YASKAWA

VS-606V7/VS mini J7
MEMOBUS INSTRUCTION MANUAL

VS-606V7 Series (All Models)

VS mini J7 Series (All Models) (Corresponding to optional units)

YASKAWA ELECTRIC CORPORATION

CONTENTS

1. INTRODUCTION

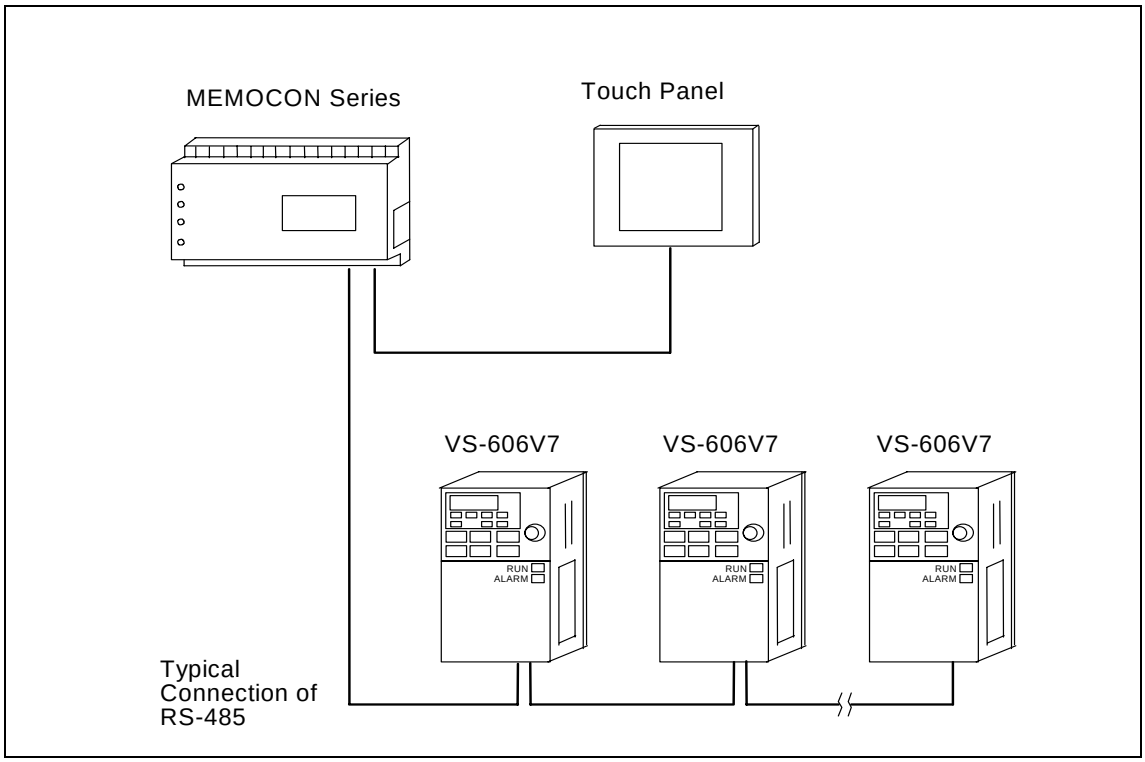
Serial communication is available with VS-606V7 (hereinafter called V7) and VS mini J7* series (hereinafter called J7) using programmable controller (PLC) and MEMOBUS protocol.

This instruction manual describes only MEMOBUS. For details of the inverter unit operation, refer to the VS-606V7 Series INSTRUCTION MANUAL (Manual No.: TOE-S606-11) or the VS mini J7 Series INSTRUCTION MANUAL (Manual No.: TOE-S606-12).

○ Configuration of MEMOBUS (MODBUS) Communications

MEMOBUS system is composed of a single master (PLC) and slaves (1 to 31 inverter units) Communication between master and slave is controlled according to the master program with the master initiating communication and the slave responding.

Basically, the master can send a command only to one slave except at simultaneous broadcasting. Even if several slaves are connected, the master selects the slave to send a command by specifying the pre-registered address No. (slave address) and sends the command to it. The slave receives the communication to carry out designated functions and responds to the master.



* VS mini J7 series can perform MEMOBUS by mounting the optional unit (model: SI-485/J7).

○ Communications Specifications

Interface	RS-422, RS-485
Synchronization	Asynchronous (Start-stop synchronization)
Communication parameters	Baud rate: Selected from 2400/4800/9600/19200 bps Data length: 8 bits fixed Parity: Selected from even/odd/none Stop bits: 1 bit fixed
Communication protocol	MEMOBUS (MODBUS) (RTU mode only)
Max. number of inverters that can be connected	31 units (When using RS-485)

