INVERTER

F510

Communication - Addendum

- Modbus RTU / ASCII
- BACNet
- Metasys N2
- Profibus
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  A1.1 RS485 Network (Modbus) ................................................................... A-1
1.0 Modbus Protocol Descriptions

1.0.1 Communication Connection and Data Frame

The inverter can communicate with a PC or PLC via RS485 using the Modbus RTU or Modbus ASCII protocol. The maximum frame length is 80 bytes.

Network Connection

**Terminate the communications line with a (120 ohm, 1/4 watt) resistor at both ends.**

For RS-485 communication use pin 1 or pin 3 for S (+) and pin 2 or pin 6 for S (-)
Data Format Frame

Data Frame for ASCII Mode

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STX(3AH)</td>
<td>Start Bit = 3AH</td>
</tr>
<tr>
<td>Node Address Hi</td>
<td>Communication Address (Station):</td>
</tr>
<tr>
<td>Node Address Lo</td>
<td>2-digit ASCII Code</td>
</tr>
<tr>
<td>Function Hi</td>
<td>Function Code (command):</td>
</tr>
<tr>
<td>Function Lo</td>
<td>2-digit ASCII Code</td>
</tr>
<tr>
<td>Command Start Address</td>
<td></td>
</tr>
<tr>
<td>Command Start Address</td>
<td>Command Start byte:</td>
</tr>
<tr>
<td>Command Start Address</td>
<td>4-digit ASCII Code</td>
</tr>
<tr>
<td>Command Start Address</td>
<td></td>
</tr>
<tr>
<td>Data length</td>
<td>The length of the command:</td>
</tr>
<tr>
<td>Data length</td>
<td>4-digit ASCII Code</td>
</tr>
<tr>
<td>Data length</td>
<td></td>
</tr>
<tr>
<td>LRC Check Hi</td>
<td>LRC Check Code:</td>
</tr>
<tr>
<td>LRC Check Lo</td>
<td>2-digit ASCII Code</td>
</tr>
<tr>
<td>END Hi</td>
<td>End Byte:</td>
</tr>
<tr>
<td>END Lo</td>
<td>END Hi = CR(0DH), END Li = LF(0AH)</td>
</tr>
</tbody>
</table>

Data Frame for RTU Mode

Master (PLC etc.) sends request to follower (inverter), and the follower sends a response to the master (PC, PLC). The data received is illustrated here.

The data length varies depending on the command (Function).

| Node Address | Function Code | DATA | CRC CHECK | Signal Interval |

** The inverter response time is 10ms.

Node Address

00H: Broadcast to all the drivers
01H: to the No. 01 inverter
0FH: to the No.15 inverter
10H: to the No.16 inverter and so on..., max to No. 254 (FEH)
Function Code

03H: Read the register contents
06H: Write a WORD to register
08H: Loop test
10H: Write several data to register (complex number register write)

Checksum Calculation

LRC

ex. NODE ADDRESS 01H
FUNCTION 03H
COMMAND 01H

+ DATA LENGTH 0AH

------------------------------------------

0FH .......................... 2’s complement

Checksum F1H
CS (H) 46H (ASCII)
CS (L) = 31H (ASCII)

CRC

CRC Check: CRC code covers the content from node address to DATA. Please calculate it according to the following methods.

(1) Load a 16-bit register with FFFF hex (all 1’s). Call this CRC register.

(2) Exclusive OR the first 8-bit byte of the message, the low-order byte of the 16-bit CRC register, putting the result in the CRC register.

(3) Shift the CRC register one bit to the right (toward the LSB), Zero-filling the MSB, Extract and examines the LSB.

(4) (If the LSB was 0): Repeat Steps (3) (another shift)
(If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001), putting the result in CRC register.

(5) Repeat Steps (3) and (4) until 8 shifts been performed. When this is done, a complete 8-bit byte will be processed.

(6) Repeat Steps (2) through (5) for next 8-bit byte of the message, Continue doing this until all bytes have been processed. The final content in the CRC register is the CRC value. When sending the CRC value, the Low-order byte should be sent firstly, then the High-order byte. For example, CRC value: 1241 Hex, the high-order byte should be set to 41hex and low-order byte 12hex.
**CRC calculate program (C language):**

```c
UWORD ch_sum ( UBYTE long , UBYTE *rxdbuff )
{
    BYTE i = 0;
    UWORD wkg = 0xFFFF;
    while ( long-- ){
        wkg ^= rxdbuff++;
        for ( i = 0 ; i < 8 ; i++ ) {
            if ( wkg & 0x0001 ) {
                wkg = ( wkg >> 1 ) ^ 0xa001;
            } else {
                wkg = wkg >> 1;
            }
        }
    }
    return( wkg );
}
```

<table>
<thead>
<tr>
<th>ASCII Mode</th>
<th>RTU Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>STX</td>
<td>Node Address 02H</td>
</tr>
<tr>
<td>Address</td>
<td>Function 83H</td>
</tr>
<tr>
<td>Function</td>
<td>Exception code 52H</td>
</tr>
<tr>
<td>Exception code</td>
<td>CRC-16 High C0H</td>
</tr>
<tr>
<td>LRC Check</td>
<td>Low CDH</td>
</tr>
<tr>
<td>END</td>
<td>'CR'</td>
</tr>
<tr>
<td></td>
<td>'LF'</td>
</tr>
</tbody>
</table>

During a communication error the drive will response with an Exception Code and send a message back to the main system consisting of a Function Code that is “ANDED (and 80h)” with 80 Hex.

<table>
<thead>
<tr>
<th>Exception code</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Function code error</td>
</tr>
<tr>
<td>02</td>
<td>Register number error</td>
</tr>
<tr>
<td>03</td>
<td>Number error</td>
</tr>
<tr>
<td>04</td>
<td>DATA setting error</td>
</tr>
</tbody>
</table>
## 1.0.2 Register and Data Format

### Command Data (Read / Write)

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Bit</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500H</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>2501H:</td>
<td>0</td>
<td>Operation Command 1: Run 0: Stop</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Reverse Command 1: Reverse 0: Forward</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>External Fault 1: Fault</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Fault Reset 1: Reset</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Multi-function Comm S1: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Multi-function Comm S2: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Multi-function Comm S3: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Multi-function Comm S4: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>Multi-function Comm S5: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Multi-function Comm S6: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Inverter mode 1: &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>Reserved</td>
</tr>
<tr>
<td>2502H</td>
<td></td>
<td>Frequency Command (Unit: 0.01Hz)</td>
</tr>
<tr>
<td>2503H</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>2504H</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>2505H</td>
<td></td>
<td>AO1 (0 ~ 1000): Voltage (0.00V ~ 10.00V); Current (4mA~20mA)</td>
</tr>
<tr>
<td>2506H</td>
<td></td>
<td>AO2 (0 ~ 1000): Voltage (0.00<del>10.00V); Current (4mA</del>20mA)</td>
</tr>
<tr>
<td>2507H</td>
<td></td>
<td>DO</td>
</tr>
<tr>
<td>2508H</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>2509H</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>250AH</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>250BH</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>250CH</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>250DH</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>250EH</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>250FH</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>2510H</td>
<td></td>
<td>G12-00 H-WORD</td>
</tr>
<tr>
<td>2511H</td>
<td></td>
<td>G12-00 L-WORD</td>
</tr>
</tbody>
</table>

