



Macurco™ RD-24
Modbus Remote Driver
Installation & Operation Manual



IMPORTANT: Keep these user instructions for reference.


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1 General Safety Information

1.1 List of warnings

 WARNING
Each person using this equipment must read and understand the information in this user manual before use. Use of this equipment by untrained or unqualified persons or use that is not in accordance with this user manual, may adversely affect product performance.
RD-24 may not function effectively below 32°F (0°C) or above 125°F (52°C). Using the equipment outside of this temperature range may adversely affect product.
Immediately exit any environment that causes an alarm condition on the sensor.
Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may adversely affect product performance and void product warranty.

2 Use Instructions and Limitations

2.1 RD-24 General Description

The RD-24 is a remote input/output device that allows flexibility for applications needing more relays, analog outputs, or analog inputs. Using Modbus communication, you can control multiple I/O based on the application. The RD-24 requires 24VDC to operate and can be used to engage or disengage other equipment such as: fans, louvers, horns, strobes, gas valves, etc. The remote device can be wired in daisy-chain on the gas detector loop to save wire and allows for great flexibility for mounting location.

2.2 Features

- Modbus addressable remote device: relays, analog output, analog input
- Compatible with the Macurco DVP-1200 control panel
- Wall mount NEMA 4X enclosure
- 4 expansion slots for expansion boards: up to 8 relays, 8 analog outputs, or 16 analog inputs, or combination of the three
- 24VDC Input
- Status Indicators (LED): Power, communication, Slot 1-4

2.3 Specifications

- Size: 10.26" x 11.06" x 3.16" (26.06 x 28.09 x 8.03 cm)
- Weight: 2.8 lbs. (1.3 kg)
- Voltage/Current: Power Input: 24VDC, 2A Overcurrent Projection
- RD-24 Current Draw without expansion boards: 20mA
- Operating Temperature: 32 to 125°F (0 - 52°C)
- Ambient Humidity: 0% - 95% RH non-condensing
- Mounting: Mounting holes in each corner
- Expansion Slots: 4
- Expansion Relay Board: 2 SDPT, 250VAC, 10A Max (resistive)
- Expansion Analog Input Board: 4 Analog Inputs
- Expansion Analog Output Board: 2 Analog Outputs

- Current: 1.2A Max (4 Analog Input Boards each with 4 sensors reading 100% of their value)
- Settings: Dip Switch – 8 positions
- Status Indicators: (LED): Power, communication, Slots 1-4
- Baud Rate: 4800, 9600, 19200 (default), 98400, 57600, 115200 bps
- Enclosure: NEMA 4X
- Warranty: Two-year limited warranty

3 Installation Instructions

3.1 Location & Mounting

Macurco RD-24 is shipped with mounting screws. RD-24 should be mounted with sufficient space all around for access to conduit entry holes (not provided) top and bottom side of the unit.