2. CONTROL CIRCUIT TERMINAL ARRANGEMENT AND WIRING

V7 Control Circuit Terminal Arrangement

	S5	S6	S7	P1	P2	R+	R-	FS	FR	FC	
S1	S2	S3	S4	SC	PC	S+	S-	AM	AC	RP	

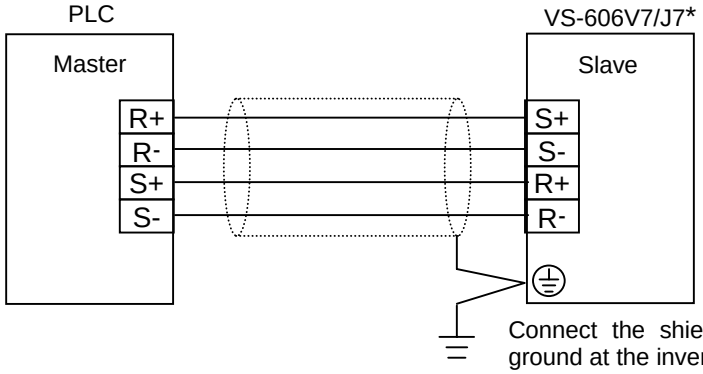
J7 Control Circuit Terminal Arrangement

S1	S2	S3	S4	S5	SC	FS	FR	FC	AM	AC

J7 Optional Communication Unit
SI-485/J7 Terminal Arrangement

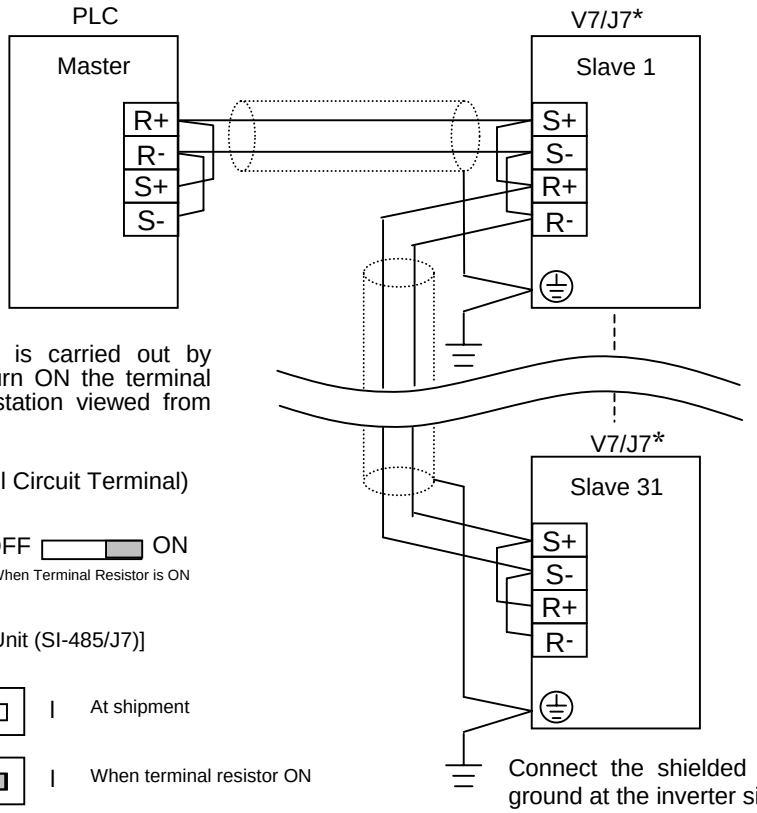
S-	S+	SG	R-	R+

Connection Example) When RS-422A (4-wire Type) is Used



Connect the shielded cable to the ground at the inverter side.

Connection Example) When RS-485 (2-wire Type) is Used

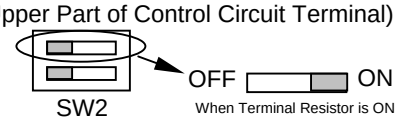


Terminal resistor

When communication is carried out by RS-422 or RS-485, turn ON the terminal resistor at the END station viewed from the PLC.

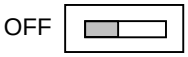
When V7 is Used

(Upper Part of Control Circuit Terminal)

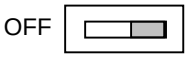


When J7 is Used

[Front Panel of Optional Unit (SI-485/J7)]



At shipment



When terminal resistor ON

Connect the shielded cable to the ground at the inverter side.

*When J7 is used on the MEMOBUS, mount the optional unit model SI-485/J7 (separately available) on the J7 inverter unit.

○ Precautions on Wiring

(1) Separate the wiring for communication from the main circuit wiring or other power lines.

(2) Use shielded cables for communication wiring; connect the shielded sheath to the ground terminal and terminate the other end to prevent it from being connected.

3. CONSTANTS RELATED TO COMMUNICATIONS

Constants related to communication must be set when communicating with PLC.

Note: If the constants setting of n151 to n157 (for V7) or n68 to n74 (for J7) is changed, turn OFF the inverter power supply, and turn it ON again after the LED display is completely erased. The new setting is enabled when the power supply is turned ON again.
Any data of constants n151 to n157 or n68 to n74 cannot be changed or set for communication. Use the digital operator.

Constant No.		Name	Description	Initial Setting
V7	J7			
n003	n02	Run command selection	0: Operator 1: Control circuit terminals 2: MEMOBUS	0
n004	n03	Frequency reference selection	0: Operator 1: Frequency ref. 1 (V7: n024, J7: n21) 2: Control circuit terminal (voltage 0 to 10V) 3: Control circuit terminal (current 4 to 20mA) 4: Control circuit terminal (current 0 to 20mA) 5: Pulse train (for V7 only) 6: MEMOBUS	0
n151	n68	MEMOBUS timeover detection (Monitors transmission time between the receiving the correct data from the PLC.) (Timeover: 2 sec.)	0: Timeover detection (coast to a stop) 1: Timeover detection (decelerates to a stop with deceleration time 1) 2: Timeover detection (decelerates to a stop with deceleration time 2) 3: Timeover detection (continuous operation, alarm is displayed) 4: Timeover detection not provided	0
n152	n69	MEMOBUS frequency reference and frequency monitor unit	0: 0.1 Hz 1: 0.01 Hz 2: 30000/100% (30000 = Max. output frequency) 3: 0.1%	0
n153	n70	MEMOBUS slave address	Setting range: 0 to 32*, setting unit: 1	0
n154	n71	MEMOBUS bps selection	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps	2
n155	n72	MEMOBUS parity selection	0: Even parity 1: Odd parity 2: No parity	0
n156	n73	Transmission waiting time	Setting range: 10 ms to 65 ms Setting unit: 1 ms	10 ms
n157	n74	RTS control	0: RTS control 1: No RTS control (RS-422 peer-to-peer communication)	0

* Setting the slave address to 0 disregards any command from any reference from the master and does not give any response.

Monitoring run status from the PLC, setting/referencing of constants, fault reset and multi-function input reference can be performed regardless of run command or frequency reference selection. Multi-function input reference from PLC becomes OR with input commands from S1 to S7 (J7: S2 to S5) multi-function input terminals.