**Note:** Write a zero into the register for not used bit; do not write data to a reserved register.
## Monitor Data (Read-only)

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Bit</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>Operation 1 : Run 0 : Stop</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Direction 1 : Reverse 0 : Forward</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Inverter ready 1 : ready 0 : Not ready</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Fault 1 : Fault</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Warning 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Zero Speed 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Is440V 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Frequency Agree 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Set Frequency Agree 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Frequency Detection 1 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>Frequency Detection 2 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>UnderVoltage 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Baseblock 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Freq Ref. not from Comm. 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Seq. not from Comm. 1 : &quot;ON&quot;</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>OverTorque 1 : &quot;ON&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Bit</th>
<th>Content</th>
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<tbody>
<tr>
<td>2520H</td>
<td>0</td>
<td>Error Description 31 Reserved</td>
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<tr>
<td></td>
<td>1</td>
<td>UV 32 Reserved</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>OC 33 Reserved</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>OV 34 Reserved</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>OH1 35 Reserved</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>OL1 36 Low Suction Fault</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>OL2 37 Low Suction Fault (with retry)</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>OT 38 CF07</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>UT 39 Low Flow Fault</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>SC 40 High Flow Fault</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Ground OC 41 Reserved</td>
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<td></td>
<td>11</td>
<td>Fuse blown 42 Low Pressure Fault</td>
</tr>
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<td></td>
<td>12</td>
<td>Input Phase Loss 43 High Pressure Fault</td>
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<td></td>
<td>13</td>
<td>Output Phase Loss 44 Feedback Loss</td>
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<td>14</td>
<td>Reserved 45 Reserved</td>
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<td></td>
<td>15</td>
<td>Reserved 46 Motor Overheat (OH4)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Reserved</td>
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<tr>
<td></td>
<td>17</td>
<td>External Fault 01</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>External Fault 02</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>External Fault 03</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>External Fault 04</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>External Fault 05</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>External Fault 06</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Reserved</td>
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<tr>
<td></td>
<td>24</td>
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<td></td>
<td>25</td>
<td>Feedback Fault</td>
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<td>Keypad Removed</td>
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<tr>
<td>Address</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>2522H</td>
<td>DI State</td>
<td></td>
</tr>
<tr>
<td>2523H</td>
<td>Frequency Command</td>
<td></td>
</tr>
<tr>
<td>2524H</td>
<td>Output Frequency</td>
<td></td>
</tr>
<tr>
<td>2525H</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>2526H</td>
<td>DC Voltage Command</td>
<td></td>
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<tr>
<td>2527H</td>
<td>Output Current</td>
<td></td>
</tr>
<tr>
<td>2528H</td>
<td>Digital Output State</td>
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<tr>
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<th>Description</th>
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<tr>
<td>27</td>
<td>Modbus External Fault</td>
</tr>
<tr>
<td>28</td>
<td>CE</td>
</tr>
<tr>
<td>29</td>
<td>STO</td>
</tr>
<tr>
<td>30</td>
<td>Reserved</td>
</tr>
<tr>
<td>1</td>
<td>Multi-function Comm S1</td>
</tr>
<tr>
<td>2</td>
<td>Multi-function Comm S2</td>
</tr>
<tr>
<td>3</td>
<td>Multi-function Comm S3</td>
</tr>
<tr>
<td>4</td>
<td>Multi-function Comm S4</td>
</tr>
<tr>
<td>5</td>
<td>Multi-function Comm S5</td>
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<tr>
<td>6</td>
<td>Reserved</td>
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<td>8</td>
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<td>9</td>
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</tr>
<tr>
<td>A</td>
<td>Reserved</td>
</tr>
<tr>
<td>B</td>
<td>Reserved</td>
</tr>
<tr>
<td>C</td>
<td>Reserved</td>
</tr>
<tr>
<td>D</td>
<td>Reserved</td>
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<thead>
<tr>
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<th>Description</th>
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<tr>
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<td>No alarm</td>
</tr>
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<td>OV</td>
</tr>
<tr>
<td>2</td>
<td>UV</td>
</tr>
<tr>
<td>3</td>
<td>OL2</td>
</tr>
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<td>4</td>
<td>OH2</td>
</tr>
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<td>Reserved</td>
</tr>
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<td>OT</td>
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<td>Reserved</td>
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<td>12</td>
<td>Reserved</td>
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<td>EF0</td>
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<td>EF2</td>
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<td>19</td>
<td>EF3</td>
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<td>SE01</td>
</tr>
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<td>SE02</td>
</tr>
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<td>SE03</td>
</tr>
<tr>
<td>37</td>
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</tr>
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<td>SE05</td>
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<td>AO1 (0 ~ 1000): Voltage (0.00V ~ 10.00V); Current (4mA~20mA)</td>
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<tr>
<td>252BH</td>
<td>AO2 (0 ~ 1000): Voltage (0.00<del>10.00V); Current (4mA</del>20mA)</td>
</tr>
<tr>
<td>Hex</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
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<tr>
<td>252CH</td>
<td>Analog Input 1</td>
</tr>
<tr>
<td>252DH</td>
<td>Analog Input 2</td>
</tr>
<tr>
<td>252EH</td>
<td>Reserved</td>
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<tr>
<td>252FH</td>
<td>F510 Check</td>
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**Note:** Write a zero into the register for not used bit; do not write data to a reserved register.
Read Holding Register [03H]

Read consecutive holding registers. The address of the first holding register is specified in the protocol.
Example: Read frequency command from the inverter with node address 1.

ASCII Mode

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<tr>
<th>Command Message</th>
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<th>Response Message (Error)</th>
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<tr>
<td>30H Function</td>
<td>30H Function</td>
<td>30H Function</td>
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<td>33H</td>
<td>35H</td>
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<tr>
<td>30H Starting Register</td>
<td>30H Data Length</td>
<td>31H Exception code</td>
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<td>32H</td>
<td>32H</td>
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<tr>
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<td>31H</td>
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<tr>
<td>0DH</td>
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<tr>
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RTU Mode

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<td>Function 03H</td>
<td>Function 83H</td>
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<tr>
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<td>Data High 17H</td>
<td>Exception code 52H</td>
</tr>
<tr>
<td>Low 23H</td>
<td>Data Low 70H</td>
<td>CRC-16 High C0H</td>
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<tr>
<td>Number of Registers High 00H</td>
<td>CRC-16 High AFH</td>
<td>CRC-16 Low CDH</td>
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<tr>
<td>Low 01H</td>
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<td>CRC-16 High 74H</td>
<td>Low 82H</td>
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<td>Low 3CH</td>
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Loop back test [08H]

Check the communication between the master and the follower (inverter). The data used can be arbitrary.

**ASCII Mode**

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<td>LRC CHECK</td>
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**RTU Mode**

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<td>Low 37H</td>
<td>Low 37H</td>
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<td></td>
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**Write Single Holding Register [06H]**

Write single holding register. The register address of the holding register is specified in the message.

**Example:** Write a 60.00Hz frequency command to node address 1.

**ASCII Mode**

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<th>Response Message (Error)</th>
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<tr>
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<td>? LRC CHECK</td>
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**RTU Mode**

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<td>Start No High</td>
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<tr>
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<td>Low 02H</td>
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<tr>
<td>DATA High 17H</td>
<td>DATA High 17H</td>
<td>DATA High 17H</td>
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<td>CRC-16 High 27H</td>
<td>CRC-16 High 27H</td>
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Write Multiple Holding Register [10H]

Write multiple holding registers. The address of the first holding register is specified in the message.

