V7 Modbus® TCP/IP Option Kit CM091

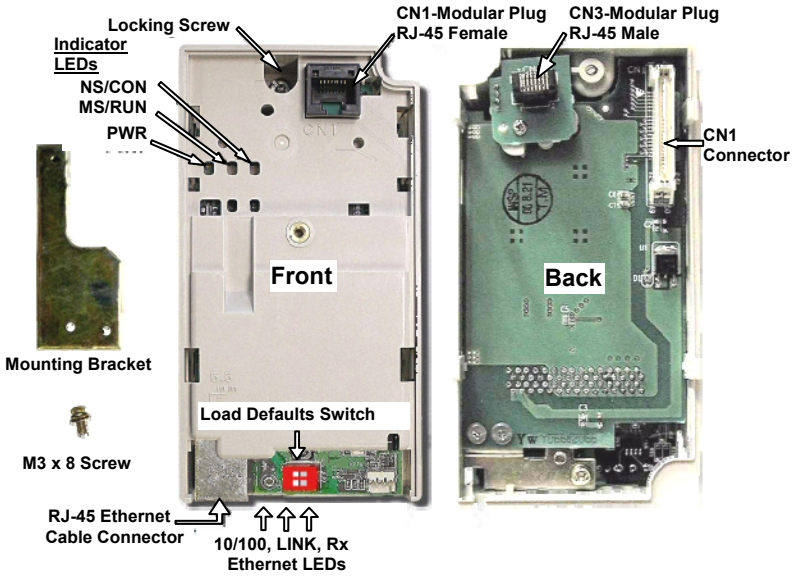
1. **Applicable products: Standard V7 drives (CIMR-V7AM*) with Ethernet specific software installed (Not V74X or V7N). Check V7 monitor U-10 or the PRG # on the V7 nameplate for version 8340 or 8350 software.**

   Note: *To order a V7 with Ethernet software, use the following part number format: CIMR-V7AM****1-057. There is no charge for this upgrade.*

2. **When using this kit, it is strongly recommended that no connections be made to the V7 drive's DC Bus terminals (+1 to -) on models CIMR-V7AMxxxx1, where xxxx is 25P5, 27P5, 45P5, or 47P5. A connection for a DC reactor (+1 to +2) or braking resistor (B1 to B2) is allowed.**

3. **Unpack the *CM091 V7 Modbus TCP/IP Option Kit* and verify that all components are present and undamaged.**

CM091 V7 Modbus TCP/IP Option Kit Parts	Qty.
V7 MODBUS TCP/IP Option Ring Kit	1
Option Mounting Bracket	1
Mounting Bracket Screw (M3 x 8)	1
Ferrite (Power and Motor Leads)	2
Ferrite (Ethernet Cable)	1
Cable Ties	3
Installation Guide (IG.V7.25)	1



4. **Connect power to the V7 drive and verify that the V7 functions correctly.** This includes running the V7 from the operator keypad. Refer to the ***V7 Technical Manual***, TM.V7.01, for information on connecting and operating the V7 drive.

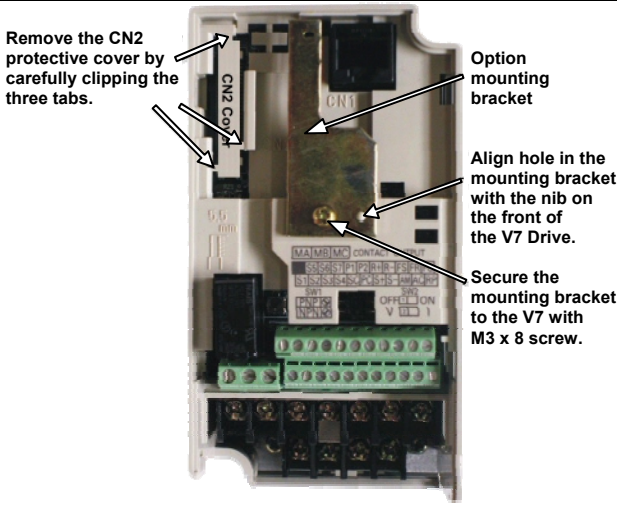
5. **Remove power from the V7 and wait for the charge lamp to be completely extinguished.** Wait at least five additional minutes for the V7 to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.

