torque monitoring status 0 = NOK 1 = OK 2 = High	0-2
LTR_PTC_ STATUS	Word, Short	Read Only	(Rev 2) Prevail torque compensate status 0 = NOK 1 = OK 2 = High	0-2
LTR_PVT	Float	Read Only	(Rev 6) PVT compensation value	0-99999.99
LTR_TERR_ STATUS	Boolean	Read Only	(Rev 2) Tightening error status This item requires a bit number (0-31) Bit 0 = Rundown angle max shut off Bit 1 = Rundown angle min shut off Bit 2 = Torque max shut off Bit 3 = Angle max shut off Bit 4 = Selftap torque max. shut off Bit 5 = Selftap torque min. shut off Bit 6 = Prevail torque max. shut off Bit 7 = Prevail torque min. shut off Bit 8 = Prevail torque compensate over-flow Bit 9 = Current monitoring max shut off Bit 10 = Post view torque min. torque shut off Bit 11 = Post view torque max. torque shut off Bit 12 = Post view torque angle too small Bit 13 = Trigger lost Bit 14 = Torque less than target Bit 15 = Tool hot Bit 16 = Multistage cancel Bit 17 = Rehit Bit 18 = DS measure failed Bit 19 = Current limit reached Bit 20 = End time out shutoff Bit 21 = Remove fastener limit exceeded Bit 22 = Disable drive	0-1

Item	Data Type	Access	Description	Data Range
LTR_TERR_ STATUS_ COMBINED	DWord, Long	Read Only	(Rev 2) All tightening error status bits are combined in one value. *Refer to LTR_ TERR_STATUS to review the match of each bit and the value.*	0 to 4294967295 (DWord) -2,147,483,648 to 2,147,483,647 (Long)
LTR_TERR_ STATUS2	Boolean	Read Only	(Rev 6) Tightening error status 2 This item requires a bit number (0-31) Bit 0 = Drive deactivated Bit 1 = Tool stall Bit 2 = Drive hot Bit 3 = Gradient monitoring high Bit 4 = Gradient monitoring low Bit 5 = Reaction bar failed Bit 6 - 31 = Reserved	0-1
LTR_TERR_ STATUS2_ COMBINED	DWord, Long	Read Only	(Rev 6) All tightening error status 2 bits are combined in one value. *Refer to LTR_TERR_STATUS2 to review the match of each bit and the value.*	0 to 4294967295 (DWord) -2,147,483,648 to 2,147,483,647 (Long)
LTR_RDA_MIN	DWord, Long	Read Only	(Rev 2) Rundown angle minimum value, in degrees	0-99999
LTR_RDA_MAX	DWord, Long	Read Only	(Rev 2) Rundown angle maximum value, in degrees	0-99999
LTR_RDA_VALUE	DWord, Long	Read Only	(Rev 2) Rundown angle value reached, in degrees	0-99999
LTR_CM_MIN	Word, Short	Read Only	(Rev 2) Current monitoring minimum limit	0-999
LTR_CM_MAX	Word, Short	Read Only	(Rev 2) Current monitoring maximum limit	0-999
LTR_CM_VALUE	Word, Short	Read Only	(Rev 2) Current monitoring value in percent	0-999
LTR_ST_MIN	Float	Read Only	(Rev 2) Selftap minimum limit	0-9999.99
LTR_ST_MAX	Float	Read Only	(Rev 2) Selftap maximum limit	0-9999.99
LTR_ST_TORQUE	Float	Read Only	(Rev 2) Selftap torque.	0-9999.99
LTR_PTM_MIN	Float	Read Only	(Rev 2) Prevail torque monitoring minimum limit	0-9999.99
LTR_PTM_MAX	Float	Read Only	(Rev 2) Prevail torque monitoring maximum limit	0-9999.99
LTR_PT	Float	Read Only	(Rev 2) Prevail torque value	0-9999.99
LTR_JOB_SEQ_ NUM	Word, Short	Read Only	(Rev 2) Job sequence number	0-65535
LTR_STID	Word, Short	Read Only	(Rev 2) Synch tightening ID	0-65535
LTR_SERIAL_NUM	String	Read Only	(Rev 2) Tool serial number	14 characters
LTR_PSET_NAME	String	Read Only	(Rev 3) Parameter set name	25 characters
LTR_UNITS	Word, Short	Read Only	(Rev 3) Torque value units 1 = Nm 2 = Lbf.ft 3 = Lbf.In 4 = Kpm	1-4

Item	Data Type	Access	Description	Data Range
LTR_RESULT_TYPE	Word, Short	Read Only	(Rev 3) Result type 1 = Tightening 2 = Loosening 3 = Batch Increment 4 = Batch decrement 5 = Bypass Pset result 6 = Cancel job result 7 = Sync tightening	1-7
LTR_IDR2	String	Read Only	(Rev 4) Identifier result part 2	25 characters
LTR_IDR3	String	Read Only	(Rev 4) Identifier result part 3	25 characters
LTR_IDR4	String	Read Only	(Rev 4) Identifier result part 4	25 characters
LTR_CUSTOM_ERR	String	Read Only	(Rev 5) Customer tightening error code	4 characters
LTR_MULTISTAGE_COUNT	Word	Read Only	(Rev 998) Number of run stages. For each completed stage the final torque and the final angle are reported.	0-99
LTR_MULTISTAGE_ANGLE.N	Long***	Read Only	(Rev 998) The turning angle stage value in degrees. Each turn represents 360 degrees. 'N' is the stage number in the tightening.	0-99999
LTR_MULTISTAGE_TORQUE.N	Float***	Read Only	(Rev 998) The stage torque value. 'N' is the stage number in the tightening.	0.0-999999.0
LTR_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear.	0-1

*These items are available in the low-bandwidth (revision 999) message.

**Writing any value to the Tightening ID will set the value in the driver to 0. This will not have any effect on the hardware.

***These items require an array index or bit index. The valid array / bit index range is 1 to 99.

***See Also**: Appendix - LTR Revision 998 Tag Behavior for more information.*

Note: Any commands that require special revisions (such as 2, 3, and so forth) are not supported by the FEP Protocol model.

Command Set: Multi-Spindle Results

The Multiple Spindle Results command set can be used to receive data that includes tightening results for tools that have multiple spindles. All items belonging to this command set use MID 100 (Multi-spindle result subscribe) for the subscription request. The device sends the data through MID 101 (Multi-spindle result), which is replied to by MID 102 (Multi-spindle result data acknowledge).

