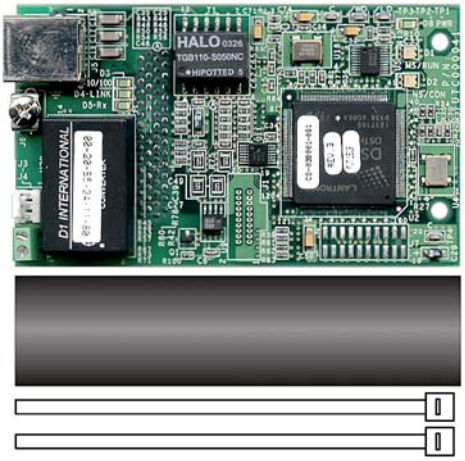
Modbus® TCP/IP Option Kit CM090

☐ This document applies to the Yaskawa F7U, G7U, P7U, E7U and G5M (Spec F) drives. For G5U(HHP) drives, refer to IG.G5HHP.25.

☐ Unpack the *CM090 Modbus TCP/IP Option* kit and verify that all components are present and undamaged.

CM090 Option Kit Parts List	Qty.
Modbus TCP/IP Option Card	1
Shielded RJ-45 M-F Cable	1
Ground Wire	1
4"x1" Insulated Tubing	1
Cable Ties	2
Installation Guide (IG.AFD.25)	1



☐ Connect power to the drive and verify that the drive functions correctly. This includes running the drive from the operator keypad. Refer to the appropriate drive technical manual for information on connecting and operating the drive.

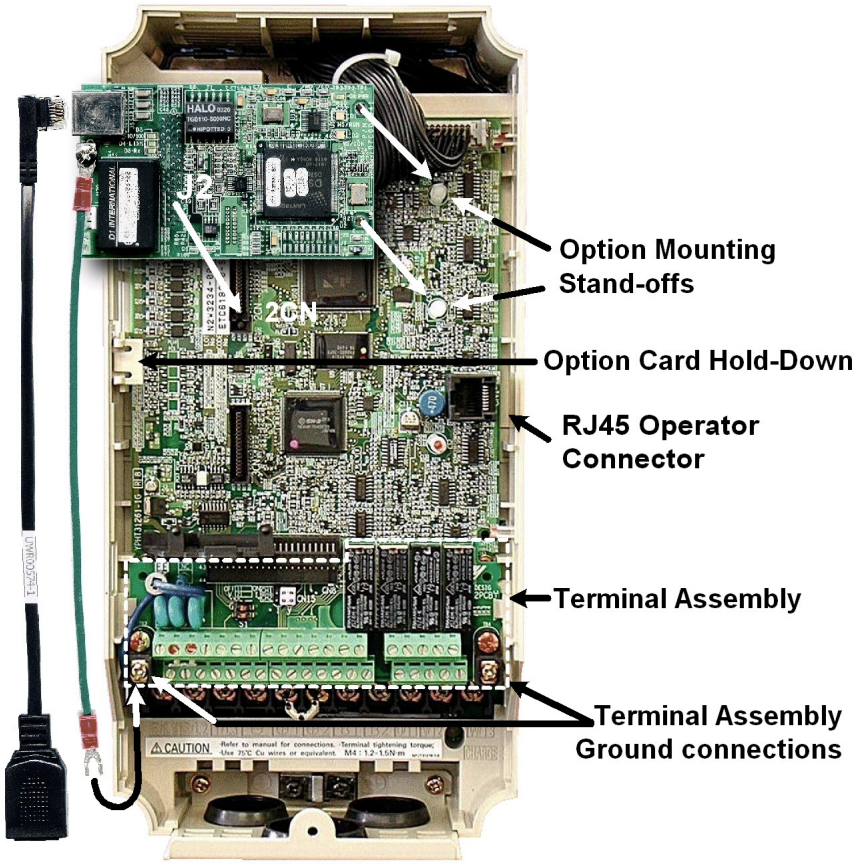
☐ Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.

☐ Remove the operator keypad and drive cover.

- Remove the operator keypad.
- Remove the terminal and control covers.
- Remove the option card hold-down by carefully compressing the top and bottom until it becomes free of its holder. Lift it out.