**Example:** Write a 60.00Hz frequency command to node address 1 and enable FWD run command.

**ASCII Mode**

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* Number of bytes is register amount x 2
### RTU Mode

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* Data amount is register amount x 2
## 1.0.3 Parameter Data

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1.1 BACnet Protocol Descriptions

BACnet is in compliance with four-layers of the seven-layer structure models in OSI (Open Systems Interconnection) of International Standard Organization (ISO). The four-layers are application layer, network layer, data link layer and physical layer. BACnet uses "object" and "properties." All BACnet devices are controlled via the property of the objects. Every controller with BACnet devices is considered an object collector so that every controller device can execute different functions supported by the objects to control and monitor a BACnet device.

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1.1.1 BACnet Services

Services provide commands to save or control information and functions for the purpose of monitoring and control. Example, a BACnet device receives information or a command to handle a request from another BACnet device therefor the two devices have to support the same service. To complete the exchange of these service messages, requires implementation of the communication protocol application layer. Therefore, services are parts of the communication protocol data unit (PDU) in the application layer and build the communication modes between the Server – Client. Client will send a service request to the Server and the Server needs to respond to Client to execute this service. Refer to the following figure.
All BACnet devices use application programs to manage and handle services. Example: Application program has to display the status of every input so it requires sending the service request to the object of another device to update its display with the input status. The application program of the device needs to respond to the service request. Refer to the following figure.

### 1.1.2 BACnet Protocol Structure

The BACnet communication protocol is implemented by way of a protocol stack composed of stacked layer types. Refer to the following figure.

When an application program sends a BACnet service request, it is handled by the BACnet node in the application layer via the application program interface. The request is sent to the application layer and application protocol data unit (APDU) consists of Application Protocol Control Information (APCI) and Service Data of application program. It then passes the APDU downward to the BACnet request program in the network layer. APDU becomes Network Layer Protocol Data Unit (NPDU) composed of Network Service Data Unit (NSDU) and Network Protocol Control Information (NPCI) and the data link layer and physical layer complete the service request for the packet.
1.1.3 BACnet Specifications

The F510 inverter has a built-in BACnet MS/TP communication protocol. Control or monitor the inverter via BACnet allowing for reading and writing of specific parameters. The BACnet implementation supports the following standard objects:

- **Inverter Objects**
- **Analog Input**
- **Digital Input**
- **Analog Output**
- **Digital Output**
- **Analog Value**
- **Digital Value**

Refer to Table 4.7.3.1 for property information of each object. User can retrieve object properties using the dedicated BACnet software to control or monitor the inverter.

### Table 4.6.3.1 Object and property supporting list

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1.1.4 BACnet Object Properties

This section gives an overview of the BACnet objects supported by the inverter.

Refer to Table 4.6.4.1 for the inverter property information.

Refer to Table 4.6.4.2 ~ Table 4.7.4.7 for object information that the inverter supports.

### Table 4.6.4.1 – Inverter property list

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<td>R</td>
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</tr>
<tr>
<td>A11</td>
<td>TM2 AIN2</td>
<td>AI2 input</td>
<td>Volt</td>
<td>R</td>
<td>0 - 10</td>
</tr>
<tr>
<td>A12</td>
<td>Error code</td>
<td>Recent fault message</td>
<td>No Units</td>
<td>R</td>
<td>0 - 45</td>
</tr>
<tr>
<td>A13</td>
<td>Freq cmd</td>
<td>Frequency command</td>
<td>Hz</td>
<td>R</td>
<td>0 - 60</td>
</tr>
<tr>
<td>A14</td>
<td>Frequency</td>
<td>Output frequency</td>
<td>Hz</td>
<td>R</td>
<td>0 - 60</td>
</tr>
<tr>
<td>A15</td>
<td>Current</td>
<td>Output current</td>
<td>Amps</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>A16</td>
<td>Control Mode</td>
<td>Control mode</td>
<td>No Units</td>
<td>R</td>
<td>0 - 2</td>
</tr>
<tr>
<td>A17</td>
<td>Motor R-Volt</td>
<td>Motor rated voltage</td>
<td>Volt</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>A18</td>
<td>Motor R-HP</td>
<td>Motor rated power</td>
<td>horsepower</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>A19</td>
<td>Motor R-RPM</td>
<td>Motor rated rotation speed</td>
<td>No Units</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>A20</td>
<td>Motor R-Hz</td>
<td>Motor rated frequency</td>
<td>Hz</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>CarrierFreq</td>
<td>Carrier frequency</td>
<td>kHz</td>
<td>R</td>
<td>4 - 16</td>
</tr>
<tr>
<td>A12</td>
<td>Comm Station</td>
<td>INV communication station</td>
<td>No Units</td>
<td>R</td>
<td>1 - 254</td>
</tr>
<tr>
<td>A13</td>
<td>BaudRate</td>
<td>Baudrate setting</td>
<td>No Units</td>
<td>R</td>
<td>0 - 3</td>
</tr>
<tr>
<td>A14</td>
<td>BacnetSel</td>
<td>Communication mode selection</td>
<td>No Units</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>A15</td>
<td>DevInstance</td>
<td>Inverter number</td>
<td>No Units</td>
<td>R</td>
<td>1 - 254</td>
</tr>
</tbody>
</table>
### Table 4.6.4.3 – Analog output property list (READ/ WRITE)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>Description</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO0</td>
<td>Set frequency</td>
<td>Frequency command</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 60</td>
</tr>
<tr>
<td>AO1</td>
<td>TB2 AO1</td>
<td>Output voltage1</td>
<td>Volt</td>
<td>R</td>
<td>0 - 10</td>
</tr>
<tr>
<td>AO2</td>
<td>TB2 AO2</td>
<td>Output voltage2</td>
<td>Volt</td>
<td>R</td>
<td>0 - 10</td>
</tr>
<tr>
<td>AO3</td>
<td>Motor R-Amp</td>
<td>Motor rated current</td>
<td>Amps</td>
<td>R/W</td>
<td>0-65535</td>
</tr>
<tr>
<td>AO4</td>
<td>PwrL Sel</td>
<td>Momentary stop and restart selection</td>
<td>No Units</td>
<td>R</td>
<td>0 - 2</td>
</tr>
<tr>
<td>AO5</td>
<td>RestartSel</td>
<td>Number of Fault Auto-Restart Attempts</td>
<td>No Units</td>
<td>R</td>
<td>0 – 10</td>
</tr>
<tr>
<td>AO6</td>
<td>RestartDelay</td>
<td>Fault Auto-Restart Time</td>
<td>seconds</td>
<td>R</td>
<td>0 - 800</td>
</tr>
<tr>
<td>AO7</td>
<td>FreqCommand1</td>
<td>Speed frequency setting-stage 0</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO8</td>
<td>FreqCommand2</td>
<td>Speed frequency setting-stage 1</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO9</td>
<td>FreqCommand3</td>
<td>Speed frequency setting-stage 2</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO10</td>
<td>FreqCommand4</td>
<td>Speed frequency setting-stage 3</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO11</td>
<td>FreqCommand5</td>
<td>Speed frequency setting-stage 4</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO12</td>
<td>FreqCommand6</td>
<td>Speed frequency setting-stage 5</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO13</td>
<td>FreqCommand7</td>
<td>Speed frequency setting-stage 6</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO14</td>
<td>FreqCommand8</td>
<td>Speed frequency setting-stage 7</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO15</td>
<td>FreqCommand9</td>
<td>Speed frequency setting-stage 8</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO16</td>
<td>FreqCommand10</td>
<td>Speed frequency setting-stage 9</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO17</td>
<td>FreqCommand11</td>
<td>Speed frequency setting-stage 10</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO18</td>
<td>FreqCommand12</td>
<td>Speed frequency setting-stage 11</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO19</td>
<td>FreqCommand13</td>
<td>Speed frequency setting-stage 12</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO20</td>
<td>FreqCommand14</td>
<td>Speed frequency setting-stage 13</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO21</td>
<td>FreqCommand15</td>
<td>Speed frequency setting-stage 14</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO22</td>
<td>FreqCommand16</td>
<td>Speed frequency setting-stage 15</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO23</td>
<td>RunMode</td>
<td>Main run command source selection</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 2</td>
</tr>
<tr>
<td>AO24</td>
<td>ReverseOper</td>
<td>Direction locked command</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
<tr>
<td>AO25</td>
<td>StoppingSel</td>
<td>Stop modes selection</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
<tr>
<td>AO26</td>
<td>FreqComm</td>
<td>Main frequency command source selection</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 5</td>
</tr>
<tr>
<td>AO27</td>
<td>FreqUpperLim</td>
<td>Upper limit frequency</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO28</td>
<td>FreqLowerLim</td>
<td>Lower limit frequency Hz</td>
<td>Hz</td>
<td>R/W</td>
<td>0 - 400</td>
</tr>
<tr>
<td>AO29</td>
<td>Acc Time1</td>
<td>Acceleration time 1</td>
<td>seconds</td>
<td>R/W</td>
<td>0 - 3600</td>
</tr>
<tr>
<td>AO30</td>
<td>Dec Time1</td>
<td>Deceleration time 1</td>
<td>seconds</td>
<td>R/W</td>
<td>0 - 3600</td>
</tr>
</tbody>
</table>