Item	Data Type	Access	Description	Data Range
MS_NUMBER	Word, Short	Read Only	Number of running spindles	2-10
MS_VIN	String	Read Only	Vehicle ID number	25 characters
MS_JOBNUM	Word, Short	Read Only	Job number (Link Group)	0-99
MS_PSET	Word,	Read Only	Parameter set (App)	0-999

Item	Data Type	Access	Description	Data Range
	Short			
MS_BSIZE*	Word, Short	Read Only	Batch size	0-9999
MS_BCOUNT*	Word, Short	Read Only	Batch counter	0-9999
MS_BSTATUS*	Word, Short	Read Only	Batch status 0 = NOK 1 = OK 2 = Batch not used	
MS_TMIN	Float	Read Only	Torque minimum limit	0-9999.99
MS_TMAX	Float	Read Only	Torque maximum limit	0-9999.99
MS_TTARG	Float	Read Only	Torque final target	0-9999.99
MS_AMIN	DWord, Long	Read Only	Angle minimum limit	0-99999
MS_AMAX	DWord, Long	Read Only	Angle maximum limit	0-99999
MS_ATARG	DWord, Long	Read Only	Angle final target	0-99999
MS_CHANGETIME	String	Read Only	Last change in setting	19 characters
MS_TIME	String	Read Only	Time stamp	19 characters
MS_SYNCID	DWord, Long	Read Only	Sync tightening ID	0-99999
MS_SYNCSTAT	Word, Short	Read Only	Overall tightening status 0 = NOK 1 = OK	0-1
SPD_NUM**	Word, Short	Read Only	Spindle number	1-10
SPD_CHAN**	Word, Short	Read Only	Channel ID	1-20
SPD_STATUS**	Word, Short	Read Only	Overall spindle status 0 = NOK 1 = OK	0-1
SPD_TSTATUS**	Word, Short	Read Only	Individual torque status 0 = NOK 1 = OK	0-1
SPD_TORQUE**	Float	Read Only	Individual torque	0-9999.99
SPD_ASTATUS**	Word, Short	Read Only	Individual angle status 0 = NOK 1 = OK	0-1
SPD_ANGLE**	DWord, Long	Read Only	Individual angle	0-99999
MS_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	0-1

*Although this was not supported by the Open protocol, the Torque Tool Ethernet Driver supports this feature. This feature is supported by prefixing the Address Item with the Spindle number delimited by a ':' (e.g. 01:VIN_VIN). For the Open protocol, the spindle data is ignored.

**This item requires an array index. The maximum array index is given by MS_Number.

Command Set: Old Tightening Results

The Old Tightening Results command set is used to retrieve data for an old tightening result. To retrieve the data for a tightening result, write the Tightening ID to the OTR_ID field. All items belonging to this command set use MID 64 (Old tightening result upload request) for requesting the item data, which is replied to with MID 65 (Old tightening result upload reply).

Item	Data Type	Access	Description	Data Range
OTR_ID	DWord, Long	Read / Write	Tightening ID. Write the Tightening ID to this item to retrieve data for that tightening. Writing 0 will retrieve the last tightening results.	0-4294967295
OTR_VIN	String	Read Only	Vehicle ID number	25 characters
OTR_PSET	Word, Short	Read Only	PSet number	0-999
OTR_BCOUNT	Word, Short	Read Only	Batch counter	0-9999
OTR_TIGHTSTAT	Word, Short	Read Only	Tightening status 0 = NOK 1 = OK	0-1
OTR_TORQSTAT	Word, Short	Read Only	Torque Status 0 = Low 1 = OK 2 = High	0-2
OTR_ANGSTAT	Word, Short	Read Only	Angle Status 0 = Low 1 = OK 2 = High	0-2
OTR_TORQUE	Float	Read Only	Torque value	0-9999.99
OTR_ANGLE	DWord, Long	Read Only	Turning angle value in degrees	0-99999
OTR_TIME	String	Read Only	Timestamp	19 characters
OTR_BATSTAT	Word, Short	Read Only	Batch status 0 = NOK 1 = OK 2 = Batch not used	0-2
OTR_JOBNUM	Word, Short	Read Only	(Rev 2) Job number	0-9999
OTR_STRATEGY	Word, Short	Read Only	(Rev 2) Strategy 1 = Torque control 2 = Torque control / angle monitoring 3 = Torque control / angle control AND 4 = Angle control / torque monitoring 5 = DS control 6 = DS control torque monitoring 7 = Reverse angle 8 = Reverse torque 9 = Click wrench 10 = Rotate spindle forward	-99

Item	Data Type	Access	Description	Data Range
			11 = Torque control angle control OR 12 = Rotate spindle reverse 99 = No strategy	
OTR_STROPT	Boolean	Read Only	(Rev 2) Strategy options This item requires a bit number (0-15) Bit 0 = Torque Bit 1 = Angle Bit 2 = Batch Bit 3 = PVT Monitoring Bit 4 = PVT Compensate Bit 5 = Selftap Bit 6 = Rundown Bit 7 = CM Bit 8 = DS Control Bit 9 = Click Wrench Bit 10 = RBW Monitoring	-1
OTR_BSIZE	Word, Short	Read Only	(Rev 2) Batch size	0-9999
OTR_RASTAT	Word, Short	Read Only	(Rev 2) Rundown angle status 0 = NOK 1 = OK 2 = High	0-2
OTR_CMSTAT	Word, Short	Read Only	(Rev 2) Current monitoring status 0 = NOK 1 = OK 2 = High	-2
OTR_STSTAT	Word, Short	Read Only	(Rev 2) Selftap status 0 = NOK 1 = OK 2 = High	0-2
OTR_PTMSTAT	Word, Short	Read Only	(Rev 2) Prevail torque monitoring status 0 = NOK 1 = OK 2 = High	0-2
OTR_PTCSTAT	Word, Short	Read Only	(Rev 2) Prevail torque compensate status 0 = NOK 1 = OK 2 = High	0-2
OTR_TERRSTAT	Boolean	Read Only	(Rev 2) Tightening error status This item requires a bit number (0-31): Bit 0 = Rundown angle max shut off Bit 1 = Rundown angle min shut off Bit 2 = Torque max shut off Bit 3 = Angle max shut off Bit 4 = Selftap torque max shut off Bit 5 = Selftap torque min shut off Bit 6 = Prevail torque max shut off Bit 7 = Prevail torque min shut off	-1

