

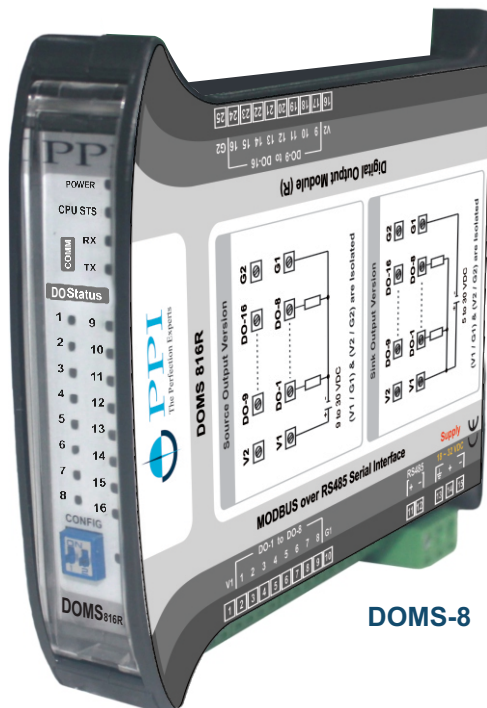
DOMS 816R

8 / 16 Channels
Source & Sink Output Versions
DIN-Rail Mount
MODBUS over Serial

Process Precision Instruments
Vasai Road (E), Dist. Palghar - 401210,
Maharashtra, India

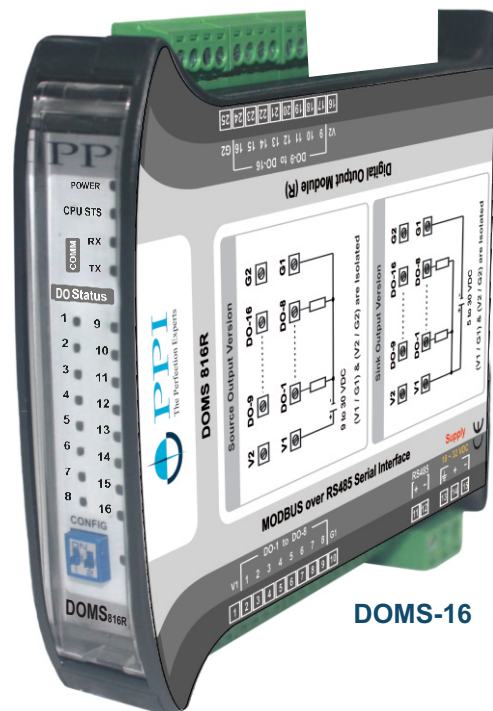
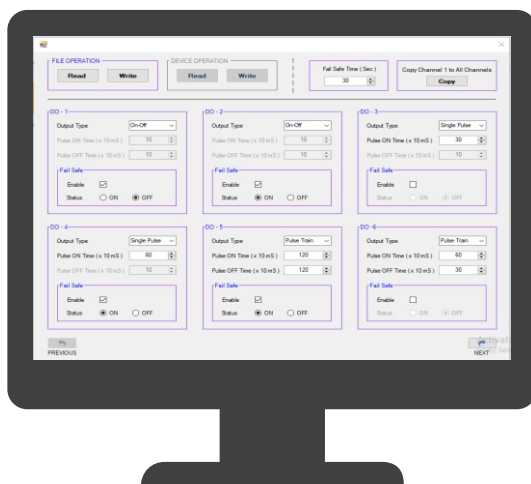
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User Manual



DOMS-8

Configuration Tool



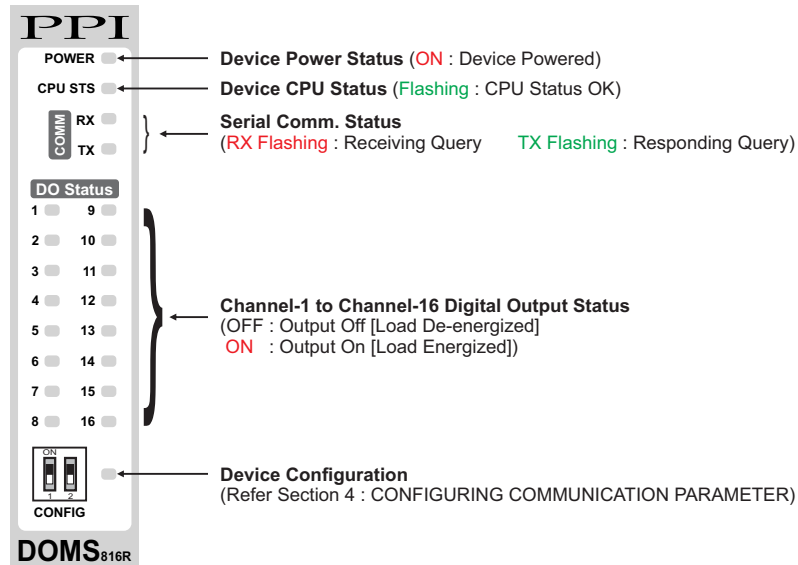
DOMS-16

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Section 1 FRONT PANEL & ELECTRICAL CONNECTIONS