Run command selection (V7: n003, J7: n02)

Selects how to input a run command. Run status monitoring from PLC, constant setting/referencing, fault reset and multi-function input reference are valid regardless of the selection. Multi-function input reference from PLC becomes OR with input commands from the control circuit terminal.

Frequency reference selection (V7: n004, J7: n03)

Selects how to input a frequency reference. Run status monitoring from PLC, constant setting/referencing, fault reset and multi-function input are valid regardless of the selection. Multi-function input reference from PLC becomes OR with the input reference from the control circuit terminal.

MEMOBUS timeover detection (V7: n151, J7: n68)

Inverter processes as follows according to the setting if data cannot be received more than two seconds after the data are once received from the PLC.

Setting	Contents
0	A communication error at timeover. "CE" lights and motor coasts to a stop.
1	A communication error at timeover. "CE" lights and motor decelerates to a stop at deceleration time 1 (V7: n020, J7: n17).
2	A communication error at timeover. "CE" lights and motor decelerates to a stop at deceleration time 2 (V7: n022, J7: n19).
3	A communication error at timeover. "CE" blinks and operation continues.
4	Timeover detection is not performed.

For communication errors, refer to 4.2 OPERATION AT ERRONEOUS COMMUNICATIONS.

MEMOBUS frequency reference and frequency monitor unit (V7: n152, J7: n69)

Selects the frequency reference from PLC, frequency reference monitor by communication, and frequency unit by output frequency monitor.

V7 and J7 output frequency calculation resolution is 0.01 Hz. When 30000/100% or 0.1% unit is selected, V7 and J7 convert the received frequency reference into the units of 0.01 Hz and round off the value of the digit below 0.001 Hz. Therefore, some frequency reference values may not coincide with the output frequencies.

The following shows the display units for digital operator frequency monitor (FREF) and output frequency monitor (FOUT).

	V7 Frequency Unit		J7 Frequency Unit	
Frequency Reference/Monitor	99.99 Hz or less	100.0 Hz or more	99.9 Hz or less	100 Hz or more
Display Unit	0.01 Hz	0.1 Hz	0.1 Hz	1Hz

MEMOBUS slave address (V7: n153, J7: n70)

Sets the slave address number. Set the address number which does not overlap any address of other slaves connected on the same communication line.

Transmission waiting time (V7: n156, J7: n73)

For details, refer to 6.3 REQUIRED TIME FOR COMMUNICATIONS.

RTS control (V7: n157, J7: n74)

Set RTS control to “no RTS control” when RS-422 uses one master and one slave. Set it to “RTS control” when RS-485 or RS-422 has one master and n slaves.

4. OPERATION WHILE WAITING FOR COMMUNICATIONS AND AT ERRONEOUS COMMUNICATIONS

4.1 OPERATION WHILE WAITING FOR COMMUNICATIONS

When communication is selected in either the run command selection or the frequency reference selection or in both, and from when the power supply is turned ON to when correct data are received from PLC, the digital operator displays "CAL" (CALL) blinking, indicating that the inverter is waiting for communications. The digital operator also sets the inverter ready signal to 0 (OFF).

When normal data are received to the self-station from the PLC, "CAL" stops blinking and being displayed, and the inverter ready signal turns to 1 (ON).

4.2 OPERATION AT ERRONEOUS COMMUNICATIONS

Error contents are stored in holding register number "003DH" if a communications error is detected when data is received with V7 or J7. If a communications error is detected, no response is returned from V7 or J7. OR of the communications error contents is stored in register number "003DH" until a fault reset command is input. A fault reset command can be input from the digital operator, control circuit input terminal (only when fault reset is selected at multi-function input selection is selected) or communication run signal (holding register number "0001H") fault reset.

Communications Errors Stored in Holding Register "003DH"

Bit	Name	Description
0	CRC error	1 = Improper CRC of sending data from PLC
1	P1 "ON"	1 = Improper length of sending data from PLC
2	(Not used)	
3	Parity error	1 = Parity error occurs.
4	Overrun error	1 = Overrun error occurs.
5	Framing error	1 = Framing error occurs.
6	Timeover	1 = Normal data cannot be received more than 2 seconds.
7 to 15	(Not used)	

When communication is selected in either run command selection or frequency reference selection or in both, and when MEMOBUS timeover detection (V7: n151, J7: n68) is set to either of 0 to 3, timeover occurs if normal data cannot be received more than two seconds after the data are once received from the PLC. When V7 or J7 detects timeover, "CE" is displayed and performs operation corresponding to the setting of MEMOBUS timeover detection (V7: n151, J7: n68).

To reset "CE" fault, the inverter must receive the correct data at least one time two seconds before a fault reset signal is input. The "CE" fault cannot be reset when communications are not performed. In addition, the run signal must be turned OFF for fault reset.

5. PROCEDURE FOR COMMUNICATIONS WITH PLC

The following describes how to do communications with the PLC.

1. Connect the communication cable between the PLC and V7 or J7 after the power supply is turned OFF.
2. Turn the power ON.
3. Set the constants required for communications with MEMOBUS by using the digital operator. (V7: n151 to n157, J7: n68 to n74)
4. Turn the power OFF once to verify that the operator display is completely erased.
5. Turn ON the power supply again.
6. Communications with the PLC is ready.

6. COMMUNICATIONS PROCEDURE

Communications between the master and the slaves is controlled by the master's program. In any case, the master sends a command to a slave, and the slave executes the command and responds to the master. The master sends a serial data (command message) in the specified order to the slave, and the slave receives the commands from the master to read and execute them. Then slave sends the data (response message) back to the master.

> Holding registers and register numbers
> The inverter memory area that can be set or referenced from the master is called holding register. Each holding register has a register number. For data setting/referencing from the master, specify the register number for the starting number of a message. For details of the holding registers, refer to 9 LIST OF HOLDING REGISTER NUMBERS.

6.1 MESSAGE CONFIGURATION

A message is composed of the following four sections: a slave address, a function code, data, and an error check, which must be sent in that order. Fig. 6.1 shows the configuration of a message.

