

INTRODUCTION

The Ethernet Modbus/TCP protocol does not include a way to detect when communication breaks down between devices. Communication breakdown can be caused by a number of reasons, which include a disconnected cable connector, a severed communications cable, or the master controller program stops running because of a power-down or from a purposeful program stoppage. Loosing communications to a drive can create a dangerous situation, since this can result in the loss of control of a spinning motor. Yaskawa Ethernet Modbus/TCP options have a feature to detect when loss of communications occurs and allows the user to configure the resultant behavior.

INTENDED AUDIENCE

This document assumes that the reader is familiar with Yaskawa AC drives and the Ethernet Modbus/TCP protocol.

COMMUNICATION LOSS METHODS

The methods used for communication loss detection and subsequent reaction in different Yaskawa Modbus/TCP options are similar, but there are some minor differences. The communication loss behaviors of Yaskawa Modbus/TCP options are explained and compared in Table 1.

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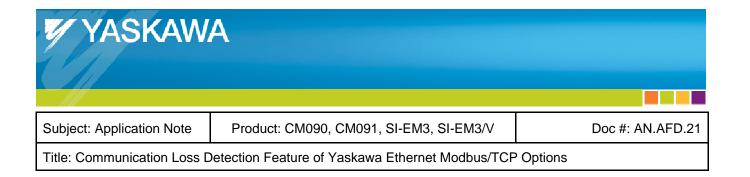
Subject: Application Note	Product: CM090, CM091, SI-EM3, SI-EM3/V	Doc #: AN.AFD.21
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Title: Communication Loss Detection Feature of Yaskawa Ethernet Modbus/TCP Options

Table 1, Communication Loss Behavior in Yaskawa Ethernet Modbus/TCP Options

	Table 1, Communication Loss Behavior in Yaskawa Ethernet Modbus/TCP Options				
#	CM090 and CM091	SI-EM3 and SI-EM3/V			
1	The communication timeout value is set on the	The communication timeout value is set in drive			
	configuration web page. The default value is 5	parameter F7-16. These options allow setting the			
	seconds. The communication loss feature cannot	timeout to a value of 0, which disables this feature			
	be disabled. See Figure 1	and never times out.			
2	The drive's command register (modbus register 1)	The drive's command register (modbus register 1)			
	and Frequency Reference register (modbus	and Frequency Reference register (modbus			
	register 2) can only be written when the Unit $ID = 1$.	register 2) can be written with any value of Unit ID.			
	See the definition of Unit ID below.	See the definition of Unit ID below.			
3	The communication timer will only count when the	The communication timer will only count when the			
	RUN bit in the modbus command word is set true	RUN bit in the modbus command word is set true			
	(bit 0 of modbus register $1 = 1$).	(bit 0 of modbus register 1 = 1).			
4	The communication timer gets reset to 0 on any	The communication timer gets reset to 0 only on			
	access, read or write, while using Unit ID = 1, even	writes to the drive's command register (modbus			
	if an illegal modbus address is used.	register 1).			
5	If the communication timer ever exceeds the	If the communication timer ever exceeds the			
	configured timeout time, the option card will declare	configured timeout value, the option card will			
	an EF0 fault to the drive. The contents of the	declare a BUS ERROR to the drive. The contents of			
	command and frequency reference registers are	the command and frequency reference registers			
	left unchanged.	are left unchanged.			
6	The communication timer will restart on the next	The communication timer will restart on the next			
	access, read or write, to a modbus register with Unit	write to the command register (modbus register 1),			
	ID = 1, providing the RUN bit is still true. Another	providing the RUN bit is still true. Another BUS			
	EF0 will be declared if it times out again.	ERROR will be declared if it times out again.			
7	The way in which the drive reacts to this EF0 fault	The way in which the drive reacts to this BUS			
	can be configured in drive parameter F6-03 (EF0	ERROR can be configured in drive parameter			
	Fault Action).	F6-01 (Communications Error Operation Selection).			
	Current F6-03 values are as follows:	Current F6-01 values are as follows:			
	0: Ramp to stop	0: Ramp to stop			
	1: Coast to stop	1: Coast to stop			
	2:Fast-stop	2:Fast-stop			
	3: Alarm only	3: Alarm only			