Item	Data Type	Access	Description	Data Range
			Bit 8 = Prevail torque compensate overflow Bit 9 = Current monitoring max shut off Bit 10 = Post view torque min torque shut off Bit 11 = Post view torque max torque shut off Bit 12 = Post view torque Angle too small Bit 13 = Trigger Lost Bit 14 = Torque Less Than Target Bit 15 = Tool Hot Bit 16 = Multistage Cancel Bit 17 = Rehit Bit 18 = DS Measure Failed Bit 19 = Current Limit Reached Bit 20 = EndTime out Shutoff Bit 21 = Remove fastener limit exceeded Bit 22 = Disable drive	
OTR_TERRSTAT_COMBINED	DWord, Long	Read Only	(Rev 2) All tightening error status bits are combined in one value. *Refer to OTR_TERRSTAT to review the match of each bit and the value.*	0 to 4294967295 (DWord) -2,147,483,648 to 2,147,483,647 (Long)
OTR_RANGLE	DWord, Long	Read Only	(Rev 2) Rundown angle value reached, in degrees	0-99999
OTR_CMVALUE	Word, Short	Read Only	(Rev 2) Current monitoring value in percent	0-999
OTR_STORQUE	Float	Read Only	(Rev 2) Selftap torque	0-9999.99
OTR_PTORQUE	Float	Read Only	(Rev 2) Prevail torque value	0-9999.99
OTR_JOBSEQ	Word, Short	Read Only	(Rev 2) Job sequence number	0-65535
OTR_STID	Word, Short	Read Only	(Rev 2) Synch Tightening ID	0-65535
OTR_SERIAL	String	Read Only	(Rev 2) Tool serial number	14 characters
OTR_TVUNIT	Word, Short	Read Only	(Rev 3) Torque value units 1 = Nm 2 = Lbf.ft 3 = Lbf.In 4 = Kpm	1-4
OTR_RTYPE	Word, Short	Read Only	(Rev 3) Result type 1 = Tightening 2 = Loosening 3 = Batch Increment 4 = Batch decrement 5 = Bypass pset result 6 = Cancel job result 7 = Sync tightening	1-7
OTR_ID2	String	Read	(Rev 4) Identifier result part 2	25 characters

Item	Data Type	Access	Description	Data Range
		Only		
OTR_ID3	String	Read Only	(Rev 4) Identifier result part 3	25 characters
OTR_ID4	String	Read Only	(Rev 4) Identifier result part 4	25 characters
OTR_CUSTOM_ ERR	String	Read Only	(Rev 5) Customer tightening error code	4 characters
OTR_PVT	Float	Read Only	(Rev 6) PVT compensation value	0-9999.99
OTR_TERR_ STATUS2	Boolean	Read Only	(Rev 6) Tightening error status This item requires a bit number (0-31): Bit 0 = Drive deactivated Bit 1 = Tool stall Bit 2 = Drive hot Bit 3 = Gradient monitoring high Bit 4 = Gradient monitoring low Bit 5 = Reaction bar failed Bit 6-31 = Reserved	0-1
OTR_TERR_ STATUS2_ COMBINED	DWord, Long	Read Only	(Rev 6) All tightening error status bits are combined in one value. *Refer to OTR_TERR_STATUS2 to review the match of each bit and the value.*	0-4294967295
OTR_STATION_ID	DWord, Long	Read Only	(Rev 7) The station ID	0-4294967295
OTR_STATION_ NAM	String	Read Only	(Rev 7) The station name	25 characters
OTR_NEWDATA	Boolean	Read / Write	New data flag. Set to 1 when new data arrives. Perform a write to this tag to reset the flag.	0-1

Note: Any commands that require special revisions (such as 2, 3, and so forth) are not supported by the FEP Protocol model.

Command Set: Operation Result

The Operation Result command set is used to receive data about tightening results using PIDs. Most of the results are dynamic and use Parameter ID numbers (PIDs) for the values returned. However, there are specific values that are not dynamic that are used to give general information about the Operation Results. Their values can be retrieved using the tags below.

Item	Data Type	Access	Description	Data Range
1201.OPERATION_ TYPE	Word	Read Only	The operation type. Values are: 0 = Non-synchronized tightening 1 = Synchronized tightening 2 = Pressing 3 = Drilling 4 = Pulse	0-4
1201.RESULT_ DATA_ID	DWord	Read Only	The unique ID for the operation result	0-4294967295
1201.RESULT_	Boolean	Read	The status of the operation. Values are:	0-1

Item	Data Type	Access	Description	Data Range
STATUS		Only	0 = Not OK 1 = OK	
1201.TIME	String	Read Only	The cycle start time	19 characters
1202.RESULT_ DATA_ID	DWord	Read Only	The unique ID for the operation result	0-4294967295
1202.OBJECT_ID	Word	Read Only	The user defined Object ID	0-9999

For more information, request the model-specific document(s) for the open protocol implementations from the Atlas Copco website (https://www.atlascopco.com).

Command Set: Parameter Set Data

The Parameter Set Data command set is used to retrieve data for a specific parameter set on demand. To retrieve data for a parameter set, write the parameter set number to the PSD_ID item. All items belonging to this command set use MID 12 (Parameter set data upload request) for requesting the item data, which is replied to with MID 13 (Parameter set data upload reply).

Note: Some command set items also have alias names. In the table below, the alias name will be listed beneath the item where applicable.

Item	Data Type	Access	Description	Data Range
PSD_ID APPD_ID	Word, Short	Read/Write	The parameter set ID. Write the ID of the desired parameter set to this item to retrieve the data for that parameter set.	0-999
PSD_NAME APPD_NAME	String	Read Only	The name of the parameter set	25 characters
PSD_DIR APPD_DIR	Word, Short	Read Only	Rotation direction 1 = Clockwise 2 = Counterclockwise	1-2
PSD_BSIZE APPD_BSIZE	Word, Short	Read Only	Batch size	0-99
PSD_TMIN APPD_TMIN	Float	Read Only	Torque minimum limit	0-9999.99
PSD_TMAX APPD_TMAX	Float	Read Only	Torque maximum limit	0-9999.99
PSD_TTARG APPD_TTARG	Float	Read Only	Torque final target value	0-9999.99
PSD_AMIN APPD_AMIN	Word, Short	Read Only	Angle minimum value in degrees	0-99999
PSD_AMAX APPD_AMAX	Word, Short	Read Only	Angle maximum value in degrees	0-99999
PSD_ATARG APPD_ATARG	Word, Short	Read Only	Target angle in degrees	0-99999

Command Set: Parameter Set Numbers

The Parameter Set Numbers command set is used to retrieve the list of parameter set numbers from the device.