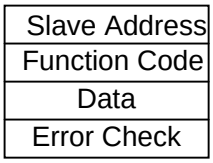


Fig. 6.1

(1) Slave address

Number in the range of pre-registered 0 to 32 for each slave. The master communicates with one slave.

A command message from the master is received by all the connected slaves, but only the slave whose address coincides with the slave address in the command message can take that command message.

On the other hand, the same data (run command, reverse run command, external fault, fault reset, frequency reference) can be set simultaneously for all the connected slaves by setting 0 to the slave address in the command message sent from the master. This is called **simultaneous broadcasting**. Simultaneous broadcasting cannot be used for reading out holding resisters or a loop back test since a response message is not sent back to the master. The frequency reference unit at simultaneous broadcasting is fixed at 30000/100% disregarding the setting of the constant n152 (V7) or n69 (J7).

(2) Function code

The master specifies the function to be executed by the slave by using a function code.

Table 6.1 describes the function codes

Function Code (Hexadecimal)	Function	Max. Qty per Message	Remarks
03H	Reading holding register contents	16	
08H	Loop back test	-	
10H	Writing in several holding registers	16	Simultaneous broadcasting available

(3) Data

Data necessary for the slave to execute the function command.

The required data differ depending on the function command. Refer to the description of the message format for each function command.

(4) Error check

Data for an error check is sent at the end of the message in order to detect the message error (bit change) when communicating.

An error check is carried out by CRC-16 (cyclic redundancy check-16). For details, refer to 7.4 CRC-16 CALCULATIONS.

6.2 SLAVE RESPONSE

When a slave receives a command message from the master, it performs various checks. If nothing is wrong, the command message in the receiving buffer is moved to the execution buffer. If something is wrong, the command message is disregarded and no procedure is taken.

When the received message is correct, the contents of the command message are decoded and executed. After that the slave prepares a response message for the master and transfers it to the sending buffer. If there is an error in the command message (for example, a function code that does not exist is provided, etc.), the slave does not execute the command and prepares a response message indicating the error and transfers it to the sending buffer.

When the response message arrives in the sending buffer, it is sent to the master.

(1) Response during normal conditions

With the loop back function, the slave returns the same response message as the command message. With the function to write to several holding registers, the slave returns a part of command message (slave address, function code, start number, number of holding registers) as the command message.

With read-out function, the slave address and the function code must be the same as the command message and the read out data are added.

(2) Response at erroneous condition

If a fault (excluding communications error) occurs in the contents of a command message, the slave does not execute anything and returns a response message as shown in Fig. 6.2. The master knows whether the sent command message has been executed by checking the response message function. If there is any fault, the contents of the fault can be examined by the subsequent error code. (For details, refer to 10. ERROR CODES.)

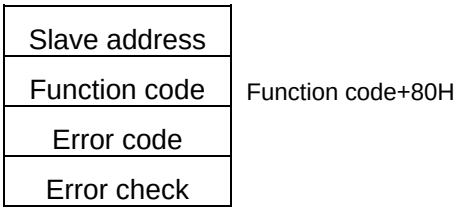


Fig. 6.2

(3) No response

The slave disregards the command message and does not respond in the following cases. If the slave address in the command message is "0" at the write-in function, all slaves execute the command but do not return any response.

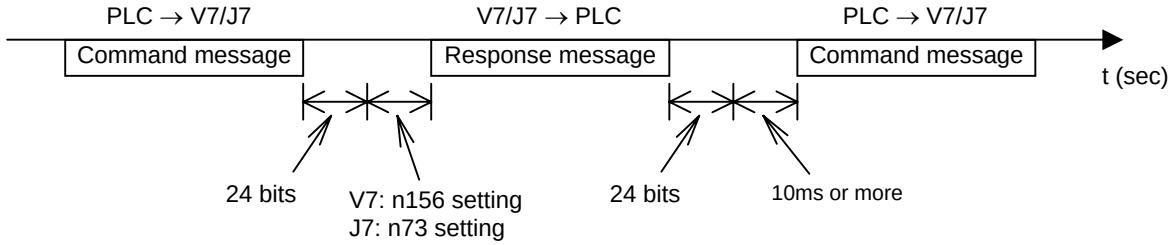
- A communications error (one of the following: overrun, framing, parity or CRC-16) is detected in the command message.
- The slave address in the command message does not coincide with the slave address (V7: n153, J7: n70) set in the slave.
- The interval between the data composing the message exceeds 24 bits.
- The data length of the command message is improper.

Note: Provide a timer for the master to monitor the response so that the same command message will be sent again if no response is returned within the time.

6.3 REQUIRED TIME FOR COMMUNICATIONS

The time from when the V7 or J7 receives the data from the PLC to when it returns the data to the PLC is: [24 bits + Set value of constant n156 (V7) or n73 (J7)].

When the PLC sends the next data to the V7 or J7 after receiving the data from V7 or J7, the interval must be: [24 bits + 10 ms or more].



7. MESSAGE FORMAT

A message format is shown in Fig. 6.1. The data length (quantity) and the contents differ depending on the functions. Table 7.1 shows the message length for each function.

Note: Communication error occurs if the data continues after CRC-16 (lower digit), do not add any data after CRC-16.

Table 7.1

Function Code (Hexadecimal)	Function	Command message		Response Message	
		Minimum (Byte)	Maximum (Byte)	Minimum (Byte)	Maximum (Byte)
03H	Reading holding resistor contents	8	8	7	37
08H	Loop back test	8	8	8	8
10H	Write in several holding resistors	11	41	8	8

7.1 READ OUT HOLDING REGISTER CONTENTS [03H]

Reads out the contents of the holding registers with the continuous numbers for the specified quantity. The contents of holding registers are divided into the upper 8 bits and the lower 8 bits. They become the data items in response message in the order of numbers.