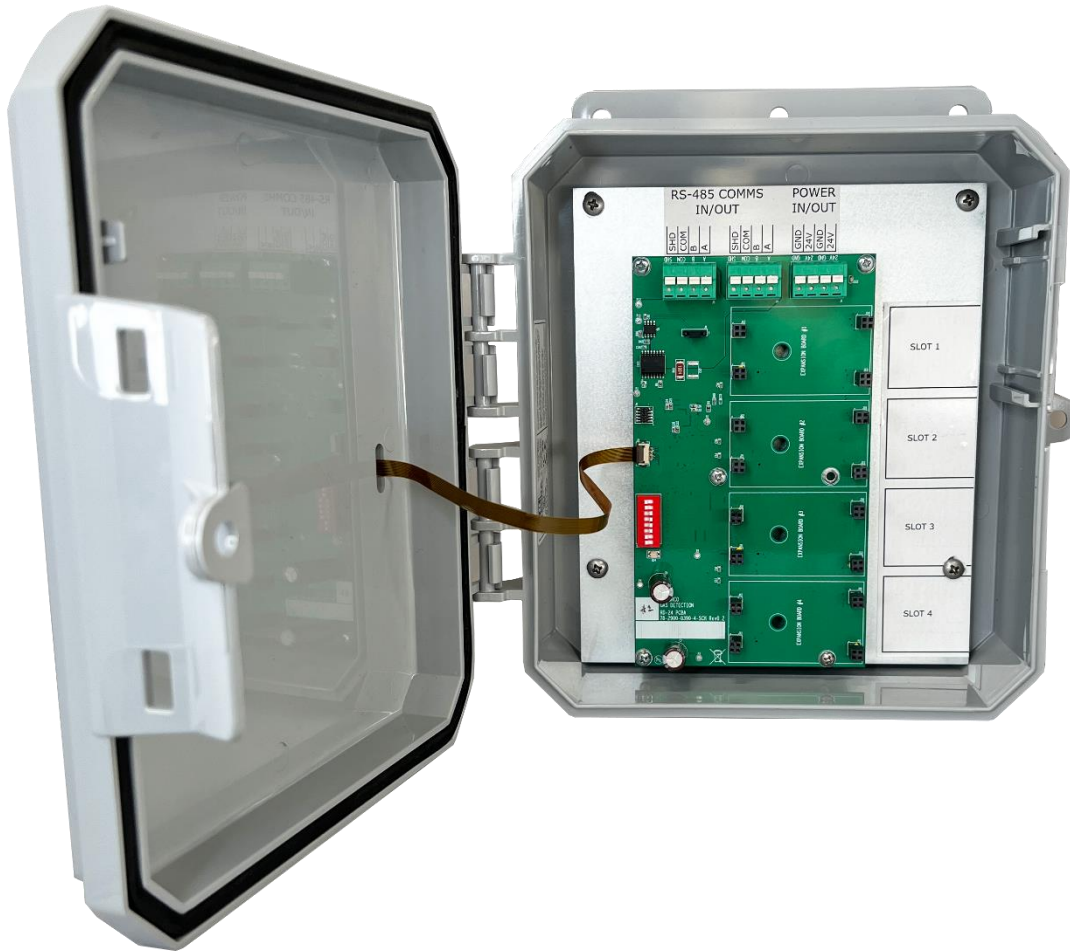


Figure 3-1 – Internal view without expansion boards



Figure 3-2 – Internal view with expansion boards

3.2 Installation

3.2.1 General Wiring Information

All the connectors in RD-24 are spring tightening (*excluding the Analog Input board) and will accept wire from 14 to 24 AWG. To connect the wires to terminals, press down the white button of the connector (use flat-headed screwdriver), insert bare wire into respective wire cavity of the connector and release the white button. Ensure that the wire cannot be easily pulled from the connector. Refer to Figure 3-2 - below for location of different connectors in RD-24.

*The Analog Input board has 4 screw-terminal connectors.

3.2.2 Power Connection

The power connections to the RD-24 should be size AWG18 (minimum) for short runs. For longer runs, follow recommended power wire gauge guidelines. Match the polarity for power connection.

3.2.3 RS-485 Communication Connection

For RS-485 or communication connection it is recommended to always use a twisted wire to reduce noise and allow for reliable data communication over greater distances. For best performance use shielded 3-conductor wire with one twisted pair providing a pair for signal (A & B), common (COM) and shield ground (SHD) connection.

NOTE: Running the RS-485 cable adjacent to or in the same conduit with high voltage wires is not recommended as there may be interference from the high voltages.