☐ Mount the *Modbus TCP/IP Option Card* on the drive.

- Connect the RJ-45 M-F cable supplied in the CM090 kit to the *Modbus TCP/IP Option Card*.
- Connect the ground cable supplied to ground terminal J6 on the *Modbus TCP/IP Option Card*.
- Align the J2 connector on the back of the *Modbus TCP/IP Option Card* with its mating 2CN connector on the drive control card.
- Align the two standoffs on the front of the drive control board with the two holes on the right side of the *Modbus TCP/IP Option Card.*
- Press the *Modbus TCP/IP Option Card* firmly onto the drive 2CN connector and standoffs until the J2 connector is fully seated on 2CN and the drive standoffs have locked into their appropriate holes.
- Route the RJ-45 M-F cable and the ground cable along the left-inside of the drive case.
- Replace the option card hold down.
- Connect the *Modbus TCP/IP Option Card* ground wire to the ground terminal on the terminal assembly.



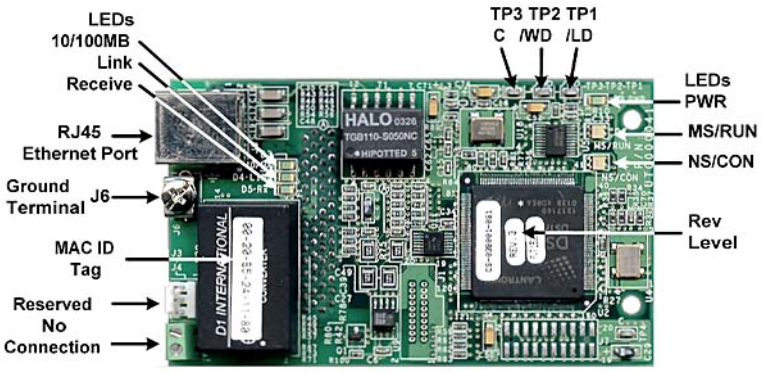
❑ Apply power to the drive and verify that the drive functions correctly.

- Verify that the MS/RUN and PWR LEDs on the *Modbus TCP/IP Option Card* are both GREEN. (Refer to the section on LEDs below)

❑ LED Definitions.

The states of the *Modbus TCP/IP Option Card* LEDs after the power up sequence has completed are described below. Please wait for at least five seconds for the loading process to complete before verifying the status of the LEDs.

Des	Label	Description
D1	MS/RUN	GREEN – Card Functioning Normally RED – Card Failure
D2	NS/CON	GREEN – Connection Made GREEN BLINK – Control Connection Active (500ms cycle) RED – Connection Fault
D3	10/100	GREEN – 100Mbs Connection Speed
D4	LINK	GREEN – Link Established
D5	Rx	GREEN - Message Received
D8	PWR	GREEN - Appropriate Power Supplied to Card