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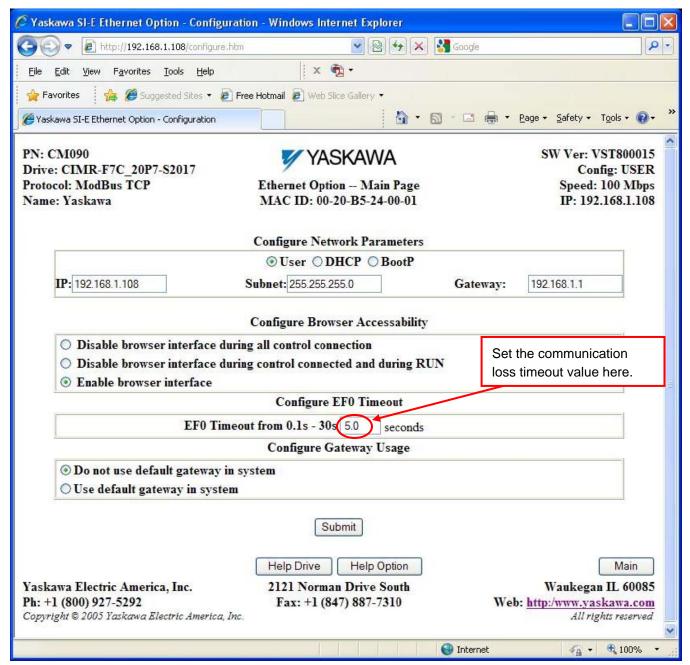
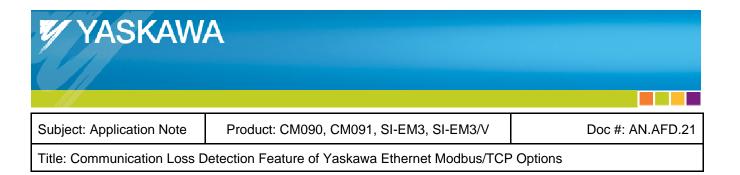


Figure 1, Screenshot of CM090 Configuration Web Page

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UNIT IDENTIFIER (UNIT ID)

The communication loss detection in CM090 and CM091 options utilize a byte in the Modbus command message called the Unit Identifier, or simply Unit ID. The data section of the Modbus/TCP packet contains the Modbus message. In this data section, the master sends commands to the drive and the drive responds. In Modbus messages, byte 1 is the Slave Address. However, in Modbus/TCP, byte 1 is used for intra-system routing purposes. It is typically used to communicate to a Modbus serial line slave through a gateway between a Modbus/TCP network and a Modbus serial line. This field is set by the Modbus master in the command and must be returned with the same value in the response by the slave. This byte is sometimes referred to as the Unit Identifier, or simply Unit ID.

As an example of a Modbus command contained in a Modbus/TCP packet, a Write Single Register command is shown in Table 2. Note that byte 1 contains the Unit ID.

Table 2, Write Single Register Modbus Command

Byte	Description
1	Slave Address / Unit ID
2	Function Code (6)
3	Register Address MSB
4	Register Address LSB
5	Data MSB
6	Data LSB

REFERENCES

Other Yaskawa documents relative to Ethernet Modbus/TCP are shown below.

AN.AFD.01	Ethernet CM090 to AB CLX PLC
AN.AFD.02	Ethernet CM090 to AB PLC5
AN.AFD.03	Ethernet CM090 to AB SLC PLC
AN.AFD.07	Ethernet CM090 to Modicon PLC
IG.AFD.25	Installation Guide for CM090 Modbus TCP/IP 7-Series Option Kit
IG.V7.25	Installation Guide for CM091 Modbus TCP/IP V7 DriveOption Kit
SIEPYEACOM02	Technical Manual for SI-EM3/V Modbus TCP/IP V1000 Drive Option
SIEPYEACOM05	Technical Manual for SI-EM3 Modbus TCP/IP 1000-Series Drive Option
TOEPYEACOM02	Installation Manual for SI-EM3/V Modbus TCP/IP V1000 Drive Option
TOEPYEACOM05	Installation Manual for SI-EM3 Modbus TCP/IP 1000-Series Drive Option

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