### Table 4.7.4.4 Analog value property list (READ/ WRITE)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>Description</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV0</td>
<td>PID – P Gain</td>
<td>Proportional gain (P)</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 10</td>
</tr>
<tr>
<td>AV1</td>
<td>PID – I Time</td>
<td>Integral time (I)</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 100</td>
</tr>
<tr>
<td>AV2</td>
<td>PID – D Time</td>
<td>Differential time (D)</td>
<td>No Units</td>
<td>R/W</td>
<td>0 – 10</td>
</tr>
</tbody>
</table>
### Table 4.7.4.5 Digital input property list (READ)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>Description</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI0</td>
<td>Run/Stop</td>
<td>Operation status</td>
<td>Stop / Run</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI1</td>
<td>Direction</td>
<td>Operation direction</td>
<td>FWD/REV</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI2</td>
<td>status</td>
<td>Inverter status</td>
<td>OK/Fault</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI3</td>
<td>Abnormal</td>
<td>Error occurs</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI4</td>
<td>Di_1 status</td>
<td>S1 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI5</td>
<td>Di_2 status</td>
<td>S2 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI6</td>
<td>Di_3 status</td>
<td>S3 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI7</td>
<td>Di_4 status</td>
<td>S4 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI8</td>
<td>Di_5 status</td>
<td>S5 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI9</td>
<td>Di_6 status</td>
<td>S6 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>

### Table 4.6.4.6 Digital output property list (READ/ WRITE)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>Description</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO0</td>
<td>RY1 status</td>
<td>Relay output 1 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BO1</td>
<td>RY2 status</td>
<td>Relay output 2 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BO2</td>
<td>RY3 status</td>
<td>Relay output 3 status</td>
<td>Close/Open</td>
<td>R</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>

### Table 4.7.4.7 Digital value property list (READ/ WRITE)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>Description</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV0</td>
<td>RUN/STOP</td>
<td>RUN/STOP</td>
<td>Stop / Run</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BV1</td>
<td>FWD/REV</td>
<td>FWD/REV</td>
<td>FWD/REV</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>
1.2 MetaSys N2 Communication Protocol

1.2.1 Introduction and Setup

This section describes Metasys N2 communication protocol. Connect Metasys controller to terminal S+ and S- of the RS485 and check that the Baud rate setting of parameter 09-02 is set to 9600 bps. To enable Metasys protocol set communication mode selection parameter 09-01 to 2 (MetaSys).

1.2.2 MetaSys N2 Specification

<table>
<thead>
<tr>
<th>Serial Communication Interface</th>
<th>RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Numbers of Connection</td>
<td>255 MetaSys N2 follower standard</td>
</tr>
<tr>
<td>Communication Speed</td>
<td>9600 (BPS)</td>
</tr>
<tr>
<td>Data Format</td>
<td>Data byte: 8 byte</td>
</tr>
<tr>
<td></td>
<td>Stop byte: 1 byte</td>
</tr>
<tr>
<td></td>
<td>No parity</td>
</tr>
<tr>
<td>Access to Data</td>
<td>15 Analog input</td>
</tr>
<tr>
<td></td>
<td>10 Digital input</td>
</tr>
<tr>
<td></td>
<td>34 Analog Output</td>
</tr>
<tr>
<td></td>
<td>5 Digital output</td>
</tr>
<tr>
<td>Commands Supported</td>
<td>Support the following command</td>
</tr>
<tr>
<td></td>
<td>0/0 : Time Setting Command</td>
</tr>
<tr>
<td></td>
<td>0/4, 0/5 : Poll Command</td>
</tr>
<tr>
<td></td>
<td>0/8 : Warm Reset Command</td>
</tr>
<tr>
<td></td>
<td>1 : Read Command</td>
</tr>
<tr>
<td></td>
<td>2 : Write Command</td>
</tr>
<tr>
<td></td>
<td>F : Identify Device Command</td>
</tr>
<tr>
<td></td>
<td>The following Override command is enabled but it will not clear automatically after 10 minutes.</td>
</tr>
<tr>
<td></td>
<td>7/2/3 : AO Override command</td>
</tr>
<tr>
<td></td>
<td>7/2/4 : BO Override command</td>
</tr>
<tr>
<td></td>
<td>The following command will respond but not execute this action.</td>
</tr>
<tr>
<td></td>
<td>7/3 : Remove Override command</td>
</tr>
<tr>
<td></td>
<td>7/2/1 : AI Override command</td>
</tr>
<tr>
<td></td>
<td>7/2/2 : BI Override command</td>
</tr>
</tbody>
</table>
1.2.3 Definition of MetaSys N2 Communication Protocol

MetaSys N2 is a communication protocol developed by Johnson Control Company. MetaSys N2 communication protocol uses a Master/Follower configuration. Each N2 Follower has to set to a unique N2 address that can range from 1 to 255.