   ⚠ WARNING!
   Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

6. **Remove the operator keypad and V7 drive cover.**
   1. Remove the terminal cover by removing the retaining screw and lifting out the cover.
   2. Remove the operator keypad.

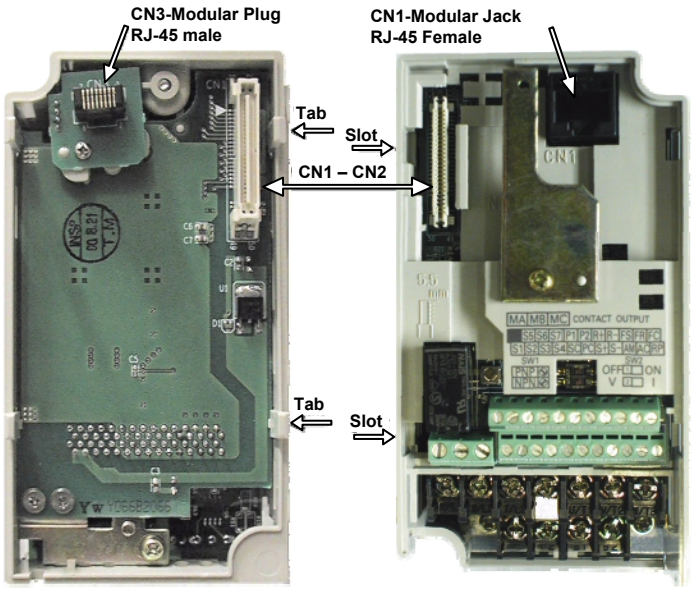
7. **Remove the CN2 cover from the V7 drive housing.** Carefully snip the 3 tabs connecting the CN2 cover to the V7 housing and remove the cover.

8. **Attach the Mounting Bracket.** Align the mounting bracket as shown in the figure to the right. Secure the mounting bracket to the V7 drive housing using the M3 x 8 screw provided.



9. **Wire the V7 I/O terminals** prior to mounting the *V7 Modbus TCP/IP Option* ring kit, as the option will obscure power and control terminals when mounted.

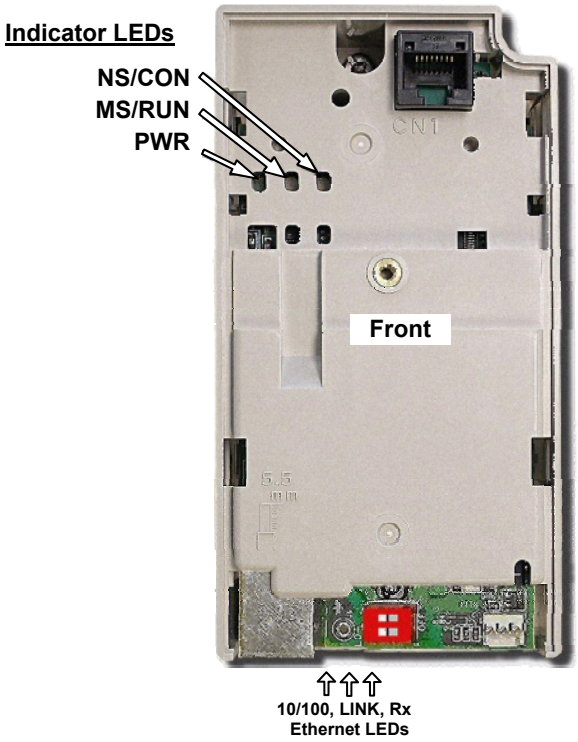
10. **Mount the *V7 Modbus TCP/IP Option* ring kit on the V7 drive.**
    1. Do NOT connect a ground wire to the screw on the back of the *V7 Modbus TCP/IP Option* kit.
    2. Align the CN1 connector on the back of the option with its mating CN2 connector on the front of the V7.
    3. Simultaneously align connector CN3 (male RJ-45) on the back of the option with connector CN1 (female RJ-45) on the front of the V7.
    4. Align the tabs on the option with their corresponding slots on the front of the V7.
    5. Press the option and the V7 drive together until the tabs lock into their associated slots.
    6. Secure the option to the V7 by tightening the locking screw at the top-center of the option.
    7. Reinstall the operator keypad and all V7 covers.