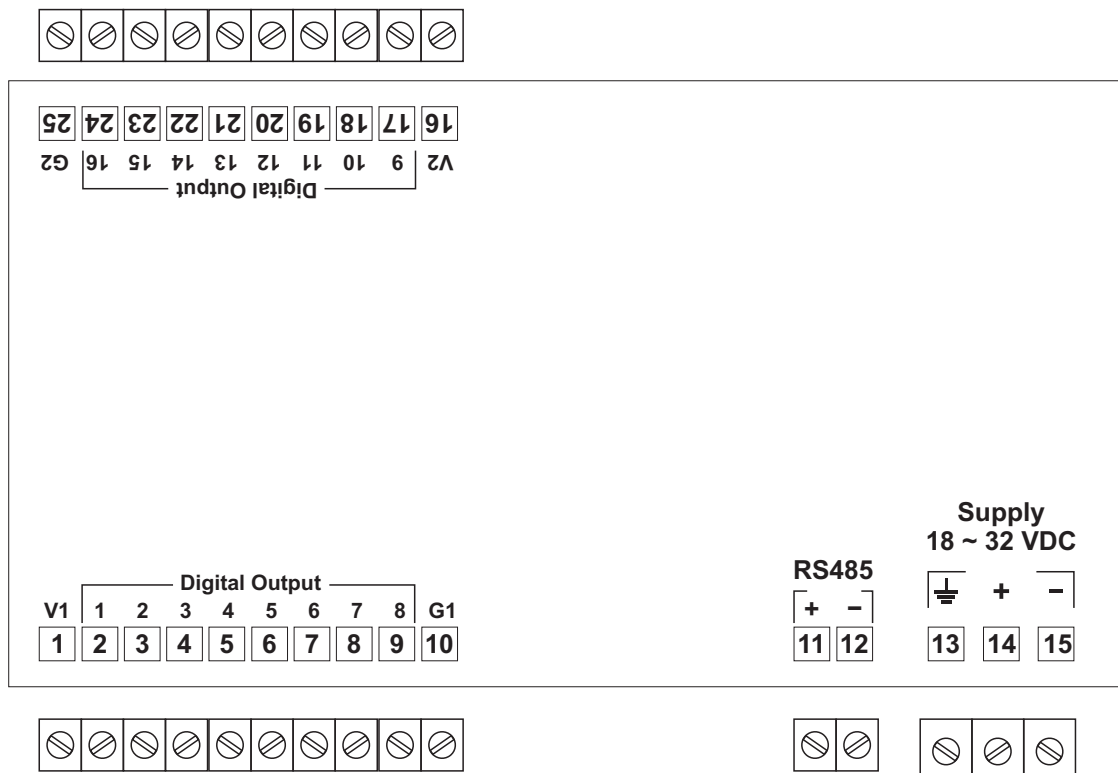
FRONT PANEL



ELECTRICAL CONNECTIONS

The Figure 1.1 illustrates Electrical Connection Diagrams.

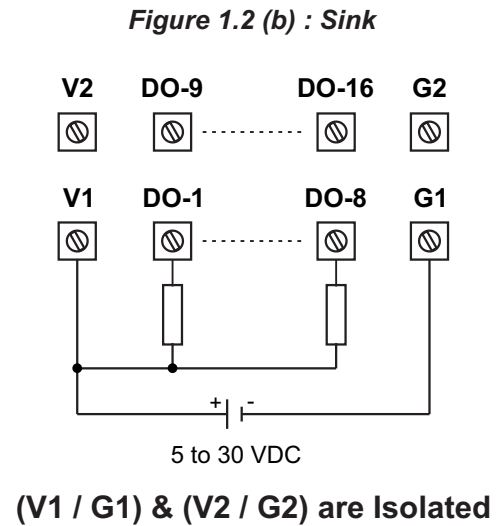
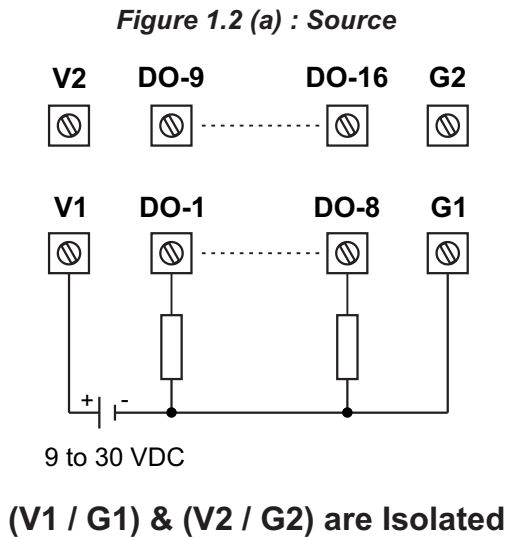
Figure 1.1