The data for each N2 Follower is displayed by the object and Network Point Type (NPT) and is supports seven types of objects:

<table>
<thead>
<tr>
<th>No.</th>
<th>NPT Name</th>
<th>NPT (abbreviation)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analog input</td>
<td>AI</td>
<td>32-bit, IEEE-Standard floating-point</td>
</tr>
<tr>
<td>2</td>
<td>Binary input</td>
<td>BI</td>
<td>1-bit</td>
</tr>
<tr>
<td>3</td>
<td>Analog output</td>
<td>AO</td>
<td>32-bit, IEEE-Standard floating-point</td>
</tr>
<tr>
<td>4</td>
<td>Binary output</td>
<td>BO</td>
<td>1-bit</td>
</tr>
<tr>
<td>5</td>
<td>Internal floating-point</td>
<td>ADF</td>
<td>32-bit, IEEE-Standard floating-point</td>
</tr>
<tr>
<td>6</td>
<td>Internal integer</td>
<td>ADI</td>
<td>16-bit</td>
</tr>
<tr>
<td>7</td>
<td>Internal Bytes</td>
<td>DB</td>
<td>8-bit</td>
</tr>
</tbody>
</table>

The input and output are mainly used by the N2 network. The input is the data send from the N2 Follower to N2 network and the output is the data sent from the N2 network to the N2 Follower.

The object of N2 Follower has grouping and every group data can be set the address of 0-255, abbreviated for NPA (Network Point Address).

Every object consists of a property that holds object data (AI and AO object), object status (BI and BI object data), and message handling (if COS can respond or not). Each property can be read or changed but the data value of analog output and digital output requires an Override command to modify the data value.

N2 supports a Change of State function (COS) that allows object of AO, BI, and BO to automatically report a change of data and respond back using a poll message.

N2 Follower device starts communicating with the N2 Network controller after receiving an identifier command.
1.2.4. MetaSys N2 Communication Protocol in F510 Model

F510 models support four NPTs: AI, AO, BI and BO, it does not support the following functions:

- JCI property or field.
- Analog Alarm and Analog Warning for AI. The fields can read or changed but are not used.
- Override function for AI and BI.
- Override function in AO and BO do not restore back to default value when releasing the override.

The followings are the supporting properties list in AI, AO, BI and BO for F510 models:

(1) AI Property List

<table>
<thead>
<tr>
<th>No.</th>
<th>Data Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Byte</td>
<td>Object Configuration</td>
<td>READ/ WRITE</td>
</tr>
<tr>
<td>2</td>
<td>Byte</td>
<td>Object Status</td>
<td>READ ONLY</td>
</tr>
<tr>
<td>3</td>
<td>Float</td>
<td>Analog Input Value</td>
<td>READ ONLY</td>
</tr>
</tbody>
</table>

(2) BI Property List

<table>
<thead>
<tr>
<th>No.</th>
<th>Data Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Byte</td>
<td>Object Configuration</td>
<td>READ/ WRITE</td>
</tr>
<tr>
<td>2</td>
<td>Byte</td>
<td>Object Status</td>
<td>READ ONLY</td>
</tr>
</tbody>
</table>

(3) AO Property List

<table>
<thead>
<tr>
<th>No.</th>
<th>Data Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Byte</td>
<td>Object Configuration</td>
<td>READ/ WRITE</td>
</tr>
<tr>
<td>2</td>
<td>Byte</td>
<td>Object Status</td>
<td>READ ONLY</td>
</tr>
<tr>
<td>3</td>
<td>Float</td>
<td>Current Value</td>
<td>READ/ Override</td>
</tr>
</tbody>
</table>

(4) BO Property List

<table>
<thead>
<tr>
<th>No.</th>
<th>Data Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Byte</td>
<td>Object Configuration</td>
<td>READ/ WRITE</td>
</tr>
<tr>
<td>2</td>
<td>Byte</td>
<td>Object Status</td>
<td>READ/ Override</td>
</tr>
<tr>
<td>3</td>
<td>Integer</td>
<td>Minimum On-time</td>
<td>READ/ WRITE</td>
</tr>
<tr>
<td>4</td>
<td>Integer</td>
<td>Minimum On-time</td>
<td>READ/ WRITE</td>
</tr>
<tr>
<td>5</td>
<td>Integer</td>
<td>Maximum Cycles/Hour</td>
<td>READ/ WRITE</td>
</tr>
</tbody>
</table>

The followings are parameters F510 models can read and write via MetaSys communication.
### Analog input property list (READ)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>F510 Parameters</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI1</td>
<td>Motor R-RPM</td>
<td>02-03 Motor Rated</td>
<td>No Units</td>
<td>R</td>
<td>0 ~ 60000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rotation Speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI2</td>
<td>Motor R-Volt</td>
<td>02-04 Motor Rated</td>
<td>Volt</td>
<td>R</td>
<td>0<del>240.0/0</del>480.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI3</td>
<td>Motor R-HP</td>
<td>02-05 Motor Rated</td>
<td>horsepower</td>
<td>R</td>
<td>0~600.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI4</td>
<td>Motor R-Hz</td>
<td>02-06 Motor Rated</td>
<td>Hz</td>
<td>R</td>
<td>0.00 ~ 400.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI5</td>
<td>Comm Station</td>
<td>09-00 INV Communication</td>
<td>No Units</td>
<td>R</td>
<td>1 - 254</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Station Address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI6</td>
<td>CommSel</td>
<td>09-01 Communication</td>
<td>No Units</td>
<td>R</td>
<td>0 ~ 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mode Selection</td>
<td></td>
<td></td>
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<tr>
<td>AI7</td>
<td>BaudRate</td>
<td>09-02 Baud Rate Setting</td>
<td>No Units</td>
<td>R</td>
<td>0 ~ 5</td>
</tr>
<tr>
<td>AI8</td>
<td>CarrierFreq</td>
<td>11-01 Carrier Frequency</td>
<td>kHz</td>
<td>R</td>
<td>0 ~ 16</td>
</tr>
<tr>
<td>AI9</td>
<td>Freq cmd</td>
<td>12-16 Frequency</td>
<td>Hz</td>
<td>R</td>
<td>0.00 ~ 400.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Command</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI10</td>
<td>Frequency</td>
<td>12-17 Output Frequency</td>
<td>Hz</td>
<td>R</td>
<td>0.00 ~ 400.00</td>
</tr>
<tr>
<td>AI11</td>
<td>Current</td>
<td>12-18 Output Current</td>
<td>Amps</td>
<td>R</td>
<td>0.0~6553.5</td>
</tr>
<tr>
<td>AI12</td>
<td>Control Mode</td>
<td>12-24 Control Mode</td>
<td>No Units</td>
<td>R/W</td>
<td>0 ~ 5</td>
</tr>
<tr>
<td>AI13</td>
<td>TM2 AIN</td>
<td>12-25 A1 Input</td>
<td>Volt</td>
<td>R</td>
<td>0 ~ 100.0</td>
</tr>
<tr>
<td>AI14</td>
<td>TM2 AIN2</td>
<td>12-26 A2 Input</td>
<td>Volt</td>
<td>R</td>
<td>0 ~ 100.0</td>
</tr>
<tr>
<td>AI15</td>
<td>Error code</td>
<td>12-45 Recent Fault</td>
<td>No Units</td>
<td>R</td>
<td>0 ~ 45</td>
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<tr>
<td></td>
<td></td>
<td>Message</td>
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<td></td>
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</table>