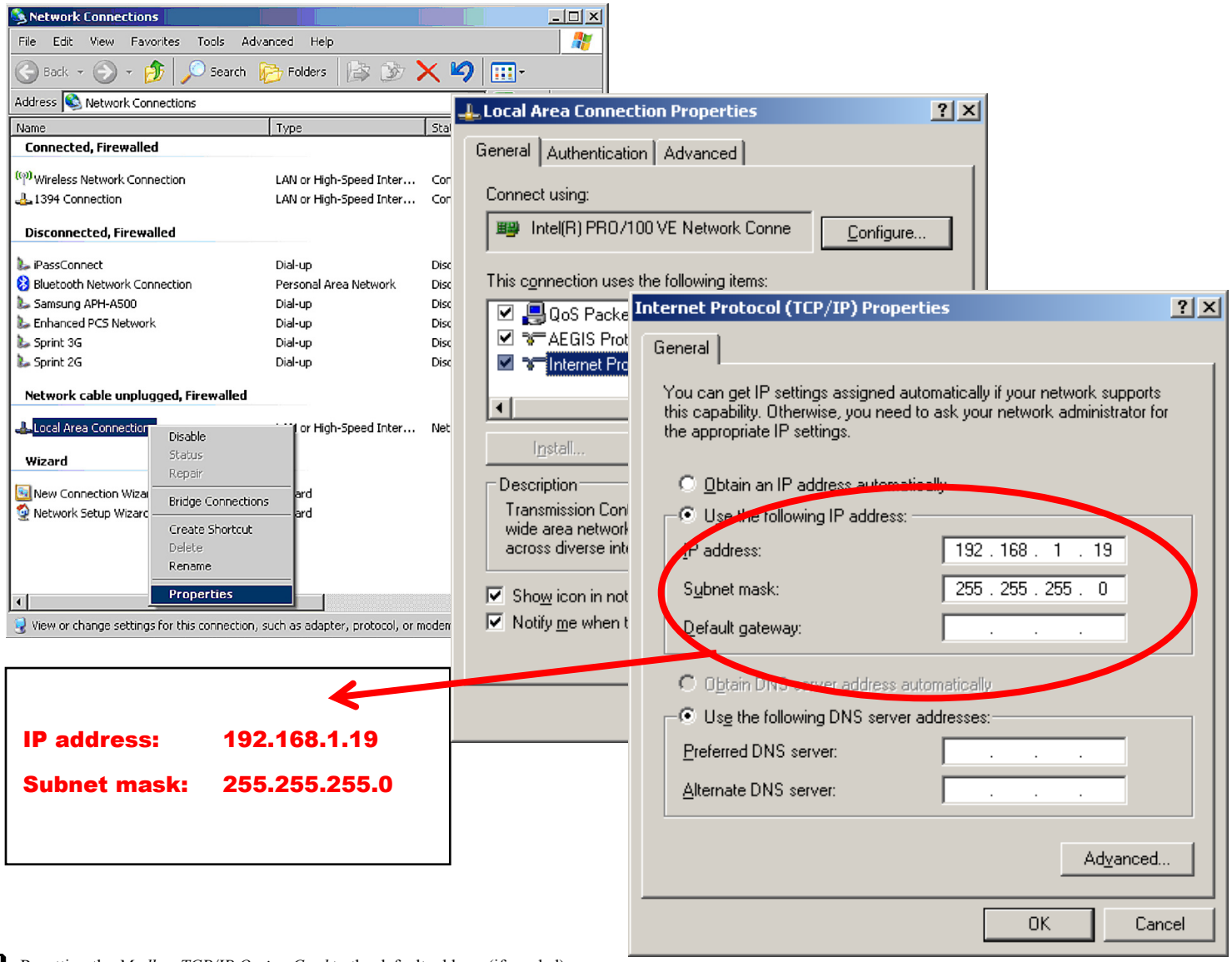


❑ Connect to the *Modbus TCP/IP Option Card*.

- Due to the presence of high voltage in the area of the network connection, insulating the connection is required.
- Prior to connecting the network cable, slide the supplied insulated tubing over the female end of the supplied RJ-45 M-F cable.
  - To connect directly to the *Modbus TCP/IP Option Card*, plug one end of a CAT-5 Ethernet **cross-over** cable into the RJ-45 socket on the RJ-45 M-F cable. Connect the other end to the RJ-45 Ethernet socket on the configuration device, typically a controller, laptop or other PC.
  - To connect through a switch, hub or router, connect the RJ-45 socket on the RJ-45 M-F cable to the switch, hub or router using a standard CAT-5 patch cable.
- After the network connection has been made, slide the insulated tubing over the connection and secure it in place using the supplied cable ties.

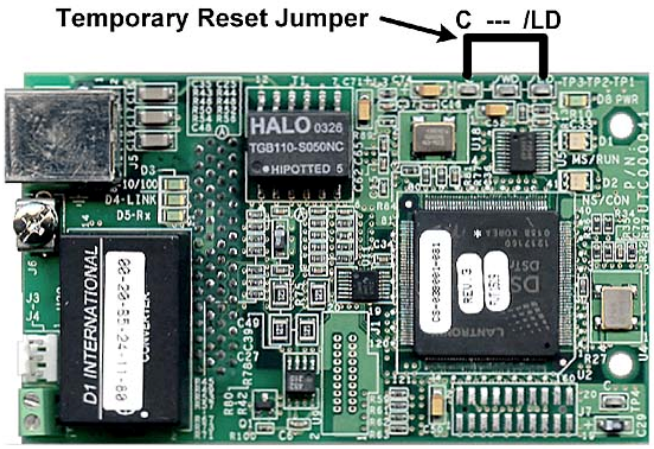
❑ Configure the PC Network Connection.