Note: Some command set items also have alias names. In the table below, the alias name will be listed beneath the item where applicable.

Item	Data Type	Access	Description	Data Range
PSN_COUNT APPN_COUNT	Word, Short	Read Only	The number of parameter sets in the list. This command set use MID 10 (Parameter set ID upload request) for requesting the item data, which is replied to with MID 11 (Parameter set ID upload reply).	0-999
PSN_ID APPN_ID	Word, Short*	Read Only	The parameter set ID. The array size is defined by the PSN_COUNT. This command set use MID 10 (Parameter set ID upload request) for requesting the item data, which is replied to with MID 11 (Parameter set ID upload reply). This item requires an array index (1-999).	0-999

*This item requires an array index or bit index.

Command Set: Parameter Set Selected

The Parameter Set Selected command set is used to select a particular parameter set, to notify the user when a new parameter set has been selected, and to control certain batch properties. All items belonging to this parameter set use MID 14 (Parameter set selected subscribe) for the subscription request. The device sends item data to the server through MID 15 (Parameter set selected), which the server responds to with MID 16 (Parameter set selected acknowledge).

Note: Some command set items also have alias names. In the table below, the alias name will be listed beneath the item where applicable.

Item	Data Type	Access	Description	Data Range
PSET_NUMBER APP_NUMBER	Word, Short	Read/Write	ID number of the last parameter set selected. Users may also write a parameter set number to this item to select a parameter set.	0-999
PSET_ LASTCHANGE APP_ LASTCHANGE	String	Read Only	Time of last change in PSet setting	19 characters
PSET_NEWDATA APP_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	0-1
PSET_BSIZE APP_BSIZE	String	Write Only	Use this item to set the batch size for a particular parameter set. The format of the string is: PSETNUM = BATCHSIZE Where PSETNUM is the parameter set number, and BATCHSIZE is the desired batch size. For example, to set the batch size to 20 for parameter set 3, users would write the following to this tag. 3 = 20	PSet: 0-999 Batch Size: 0-99
PSET_RESETBC APP_RESETBC	Word, Short	Write Only	Writing a parameter set number to this item will reset the batch counter for that parameter set	0-999

Command Set: Program Messages

The Program Messages command set can be used to read multi-step tightening programs from the device or write multi-step tightening programs to the device using MIDs 2500 and 2501, respectively. The implementation of this MID in the server is built as a pass-through; it is up to the client application to write a valid string that matches what the device expects.

Note: The Program Messages command set is currently only supported on the Power Focas 6000.

See Also:
Refer to the Open Protocol Specification for exact details on what the device accepts
See Appendix for examples

Item	Data Type	Access	Description
PSET_ PROGRAM_ WRITE	String	Write Only*	Passes the message to the device with the string written as a payload. If successful, the device is updated with the program specified in the string.
PSET_ PROGRAM_ READ	String	Write Only*	Passes the message to the device with the string written as a payload. If successful, the response tags are populated with the program specified by the PSET ID** in the payload.
PSET_ PROGRAM_ RESPONSE_ALL	String	Read Only	If the PSET_PROGRAM_READ message was successful, this tag will contain the entire response message from the device.
PSET_ PROGRAM_ RESPONSE_ HEADER	String	Read Only	If the PSET_PROGRAM_READ message is successful, this tag contains the header of the response message from the device. This normally contains any PIDs sent in the response and includes the string length of the multi-step program definition.
PSET_ PROGRAM_ RESPONSE_ BODY	String	Read Only	If the PSET_PROGRAM_READ message is successful, this tag contains the multi-step program definition (in JSON format) from within the response message.

*While the tags are only meant to be written to, they will contain that last string that was written to them whether that string was valid or not.

**Depending on the Controller setup, PSET ID can be interpreted as an Identifier or an Index. Please refer to the Open Protocol Specification for exact details on how the device behaves in these scenarios.

Command Set: Selector Messages

The Selector command set is used to send and receive data for the socket selector accessory. MID 250 is used to subscribe to selector socket information and that information is sent back using MID 251. MID 254 and MID 255 can be used to set the lights on the selector socket.

Item	Data Type	Access	Description	Data Range
SELECTOR_ DEVICE_ID	Word, Short	Read Only	The ID of the selector device.	0-99
SELECTOR_NUM_ SOCKETS	Word, Short	Read Only	The number of sockets on the selector device.	0-99
SELECTOR_ SOCKET_STATUS	Boolean*	Read Only	The status of the socket: 0 = socket not lifted 1 = socket lifted	0-1
SELECTOR_ GREEN_LIGHTS SELECTOR_RED_ LIGHTS	String	Write Only	Use this item to set the lights on the selector socket device. The format of the string is: DEVICEID = LIGHTDATA	102 characters Device ID: 0-99 Light Data:

Item	Data Type	Access	Description	Data Range
			Where DEVICEID is the device ID of the selector socket and LIGHTDATA is a list of values for each socket in order. Those values can be: 0 = Off 1 = Steady 2 = Flashing For example, to turn off the first two socket lights and set the last two sockets to flashing on a selector with a device ID of 2 the value would be: 2=00220000 (Rev 0,1) 2=0022 (Rev 2) With Rev 0 or 1; eight sockets values must be given. With Rev 2 any amount of values can be given from 1-99.	(Rev 0,1) 8 characters (Rev 2) 1-99 characters

*This item requires an array index or bit index. The valid array / bit index range is 1 to 99.

Command Set: Time

The Time command set is used to read the controller's time and to synchronize it with the PC.

Item	Data Type	Access	Description	Data Range
TIME	String	Read Only	Current time in the controller. TIME uses MID 80 (Read time upload request) for requesting time data, which is replied to with MID 81 (Read time upload reply).	19 characters
TIME_SYNC	Boolean	Write Only	Write any value to this item to set the controller's time to the current PC time. TIME_SYNC uses MID 82 (Set Time) for setting the controller's time to the current PC time.	N/A

Command Set: Tool Data

The Tool Data command set is used to receive data for the connected tool and to enable/disable the tool. The TOOLDATA items use MID 40 (Tool data upload request) for requesting tool data, which is replied to with MID 41 (Tool data upload reply). The TOOL_ENABLE item uses MID 42 (Disable tool) when a 0 is written and MID 43 (Enable tool) when a 1 is written.