DIGITAL OUTPUT CHANNELS

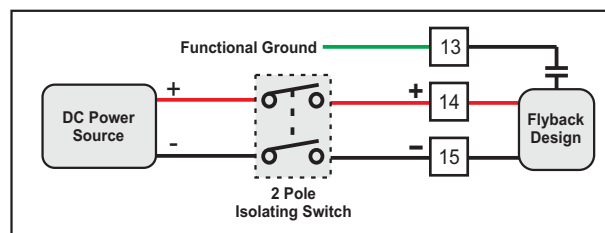
The Digital Output Module (DOMS) is available in 2 Versions - Source & Sink, depending on how the output load will be connected.

Figures 1.2 (a) & 1.2 (b) below show the connection details for Source & Sink Version, respectively.



Power Supply (Terminals 13, 14 & 15)

Figure 1.3



As standard, the connections are suited for 18 to 32 VDC power sources. The accuracy or performance of the Module is not affected by the variations in the supply within specified limits of 18 to 32 VDC.

Use well-insulated copper conductor wire of a size not smaller than 0.5mm² for power supply connections ensuring proper polarity, as shown in Figure 1.3. The Module is not provided with a power switch. If necessary, mount them separately.

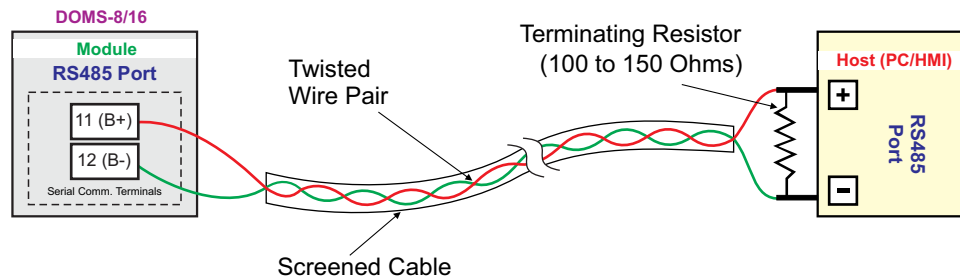
For safety and enhanced electrical noise immunity, it is highly recommended to connect the Mains Power Supply 'Earth' to terminal 13.

Serial Communication Port (Terminals 11, 12)

Figure 1.4 shows the wiring connections for interfacing the Host (PC/HMI) with DOMS.

Use a pair of twisted wires inside the screened cable for reliable noise-free communication. The wire should have less than 100 ohms/km nominal DC resistance (typically 24 AWG or thicker). Connect the terminating resistor (typically 100 to 150 ohm) at one end to improve noise immunity.

Figure 1.4

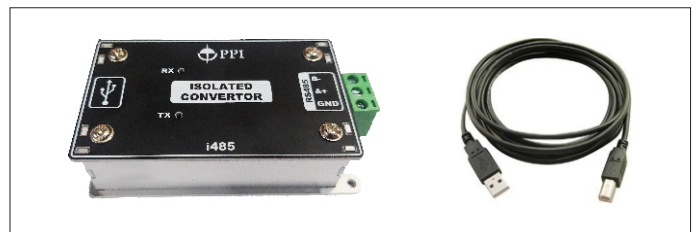


Note

In case of non-availability of an RS485 port on the Host PC, use the appropriate Serial Protocol Converter to match the available serial port on the host like “USB to RS485” and “RS232 to RS485” (Refer few images below). Please ensure that the appropriate Device Driver for the selected converter is installed on the Host PC.



RS232 to RS485



USB to RS485



Section 2 PARAMETERS

The communication parameter settings and the data packet format have been discussed in Section 4: Configuring Communication Parameters.

For user convenience, most parameters are accessible as **Bit-Mapped Modbus Registers** and **Discrete Input Coils**.

1. Digital Output Function Modes & Associated Parameters

Each Digital Output can be independently programmed to function as **On-Off**, **Re-triggerable Single Pulse**, or continuous **Pulse Train** output.