(Example)

Reads out status signal, fault contents, data link status and frequency reference from the slave 2 V7 or J7.

Command Message

Slave address		02H
Function code		03H
Start No.	Upper	00H
	Lower	20H
Quantity*	Upper	00H
	Lower	04H
CRC-16	Upper	45H
	Lower	F0H

Response message (at Normal Operation)

Slave address		02H
Function code		03H
Number of data		08H
First holding register	Upper	00H
	Lower	65H
Next holding register	Upper	00H
	Lower	00H
Next holding register	Upper	00H
	Lower	00H
Next holding register	Upper	01H
	Lower	F4H
CRC-16	Upper	AFH
	Lower	82H

Command Message (at Faulty Operation)

Slave address		02H
Function code		83H
Error code		03H
CRC-16	Upper	F1H
	Lower	31H

*: If the quantity is 0 or exceeds 16, error code “03H” is returned.

7.2 LOOP BACK TEST [08H]

Command message is returned as a response message without being changed. This function is used to check communication between the master and the slave. Any arbitrary values can be used for test codes or data.

(Example)

Loop-back test of slave 1 V7 or J7

Command Message

Slave address		01H
Function code		08H
Test code	Upper	00H
	Lower	00H
Data	Upper	A5H
	Lower	37H
CRC-16	Upper	DAH
	Lower	8DH

Response Message (at Normal Operation)

Slave address		01H
Function code		08H
Test code	Upper	00H
	Lower	00H
Data	Upper	A5H
	Lower	37H
CRC-16	Upper	DAH
	Lower	8DH

Command Message (at Faulty Operation)

Slave address		01H
Function code		88H
Error code		01H
CRC-16	Upper	86H
	Lower	50H

7.3 WRITING TO SEVERAL HOLDING REGISTERS [10H]

Specified data are written into the several specified holding registers from the specified number, respectively. Written data must be arranged in a command message in the order of holding register numbers; from upper eight bits to lower eight bits.

(Example)

Set forward run at frequency reference 60.0 Hz to slave 1 V7 or J7 from the PLC.

Command Message

Slave address *1		01H
Function code		10H
Start No.	Upper	00H
	Lower	01H
Quantity *2	Upper	00H
	Lower	02H
Number of data *2		04H
First data	Upper	00H
	Lower	01H
Next data	Upper	02H
	Lower	58H
CRC-16	Upper	63H
	Lower	39H

Response Message (at Normal Operation)

Slave address		01H
Function code		10H
Start No.	Upper	00H
	Lower	01H
Quantity	Upper	00H
	Lower	02H
CRC-16	Upper	10H
	Lower	08H

Command Message (at Fault Operation)

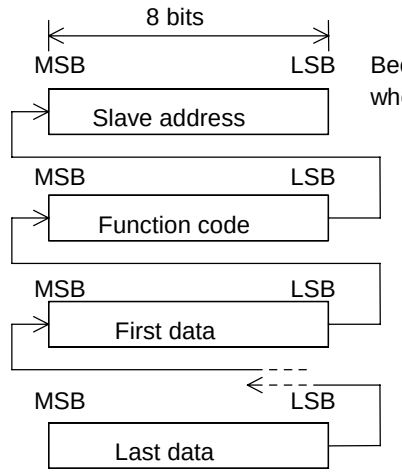
Slave address		01H
Function code		90H
Error code		02H
CRC-16	Upper	CDH
	Lower	C1H

*1: Setting the slave address to "00H", all the slaves execute this command. However, no slave respond after execution.

*2: If the quantity is 0 or exceeds 16, or if the number of data is not [quantity × 2], error code "03H" is returned.

7.4 CRC-16 CALCULATIONS

CRC-16 (cyclic redundancy check-16) refers to a checking method that connects all message blocks (up to the last data from a slave address) in series as shown in Fig. 7.1 and divides that data by a preset 17-bit decimal number (1 1000 0000 0000 0101) to get a 16-bit remainder.



Becomes the MSB when calculating CRC-16

Notes:

1. The initial setting when calculating CRC-16 is very often 0, but for the MEMOBUS system set the initial setting to –1 (16 bits all set to 1).
2. Use the LSB of the slave address for the MSB, and use the MSB of the last data for the LSB when calculating CRC-16.
3. Calculate CRC-16 for the response message from the slave, and compare that result with the CRC-16 in the response message.

Fig. 7.1 CRC-16 Calculation Data

(1) Method for calculating CRC-16

Calculate the CRC-16 in the following procedure.

1. Set the 16-bit remainder to all ones (initial setting).
2. Perform an Exclusive OR operation with the slave address and remainder.
3. Shift the result one digit to the right. Continue shifting digits until the overflow bit to the right becomes 1.
4. When the bit becomes 1, perform an Exclusive OR operation with the lower-place 16 bits (1000 0000 0000 0101) of the constant data defined by CRC-16.
5. After shifting to the right eight times (if the overflow bit becomes 1, perform an Exclusive OR operation as explained in step 4), perform an Exclusive OR operation between the next 8 bits (function code) and the results yielded to this point.
6. Repeat the same calculation until you reach the last data item.
7. Add the 16-bit calculation results starting with the most significant 8 bits (actually the least significant) and ending with the least significant 8 bits (actually the most significant) to align the query message.

(1) CRC-16 calculation process

```
10   XMT(1)=&H2 : XMT(2)=&H7 : N=2
20   GOSUB *CRC16
30   END
40   '
100 *CRC16
110 CRCTMP=&HFFFF
120 FOR I=1 TO N
130 CRCTMP=CRCTMP XOR XMT(I)
140 FOR J=1 TO 8
150 CT=CRCTMP AND &H1
160 IF CRCTMP<0 THEN CH=1 ELSE CH=0
    : GOTO 180
170 CRCTMP=CRCTMP AND &H7FFF
180 CRCTMP=CRCTEMP ¥ 2
190 IF CH=1 THEN CRCTMP=CRCTMP OR
    &H4000
200 IF CT=1 THEN CRCTMP=CRCTMP XOR
    &HA001
210 NEXT J,I
220 IF CRCTMP<0 THEN CL=1 : CRCTMP=
    CRCTMP AND &H7FFF ELSE CL=0
230 C1=CRCTMP AND &HFF : C2=(CRCTMP

    AND &H7F00) ¥ 256
240 IF CL=1 THEN C2=C2 OR &H80
250 XMT(N+1)=C1 : XMT(N+2)=C2
260 XMT$(N+1)=HEX$(XMT(N+1))
270 XMT$(N+2)=HEX$(XMT(N+2))
280 RETURN
```

For the example of the message in Fig. 7.2, Fig. 7.3 shows the process of CRC-16 calculation.