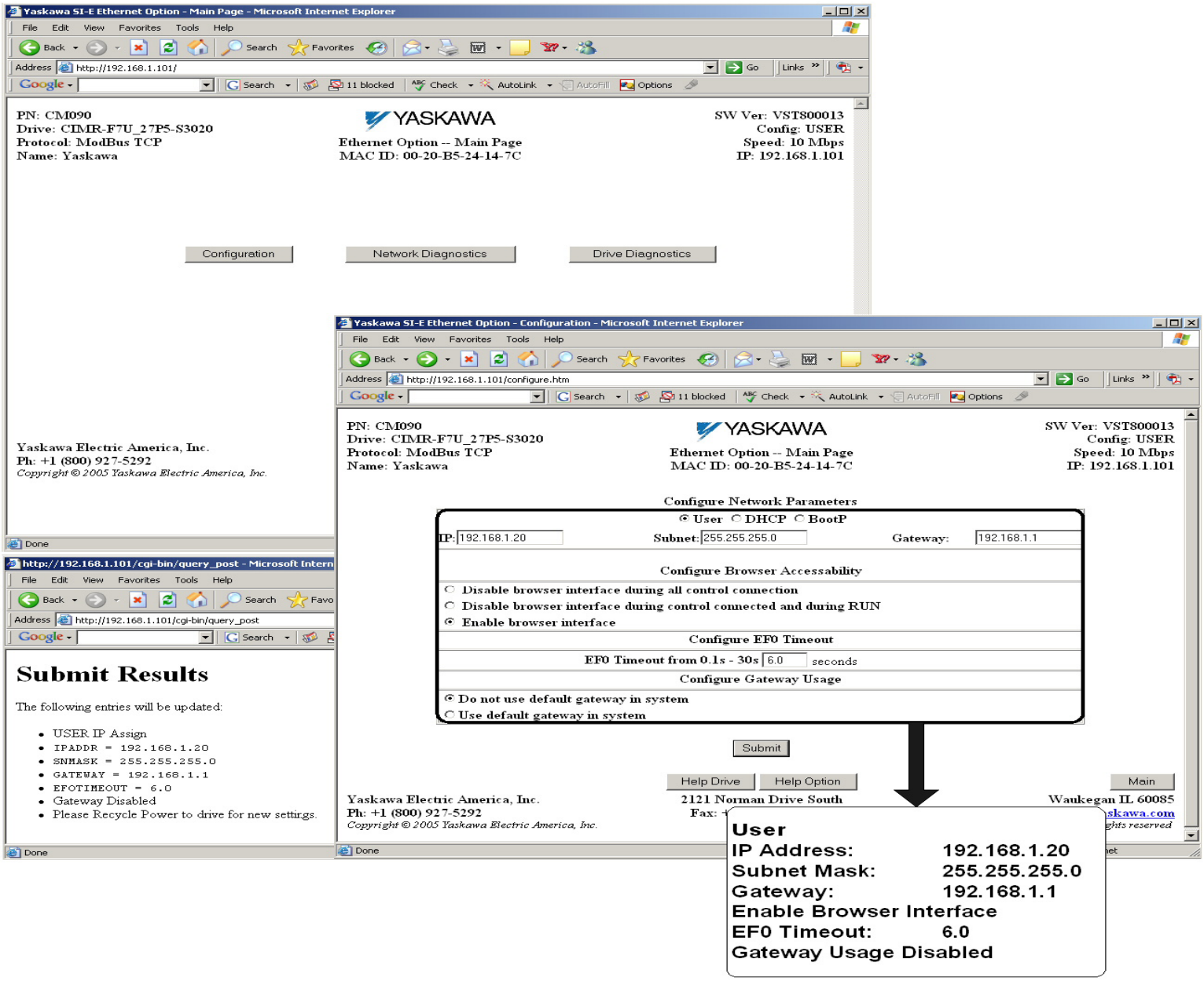
- Select an existing or create a new network connection that will be used to communicate with the *Modbus TCP/IP Option Card*.
  - Select **Start ⇒ Settings ⇒ Network Connections** from the task bar
  - Select the network connection to be used
- Right click on the network connection and select properties from the menu
- Select **Internet Protocol (TCP/IP)** from the components displayed
  - If a TCP/IP selection is not available, it may be installed by selecting **Install.** Note that Administrator access is required and that the operating system installation CD may also be required. Consult with your IT department as needed.
- Select **Properties**
  - If the network connection already has an IP address assigned, ignore the following instructions
  - Select the **Use the following IP address** radio button
  - Enter the **IP address** as **192.168.1.19** and the **Subnet mask** as **255.255.255.0**. Check the system network schematic or with the IT department to make sure that the address does not already exist on the network.
  - Once the **IP address** and **Subnet mask** are entered select **OK**
- It may be necessary to reboot the PC in order for the changes to take affect.