Item	Data Type	Access	Description	Data Range
TOOLDATA_CALIBRATION_VAL	Float	Read Only	(Rev 2) The tool calibration value	0-9999.99
TOOLDATA_CONT_SOFT_VER	String	Read Only	(Rev 2) The controller software version	19 characters
TOOLDATA_CSERIAL	String	Read Only	Controller serial number	10 characters
TOOLDATA_GEAR_RATIO	Float	Read Only	(Rev 3) The gear ratio; last calibration date	0-9999.99
TOOLDATA_LAST_SERV_DATE	String	Read Only	(Rev 2) The date of the last service	19 characters

Item	Data Type	Access	Description	Data Range
TOOLDATA_LCD	String	Read Only	Last calibration date	19 characters
TOOLDATA_ MOTOR_SIZE	Word, Short	Read Only	(Rev 2) The seize of the motor	0-99
TOOLDATA_NT	DWord, Short	Read Only	Tool number of tightening	0-4294967295
TOOLDATA_ OPEN_END_DATA	Word, Short	Read Only	(Rev 2) The open end data. The first digit represents the "use open end": 1 = true 0 = false The second digit indicates the tightening direction: 0 = CW 1 = CCW The third digit indicates motor rotation: 0 = normal 1 = inverted	0-111
TOOLDATA_ PRIMARY_TOOL	Word, Short	Read Only	(Rev 4) Specifies the primary tool: 01 = Cable (invalid for IRC-controller) 02 = IRC-B 03 = IRC-W	0-99
TOOLDATA_ TFULL_SPEED	Float	Read Only	(Rev 3) The tool full speed	0-9999.99
TOOLDATA_ TIGHT_SINCE_ SERV	DWord, Long	Read Only	(Rev 2) The number of tightening since the last service	0-4294967295
TOOLDATA_TMAX_ TORQUE	Float	Read Only	(Rev 3) The tool maximum torque value	0-9999.99
TOOLDATA_ TMODEL	String	Read Only	(Rev 5) The tool model	12 characters
TOOLDATA_ TSERIAL	String	Read Only	Tool serial number	14 characters
TOOLDATA_TTYPE	Word, Short	Read Only	(Rev 2) The tool type: 0 = No Tool 1 = S-tool 2 = DS-tool 3 = Ref. transducer 4 = ST-tool 5 = EP=tool 6 = ETX-tool 7 = SL-tool 8 = DL-tool 9 = IRC Offline 10 = STB-tool 11 = OST-tool 12 = STT-tool 13 = STwrench 14 = ES-tool	0-99
TOOL_ENABLE	Boolean	Write Only	Write a 0 to disable the tool or a 1 to enable the tool	0-1

Item	Data Type	Access	Description	Data Range
TOOLDATA_FWV1*	String	Read Only	The controller firmware version	10 characters
TOOLDATA_FWV2*	String	Read Only	Auxiliary firmware version in the case there is a second firmware required	10 characters

*This item is only supported by the FEP Protocol model.

Command Set: Trace Curve Data Messages

The Trace Curve Data command set can be used to request or subscribe to tightening trace curve data from the device using MIDs 900 and 901. The implementation of this MID in the server is built as a pass-through; it is up to the client application to write a valid string that matches what the device expects – examples below. Some of the results returned in the MID901 response are dynamic and use Parameter ID numbers (PIDs) for the values returned.

See Also: Variable Data

Note: The Trace Curve Data command set was tested and is supported on the Power Focus 6000, and Micro Torque 6000 devices with Firmware versions above v3.6.8.10585 and v2.0.4.1, respectively. Extended support and functionality depends on device specific firmware implementation by manufacturer.

Tip: The following trace curve types are supported by the protocol.

1 = Angle trace
2 = Torque trace
3 = Current trace
4 = Gradient trace
5 = Stroke trace
6 = Force trace

Available Feature Tags

Item	Data Type	Access	Description
900.REQUEST	String	Write Only	Passes the message to the device with the string written as a message payload
900.ANGLE _LENGTH	UINT	Read Only	The total number of samples in the response payload
900.ANGLE _RESPONSE [1000]	Float Array	Read Only	The device's Angle Trace Curve response samples payload; range is 1000 to 9999.
900.ANGLE_UNIT	DWord	Read Only	Unit of measurement for this trace type
900.TORQUE_LENGTH	UINT	Read Only	The total number of samples in the binary samples payload
900.TORQUE_RESPONSE [1000]	Float Array	Read Only	The device's Torque Trace Curve response binary samples payload; range is 1000 to 9999.
900.TORQUE_UNIT	DWord	Read Only	Unit of measurement for this trace type
900.CURRENT_LENGTH	UINT	Read Only	The total number of samples in the binary samples payload
900.CURRENT_RESPONSE [1000]	Float Array	Read Only	The device's Current Trace Curve response binary samples payload; range is 1000 to 9999.
900.CURRENT_UNIT	DWord	Read Only	Unit of measurement for this trace type
900.GRADIENT_LENGTH	UINT	Read Only	The total number of samples in the binary samples payload
900.GRADIENT_RESPONSE [1000]	Float Array	Read Only	The device's Gradient Trace Curve response binary samples payload; range is 1000 to 9999.
900.GRADIENT_UNIT	DWord	Read Only	Unit of measurement for this trace type
900.STROKE_LENGTH	UINT	Read Only	The total number of samples in the binary samples payload
900.STROKE_RESPONSE [1000]	Float Array	Read Only	The device's Stroke Trace Curve response binary samples payload; range is 1000 to 9999.
900.STROKE_UNIT	DWord	Read Only	Unit of measurement for this trace type

Item	Data Type	Access	Description
900.FORCE_LENGTH	UINT	Read Only	The total number of samples in the binary samples payload for this type
900.FORCE_RESPONSE [1000]	Float Array	Read Only	The device's Force Trace Curve response binary samples payload; range is 1000 to 9999.
900.FORCE_UNIT	DWord	Read Only	Unit of measurement for this trace type
900.SAMPLE_RESOLUTION	Float	Read Only	Sample Delta Time in seconds
900.TIGHTENING_ID	DWord	Read Only	The tightening identification number
900.TIGHTENING_ TIMESTAMP	Date	Read Only	The time at which the tightening took place on the controller

MID900 Generic Subscription Extra Data Description and Breakout

Send Alternatives	0 (0x30)	Specifies to send only latest curve data
Data Identifier - TimeStampType	19 Spaces (0x20)	Not used
Data Identifier - IndexType	10 Spaces (0x20)	Not used
Trace Type Number	01 (0x30, 0x31)	The number of trace curve types that are being requested
Trace Type	001 (0x30, 0x30, 0x31)	The trace type integer value, repeated for each type

Example Requests:

Request a generic subscription, with expected application-level acknowledgements to message ID 900, revision 2, with 2 curve types (Angle and Torque):

```
Write request string: 006700080010        0900002380                                02001002
```

Request a generic subscription, without application-level acknowledgements to message ID 900, revision 1, with 2 curve types (Angle and Torque):

```
Write request string: 006700080011        0900001380                                02001002
```

Reference the Torque Tool Open Protocol Specification for further information.