0000 0010	Slave address (2)
0000 0111	Function code (7H)*

Fig. 7.2 Typical Message

0000 0010	Slave address
0000 0111	Function code
0100 0001	CRC-16(MSB)
0001 0010	CRC-16(LSB)

Fig. 7.4 CRC-16 Calculation Result

CRCTMP	FLAG	
1111 1111 1111 1111		Initial value
0000 0010		Address
1111 1111 1111 1101		ExOR result
0111 1111 1111 1110	1	Shift 1
1010 0000 0000 0001		
1101 1111 1111 1111		ExOR result
0110 1111 1111 1111	1	Shift 2
1010 0000 0000 0001		
1100 1111 1111 1110		ExOR result
0110 0111 1111 1111	0	Shift 3
0011 0011 1111 1111	1	Shift 4
1010 0000 0000 0001		
1001 0011 1111 1110		ExOR result
0100 1001 1111 1111	0	Shift 5
0010 0100 1111 1111	1	Shift 6
1010 0000 0000 0001		
1000 0100 1111 1110		ExOR result
0100 0010 0111 1111	0	Shift 7
0010 0001 0011 1111	1	Shift 8
1010 0000 0000 0001		
1000 0001 0011 1110		ExORresult
0000 0111		Function code
1000 0001 0011 1001		ExOR result
0100 0000 1001 1100	1	Shift 1
1010 0000 0000 0001		
1110 0000 1001 1101		ExORresult
0111 0000 0100 1110	1	Shift 2
1010 0000 0000 0001		
1101 0000 0100 1111		ExOR result
0110 1000 0010 0111	1	Shift 3
1010 0000 0000 0001		
1100 1000 0010 0110		ExOR result
0110 0100 0001 0011	0	Shift 4
0011 0010 0000 1001	1	Shift 5
1010 0000 0000 0001		
1001 0010 0000 1000		ExOR result
0100 1001 0000 0100	0	Shift 6
0010 0100 1000 0010	0	Shift 7
0001 0010 0100 0001	0	Shift 8
12	41	
CRC-16(LSB)	CRC-16(MSB)	

Fig. 7.3 Process of CRC-16 Calculation

*: Function code (07H) cannot be used in the MEMOBUS system. In this section, an example of function code (07H) is taken for brief description.

8. SELF-TEST

V7 and J7 are provided with a function to perform self-diagnosis for operation check of the serial communication I/F circuit. This function is called self-test. In the self-test, connect the sending terminal with the receiving terminal in the communication section. It assures if the data received by V7 or J7 is not being changed. It also checks if the data can be received normally.

Carry out the self-test in the following procedure.

(1) Turn ON the V7 or J7 power supply. Set constant as follows:

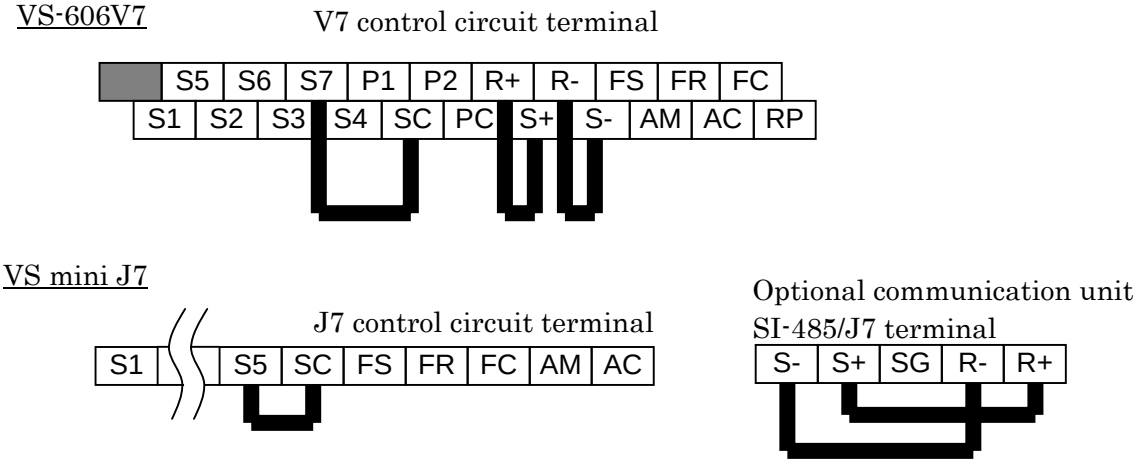
V7: n056 = 35 (self-test)

J7: n39 = 35 (self-test)

(2) Turn OFF the V7 or J7 power supply.

(3) Make the following wiring with the power supply turned OFF.

(4) Turn the power ON.



RS-422/485 Self-test Connection Diagram

Normal operation : Frequency reference is displayed on the digital operator.

Faulty operation : "CE" fault signal is displayed on the digital operator, fault signal is turned ON, and inverter ready signal is turned OFF.