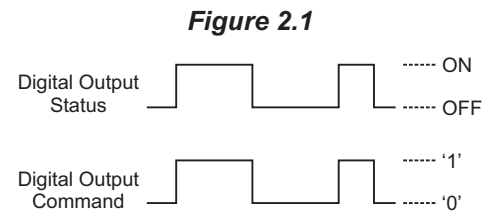
For Single Pulse output, the Pulse-Time is settable. For Pulse Train output, the Pulse-On & Pulse-Off times are settable.

The outputs are switched/triggered by writing to the Digital Output Command Register / Coils.

The three modes & the parameters are described below.

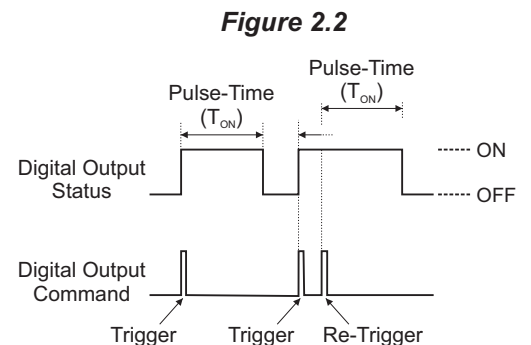
On-Off Mode

In this mode, the output switches On or Off following the Digital Output Command Value. If Digital Output Command is written '1', the output turns On. If Digital Output Command is written '0', the output turns OFF. Refer to Figure 2.1.



Re-triggerable Single Pulse Mode

In this mode, the output generates a single Logic High Pulse whenever the Digital Output Command is written '1'. The module automatically writes '0' to the Digital Output Command as soon as the output pulse is initiated. If the Output Command is again written '1' while the pulse is still Logic High, the pulse time restarts (Re-triggered). Refer to Figure 2.2.



Pulse Train Mode

In this mode, the output initiates a continuous series of High-Low Pulses when the Digital Output Command is written '1'. The Pulse Train continues as long as the Digital Output Command remains '1'. The Pulse-Train stops immediately upon writing '0' to the Digital Output Command. Refer to Figure 2.3.

