Torque Tool Ethernet Driver Help

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Help version 1.029

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Overview

The Torque Tool Ethernet Driver provides an easy and 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.

Device 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.

Maximum Number of Channels and Devices
The Torque Tool Ethernet Driver supports a maximum of 100 channels and 1024 devices.

Cable Diagrams

Patch Cable (Straight Through)

TD +	1	OR/WHT	OR/WHT	1	TD +
TD -	2	OR	OR	2	TD -
RD +	3	GRN/WHT	GRN/WHT	3	RD +
	4	BLU	BLU	4	
	5	BLU/WHT	BLU/WHT	5	
RD -	6	GRN	GRN	6	RD -
	7	BRN/WHT	BRN/WHT	7	
	8	BRN	BRN	8	

RJ45 / RJ45

10 BaseT

1 2 3 4 5 6 7 8
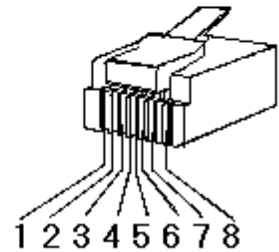
8-pin RJ45

Crossover Cable

TD +	1	OR/WHT	GRN/WHT	1	TD +
TD -	2	OR	GRN	2	TD -
RD +	3	GRN/WHT	OR/WHT	3	RD +
	4	BLU	BLU	4	
	5	BLU/WHT	BLU/WHT	5	
RD -	6	GRN	OR	6	RD -
	7	BRN/WHT	BRN/WHT	7	
	8	BRN	BRN	8	

RJ45 / RJ45

Communications Parameters
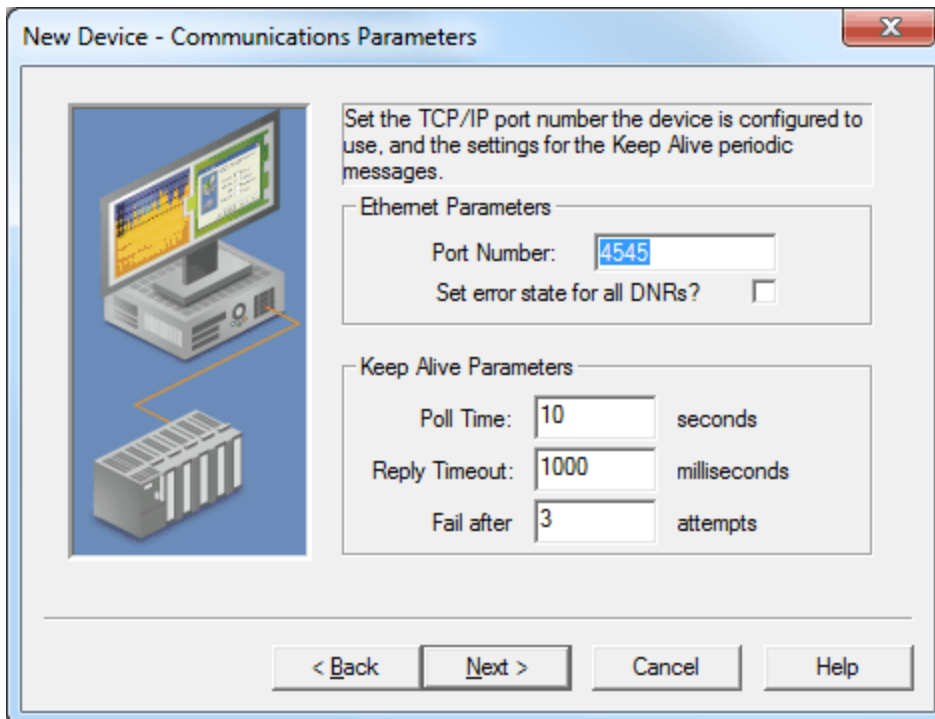
Descriptions of the parameters are as follows:

- **Port Number:** This parameter specifies the port number that the driver will use when connecting to the device. The valid range is 0 to 65535. The default setting is 4545. For Open Protocol, the default setting is 4545. For FEP, the default setting is 9001.
- **Set Error State for All DNRs:** When checked, 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 unchecked.
- **Poll Time:** This parameter specifies 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:** This parameter specifies 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:** This parameter specifies 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.