- ☐ Resetting the *Modbus TCP/IP Option Card* to the default address (if needed).
  - The factory default settings are as follows:

    Configure Network Parameters: USER
    IP Address: 192.168.1.20
    Subnet: 255.255.255.0
    Gateway: 192.168.1.1
    EF0 Timeout: 5.0 seconds
    Gateway Usage: Disabled
  - If the web page is not visible, check that the PC has been setup and connected properly. If the PC has been setup and connected properly and the web page is still not visible, the IP address of the *Modbus TCP/IP Option Card* may need to be reset to its factory default as follows:
    - Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.
    - Place a jumper between test points **C** and **/LD** on the *Modbus TCP/IP Option Card* as shown in the figure to the right.
    - Reapply power to the drive and wait approximately 10 seconds for the power-up cycle to complete.
    - Remove power from the drive and remove the jumper between **C** and **/LD** on the *Modbus TCP/IP Option Card*.
    - Reapply power to the drive and wait approximately 10 seconds for the power-up cycle to complete. You should now be able to connect to IP address 192.168.1.20 and open the main web page.





- Configure the *Modbus TCP/IP Option Card*.
  - Select the **Configure** button from the main web page.
  - Select the way in which the *Modbus TCP/IP Option Card* should obtain its network address.
    - **User**. The *Modbus TCP/IP Option Card* will use the network address as entered in the **IP**, **Subnet**, and **Gateway** fields. Check with the system schematic or network administrator to verify that the IP address and subnet mask entered are valid.
    - **DHCP**. The *Modbus TCP/IP Option Card* will get its network address information upon power-up from an appropriate DHCP server.
    - **BootP**. The *Modbus TCP/IP Option Card* will get its network address information upon power-up from an appropriate BootP server.
  - Select the EF0 Timeout Value between 0.1 seconds to 30.0 seconds.
  - Select the Gateway Usage. Connectivity to the *Modbus TCP/IP Option Card* may be limited or nonfunctional if the gateway usage setting and gateway address do not match the network infrastructure in which it is installed.
    - **Do not use default gateway in system.** Use this option to disable the gateway when there is no external gateway in your network.
    - **Use default gateway in system.** Use this option to enable the gateway, when there is an external gateway present on the network. Verify and/or update the gateway address as necessary, so that it correctly matches the address of the installed network gateway equipment.
  - Select the **Submit** button.
  - A confirmation of the entered configuration selections will be displayed.
  - Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.
  - If necessary, reconfigure the network connection of the configuration device to match the entered *Modbus TCP/IP Option Card* configuration.
  - Reapply power to the drive and connect to the desired network.

Finish the *Modbus TCP/IP Option Card* installation.

- Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.
- Reinstall all drive covers and the operator keypad. Apply power to the drive.
- Set parameters b1-01 and b1-02 to their appropriate values. Refer to the table to the right for available b1-01 and b1-02 values.
- Refer to the appropriate programming or parameter access manual for a complete list of drive parameters and registers available. A list of applicable manuals is available at the end of this document.