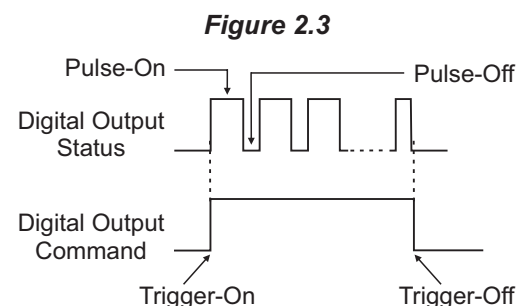


Table 2.1 (a) : Output Status Command Register
Run-Time Parameter

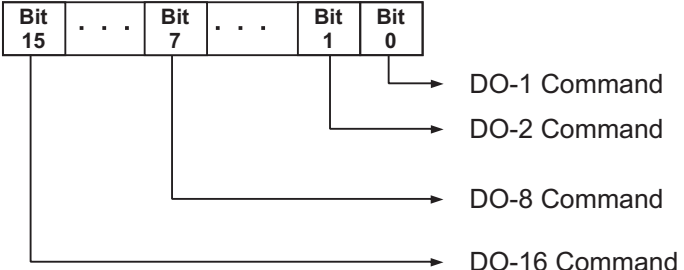
Modbus Data Type	MODBUS Address	Values																	
Bit-Mapped Holding Register <i>Function Code (0x06 & 0x10)</i>	2	 <p>For 8 Channel Version (DOMS-8), ignore Bit-8 to Bit-15</p> <p>Write Operation (Bit Positions 0 to 15)</p> <table border="1"> <thead> <tr> <th>Bit Value</th> <th>Mode</th> <th>DO Status</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1</td> <td>On-Off</td> <td>Output ON</td> </tr> <tr> <td>Single Pulse</td> <td>Start a new pulse or re-trigger a running pulse</td> </tr> <tr> <td>Pulse Train</td> <td>Start / Keep running a Pulse-Train</td> </tr> <tr> <td rowspan="3">0</td> <td>On-Off</td> <td>Output OFF</td> </tr> <tr> <td>Single Pulse</td> <td>No effect</td> </tr> <tr> <td>Pulse Train</td> <td>Stop Pulse-Train</td> </tr> </tbody> </table>	Bit Value	Mode	DO Status	1	On-Off	Output ON	Single Pulse	Start a new pulse or re-trigger a running pulse	Pulse Train	Start / Keep running a Pulse-Train	0	On-Off	Output OFF	Single Pulse	No effect	Pulse Train	Stop Pulse-Train
Bit Value	Mode	DO Status																	
1	On-Off	Output ON																	
	Single Pulse	Start a new pulse or re-trigger a running pulse																	
	Pulse Train	Start / Keep running a Pulse-Train																	
0	On-Off	Output OFF																	
	Single Pulse	No effect																	
	Pulse Train	Stop Pulse-Train																	
Coils <i>Function Code (0x05 & 0x0F)</i>	1 to 8 (8 Channel) 1 to 16 (16 Channel)	<p>Write Operation (Coil Address 1 to 16)</p> <p>For 8 Channel Version (DOMS-8), address 9 to 16 are Ignored</p> <table border="1"> <thead> <tr> <th>Coil Value</th> <th>Mode</th> <th>DO Status</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1</td> <td>On-Off</td> <td>Output ON</td> </tr> <tr> <td>Single Pulse</td> <td>Start a new pulse or re-trigger a running pulse</td> </tr> <tr> <td>Pulse Train</td> <td>Start / Keep running a Pulse-Train</td> </tr> <tr> <td rowspan="3">0</td> <td>On-Off</td> <td>Output OFF</td> </tr> <tr> <td>Single Pulse</td> <td>No effect</td> </tr> <tr> <td>Pulse Train</td> <td>Stop Pulse-Train</td> </tr> </tbody> </table>	Coil Value	Mode	DO Status	1	On-Off	Output ON	Single Pulse	Start a new pulse or re-trigger a running pulse	Pulse Train	Start / Keep running a Pulse-Train	0	On-Off	Output OFF	Single Pulse	No effect	Pulse Train	Stop Pulse-Train
Coil Value	Mode	DO Status																	
1	On-Off	Output ON																	
	Single Pulse	Start a new pulse or re-trigger a running pulse																	
	Pulse Train	Start / Keep running a Pulse-Train																	
0	On-Off	Output OFF																	
	Single Pulse	No effect																	
	Pulse Train	Stop Pulse-Train																	

Table 2.1 (b) : Output Function Mode
Configuration Parameter (Stored in Non-Volatile memory)

Modbus Data Type	MODBUS Address	Values								
Holding Register <i>Function Code (0x06 & 0x10)</i>	6 to 13 (8 Channel) 6 to 21 (16 Channel)	<table border="1"> <thead> <tr> <th>Value</th> <th>Function Mode</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>ON-OFF</td> </tr> <tr> <td>1</td> <td>Single Pulse</td> </tr> <tr> <td>2</td> <td>Pulse Train</td> </tr> </tbody> </table> <p>(Default : ON-OFF Mode)</p>	Value	Function Mode	0	ON-OFF	1	Single Pulse	2	Pulse Train
Value	Function Mode									
0	ON-OFF									
1	Single Pulse									
2	Pulse Train									

Table 2.1 (c) : Pulse-ON Time

Run-Time / Configuration Parameter (Refer Parameter : 'Save Pulse-ON & Pulse-OFF Times to Non-Volatile Memory')

Modbus Data Type	MODBUS Address	Values
Holding Register <i>Function Code (0x06 & 0x10)</i>	22 to 29 (8 Channel) 22 to 37 (16 Channel)	Applicable for 'Single Pulse' & 'Pulse-Train' Mode Only 0 to 30000 Counts (0.01 to 300 Seconds) 1 count = 10 milli-Seconds (Default : 10 Counts)

Table 2.1 (d) : Pulse-OFF Time

Run-Time / Configuration Parameter (Refer Parameter : 'Save Pulse-ON & Pulse-OFF Times to Non-Volatile Memory')

Modbus Data Type	MODBUS Address	Values
Holding Register <i>Function Code (0x06 & 0x10)</i>	38 to 45 (8 Channel) 38 to 53 (16 Channel)	Applicable for 'Pulse-Train' Mode Only 0 to 30000 Counts (0.01 to 300 Seconds) 1 count = 10 milli-Seconds (Default : 10 Counts)

Table 2.1 (e) : Save Pulse-ON & Pulse-OFF Times to Non-Volatile Memory

Modbus Data Type	MODBUS Address	Values						
Holding Register <i>Function Code (0x06 & 0x10)</i>	54	<p>Applicable for 'Single Pulse' & 'Pulse-Train' Mode Only</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Save to Memory</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No</td> </tr> <tr> <td>1</td> <td>Yes</td> </tr> </tbody> </table> <p>If Pulse ON and / or Pulse OFF times are constant for a given application, it is advisable to store these values in module's non-volatile memory. This feature eliminates the need for programming the Pulse ON & Pulse OFF parameter values each time the module is powered.</p> <p>To store values in non-volatile memory, set this Register value (Modbus Address 54) to '1' after setting the values for Pulse ON & Pulse OFF parameters.</p>	Value	Save to Memory	0	No	1	Yes
Value	Save to Memory							
0	No							
1	Yes							

2. Output Fail-Safe Status

Each of the 8 / 16 outputs can be independently enabled to enter into a fail-safe On or Off output state. If enabled, the outputs enter into the fail-safe states if there is no communication (read / write request) from the host to the module for a user-programmed time interval.