Settings

The Settings parameters 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.
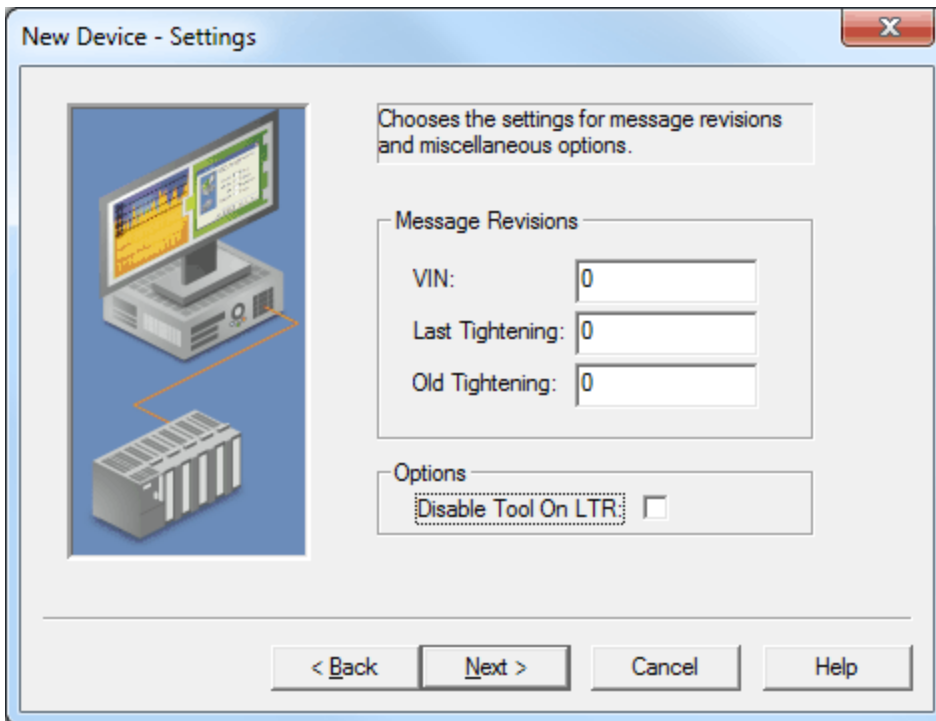
Descriptions of the parameters are as follows:

- **VIN:** This parameter specifies the revision number for the Vehicle Identification Number messages. At this time, 1, 2 is supported. The default setting is 0.
- **Last Tightening:** This parameter specifies the revision number for the Last Tightening Results messages. At this time, 1..5 and 999 (for low-bandwidth version) are supported. The default setting is 0.
- **Old Tightening:** This parameter specifies the revision number for the Old Tightening Results messages. At this time, 1..4 is supported. The default setting is 0.
- **Disable Tool On LTR:** When checked, 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 unchecked.

Optimizing Your Torque Tool Ethernet 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 Torque Tool Ethernet Driver is fast, there are a couple of guidelines that can be used in order 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.
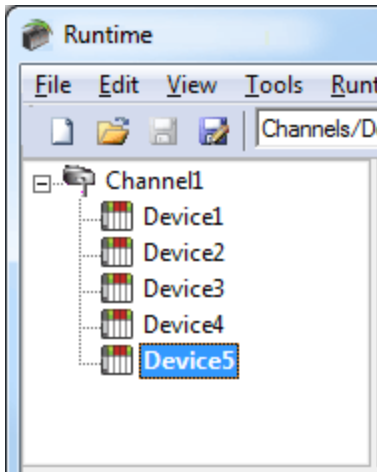
Each device appears under a single Torque Tool Ethernet channel. In this configuration, the driver must move from one device to the next as quickly as possible in order to gather information at an effective rate. As more devices are added or more information is requested from a single device, the overall update rate begins to suffer.

If the Torque Tool Ethernet Driver could only define one single channel, then the example shown above would be the only option available; however, the Torque Tool Ethernet Driver can define up to 100 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.
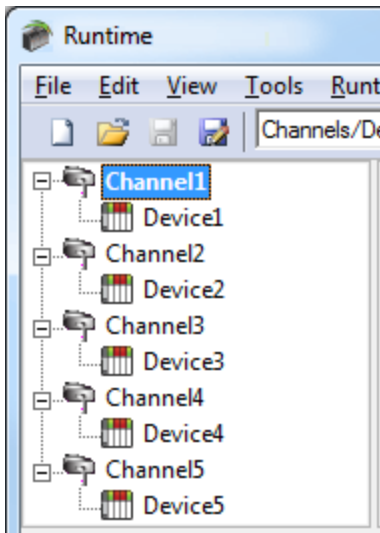
Each device has now been defined under its own channel. In this new configuration, a single path of execution is dedicated to the task of gathering data from each device. If the application has 100 or fewer devices, it can be optimized exactly how it is shown here.

The performance will improve even if the application has more than 100 devices. While 100 or 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
Double*	64 bit floating point value

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

Note: Each tag used in the driver has 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.

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, refer select a link from the list below.

Alarm
Auto-Disable Settings
Flash
Identifiers
Job Info
Job Number Data
Last Tightening Results
Multi Spindle Results
Old Tightening Results
Parameter Set Data
Parameter Set Numbers
Parameter Set Selected
Time
Tool Data
VIN

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
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
0034	Job selected/info subscribe.	Open, FEP
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 abort.	Open, FEP
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
0999	Keep alive.	Open, FEP

*Only supports MID Revision 1 as indicated in Revision 4.62 of the FEP specification.

Command Set: Alarm

The Alarm command set is used to receive alarm data.

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
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

*The ALARM_STATUS flag may not be available, depending on the type of alarm message received.