11. LED Descriptions

The *V7 Modbus TCP/IP Option* LEDs status after the power up sequence is described below. Please wait for at least five seconds for the loading process to complete before verifying the status of the LEDs.

LED	Description
MS/RUN	**GREEN – Card Functioning Normally** RED – Card Failure
NS/CON	**GREEN – Connection Made** **GREEN BLINK – Control Connection Active** (500ms cycle) RED – Connection Fault
10/100	GREEN – 100MBPS Connection Speed
LINK	**GREEN – Link Established**
Rx	GREEN - Message Received
PWR	**GREEN - Appropriate Power Supplied to Card**



12. Connect to the *V7 Modbus TCP/IP Option* card.

Note: It is strongly recommended that shielded CAT-5 cable be used.

1. Connect to the Ethernet network.
   - 1.1. **Direct connection:** To connect directly to the *V7 Modbus TCP/IP Option* card, plug one end of a shielded CAT-5 **cross-over** cable into the RJ-45 socket on the *V7 Modbus TCP/IP Option* card. Connect the other end to the RJ-45 Ethernet socket on the configuration device, typically a controller, laptop or other PC.
   - 1.2. **Connection through hub or switch:** To connect through a switch, hub or router, connect *V7 Modbus TCP/IP Option* card to the switch, hub or router using a standard shielded CAT-5 patch cable.
2. **Loop the CAT-5 Ethernet cable through the provided ferrite** (Intermark RFC-13) and connect the ferrite as close to the RJ-45 connection as possible. Secure the ferrite to the Ethernet cable with the provided cable tie. If the ferrite core cannot be mounted in your installation please contact Yaskawa for application assistance. See the figure in the lower right corner of this page.
3. **Attach the provided ferrites** to the V7 drive motor and power leads as close to the V7 drive terminals as possible (typically within 1 foot). Secure the ferrites to the motor and power leads with the provided cable ties. See the figure in the lower right corner of this page.

Successful Initialization:

The *V7 Modbus TCP/IP Option* kit hardware is installed and operating correctly with the LEDs in the states shown in **bold text** in the "LED Descriptions" table. The LINK LED represents the status of the physical connection to the network and is not indicative of any card state.

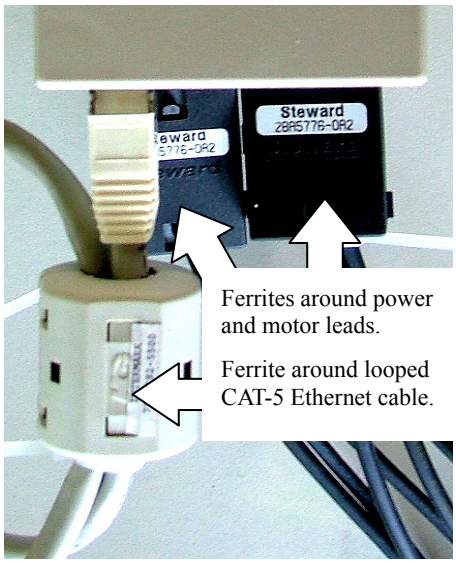
13. Configure the PC Network Connection.

1. Select an existing connection or create a new network connection for communication with the *V7 Modbus TCP/IP Option* card.
   - 1.1. Select **Start ⇒ Settings ⇒ Network Connections** from the task bar in the Windows OS.
   - 1.2. Select the network connection to be used.
2. Right click on the network connection and select **Properties** from the menu.
3. Select **Internet Protocol (TCP/IP)** from the components displayed.

   Note: If a TCP/IP selection is not available, it may be installed by selecting **Install.** Administrator access to the PC and the operating system installation CD-ROM may also be required.
   - 3.1. Select **Properties**.