The following three sets of Registers / Coils configure the Fail-Safe feature.

Table 2.2 (a) : 'Fail-Safe Enable' Register / Coils
Configuration Parameter (Stored in Non-Volatile memory)

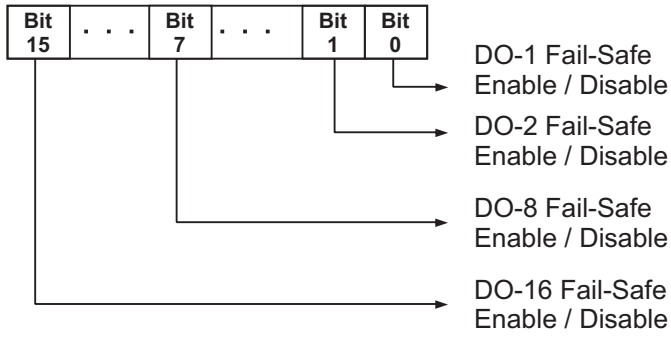
Modbus Data Type	MODBUS Address	Values						
Bit-Mapped Holding Register <i>Function Code (0x06 & 0x10)</i>	3	 <p>For 8 Channel Version (DOMS-8), ignore Bit-8 to Bit-15</p> <table border="1"> <thead> <tr> <th>Bit Value</th> <th>Enable / Disable</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Fail-Safe Disable</td> </tr> <tr> <td>1</td> <td>Fail-Safe Enable</td> </tr> </tbody> </table> <p>(Default : Disable)</p>	Bit Value	Enable / Disable	0	Fail-Safe Disable	1	Fail-Safe Enable
Bit Value	Enable / Disable							
0	Fail-Safe Disable							
1	Fail-Safe Enable							
Coils <i>Function Code (0x05 & 0x0F)</i>	17 to 24 (8 Channel) 17 to 32 (16 Channel)	<table border="1"> <thead> <tr> <th>Coil Value</th> <th>Enable / Disable</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Fail-Safe Disable</td> </tr> <tr> <td>1</td> <td>Fail-Safe Enable</td> </tr> </tbody> </table> <p>(Default : Disable)</p>	Coil Value	Enable / Disable	0	Fail-Safe Disable	1	Fail-Safe Enable
Coil Value	Enable / Disable							
0	Fail-Safe Disable							
1	Fail-Safe Enable							

Table 2.2 (b) : 'Fail-Safe Status' Register / Coils
 (This parameter is applicable only if 'Fail-Safe' is enabled)
 Configuration Parameter (Stored in Non-Volatile memory)

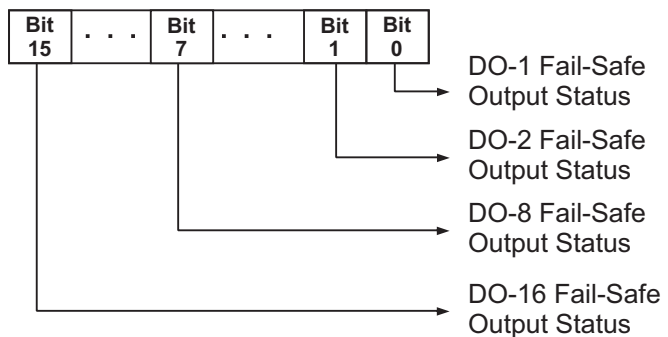
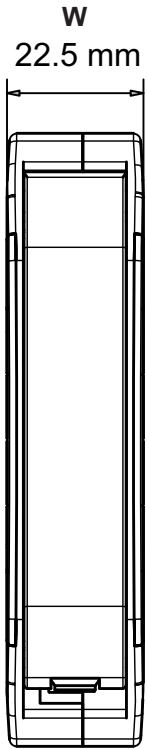
Modbus Data Type	MODBUS Address	Values						
Bit-Mapped Holding Register <i>Function Code (0x06 & 0x10)</i>	4	 <p>DO-1 Fail-Safe Output Status DO-2 Fail-Safe Output Status DO-8 Fail-Safe Output Status DO-16 Fail-Safe Output Status</p> <p>For 8 Channel Version (DOMS-8), ignore Bit-8 to Bit-15</p> <table border="1"> <thead> <tr> <th>Bit Value</th> <th>Output Status</th> </tr> </thead> <tbody> <tr> <td align="center">0</td> <td align="center">OFF</td> </tr> <tr> <td align="center">1</td> <td align="center">ON</td> </tr> </tbody> </table> <p align="center">(Default : OFF)</p>	Bit Value	Output Status	0	OFF	1	ON
Bit Value	Output Status							
0	OFF							
1	ON							
Coils <i>Function Code (0x05 & 0x0F)</i>	33 to 40 (8 Channel) 33 to 48 (16 Channel)	<table border="1"> <thead> <tr> <th>Coil Value</th> <th>Output Status</th> </tr> </thead> <tbody> <tr> <td align="center">0</td> <td align="center">OFF</td> </tr> <tr> <td align="center">1</td> <td align="center">ON</td> </tr> </tbody> </table> <p align="center">(Default : OFF)</p>	Coil Value	Output Status	0	OFF	1	ON
Coil Value	Output Status							
0	OFF							
1	ON							