### Analog output property list (READ/Write)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>F510 Parameters</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO1</td>
<td>Set frequency</td>
<td>Register 2502H</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO2</td>
<td>AO1</td>
<td>Register 2505H</td>
<td>Volt/Amps</td>
<td>R</td>
<td>0.00 ~ 100.00</td>
</tr>
<tr>
<td>AO3</td>
<td>AO2</td>
<td>Register 2506H</td>
<td>Volt/Amps</td>
<td>R</td>
<td>0.00 ~ 100.00</td>
</tr>
<tr>
<td>AO4</td>
<td>RunSource</td>
<td>00-02 Main Run Command</td>
<td>No Units</td>
<td>R/W</td>
<td>0 ~ 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Source Selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO5</td>
<td>FrequencyComm</td>
<td>00-05 Main Frequency</td>
<td>No Units</td>
<td>R/W</td>
<td>0 ~ 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Command Source Selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO6</td>
<td>FreqUpperLim</td>
<td>00-12 Upper Limit</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 109</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO7</td>
<td>FreqLowerLim</td>
<td>00-13 Lower Limit</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 109</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO8</td>
<td>Acc Time1</td>
<td>00-14 Acceleration</td>
<td>seconds</td>
<td>R/W</td>
<td>0 ~ 6000.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 1</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>AO9</td>
<td>Dec Time1</td>
<td>00-15 Deceleration</td>
<td>seconds</td>
<td>R/W</td>
<td>0 ~ 6000.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO10</td>
<td>Motor R-Amp</td>
<td>02-01 Motor Rated</td>
<td>Amps</td>
<td>R/W</td>
<td>1 ~ 999.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>AO11</td>
<td>FreqCommand1</td>
<td>05-01 Frequency Setting of</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
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1-34
<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>F510 Parameters</th>
<th>Unit</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO12</td>
<td>FreqCommand2</td>
<td>06-01 Frequency Setting of Speed-Stage 1</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO13</td>
<td>FreqCommand3</td>
<td>06-02 Frequency Setting of Speed-Stage 2</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO14</td>
<td>FreqCommand4</td>
<td>06-03 Frequency Setting of Speed-Stage 3</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO15</td>
<td>FreqCommand5</td>
<td>06-04 Frequency Setting of Speed-Stage 4</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO16</td>
<td>FreqCommand6</td>
<td>06-05 Frequency Setting of Speed-Stage 5</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO17</td>
<td>FreqCommand7</td>
<td>06-06 Frequency Setting of Speed-Stage 6</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO18</td>
<td>FreqCommand8</td>
<td>06-07 Frequency Setting of Speed-Stage 7</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO19</td>
<td>FreqCommand9</td>
<td>06-08 Frequency Setting of Speed-Stage 8</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO20</td>
<td>FreqCommand10</td>
<td>06-09 Frequency Setting of Speed-Stage 9</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO21</td>
<td>FreqCommand11</td>
<td>06-10 Frequency Setting of Speed-Stage 10</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO22</td>
<td>FreqCommand12</td>
<td>06-11 Frequency Setting of Speed-Stage 11</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO23</td>
<td>FreqCommand13</td>
<td>06-12 Frequency Setting of Speed-Stage 12</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO24</td>
<td>FreqCommand14</td>
<td>06-13 Frequency Setting of Speed-Stage 13</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO25</td>
<td>FreqCommand15</td>
<td>06-14 Frequency Setting of Speed-Stage 14</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO26</td>
<td>FreqCommand16</td>
<td>06-15 Frequency Setting of Speed-Stage 15</td>
<td>Hz</td>
<td>R/W</td>
<td>0 ~ 400.00</td>
</tr>
<tr>
<td>AO27</td>
<td>PwrL Sel</td>
<td>07-00 Momentary Power Loss/Fault Restart Selection</td>
<td>No Units</td>
<td>R</td>
<td>0 ~ 1</td>
</tr>
<tr>
<td>AO28</td>
<td>RestartDelay</td>
<td>07-01 Fault Auto-Restart Time</td>
<td>seconds</td>
<td>R</td>
<td>0 ~ 7200</td>
</tr>
<tr>
<td>AO29</td>
<td>RestartSel</td>
<td>07-02 Number of Fault Auto- Restart Attempts</td>
<td>No Units</td>
<td>R</td>
<td>0 ~ 10</td>
</tr>
<tr>
<td>AO30</td>
<td>StoppingSel</td>
<td>07-09 Stop Mode Selection</td>
<td>No Units</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
<tr>
<td>AO31</td>
<td>PID – P Gain</td>
<td>10-05 Proportional Gain (P)</td>
<td>No Units</td>
<td>R/W</td>
<td>0 ~ 10.00</td>
</tr>
<tr>
<td>AO32</td>
<td>PID – I Time</td>
<td>10-06 Integral Time (I)</td>
<td>No Units</td>
<td>R/W</td>
<td>0 ~ 100.00</td>
</tr>
<tr>
<td>AO33</td>
<td>PID – D Time</td>
<td>10-07 Differential Time (D)</td>
<td>No Units</td>
<td>R/W</td>
<td>0 – 10.00</td>
</tr>
<tr>
<td>AO34</td>
<td>ReverseOper</td>
<td>11-00 Direction Lock Selection</td>
<td>No Units</td>
<td>R/W</td>
<td>0 ~ 2</td>
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</tbody>
</table>
### Binary input property list (READ)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>No Action / Action</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI1</td>
<td>Run/ Stop</td>
<td>Stop/ Run</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI2</td>
<td>Direction</td>
<td>Forward/ Reverse</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI3</td>
<td>Status</td>
<td>OK/ Fault</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI4</td>
<td>Abnormal</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI5</td>
<td>DI_1 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI6</td>
<td>DI_2 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI7</td>
<td>DI_3 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI8</td>
<td>DI_4 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI9</td>
<td>DI_5 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BI10</td>
<td>DI_6 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>

### Binary output property list (READ/ WRITE)

<table>
<thead>
<tr>
<th>No.</th>
<th>Object Name</th>
<th>No Action / Action</th>
<th>Classification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO1</td>
<td>Run/ Stop</td>
<td>Stop/ Run</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BO2</td>
<td>Forward/ Reverse</td>
<td>Forward/ Reverse</td>
<td>R/W</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BO3</td>
<td>RY1 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BO4</td>
<td>RY2 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
<tr>
<td>BO5</td>
<td>RY3 Status</td>
<td>Off/ On</td>
<td>R</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>

### MetaSys N2 Error Code List

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>No identify command received at power up</td>
</tr>
<tr>
<td>01</td>
<td>Command not supported</td>
</tr>
<tr>
<td>02</td>
<td>Check Code Error</td>
</tr>
<tr>
<td>03</td>
<td>Data received exceeds 256 bytes</td>
</tr>
<tr>
<td>05</td>
<td>Incorrect command length</td>
</tr>
<tr>
<td>10</td>
<td>Data is out of the range</td>
</tr>
<tr>
<td>11</td>
<td>Save undefined fields or dedicated JCI fields</td>
</tr>
<tr>
<td>12</td>
<td>The parameter read only</td>
</tr>
</tbody>
</table>
1.3 Profibus Communication Option Card

1.3.1 Introduction

This is a detailed description and application setup for the F510 Profibus DP communication option card (JN5-CM-PMUS).