Command Set: User Data Messages

The User Data command set is used to send, subscribe to changes for, and receive data to or from the device using MIDs 240, 241, and 242. MID 245 (user data download with offset) is not supported at this time. Data sent or received with this message is defined as a string of ASCII HEX characters that can be defined within the PLC.

Item	Data Type	Access	Description
USER_DATA	String	Read / Write	PLC data that can be monitored and written to.

Command Set: VIN

The VIN command set is used to receive data about the VIN (Vehicle ID Number). Writing to VIN_VIN sends a MID 50 (Vehicle ID Number download request) message to the controller. The device subscribes to all VIN data through MID 51 (Vehicle ID Number subscribe), the controller sends item data to the server through MID 52 (Vehicle ID Number), which the server responds to with a MID 53 (Vehicle ID Number Acknowledge).

Item	Data Type	Access	Description	Data Range
VIN_VIN	String	Read/Write	Vehicle ID Number. To send it to the controller, write a VIN to this field.	25 characters
VIN_VIN2	String	Read Only	(Rev 2) Identifier result part 2	25 characters
VIN_VIN3	String	Read Only	(Rev 2) Identifier result part 3	25 characters
VIN_VIN4	String	Read Only	(Rev 2) Identifier result part 4	25 characters
VIN_NEWDATA	Boolean	Read/Write	New data flag. Set to 1 when new data arrives. Write a 0 to this flag to clear it.	0-1

Note: Any commands that require special revisions (such as 2, 3, and so forth) are not supported by the FEP Protocol model.

Event Log Messages

The following information concerns messages posted to the Event Log pane in the main user interface. Consult the OPC server help on filtering and sorting the Event Log detail view. Server help contains many common messages, so should also be searched. Generally, the type of message (informational, warning) and troubleshooting information is provided whenever possible.

Tip: Messages that originate from a data source (such as third-party software, including databases) are presented through the Event Log. Troubleshooting steps should include researching those messages online and in vendor documentation.

Error Descriptions

The following messages may be generated. Click on the link for a description of the message.

Address Validation Errors

Address <address> is out of range for the specified device or register.
Array size is out of range for address <address>.
Array support is not available for the specified address: <address>.
Data type <type> is not valid for device address <address>.
Device address <address> contains a syntax error.
Device address <address> is read only.
Subscription failed for device <device>, <type> subscription.

Ethernet Errors

Unable to bind to adapter: <adapter name>. Connect failed.
Winsock initialization failed (OS Error = <error code>).
Winsock shut down failed (OS Error = <error code>).
Winsock V1.1 or higher must be installed to use the driver.

Runtime Errors

Device <device name> failed to connect.
Device <device name> is not responding.
Unable to read tag <tag name>: Device <device name> encountered a parsing error.
Unable to read tag <tag name>: Device <device name> received an error response (Error <error code>).
Unable to read unsolicited packed data group: Device <device name> received an error response (Error <error code>).
Unable to write tag <tag name>: Device <device name> encountered a parsing error.
Unable to write tag <tag name>: Device <device name> received an error response (Error <error code>).
Unable to write tag <tag name>: Device <device name> received invalid data for write.
Unable to write to <address> on device <device name>.

Error Codes

Error Codes

Address <address> is out of range for the specified device or register.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically references a location that is beyond the range of supported locations for the device.

Solution:
Verify that the address is correct; if it is not, re-enter it in the client application.

Array size is out of range for address <address>.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically is requesting an array size that is too large for the address type or block size of the driver.

Solution:
Re-enter the address in the client application to specify a smaller value for the array or a different starting point.

Array support is not available for the specified address: <address>.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically contains an array reference for an address type that doesn't support arrays.

Solution:
Re-enter the address in the client application to remove the array reference or correct the address type.

Data type <type> is not valid for device address <address>.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically has been assigned an invalid data type.

Solution:
Modify the requested data type in the client application.

Device address <address> contains a syntax error.

Error Type:
Warning

Possible Cause:
An invalid tag address has been specified in a dynamic request.

Solution:
Re-enter the address in the client application.

Device address <address> is read only.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically has a requested access mode that is not compatible with what the device supports for that address.

Solution:
Change the access mode in the client application.

Subscription failed for device <device>, <type> subscription.

Error Type:
Warning

Possible Cause:
The device does not support subscriptions of that type or the device only supports generic subscriptions of that type.

Solution:
Check the device documentation to verify that the device supports subscriptions of that type. If the device requires use of the generic subscription MID, set the **Use Generic Subscribe** device property to **Enable**.

Unable to bind to adapter: <adapter name>. Connect failed.

Error Type:
Fatal

Possible Cause:
The specified adapter is not working properly or is not installed correctly.

Solution:
Make sure that the correct Ethernet adapter is chosen, and verify that it is functioning properly.

Winsock initialization failed (OS error = <error>).

Error Type:
Fatal

OS Error	Indication	Possible Solution
10091	Indicates that the underlying network subsystem is not ready for network communication.	Wait a few seconds and restart the driver.
10067	Limit on the number of tasks supported by the Windows Sockets implementation has been reached.	Close one or more applications that may be using Winsock and restart the driver.

Winsock shut down failed (OS error = <error>).

Error Type:
Informational

Possible Cause:
Indicates that Winsock encountered a problem when shutting down.

Winsock V1.1 or higher must be installed to use the driver.

Error Type:
Fatal

Possible Cause:
The version number of the Winsock DLL found on the system is less than 1.1.

Solution:
Upgrade Winsock to version 1.1 or higher.

Device <device name> failed to connect.

Error Type:
Serious

Possible Cause:

1. The device is offline.
2. The IP address entered for the device is incorrect.

Solution:

1. Verify that the device is online.
2. Verify that the IP address entered for the device is correct.

Device <device name> is not responding.