9. LIST OF HOLDING REGISTER NUMBERS

9.1 REFERENCE DATA (AVAILABLE FOR READ-OUT AND WRITE-IN)

(1) Individual data

Register No.		Bit	Contents	
			VS-606V7	VS mini J7
0000H	Reserved			
0001H	Operation signal	0	Run command 1: Run 0: Stop	
		1	Reverse run 1: Reverse run 0: Forward run	
		2	External fault 1: Fault (EFO)	
		3	Fault reset 1: Reset command	
		4	Multi-function input reference 1 (Function selected by n50)	Reserved
		5	Multi-function input reference 2 (Function selected by n51)	Multi-function input reference 2 (Function selected by n36)
		6	Multi-function input reference 3 (Function selected by n52)	Multi-function input reference 3 (Function selected by n37)
		7	Multi-function input reference 4 (Function selected by n53)	Multi-function input reference 4 (Function selected by n38)
		8	Multi-function input reference 5 (Function selected by n54)	Multi-function input reference 5 (Function selected by n39)
		9	Multi-function input reference 6 (Function selected by n55)	Reserved
		A	Multi-function input reference 7 (Function selected by n56)	Reserved
		B-F	Not used	
0002H	Frequency reference		Unit: Depends on constant n152.	Unit: Depends on constant n69.
0003H	V/f gain (1000/100%), Setting range: 2.0 to 200.0%			
0004H to 0008H	(Reserved)			
0009H		0	Multi-function output reference 1 1: MA "ON" (Effective when n057=18)	Multi-function output reference 1 1: MA "ON" (Effective when n040=18)
		1	Multi-function output reference 2 1: P1 "ON" (Effective when n058=18)	Reserved
		2	Multi-function output reference 3 1: P2 "ON" (Effective when n059=18)	Reserved
		3-F	Not used	Not used
000AH to 001FH	Reserved			

Note: Write in "0" for unused bit. Never write in data for the reserved register.

(2) Simultaneous broadcasting data

Register No.		Bit	Contents	
			VS-606V7	VS mini J7
0001H	Operation signal	0	Run command 1: Run	0: Stop
		1	Reverse run 1: Reverse run	0: Forward run
		2	Not used	Not used
		3	Not used	Not used
		4	External fault 1: Fault (EFO)	
		5	Fault reset 1: Reset command	
		6	Not used	Not used
		7	Not used	Not used
		8-F	Not used	Not used
0002H	Frequency reference 30000/100% fixed unit (Data is converted into 0.01 Hz inside the inverter, and fractions are rounded off.)			

Bit signals not defined as the broadcast operation signals are used as the local station data signals.

9.2 MONITOR DATA (AVAILABLE ONLY FOR READ-OUT)

Register No.		Bit	Contents	
			VS-606V7	VS mini J7
0020H	Status Signal	0	Run command 1: Run 0: Stop	
		1	Reverse run 1: Reverse run 0: Forward run	
		2	Inverter operation ready 1: Ready 0: Not ready	
		3	Fault 1: Fault	
		4	Data setting error 1: Error	
		5	Multi-function output 1 (1: MA: ON)	Multi-function output 1 (1: MA ON)
		6	Multi-function output 2 (1: P1: ON)	Reserved
		7	Multi-function output 3 (1: P2: ON)	Reserved
		8-F	Not used	
0021H	Fault Contents	0	Overcurrent (OC)	
		1	Overvoltage (OV)	
		2	Inverter overload (OL2)	
		3	Inverter overheat (OH)	
		4	Not used	
		5	Not used	
		6	PID feedback lost (FbL)	Reserved
		7	External fault (EF, EF0), Emergency stop (STP)	
		8	Hardware fault (FXX)	
		9	Motor overload (OL1)	
		A	Overtorque detection (OL3)	
		B	Not used	
		C	Power loss (UV1)	
		D	Control power fault (UV2)	Grounding (GF)
		E	MEMOBUS communications timeover (CE)	
		F	Operator connection (OPR)	Reserved
0022H	Data Link Status	0	Data write in	
		1	Not used	
		2	Not used	
		3	Upper/lower limit fault	
		4	Consistency fault	
		5	Not used	
		6	Not used	
		7	Not used	
		8-F	Not used	

Register No.		Bit	Contents	
			VS-606V7	VS mini J7
0023H	Frequency reference		(Unit: n152)	(Unit: n69)
0024H	Output frequency		(Unit: n152)	(Unit: n69)
0025H	Not used			
0026H	Not used			
0027H	Output current (10/1A)			
0028H	Output voltage reference (1/1V)			
0029H	Not used			
002AH	Not used			
002BH	Control Circuit Terminal Input Status	0	Terminal S1 1: Closed	
		1	Terminal S2 1: Closed	
		2	Terminal S3 1: Closed	
		3	Terminal S4 1: Closed	
		4	Terminal S5 1: Closed	
		5	Terminal S6 1: Closed	Reserved
		6	Terminal S7 1: Closed	Reserved
		7-F	Not used	
002CH	Inverter Status	0	Run 1: Run	
		1	Zero-speed 1: Zero-speed	
		2	Frequency agreed 1: Agreed	
		3	Minor fault (Alarm is indicated.)	
		4	Frequency detection 1 1: Output frequency ≤ (n095)	Frequency detection 1 1: Output frequency ≤ (n58)
		5	Frequency detection 2 1: Output frequency ≥ (n095)	Frequency detection 2 1: Output frequency ≥ (n58)
		6	Inverter operation ready 1: Ready	
		7	Undervoltage detection 1: Undervoltage detection	
		8	Baseblock 1: Inverter baseblock detection	
		9	Frequency reference mode 1: Other than communications 0: Communications	
		A	Run command mode 1: Other than communications 0: Communications	
		B	Overtorque detection 1: Overtorque detection	
		C	Not used	
		D	Fault restart	
		E	Fault (Including communications timeover) 1: Fault	
		F	Communications timeover 1: Timeover	