1.3.2 Specifications (JN50CM-PBUS)

The RS-485 port becomes unavailable for communication when the Profibus card is used.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Function</td>
<td>Connect F510 inverter with Profibus-DP network</td>
</tr>
<tr>
<td>Suitable Inverter</td>
<td>F510 Series</td>
</tr>
<tr>
<td>Mounting Base</td>
<td>Connector on F510 Control Board</td>
</tr>
<tr>
<td>Maximum Connection</td>
<td>32 DP-Slave nodes</td>
</tr>
<tr>
<td>Auto-Baud Search(bit/Sec)</td>
<td>9.6K 19.2K 93.75K 187.5K 500K 1.5M 3M 6M 12M</td>
</tr>
<tr>
<td>Transmission Distance(m)</td>
<td>1200 1200 1200 1000 400 200 100 100 100</td>
</tr>
<tr>
<td>Connection Medium</td>
<td>Profibus Layer 2 Cable</td>
</tr>
<tr>
<td>Optic Coupler Isolation</td>
<td>Common Mode Rejection Vcm=50V,dV/dt=5000V/uSec</td>
</tr>
<tr>
<td>Access Parameter</td>
<td>16 Words in, 16 Words out</td>
</tr>
<tr>
<td>Terminal Resistor</td>
<td>DIP Switch Setting On Board</td>
</tr>
<tr>
<td>LED Indication</td>
<td>Operation, Profibus communication</td>
</tr>
<tr>
<td>Dimension</td>
<td>101 mm x 40.5 mm</td>
</tr>
</tbody>
</table>
1.3.3 Wiring Diagram

PLC

SIEMENS SIMATIC S7-300

CPU315-2 DP

Profibus DP Card

F510

Profibus Layer2 Cable

Terminals of JN5-CM-PBUS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>B+</td>
<td>Profibus sends and receives signals (Positive)</td>
</tr>
<tr>
<td>A-</td>
<td>Profibus sends and receives signals (Negative)</td>
</tr>
<tr>
<td>E</td>
<td>Connect to the isolation layer of Profibus Cable</td>
</tr>
</tbody>
</table>

1.3.4 Installation

- Turn on the inverter and check the Software version in parameter 13-01.

- In order to support functions of Profibus-DP communication card, it is necessary to use F510 inverter with software version 1.2 or newer version.

- Set parameters 09-02, 00-02, 00-05. Please refer to section 11.9.6 for the setting of related communication parameters. Then turn off the inverter.

- Remove the Digital Operator and front cover / terminal cover. Please also refer to Section 3.2.4 for the installation process to remove operator and covers for avoiding damage to the inverter.

- Turn off the inverter and check the CHARGE indicator is OFF.
- Install the Profibus-DP communication card on the control board, with the holes aligned to the locking supports, and the connector CN1 aligned to CN3 (36pin) of the control board. Please refer to the following figure.
  - Connect the Profibus Layer 2 Cable to TB1 on the Profibus-DP Option Card.
  - (The green line is for A-, and the red one is for B+ )
  - Set Profibus Address and terminal resistor via SW1 and SW2. (Refer to section 11.9.5 for information of setting of SW1 and SW2.)
  - Turn on Inverter.
(1) For IP00/ IP20 models

1. Unfasten screws on the terminal cover.
2. Press the latch on both sides and remove the terminal cover.
3. Press the latch on the side of digital operator to remove it.
4. Disconnect the RJ45 cable from the digital operator.
5. Press the latch on both sides of the front cover, and remove the front cover.
6. Install option card.
7. Follow the instructions above in a reverse order to re-install covers and operator.
1.3.5 Descriptions of Terminals, LEDs and DIP switch

(1) Terminals

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B+</td>
<td>Profibus Signal (Positive)</td>
</tr>
<tr>
<td>A−</td>
<td>Profibus Signal (Negative)</td>
</tr>
<tr>
<td>E</td>
<td>Connect to shield of Profibus Cable</td>
</tr>
</tbody>
</table>

(2) LED

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED1 (Red)</td>
<td>LED lights during the Profibus-DP communication.</td>
</tr>
<tr>
<td>LED2 (Red)</td>
<td>LED lights while the option card operates without error.</td>
</tr>
</tbody>
</table>

(3) DIP Switch

A. SW1 (Profibus Address. Set SW1-6, 1-7, 1-8 to OFF)

<table>
<thead>
<tr>
<th>Address</th>
<th>SW1-5</th>
<th>SW1-4</th>
<th>SW1-3</th>
<th>SW1-2</th>
<th>SW1-1</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
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</tr>
<tr>
<td>2</td>
<td>OFF</td>
<td>OFF</td>
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<td>!</td>
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</tr>
<tr>
<td>30</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
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<td>31</td>
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B. SW2 (Terminal Resistor)

<table>
<thead>
<tr>
<th>SW2</th>
<th>Description</th>
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<tr>
<td>ON</td>
<td>Enable terminal resistor between B+ and A-</td>
</tr>
<tr>
<td>OFF</td>
<td>Disable terminal resistor between B+ and A-</td>
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</table>

1.3.6 Related Parameters for Communication

The Profibus master PLC can monitor the status of F510 via Profibus DP option card when parameter 09-01 is set to 4 (Profibus). Operating and frequency commands are enabled by the setting of 00-02 to 2 and 00-05 to 3 (communication control). Refer to the following table:

<table>
<thead>
<tr>
<th>Group</th>
<th>Parameter Name</th>
<th>Setting Range</th>
<th>Default</th>
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<tbody>
<tr>
<td>09-01</td>
<td>Communication Selection</td>
<td>4:Profibus</td>
<td>0</td>
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<tr>
<td>00-02</td>
<td>Main Run Command Source Selection</td>
<td>2:Communication Control</td>
<td>1</td>
</tr>
<tr>
<td>00-05</td>
<td>Main Frequency Command Source Selection</td>
<td>3:Communication Control</td>
<td>1</td>
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</table>

1.3.7 Profibus I/O List

The Profibus master (PLC) configuration defines the Profibus I/O address with a range of 400~431. See table below for Profibus address and related parameters.

(1) Data input (Data sent by the inverter to the PLC)

<table>
<thead>
<tr>
<th>No.</th>
<th>Profibus address</th>
<th>Signal Status</th>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PIW400</td>
<td>Status</td>
<td>0</td>
<td>Inverter status</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1 : Running 0 : Stop</td>
</tr>
<tr>
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<td>1</td>
<td>Direction status</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1 : Reverse 0 : Forward</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>2</td>
<td>Inverter ready status</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>3</td>
<td>1 : Inverter ready 0 : Preparing</td>
</tr>
<tr>
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<td>3</td>
<td>Error</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>4</td>
<td>1 : &quot;ON&quot;</td>
</tr>
<tr>
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<td></td>
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<td>5</td>
<td>1 : &quot;ON&quot;</td>
</tr>
<tr>
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<td></td>
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<td>1 : &quot;ON&quot;</td>
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<td>1 : &quot;ON&quot;</td>
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<td>Setting frequency agree</td>
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<td>9</td>
<td>1 : &quot;ON&quot;</td>
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<td>Frequency detection 2</td>
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<td>1 : &quot;ON&quot;</td>
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<td>B</td>
<td>Under voltage</td>
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<td>B</td>
<td>1 : &quot;ON&quot;</td>
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<td>1 : &quot;ON&quot;</td>
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<td>Frequency command source</td>
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<td>4</td>
<td>PIW406</td>
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<td>Frequency command (6000/60Hz)</td>
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</tr>
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<td>PIW408</td>
<td></td>
<td>Output frequency (6000/60Hz)</td>
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<td>PIW410</td>
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<td>PIW412</td>
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<td>Voltage command (1/0.1V)</td>
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<td>PIW414</td>
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<td>Output current (1/0.1A)</td>
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<td>No alarm</td>
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<td>DO Status</td>
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<td>R1A-R1C output</td>
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<tr>
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<td></td>
<td>1</td>
<td>R2A-R2C output</td>
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<td>2</td>
<td>R3A-R3C output</td>
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<td>3-</td>
<td>Reserved</td>
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<td>15</td>
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</tr>
<tr>
<td>11</td>
<td>PIW420</td>
<td></td>
<td>AO1 (0.00V ~ 10.00V)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>PIW422</td>
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<td>AO2 (0.00V ~ 10.00V)</td>
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<tr>
<td>13</td>
<td>PIW424</td>
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<td>Analog input 1 (1/0.1%)</td>
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<tr>
<td>14</td>
<td>PIW426</td>
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<td>Analog input 2 (1/0.1%)</td>
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<td>15</td>
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</table>
(2) Data output (Data sent by the PLC to the inverter)