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.	0-99
AD_BATCH	Word, Short	Read Only	Current batch.	0-99
AM_MODE	Boolean	Read Only	Automatic/Manual mode. 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: 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.	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.

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.	100 characters
ID_BYPASS	Boolean	Write Only	Write any value to this item in order to bypass the next identifier expected in the work order.	N/A
ID_RESET	Boolean	Write Only	Write any value to this item in order 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 in order to reset all identifiers in the 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.*	0-1

			0 = No 1 = Yes	
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: 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.

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
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_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
JOB_RESTART LINK_RESTART	Word, Short	Write Only	Write a job number to this item to restart that job.	0-99
JOB_ABORT LINK_ABORT	Boolean	Write Only	Write any value to this item to abort the current job.	N/A

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

Command Set: Job Number Data

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
JOBN_COUNT LINKN_COUNT	Word, Short	Read Only	Count of the number of valid jobs.	0-99
JOBN_ID LINKN_ID	Word, Short*	Read Only	Valid job numbers (the number available is specified by JOBN_COUNT).	0-99

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

Command Set: Last Tightening Results

The Last Tightening Results command set is used to receive data for the last tightening.

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
LTR_TORQUE_MAX	Float	Read Only	Torque maximum limit.	0-9999.99
LTR_TORQUE_TAR- GET	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_TAR- GET	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	Time stamp.*	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**	Tighting 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.	0-99

			11 = Torque control angle control OR. 12 = Rotate spindle reverse. 99 = No strategy.	
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_STATUS	Word, Short	Read Only	(Rev 2) Rundown angle status. 0 = NOK 1 = OK 2 = High	0-2
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_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 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.	0-1

			Bit 13 = Trigger Lost. Bit 14 = Torque Less Than Target. Bit 15 = Tool Hot. Bit 16 = Multistage Abort. 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.	
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
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 = Abort 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_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

*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.

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 Alarm command set is used to receive alarm data.

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, Short	Read Only	Parameter set (App).	0-999
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

*This item is only supported by the Open Protocol model.
**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. To retrieve the data for a tightening, write the Tightening ID to the OTR_ID field.

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	Time stamp.	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. 11 = Torque control angle control OR. 12 = Rotate spindle reverse. 99 = No strategy.	0-99
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.	0-1
OTR_BSIZE	Word, Short	Read Only	(Rev 2) Batch size.	0-9999
OTR_RASTAT	Word, Short	Read Only	(Rev 2) Rundown angle status.	0-2

			0 = NOK 1 = OK 2 = High	
OTR_CMSTAT	Word, Short	Read Only	(Rev 2) Current monitoring status. 0 = NOK 1 = OK 2 = High	0-2
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. 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 Abort. 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.	0-1
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.	1-4

			1 = Nm 2 = Lbf.ft 3 = Lbf.In 4 = Kpm	
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 = Abort job result. 7 = Sync tightening.	1-7
OTR_ID2	String	Read Only	(Rev 4) Identifier result part 2.	25 characters
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

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

Command Set: Parameter Set Data

The Parameter Set Data command set is used to retrieve data for a specific command set on demand. To retrieve data for a command set, write the command set number to the PSD_ID item.

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 in order 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	Word, Short	Read Only	The number of parameter sets in the list.	0-999

APPN_COUNT				
PSN_ID APPN_ID	Word, Short*	Read Only	The parameter set ID. The array size is defined by the PSN_COUNT. 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 command set, to notify the user when a new command set has been selected, and to control certain batch parameters.

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: 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.	19 characters
TIME_SYNC	Boolean	Write Only	Write any value to this item to set 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.

Item	Data Type	Access	Description	Data Range
TOOLDATA_TSERIAL	String	Read Only	Tool serial number.	14 characters
TOOLDATA_NT	DWord, Long	Read Only	Tool number of tightening.	0-4294967295
TOOLDATA_LCD	String	Read Only	Last calibration date.	19 characters
TOOLDATA_CSERIAL	String	Read Only	Controller serial number.	10 characters
TOOL_ENABLE	Boolean	Write Only	Write a 0 to disable the tool or a 1 to enable the tool.	0-1

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: VIN

The VIN command set is used to receive data about the VIN (Vehicle ID Number).

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 3.	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 3.	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.

Error Descriptions

The following error/warning 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

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 Torque Tool Ethernet device 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 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 Validation Error Messages

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

Address Validation
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

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.

Ethernet Errors

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

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 Torque Tool Ethernet device driver

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 Torque Tool Ethernet device 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.

Runtime Errors

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

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 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>'

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 setting.
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 setting 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:
Serious

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:
Serious

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>' encountered a parsing error

Error Type:
Serious

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:
Serious

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.
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.
30	Controller is not a sync Master.
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.
40	Job line control info subscription already exists.
41	Job line control info subscription does not exist.
42	Identifier input source not granted.
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.
58	No alarm present.
59	Tool currently in use.
60	No histogram available.
80	Reserved.
81	Reserved.
82	Automatic/manual mode subscribe already exists.
83	Automatic/manual mode subscribe 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.

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