Parameter	Function	Data	Description	Default
b1-01	Frequency Reference Source Selection	0	Digital Operator	1
		1	Terminal Strip	
		2	Built-in Modbus RTU	
		3	**Option Card (Modbus TCP/IP Option Kit)**	
		4	Pulse Input (F7 and G7 Only)	
b1-02	Run Command Source Selection	0	Digital Operator	1
		1	Terminal Strip	
		2	Built-in Modbus RTU	
		3	**Option Card (Modbus TCP/IP Option Kit)**	

Important Modbus TCP/IP notes.

- It is strongly recommended that shielded CAT-5 cable be used for all network cables.
- A maximum of 10 simultaneous connections are allowed.
- The run command and frequency reference may only be accessed through UNIT ID 1. While the drive is in remote run mode, the run command must be continually refreshed within the configured EF0 timeout value. If the run command is not refreshed within the set timeout period, an EF0 fault will occur. Refer to the appropriate drive manual for information on EF0 and setting the appropriate drive response. If a UNIT ID 1 connection is active, the NS/CON LED will blink at approximately a 500ms cycle.
- The TCP/IP connection must be refreshed within 60 seconds. If it is not refreshed within 60 seconds, the connection will be closed.
- This implementation of Modbus TCP/IP supports Modbus functions 3 (read multiple registers), 6 (write single register), 16 (write multiple registers), and 23 (read/write multiple registers).
- Refer to the appropriate programming or parameter access manual (TM.XX.11) for a complete list of drive parameters and registers available. A list of applicable manuals is available at the end of this document. Aside from command registers, Modbus TCP/IP and Modbus RTU share all other registers.
- The table below lists the Modbus TCP/IP command registers. *These are different from Modbus RTU command registers.* These are designed to be used as part of the standard PLC I/O or scan table, where fast response is required. Other register values should be accessed via individual messages, i.e. via an MSTR block.
- Addresses 0001h, 0002h, 0003h, 0004h, 0007h, 0008h, and 0009h may be written while all other registers in the table below are read only. Addresses 0001h and 0002h may only be accessed through UNIT ID 1 (see above).

Address	Description		
0001h	Command	0h	Forward Run Input
		1h	Reverse Run Input
		2h	Multi-Function Digital Input S3
		3h	Multi-Function Digital Input S4
		4h	Multi-Function Digital Input S5
		5h	Multi-Function Digital Input S6
		6h	Multi-Function Digital Input S7
		7h	Multi-Function Digital Input S8 (G5/F7/G7)
		8h	External Fault (EF0) Input
		9h	Fault Reset Input
		Ah	Multi-Function Digital Input S9 (G7)
		Bh	Multi-Function Digital Input S10 (G7)
		Ch	Multi-Function Digital Input S11 (G7)
		Dh	Multi-Function Digital Input S12 (G7)
		Eh	Fault Log Trace Clear Input
		Fh	External Base Block Input
0002h	Frequency Reference		
0003h	Torque Reference/Torque Limit		
0004h	Torque Compensation		
0007h	Analog Output FM (21 for G5)		
0008h	Analog Output AM (23 for G5)		
0009h	Multi-function Digital Outputs	0h	Multi-function Digital Output 1
		1h	Multi-function Digital Output 2
		2h	Multi-function Digital Output 3 (G5/F7/G7)
		3h	Multi-function Digital Output 4 (G5/F7/G7)
		4h	Multi-function Digital Output 5 (G5/F7/G7)
2000h	Status Word 1	0h	@ Run
		1h	@ Zero Speed
		2h	@ Reverse Direction
		3h	@ Fault Reset Active
		4h	@ Speed Agree
		5h	@ Drive Ready
		6h	@ Minor Fault (Alarm)
		7h	@ Fault
		8h	@ OPE Fault (Keypad Setting Error)
		9h	@ Power Loss Ride Thru