Register No.		Bit	Contents	
			VS-606V7	VS mini J7
002DH	Control Circuit Terminal Output Status	0	MA"ON" 1 : Closed	MA "ON" 1: Closed
		1	P1"ON" 1 : Closed	Reserved
		2	P2"ON" 1 : Closed	Reserved
		3	Not used	
		4	Not used	
		5	Not used	
		6	Not used	
		7	Not used	
		8-F	Not used	
002EH to 0030H	Reserved			
0031H	Main circuit DC voltage (1/1V)			
0032H	Torque monitor (1/1%, 100%/motor rated torque, with sign)			Reserved
0033H	Not used			
0034H	Not used			
0035H	Not used			
0036H	Not used			
0037H	Output power (1/1W, with sign)			Reserved
0038H	PID feedback (100%/input equivalent to maximum output frequency, 10/1%, without sign)			Reserved
0039H	PID input (±100%/±maximum output frequency, 10/1%, with sign)			Reserved
003AH	PID output (±100%/±maximum output frequency, 10/1%, with sign)			Reserved
003BH	Reserved			
003CH	Reserved			
003DH*	Contents of Communications Error	0	CRC error	
		1	Improper data length	
		2	Not used	
		3	Parity error	
		4	Overrun error	
		5	Framing error	
		6	Timeover	
		7	Not used	
		8-F	Not used	
003EH to 00FFH	Reserved			

*: The contents of a communications error is held unless a fault reset is input (can be reset during running.)

9.3 CONSTANT DATA (AVAILABLE FOR READ-OUT AND WRITE-IN)

Refer to "■ CONTANTS LIST" of the VS-606V7 or VS mini J7 instruction manual.

9.4 ENTER COMMAND (AVAILABLE ONLY FOR WRITE-IN)

Register No.	Name	Contents	Setting Range	Initial setting
0900H	ENTER command	Write-in constant data to non-volatile memory (EEPROM)	0000H to FFFFH	-

When a constant is written from the PLC by communications, the constant is written to the constant data area on the RAM in the V7 or J7. ENTER command is a command to write the constant data on the RAM to the non-volatile memory in the V7 or J7. Writing data (can be undefined) to register number 0900H executes this ENTER command.

Maximum number of writing times of the non-volatile memory used for V7 or J7 is 100,000; do not execute the ENTER command excessively. When a constant is changed from the digital operator, the constant data on the RAM is written to the non-volatile memory without ENTER command.

Register number 0900H is used only for write-in. If this register is read-out, register number error (error code: 02H) occurs.

10. ERROR CODES

Error Code	Contents
01H	Function code error • Function code from PLC is other than 03H, 08H or 10H.
02H	Improper register number • No register numbers to be accessed have been registered. • 000H, 0001H, or 002H is not specified as broadcasting start number. • ENTER command “0900H” that is an exclusive-use register for write-in was read out.
03H	Improper quantity • The number of data items to be read or write in is not in the range between 1 and 16. • The number of data items in a message is not the value obtained by multiplying the quantity by two in the write-in mode.
21H	Data setting error • A simple upper/lower limit error occurred with control data or constant write-in. • A constant setting error occurred when a constant was written.
22H	Write-in mode error • Attempt to write in a constant from PLC was made during running. • Attempt to write in an ENTER command from PLC was made during running. • Attempt to write in a constant from PLC was made during UV occurrence. • Attempt to write in an ENTER command from PLC was made during UV occurrence. • Attempt to write in a constant other than initialization constants to n001(V7) or n01(J7) from PLC was made during “F04” occurrence. For initialization constants, refer to the V7 or J7 Instruction Manual. • Attempt to write in a constant from PLC was made while data were being stored. • Attempt to write in data exclusive for read-out from PLC was made.

Note: For constants of which settings can be changed during running, refer to “■ CONSTANTS LIST” of the V7 or J7 Instruction Manual.

11. DIGITAL OPERATOR DISPLAY

The following describes the digital operator displays appear only during communications. For displays other than below, refer to the V7 or J7 instruction manual.

Operator Display	Status Display Lamp RUN: Green ALARM: Red	Name	Description
CAL (Blinking)	RUN: Blinking ALARM: Blinking	Waiting for communications	Displayed and blinks from when power supply is turned ON to when normal data to self-station is received. Not displayed unless run command selection (V7: n003, J7: n02) is "2" or when frequency reference selection (V7: n004, J7: n03) is "6."
SrP (Blinking)		Emergency stop	Displayed and blinks if an emergency stop command is input during running when multi-function input selection (V7:n050 to n056, J7: n-36 to n39) is set to "20" or "22" (emergency stop alarm).
CE (Blinking)		Communications error	Displayed and blinks if normal data is not received for two seconds after normal data was received last time. At this time, inverter continues the previous status and no inverter fault is output.
CE	RUN: OFF ALARM: OFF	Communications error	Displayed if normal data is not received for two seconds after the normal data was received last time. Operates according to MEMOBUS timeover detection (V7: n151, J7: n68) setting, and outputs an inverter fault. However, no inverter fault is output when the set value is "4."
SrP		Emergency stop	Displayed if an emergency stop command is input during running when multi-function input function selection (V7: n050 to n056, J7: n36 to n39) is set to "19" or "21" (emergency stop alarm).
oP1	RUN: Blinking ALARM: Blinking	Improper constant setting	Displayed when the same setting is made for at least two constants among multi-function input function selection (V7: n050 to n056, J7: n36 to n39).
oP2			Displayed unless the following conditions are satisfied: Max. output frequency (V7: n011, J7: n09) ≥ Max. voltage output frequency (V7: n013, J7:n11) > Mid. output frequency (V7: n014, J7: n12) ≥ Min. output frequency (V7: n016, J7: n14)
oP3			Displayed when a value exceeding 150% (120% with J7) of inverter rated current is set at setting of motor rated current (V7: n036, J7: n32).
oP4			Displayed unless the following setting is satisfied: Frequency reference upper limit (V7: n033, J7: n30) ≥ Frequency reference lower limit (V7: n034, J7: n31)
oP5			Displayed unless the following setting is satisfied: Jump frequency1 (V7: n083, J7: n49) ≥ Jump frequency 2 (V7: n084, J7: n50) ≥ Jump frequency 3 (V7: n085, J7: ---)