Error Type:
Serious

Possible Cause:

1. The device does not support the specified command set.
2. The response from the device took longer to receive than the amount of time specified in the "Request Timeout" device property.
3. The connection to the device failed.
4. The device is offline.
5. The device cannot answer the request within the allotted time.

Solution:

1. Verify that the device is online.
2. Increase the Request Timeout property so that the entire response can be handled.
3. Verify that the connection to the device is still valid.
4. Increase the timeout value to allow the device more time to respond.

Unable to read tag <tag name>: Device <device name> encountered a parsing error.

Error Type:
Warning

Possible Cause:

1. The device supports a different command set version than standard.
2. Line noise has corrupted the packet.

Solution:
Use channel diagnostics to verify that the received packet is in the correct format.

Unable to read tag <tag name>: Device <device name> received an error response (Error <error code>).

Error Type:
Warning

Possible Cause:

1. The device does not support the specified command set.
2. One or more parameters sent to the device are out of range.
3. The device is not in the proper state to execute the command.

Solution:
Look up the error code.

See Also:
Error Codes

Unable to read unsolicited packed data group: Device <device name> received an error response (Error <error code>).

Error Type:
Warning

Possible Cause:
An unsolicited message hasn't been received for the requested data group.

Solution:
After receiving an unsolicited message for the requested data group, the reads will no longer fail.

See Also:
Error Codes

Unable to write tag <tag name>: Device <device name> encountered a parsing error.

Error Type:
Warning

Possible Cause:

1. The device supports a different command set version than standard.
2. Line noise has corrupted the packet.

Solution:
Use channel diagnostics to verify that the received packet is in the correct format.

Unable to write tag <tag name>: Device <device name> received an error response (Error <error code>).

Error Type:
Warning

Possible Cause:
1. The device does not support the specified command set.
2. One or more parameters sent to the device are out of range.
3. The device is not in the proper state to execute the command.

Solution:
Look up the error code.

See Also:
Error Codes

Unable to write tag <tag name>: Device <device name> received invalid data for write.

Error Type:
Warning

Possible Cause:
The data that was written to a tag was not in the proper format.

Solution:
View the information for the named tag to learn the proper format for data writes.

Unable to write to <address> on device <device name>.

Error Type:
Serious

Possible Cause:
1. The named device may not be connected to the network.
2. The named device may have been assigned an incorrect Network ID.
3. The named device is not responding to write requests.
4. The device does not support the requested command set.

Solution:
1. Check the hardware network connections.
2. Verify that the Network ID given to the named device matches that of the actual device.

Error Codes

Error Code	Description
01	Invalid data

Error Code	Description
02	Pset number not present
03	Pset can not be set
04	Pset not running
06	VIN upload subscription already exists
07	VIN upload subscription does not exists
08	VIN input source not granted
09	Last tightening result subscription already exists
10	Last tightening result subscription does not exist
11	Alarm subscription already exists
12	Alarm subscription does not exist
13	Parameter set selection subscription already exists
14	Parameter set selection subscription does not exist
15	Tightening ID requested not found
16	Connection rejected protocol busy
17	Job number not present
18	Job info subscription already exists
19	Job info subscription does not exist
20	Job can not be set
21	Job not running
22	Spindle exceeds limits
23	Spindle off line
24	Not possible to create Pset
25	Programming control not granted
26	Wrong tool type to Pset download connected
27	Tool is inaccessible
28	Job abortion is in progress
29	Tool does not exist
30	Controller is not a user data sync client or sync station
31	Multi-spindle status subscription already exists
32	Multi-spindle status subscription does not exist
33	Multi-spindle result subscription already exists
34	Multi-spindle result subscription does not exist
35	Other user data sync client already connected
36	Lock type not supported
40	Job line control info subscription already exists
41	Job line control info subscription does not exist
42	Identifier input source not granted

Error Code	Description
43	Multiple identifiers work order subscription already exists
44	Multiple identifiers work order subscription does not exist
50	Status "external monitored inputs" subscription already exists
51	Status "external monitored inputs" subscription does not exist
52	IO device not connected
53	Faulty IO device number
54	Tool tag ID unknown
55	Tool tag ID subscription already exists
56	Tool tag ID subscription does not exist
57	Tool motor tuning failed
58	No alarm present
59	Tool currently in use
60	No histogram available
61	Pairing failed
62	Pairing denied
63	Pairing or pairing abortion attempt on wrong tool type
64	Pairing abortion denied
65	Pairing abortion failed
66	Pairing disconnection failed
67	Pairing in progress or already done
68	Pairing denied; no program control
69	Unsupported extra data revision
70	Calibration failed
71	Subscription already exists
72	Subscription does not exist
73	Subscribed MID unsupported
74	Subscribed MID revision unsupported
75	Requested MID unsupported
76	Requested MID revision unsupported
77	Requested on specific data not supported
78	Subscription on specific data not supported
79	Command failed
80	Reserved
81	Reserved
82	Automatic / manual mode subscribe already exists
83	Automatic / manual mode subscribe does not exist
84	The relay function subscription already exists

Error Code	Description
85	The relay function subscription does not exist
86	The selector socket info subscription already exists
87	The selector socket info subscription does not exist
88	The digit input information subscription already exist
89	The digit input information subscription does not exist
90	Lock at batch done subscription already exists
91	Lock at batch done subscription does not exist
92	Open protocol commands disabled
93	Open protocol commands disabled subscription already exists
94	Open protocol commands disabled subscription does not exist
95	Reject request, PowerMACS is in manual mode
96	Client already connected
97	MID revision unsupported
98	Controller internal request timeout
99	Unknown MID

Appendix – Dynamic Job Request

Create a dynamic job request message with the following:

Request Header Data

Parameter	Size	Range (Default Value)
Length	4 bytes	0000-9999 - The length is the length of the header plus the data field excluding the NUL termination.
MID	4 bytes	The MID describes how to interpret the message.
Revision	3 bytes	The MID Revision is unique per MID and is used in case different versions are available for the same MID.
No Ack Flag	1 byte	If set, the controller will only push out the information required without waiting for a receive acknowledgment from the subscriber.
Station ID	2 bytes	The station the message is addressed to in the case of controller with multi-station configuration.
Spindle ID	2 bytes	The spindle the message is addressed to in the case several spindles are connected to the same controller.
Sequence number	2 bytes	Not used
Number of Message Parts	1 byte	0-9
Message Part Number	1 byte	0-9

Request Message Data

Parameter	Size	Range
Job ID	4 bytes	0000-9999
Job Name	25 bytes	ASCII Characters
Job List	15 bytes	see Job List Breakout below
Maximum Time to	5 bytes	00000-99999

Parameter	Size	Range
Complete (seconds)		

Job List Breakout

Parameter	Size	Range
Channel ID	2 bytes	00-99
Program ID	3 bytes	000-999
Auto Select	1 byte	1 or 0
Batch Size	2 bytes	00-99
Max Coherent NOK	2 bytes	00-99

Job List Syntax:

"[Channel-ID]:[Program-ID]:[AutoSelect]:[BatchSize]:[Max Coherent NOK];"

Write request string:

```
012901400011   01010102    TheJobName12303010401:010:1:01:42;
0500600700800901001101200001300500140000150160170180190
```

Note: A more detailed description of the error i.e. "faulty Job select source" or "job in off mode" will be received if an alarm subscription has been made (MID 0070).