Address	Description		
2000h	Status Word 1 (continued)	Ah	@ Remote Mode
		Bh	Multi-Function Output 1 (M1-M2)
		Ch	Multi-Function Output 2 (M3-M4)
		Dh	Multi-Function Output 3 (M5-M6)
		Eh	@ Motor 2 Selected
		Fh	@ Zero Servo Complete
2001h	Speed Feedback Monitor (U1-05)		
2002h	Torque Reference Monitor (U1-09)		
2003h	Encoder (PG) Count Channel 1 Monitor		
2004h	Frequency Reference Monitor (U1-01)		
2005h	Output Frequency Monitor (U1-02)		
2006h	Output Current Monitor(U1-03)		
2007h	Analog Input A2 Monitor (U1-16) (Terminal 14 for G5)		
2008h	DC Bus Voltage Monitor (U1-07)		
2009h	Error Signal 1	0h	PUF DC Bus Fuse Failure
		1h	UV1 Main Circuit Undervoltage
		2h	UV2 Control Power Undervoltage
		3h	UV3 Pre-Charge Contactor Failure
		4h	Reserved
		5h	GF Ground Fault
		6h	OC Overcurrent
		7h	OV Overvoltage
		8h	OH Drive Overheat
		9h	OH1 Motor Overheat Alarm
		Ah	OL1 Motor Overload
		Bh	OL2 Drive Overload
		Ch	OL3 Overtorque Detection 1
		Dh	OL4 Overtorque Detection 2
		Eh	RR Braking Transistor Failure
		Fh	RH Braking Resistor Overheat
200Ah	Error Signal 2	0h	EF3 External Fault 3
		1h	EF4 External Fault 4
		2h	EF5 External Fault 5
		3h	EF6 External Fault 6

Address	Description		
200Ah	Error Signal 2 (continued)	4h	EF7 External Fault 7
		5h	Reserved
		6h	Reserved
		7h	OS Overspeed
		8h	DEV Speed Deviation
		9h	PGO Encoder (PG) Loss
		Ah	PF Input Phase Loss
		Bh	LF Output Phase Loss
		Ch	OH3 Motor Overheat 1
		Dh	OPR Operator Disconnected
		Eh	ERR EEPROM Write Failure
		Fh	OH4 Motor Overheat 2
200Bh	Error Signal 3	0h	CE Communication Loss
		1h	BUS Option Card Error
		2h	Reserved
		3h	Reserved
		4h	CF Loss of Control
		5h	SVE Zero Servo Error
		6h	EF0 Option Card External Fault
		7h	FBL PID Feedback Loss
		8h	UL3 Undertorque Detection 1
		9h	UL4 Undertorque Detection 2
		Ah	OL7 High Slip Brake Overload
		Bh	Reserved
		Ch	Reserved
		Dh	Reserved
		Eh	Reserved
		Fh	CPF Control Bd Hardware Fault
200Ch	Analog Input A1 Monitor (U1-15) (Terminal 13 for G5)		
200Dh	Digital Input Status (Bit Field of Terminals S1-S8)		
200Eh	Analog Input A3 Monitor (U1-17) (Terminal 16 for G5)		
200Fh	PG Count Channel 2 Monitor (when PG-W2 is installed)		
2010h	Drive Software Number (U1-14)		

Modbus® TCP/IP Option Kit CM090

Copies of this Installation Guide along with all technical manuals in ".pdf" format and support files may be obtained from either the CD supplied with the drive or from **www.yaskawa.com**. Printed copies of any Yaskawa manual may be obtained by contacting the nearest Yaskawa office. Information on Modbus TCP/IP may be obtained from **www.modbus.org.**

Reference documents:

- ***Modbus TCP/IP Option Card Installation Guide*** **– IG.AFD.25**
- ***Modbus TCP/IP Option Card Installation Guide for G5HHP*** **– IG.G5HHP.25**
- ***G5M Technical Manual*** **– TM.4515**
- ***G5M Modbus Technical Manual*** **– TM.4025**
- ***F7U Drive User Manual*** **– TM.F7.01**
- ***F7U Drive Programming Manual*** **– TM.F7.02**
- ***F7U Drive Parameter Access Technical Manual*** **– TM.F7.11**
- ***G7U Drive Technical Manual*** **– TM.G7.01**
- ***G7U Drive Parameter Access Technical Manual*** **– TM.G7.11**
- ***P7U Drive User Manual*** **– TM.P7.01**
- ***P7U Drive Programming Manual*** **– TM.P7.02**
- ***P7U Drive Parameter Access Technical Manual*** **– TM.P7.11**

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