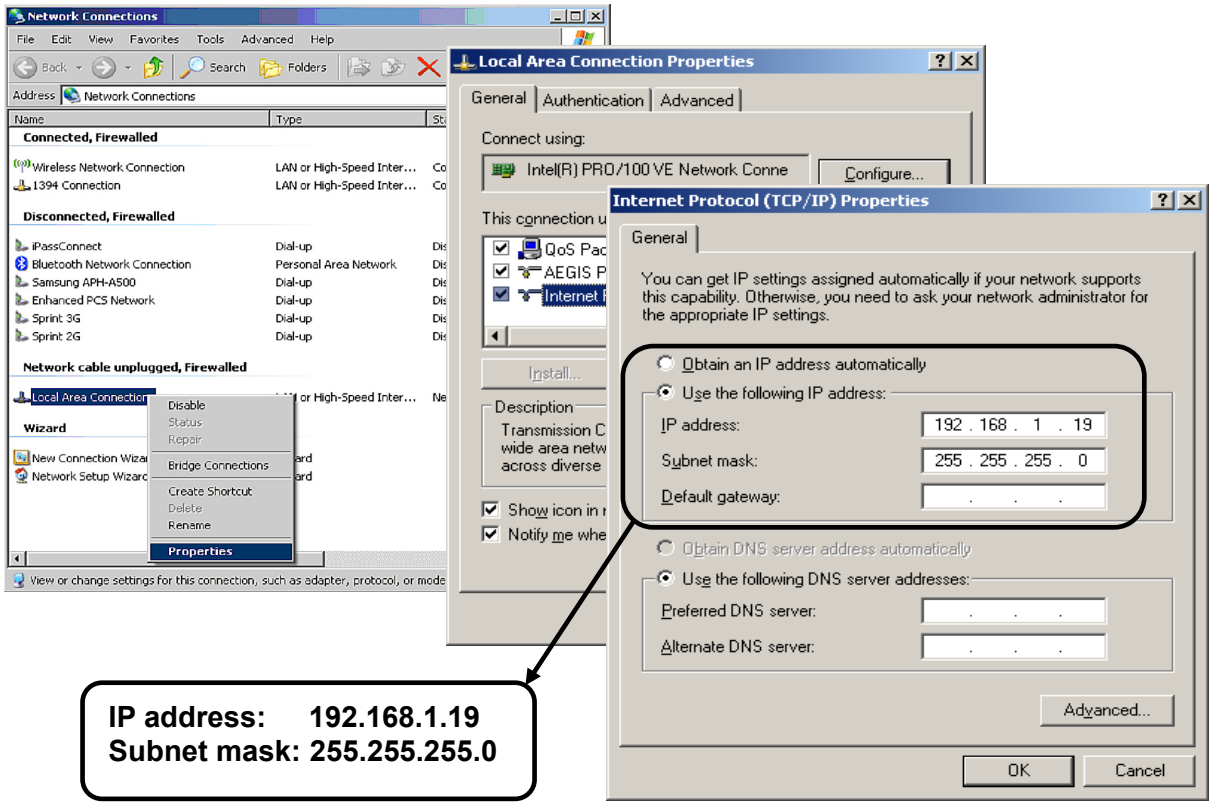
     Note: It is very important to record the existing network setup so that the configuration PC can be restored to its original configuration.
   - 3.2. Select the **Use the following IP address** radio button.
   - 3.3. Enter the **IP address** as **192.168.1.19** and the **Subnet mask** as **255.255.255.0**. Check the system network schematic or with your network administrator to ensure that the IP address does not already exist on the network.
   - 3.4. Once the **IP address** and **Subnet mask** are entered, select **OK**.

Note: It may be necessary to reboot the PC in order for the changes to take affect.



Application of Ferrites:

The *V7 Modbus TCP/IP Option* kit includes 3 ferrites which must be mounted to the Ethernet cable, incoming power leads, and motor leads. See Section 12, steps 2 and 3.



14. Resetting the *V7 Modbus TCP/IP Option* card to the default address (if needed).

1. 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

Symptom: The *V7 Modbus TCP/IP Option* card main web page does not display on the PC web browser screen.

Corrective Action: Check that the PC is setup and properly connected.

If the web page is still not visible after confirming PC setup, then reset the IP address of the *V7 Modbus TCP/IP Option* card to its factory default as follows:

1.1. Remove power from the V7 drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the V7 to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.