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<th>Profibus address</th>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PQW400</td>
<td>0</td>
<td>Operating command 1 : Run 0 : Stop</td>
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<td></td>
<td></td>
<td>1</td>
<td>Direction command 1 : Reversed 0 : Forward</td>
</tr>
<tr>
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<td>(User can prohibit the direction via parameter 11-00, 0: Allow FWD/REV 1: Allow FWD only 2: Allow REV only)</td>
</tr>
<tr>
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<td></td>
<td>2</td>
<td>External fault 1 : Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Fault reset 1 : Reset</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Programmable digital Input S1 1 : “ON”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Programmable digital Input S2 1 : “ON”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Programmable digital Input S3 1 : “ON”</td>
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<td>Programmable digital Input S4 1 : “ON”</td>
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<td>A</td>
<td>Programmable digital Input S5 1 : “ON”</td>
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<td>B</td>
<td>Programmable digital Input S6 1 : “ON”</td>
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<td>C</td>
<td>Reserved</td>
</tr>
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<td></td>
<td>D</td>
<td>Reserved</td>
</tr>
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<td>E</td>
<td>Controller mode 1 : “ON”</td>
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<td>F</td>
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<td>PQW402</td>
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<td>Frequency command(6000/60Hz)</td>
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<td>Reserved</td>
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<tr>
<td>5</td>
<td>PQW408</td>
<td></td>
<td>AO1 (0.00V ~ 10.00V)</td>
</tr>
<tr>
<td>6</td>
<td>PQW410</td>
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<td>AO2 (0.00V ~ 10.00V)</td>
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<td>PQW412</td>
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<td>R1A-R1C output( 0: No action 1 : output)</td>
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<td>(It is enabled while 03-11=32)</td>
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<td></td>
<td></td>
<td>1</td>
<td>R2A-R2C output ( 0: No action 1 : output)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(It is enabled while 03-12=32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>R3A-R3C output ( 0:No action 1 : output)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(It is enabled while 03-39=32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3-15</td>
<td>Reserved</td>
</tr>
<tr>
<td>8</td>
<td>PQW414</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>9</td>
<td>PQW416</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>10</td>
<td>PQW418</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>11</td>
<td>PQW420</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>12</td>
<td>PQW422</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>13</td>
<td>PQW424</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>14</td>
<td>PQW426</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>15</td>
<td>PQW428</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>16</td>
<td>PQW430</td>
<td></td>
<td>Reserved</td>
</tr>
</tbody>
</table>
1.3.8 Error Message

If the Profibus DP option card is unable to communicate with the Profibus network or F510, or the option card is defective, the F510 will display an error message on the digital operator. For the majority of errors, LED1 on the communication option card will flash or be off, showing that a fault is active.

<table>
<thead>
<tr>
<th>Message in Operator</th>
<th>Option card LED Status</th>
<th>Content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication error 1</td>
<td>LED1 Flash</td>
<td>Communication Time-out</td>
<td>Profibus DP option card does not receive any data from Profibus network in specified period.</td>
</tr>
<tr>
<td>Communication error 2</td>
<td>LED2 Flash</td>
<td>Dual port RAM Fault</td>
<td>Dual-port RAM Fault.</td>
</tr>
<tr>
<td>Communication error 3</td>
<td>LED2 Flash</td>
<td>Dual port RAM Checksum Error</td>
<td>Dual-port RAM Checksum Error while data is being exchanged in Dual-port RAM.</td>
</tr>
<tr>
<td>Communication error 4</td>
<td>LED2 Flash</td>
<td>Dual port RAM data error</td>
<td>Dual-port RAM data Error while data is being exchanged in Dual-port RAM</td>
</tr>
</tbody>
</table>

1.3.9 GSD File

```plaintext
;(xhr**********************************************************************************************************************************************/
;//* Filename:  F510-P.GSD
;//* ModelName:  TECO AC DRIVES F510
;//* CreateDate:  2012.12.18
;//xhr**********************************************************************************************************************************************/

#Profibus_DP
GSD_Revision = 1
Vendor_Name = "TECO"
Model_Name = "F510-P"
Revision = "Version0.0"
Ident_Number = 0xF510
Protocol_Ident = 0 ;Profibus-DP
Station_Type = 0 ;DP Slave
FMS_supp = 0 ;Pure DP Device
Hardware_Release = "HW_V1.0"
Software_Release = "SW_V1.0"

; 9.6_supp = 1
19.2_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp = 1
```

1-46
6M_supp = 1
12M_supp = 1
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800
Redundancy = 0 ; No Redundancy Supported
Repeater_Ctrl_Sig = 2 ; TTL
24V_Pins = 0 ; Not Connected
;
Implementation_Type = "VPC3"
Bitmap_Device = "DP_NORM"
Bitmap_Diag = "bmpdia"
Bitmap_SF = "bmpsf"
;
Freeze_Mode_supp = 1 ; Supported
Sync_Mode_supp = 1 ; Supported
Auto_Baud_supp = 1 ; Supported
Set_Slave_Add_supp = 0 ; cannot change via profibus
;
Fail_Safe = 0
Slave_Family = 1 ; Drives Family
Min_Slave_Intervall = 10 ; PollingCycle: 10*100uS = 1mS
;
Max_Diag_Data_Len = 16
Max_User_Prm_Data_Len = 5
Modul_Offset = 255
Ext_User_Prm_Data_Const(0) = 0x00,0x00,0x00,0x00,0x00,0x00
;
Modular_Station = 1 ; Modular Device
Max_Module = 1 ; Only 1 Module can be inserted
Max_Input.Len = 32
Max_Output.Len = 32
Max_Data.Len = 64
Module = "16 Word In, 16 Word Out" 0x7f

EndModule
Appendix A: Communication Network

A1.1 RS485 –Network (Modbus)

This section shows a RS485 network consisting of several inverters communicating using the built-in Modbus RTU protocol.

Notes:

- A PC / PLC controller with a built-in RS-485 interface can be connected directly to the RS-485 network. Use a RS232 to RS485 converter to connect a PC / PLC with a built-in RS-232 interface.
- A maximum of 31 inverters can be connected to the network. Terminating resistors of 220 ohm must be installed at both end of the network.

Refer to F510 RS-485 Modbus communication manual for more information.