

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. Losing 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.

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

PN: CM090
Drive: CIMR-F7C_20P7-S2017
Protocol: ModBus TCP
Name: Yaskawa

YASKAWA
Ethernet Option -- Main Page
MAC ID: 00-20-B5-24-00-01

SW Ver: VST800015
Config: USER
Speed: 100 Mbps
IP: 192.168.1.108

Configure Network Parameters

User DHCP BootP

IP: 192.168.1.108 Subnet: 255.255.255.0 Gateway: 192.168.1.1

Configure Browser Accessibility

Disable browser interface during all control connection
 Disable browser interface during control connected and during RUN
 Enable browser interface

Configure EF0 Timeout

EF0 Timeout from 0.1s - 30s **5.0** seconds

Configure Gateway Usage

Do not use default gateway in system
 Use default gateway in system

Submit

Help Drive Help Option Main

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Figure 1, Screenshot of CM090 Configuration Web Page



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

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