> **⚠ WARNING!**
> Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

1.2. Slide the bottom Load Defaults **(LD)** switch **(SW1)** to the **ON** position.

1.3. Reapply power to the V7 and wait approximately 10 seconds for the power-up cycle to complete.

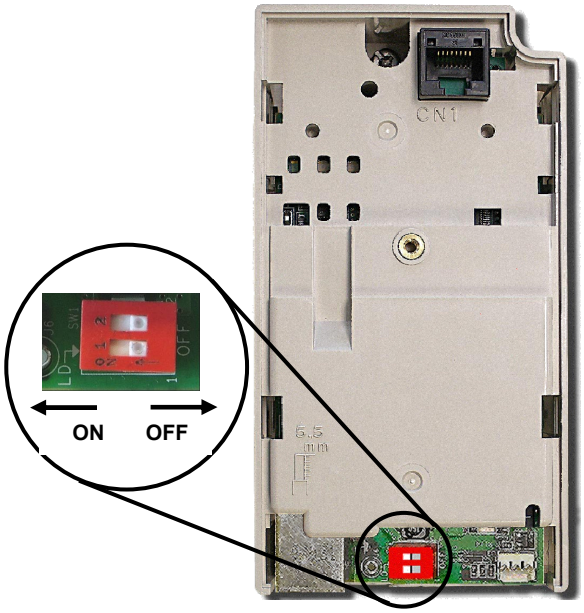
Note: Additional wait time (approximately 2 minutes) may be required if utilizing the DHCP feature of this card, and the DHCP server is not available, or it did not respond to the request for an IP address. The *V7 Modbus TCP/IP Option* card will indicate that the load defaults is complete when the MS/RUN LED is displaying a steady green status indication after the wait time.

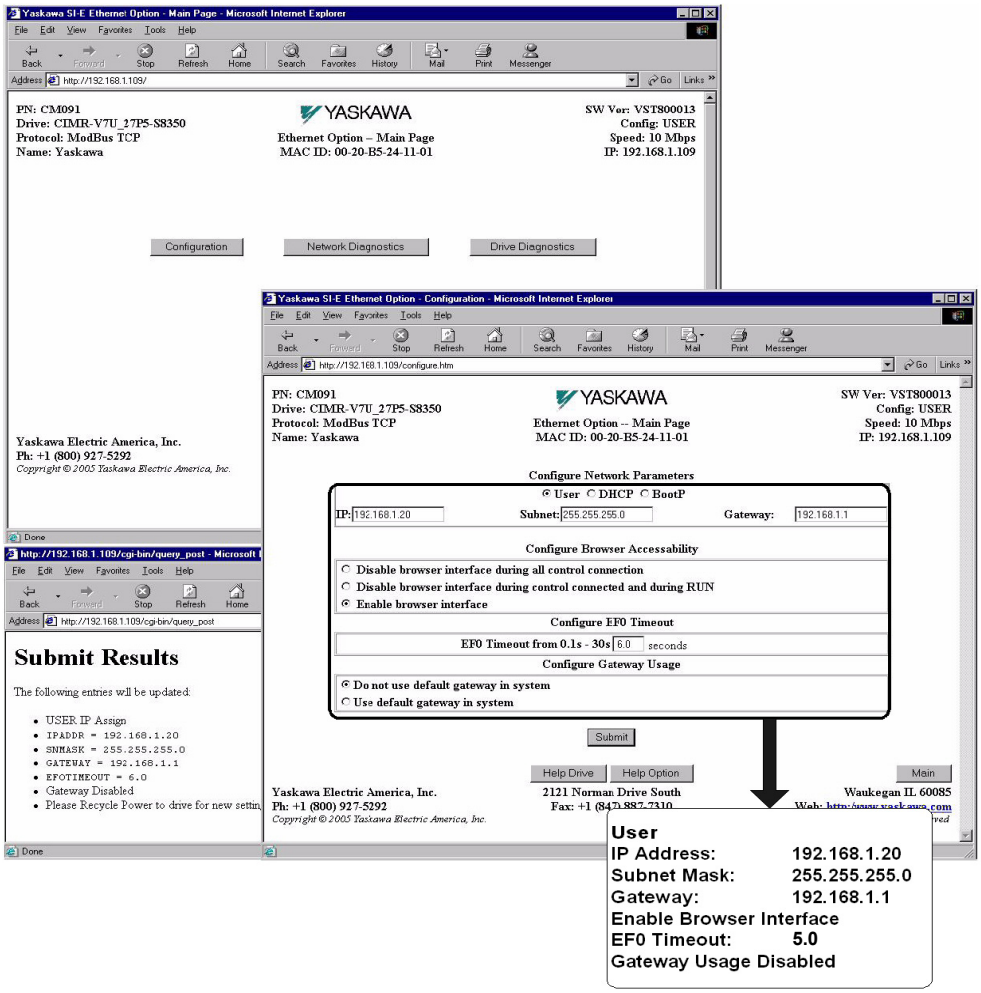
1.4. Remove power from the V7 and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the V7 to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.