Table 2.2 (c) : 'Fail-Safe Time Period' Register
 (This parameter is applicable only if 'Fail-Safe' is enabled)
 Configuration Parameter (Stored in Non-Volatile memory)

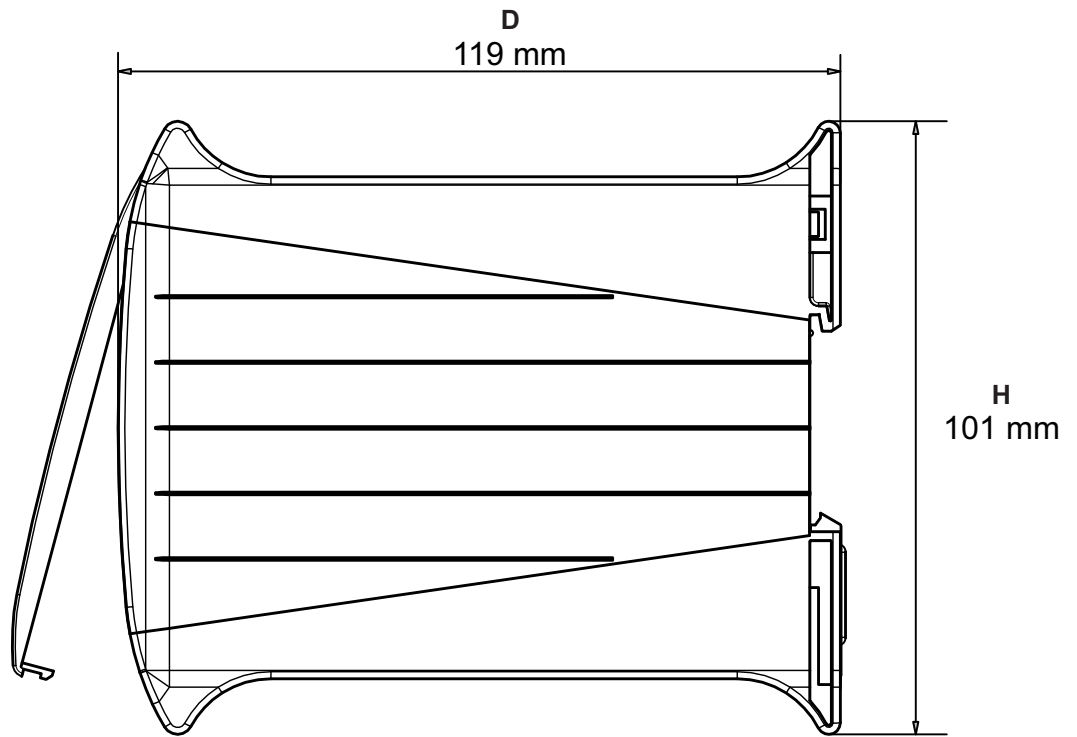
Modbus Data Type	MODBUS Address	Values
Holding Register <i>Function Code (0x06 & 0x10)</i>	5	1 to 300 Seconds (Default : 10 Seconds)



Section 3 MECHANICAL DIMENSIONS



Front View



Side View

Width (W)	22.5 mm
Height (H)	101.0 mm
Depth (D)	119.0 mm



Section 4

CONFIGURING COMMUNICATION PARAMETERS

The Module supports industry standard **MODBUS RTU over Serial** Protocol for configuration & Operation.

The Serial Communication Port specification are shown in Table 4.1 below.