Note: Some devices do not support checking if a Pset exists before accepting the Job.

Reference the Torque Tool Open Protocol Specification for further information.

Appendix – Tightening Program Read/Write

Reading and writing multi-step programs back and forth from the device using the Program Messages command set tags can be difficult and should be done with caution. Depending on the model of the device; the payloads can be significantly different, and it can be complicated to create the message payload correctly. Below are some examples of the payloads that could be used for a Power Focas 6000 device using firmware version 3.0 or above.

Reading a Program from the Device

The payload for the PSET_PROGRAM_READ tag can look something like this; where YYYY is replaced with the 4-digit PSET ID of the program to read:

```
00360006001000000000250100207YYYY201
```

where:
YYYY = PSET ID

For example, to read the program with PSET ID 3, write the following string to the PSET_PROGRAM_READ tag:

```
00360006001000000000250100207000 3201
```

Writing a Program to the Device

To write a program to the device, the header information must be constructed and sent along with the program. Again, this header depends on the model of the device being used but for a PF 6000 this can be used:

```
AAAA250000200000000020100101000004010000000YYYY00XXXX{JSON Program Definition}
```

where:
AAAA = Total length
YYYY = PSET ID
XXXX = Length of the program

The program must then be added to the header for a complete payload. For example, the following will write a simple program to PSET ID 12:

```
16542500002000000000201001010000040100000000012001601{"changeState":2,"re-
vision":43,"id":{"value":
[207,5,207,152,224,99,74,44,136,52,224,208,238,183,216,17]},"versionId":{"value":
{"value":[135,165,107,190,250,248,69,229,136,225,236,201,21,253,42,64]}},"user-
":"ExternalwebHMI","timestamp":{"value":1557216299},"-
name":"Program","descr":"","indexId":
{"value":5},"threadDirection":1,"tighteningType":2,"operationMode":1,"looseningId":
{"value":[67,154,12,156,38,192,77,122,190,129,177,188,221,140,194,196]},"steps":
[{"internalNumber":1,"stepNumber":0,"nextInternalNumber":2,"stepPath":1,"type":10},
{"intern-
alNum-
ber-
":2,"stepNum-
ber":1,"nextInternalNumber":10,"stepPath":1,"type":13,"stepTightenToAngle":
{"motorControlSpeedRamp":
{"speedTar-
get":60,"ac-
cel-
eration":500,"speedRampType":1},"brake":true,"angleTarget":80,"speedRampChanges":
[],"brakeConfig":{"brakeType":1,"configErgoStop":
{"isBrakeRamptimeAdaptive":true,"rampTime":200}}}},{"intern-
alNum-
ber-
":10,"stepNumber":9,"nextInternalNumber":10,"stepPath":1,"type":11}],"syncPoints":
[],"programRestrictions":[{"internalNumber":7,"type":2,"timeHigh":
{"timeLimitHigh":30}},{"internalNumber":8,"type":1,"torqueHigh":{"torqueLim-
itHigh":10}}],"stepMonitors":[{"intern-
alNumber":3,"startInternalStepNumber":2,"type":2,"peakTorque":{}},
{"internalNumber":4,"startInternalStepNumber":2,"type":6,"angle":{"stopCondi-
tion":2}}],"stepRestrictions":[{"intern-
alNumber":5,"startInternalStepNumber":2,"type":3,"timeHigh":{"timeLimitHigh":5}},
{"internalNumber":6,"startInternalStepNumber":2,"type":1,"torqueHigh":{"torqueLim-
itHigh":10}}],"programMonitors":[{"internalNumber":9,"type":1,"angle":{"enabled":-
false,"stopCondition":2}}]}
```


Troubleshooting

- The maximum program size that can be handled with these calls is 9967 bytes since the maximum protocol message size has to be specified by a 4-digit number. This is a limitation imposed by the Open Protocol. If a program has a length longer than 9967 bytes then the device does not respond to the program read requests.
- Subscribing to MID 2501 updates are not supported through the server. The header for PSET_ PROGRAM_READ must specify MID 6 or MID 2501 depending on the model and firmware of the device. MID 8 (Generic Subscribe) is not supported for this message.
- When writing to either PSET_PROGRAM_READ or PSET_PROGRAM_WRITE and an error occurs with response “Error 1” this usually means the payload is not correct. Verify the lengths are correct and check with the device appendix documentation to verify the payload is in the correct format.
- When writing to the PSET_PROGRAM_WRITE tag and an error occurs with response “Error 79” this usually means that the JSON Program Definition within the message payload was invalid.

Appendix – LTR Revision 998 Tag Behavior

Revision 998 allows for each stage to report its own torque and angle values. Since the number of stages can change between tightenings, reporting these values can be a challenge. It’s recommended that tags be built for the maximum number of expected stages in tightening parameters in the device.
For example, if there is a tightening with two stages and one with five stages, it is recommended to create these tags:

LTR_MULTISTAGE_COUNT

LTR_MULTISTAGE_ANGLE.1
LTR_MULTISTAGE_TORQUE.1
LTR_MULTISTAGE_ANGLE.2
LTR_MULTISTAGE_TORQUE.2
LTR_MULTISTAGE_ANGLE.3
LTR_MULTISTAGE_TORQUE.3
LTR_MULTISTAGE_ANGLE.4
LTR_MULTISTAGE_TORQUE.4
LTR_MULTISTAGE_ANGLE.5
LTR_MULTISTAGE_TORQUE.5

When a tightening is processed, the COUNT tag is updated with the number of stages and the ANGLE and TORQUE tags are set with the values reported. Any tags that had a prior value, but are not included in the current tightening, are set to a value of -1 and continue to have "Good" quality. Tags that have never been set continue to report as "Bad" (out of service).

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