1.5. Slide the bottom Load Defaults **(LD)** switch **(SW1)** to the **OFF** position.

1.6. Reapply power to the V7 and wait approximately 10 seconds for the power-up cycle to complete.

1.7. Direct the PC web browser to IP address 192.168.1.20 and the *V7 Modbus TCP/IP Option* card main web page should now be displayed.





15. Configure the *V7 Modbus TCP/IP Option* card.

1. Select the **Configure** button from the *V7 Modbus TCP/IP Option* card main page.
2. Select the way in which the *V7 Modbus TCP/IP Option* card should obtain its network address.
   - 2.1. **User**. The *V7 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.
   - 2.2. **DHCP**. The *V7 Modbus TCP/IP Option* card will get its network address information upon power-up from an appropriate DHCP server.
   - 2.3. **BootP**. The *V7 Modbus TCP/IP Option* card will get its network address information upon power-up from an appropriate BootP server.
3. Select the **EF0 Timeout Value** between 0.1 seconds to 30.0 seconds.
4. Select the **Gateway Usage**. Connectivity to the option card may be limited or nonfunctional, if the gateway usage setting and gateway address does not match the network infrastructure in which it is installed.
   - 4.1. **Do not use default gateway in system.** Use this option to disable the gateway when there is no external gateway in your network.
   - 4.2. **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.
5. Select the **Submit** button.
6. A confirmation of the entered configuration selections will be displayed in the web browser on the Submit Page.
7. Remove power from the V7 drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the V7 to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.

> **⚠ WARNING!**
> Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

8. If necessary, reconfigure the network connection of the configuration device to match the entered *V7 Modbus TCP/IP Option* card configuration.
9. Reapply power to the V7 and connect to the desired network. Refresh the web browser to verify that the main web page is displayed.

16. **Remove power from the V7 drive** and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the V7 to be completely discharged. Measure the DC bus voltage and verify that it is at a safe level.

> **⚠ WARNING!**
> Dangerous voltages in excess of 400VDC (230V drives) or 800VDC (460V drives) are present at the DC bus terminals of the drive.

17. **Reinstall the operator keypad and terminal cover.**
18. **Reapply power to the V7 drive.**
19. **Set parameters n003 and n004 to their appropriate values.**

Important Notes:

1. **Note:** A maximum of 10 simultaneous connections are allowed.
2. The Run Command and Frequency Reference may only be accessed through UNIT ID 1. While the V7 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 V7 manual for information on EF0 and setting the appropriate V7 response. If a UNIT ID 1 connection is active, the NS/CON LED will blink at approximately a 500ms cycle.
3. The TCP/IP connection must be refreshed within 60 seconds. If it is not refreshed within 60 seconds, the connection will be closed.

Address	Parameter	Function	Data	Description	Default
103h	n003	Operation Method Selection	0	Operator Keypad	1
			1	Terminal Strip	
			2	Built-in Modbus RTU	
			3	**Option Kit** ***(V7 Modbus TCP/IP Option)***	
104h	n004	Reference Selection	0	Operator Keypad Potentiometer	2
			1	Operator Keypad	
			2	Voltage Reference (0-10VDC)	
			3	Current Reference (4-20mA)	
			4	Current Reference (0-20mA)	
			5	Pulse Train Reference	
			6	Built-in Modbus RTU	
			7	Multi-Function Analog Input (0-10VDC)	
			8	Multi-Function Analog Input (4-20mA)	
			9	**Option Kit** ***(V7 Modbus TCP/IP Option)***	
198h	n152	Display Scaling	0	0.01 Hz	0
			1	0.1 %	
			2-39	RPM (Enter motor poles)	
			40-3999	User Setting	

4. This implementation of Modbus TCP/IP supports the following Modbus functions: 3 (read multiple registers), 6 (write single register), 16 (write multiple registers) and 23 (read/write multiple registers).
5. Refer to the appropriate programming or parameter access manual for a complete list of V7 parameters and registers available. A list of applicable manuals is available at the end of this document.