Table 4.1

Port	RS485, 2-wire, Half duplex, Start-stop synchronized	
Protocol	Modbus RTU	
Communication Parameters	Parameter	Settings
	Slave ID	1 to 127
	Baud Rate	2400, 4800, 9600, 19200, 38400 bps
	Parity	None (1 or 2 Stop Bits) Even (1 Stop Bit) odd (1 Stop Bit)
Max. No. of Units per Loop	31	
Maximum Distance	1200 Meters	

The Module is shipped from the factory with the following default values for the Communication Parameters.

Slave ID : 1	Baud Rate : 9600 bps	Parity : Even
--------------	----------------------	---------------

The above parameters can be altered to match with the Host (Master) parameters by putting the Module in **Configuration Mode**. In Configuration Mode, the Module always communicates with the host with the **fixed** communication parameter values (Slave ID : 1, Baud Rate : 9600 & Parity : None) regardless of the actual set values. The user set values are applicable only when the Module is put back in the **Normal Operation Mode**.

A Slide Switch Set is provided on the Module, as shown in the Figure 4.1, to select between the Configuration and Normal Operation modes. The Table 4.2 shows the Switch Positions and the respective mode.

It is important to note that the switch position is detected only upon power-up. Select the desired Mode while the Module is OFF. That is changing the switch position while the Module is powered does not have any effect on the Mode.

Figure 4.1

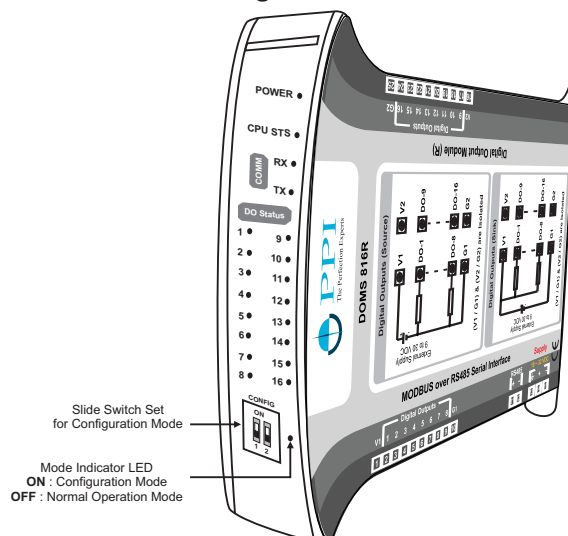
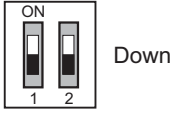
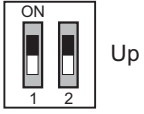


Table 4.2

Switch Position		
Mode Indicator	OFF	ON
Operation Mode	Normal	Configuration
Communication Parameter Values	User Set values for <i>Module Slave ID,</i> <i>Baud Rate & Parity</i>	<i>Module Slave ID : 1</i> <i>Baud Rate : 9600</i> <i>Parity : None</i>


The Communication Parameters values can be altered by using the MODBUS RTU protocol while the Module is in Configuration Mode. Set the host (Master) Baud Rate to “9600 bps” and Parity to “None”. The MODBUS Addresses and Settings for the Module communication parameters are listed in the Table 4.3 below.


Table 4.3



Parameter Description	MODBUS Address	Settings (Default Value)												
Module Slave ID Unique numeric value assigned to the module for identification by the host. Set the value as required by the host.	1	1 to 127 (Default : 1)												
Baud Rate Communication speed in ‘Bits per Second’. Set the value to match with the host baud rate.	2	<table border="1"> <thead> <tr> <th>Value</th> <th>Baud Rate</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>2400 bps</td> </tr> <tr> <td>1</td> <td>4800 bps</td> </tr> <tr> <td>2</td> <td>9600 bps</td> </tr> <tr> <td>3</td> <td>19200 bps</td> </tr> <tr> <td>4</td> <td>38400 bps</td> </tr> </tbody> </table> (Default : 9600 bps)	Value	Baud Rate	0	2400 bps	1	4800 bps	2	9600 bps	3	19200 bps	4	38400 bps
Value	Baud Rate													
0	2400 bps													
1	4800 bps													
2	9600 bps													
3	19200 bps													
4	38400 bps													
Parity One of the communication error trapping features. Set the data packet parity as implemented by the host protocol.	3	<table border="1"> <thead> <tr> <th>Value</th> <th>Parity</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>None</td> </tr> <tr> <td>1</td> <td>Even</td> </tr> <tr> <td>2</td> <td>Odd</td> </tr> </tbody> </table> (Default : Even)	Value	Parity	0	None	1	Even	2	Odd				
Value	Parity													
0	None													
1	Even													
2	Odd													



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