---

20. **Notes:**
    1. **It is strongly recommended that shielded CAT-5 cable be used**. Verify that the shield is continuous to the drive and that it is grounded only at the drive end.
    2. **DriveWizard version 6.1 or later with a custom database is required** for DriveWizard to operate with this option. Install DriveWizard with the "Custom" install option checked and the appropriate databases selected.

---

21. Registers Available via High-Speed Command Registers

Command Register access is 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 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). Please note that Modbus RTU has different command registers.

Address	Description		
0001h	Digital Input Command	0h	Multi-Function Digital Input S1 (Forward Run)
		1h	Multi-Function Digital Input S2 (Reverse Run)
		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	Reserved
		8h	External Fault (EF0)
		9h	Fault Reset
		Ah-Dh	Reserved
		Eh	Fault Log Trace Clear
		Fh	External Base Block
0002h	Frequency Reference Command (Scaled by n152)		
0009h	Digital Output Command	0h	Terminals MA, MB, MC
		1h	Terminals P1, PC
		2h	Terminals P2, PC
2000h	Status Word	0h	During Run
		1h	Zero Speed
		2h	Reverse Direction
		3h	During Fault Reset
		4h	Speed Agree
		5h	Drive Ready
		6h	Minor Fault (Alarm)
		7h	Major Fault
		8h	OPE Fault
		9h	Momentary Powerloss Ride Thru
		Ah	Local Mode
		Bh	Digital Output Terminals MA, MB, MC
		Ch	Digital Output Terminals P1, PC
		Dh	Digital Output Terminals P2, PC
		Eh-Fh	Reserved

Address	Description		
2001h	Output Frequency (U-02) (Scaled by n152)		
2002h	Torque Monitor (U-08) (1%) (Open Loop Vector only)		
2003h	Reserved		
2004h	Frequency Reference Monitor (U-02) (Scaled by n152)		
2005h	Output Frequency (U-02) (Scaled by n152)		
2006h	Output Current (U-03) (0.1A)		
2007h	Pulse Input (Terminal RP) Value		
2008h	DC Bus Voltage (U-05) (1VDC)		
2009h	Error Signal 1	0h	Reserved
		1h	UV1 Main Circuit Undervoltage
		2h	UV2 Control Power Undervoltage
		3h	Reserved
		6h	OC Overcurrent
		7h	OV Overvoltage
		8h	OH Overheat
		9h	Reserved
		Ah	OL1 Motor Overload
		Bh	OL2 Drive Overload
		Ch	OL3 Overtorque Detection
		Dh-Fh	Reserved
200Ah	Error Signal 2	0h	EF3 External Fault S3
		1h	EF4 External Fault S4
		2h	EF5 External Fault S5
		3h	EF6 External Fault S6
		4h	EF7 External Fault S7
		5h ~ Ch	Reserved
		Dh	oPA Operator Disconnected
		Eh ~ Fh	Reserved

Address	Description		
200Bh	Error Signal 3	0h	CE Communications Fault
		1h	BUS Option Error
		2h ~ 5h	Reserved
		6h	EF0 Option External Error
		8h	UL3 Undertorque Detection
		9h ~ Eh	Reserved
		Fh	Fxx Hardware Fault
200Ch	Reserved		
200Dh	Digital Input Terminal Status	0h	Terminal S1
		1h	Terminal S2
		2h	Terminal S3
		3h	Terminal S4
		4h	Terminal S5
		5h	Terminal S6
		6h	Terminal S7
		7h ~ Fh	Reserved
200Eh	Analog Input (Terminal FR) Value (0.1VDC)		
200Fh	Reserved		
2010h	Drive Software Number (U-10)		

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 V7 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:

V7 Drive Technical Manual – **TM.V7.01**

Technical Manual for V7 Modbus RTU – **TM.V7.11**

YASKAWA ELECTRIC AMERICA, INC.
Chicago-Corporate Headquarters
2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone: (800) YASKAWA (800-927-5292) Fax: (847) 887-7310
Internet: http://www.yaskawa.com

YASKAWA ELECTRIC CORPORATION
New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo, 105-0022, Japan
Phone: 81-3-5402-4511 Fax: 81-3-5402-4580
Internet: http://www.yaskawa.co.jp

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone: 49-6196-569-300 Fax: 49-6196-888-301