The RD-24 provides integral termination for end of line resistors (EOL). The termination uses a 4-pin connector (labeled J8) to select termination. Place the EOL jumper on one of the following positions:

- NU = No termination (default)
- 120 = 120 Ohm
- 100 = 100 Ohm

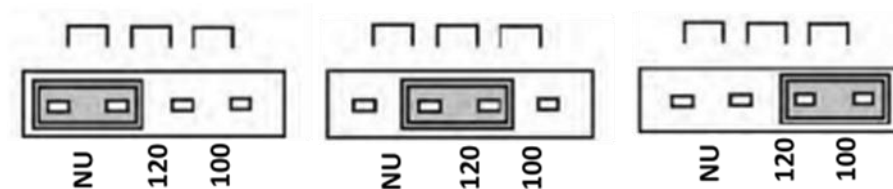


Figure 3-3 – EOL Jumper Placement

3.2.4 Input/Output Connections

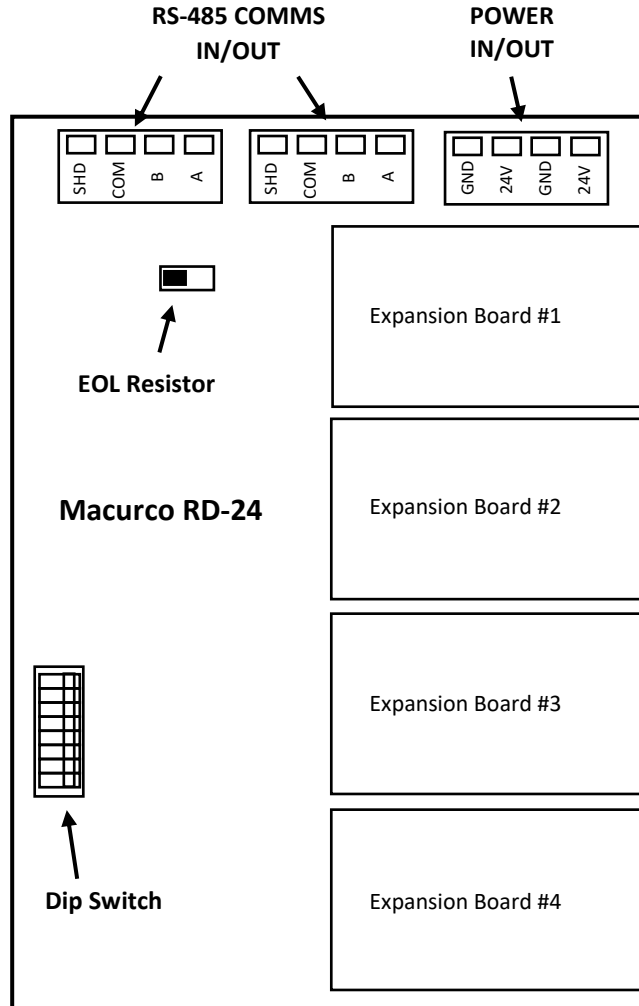


Figure 3-4 – RD-24 Board Diagram

3.2.5 Expansion Board Connections

3.2.5.1 Expansion Relay Board

2 SDPT, 250VAC, 10A Max (resistive), Current: Single Relay activated 35mA, Both relays activated 55mA



Figure 3-5 Relay Expansion Board

3.2.5.2 Expansion Analog Output Board

Expansion Analog Input Board: 2 Analog Outputs, Both outputs at 4mA Current: 32mA, Both at 20mA Current: 70mA

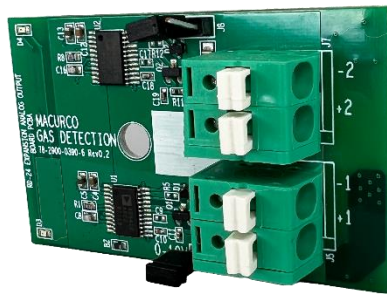


Figure 3-6 Analog Output Expansion Board

3.2.5.3 Expansion Analog Input Board

Expansion Analog Output Board: 4 Analog Inputs Current: no sensor 21mA, one sensor at 0% 48mA, one sensor at 100% 75mA



Figure 3-7 Analog Input Expansion Board

4 Operations

4.1 Power up

Power LED will light up green to indicate the unit is operational. TX LED will flash blue to indicate the unit is communicating. Slot 1, Slot 2, Slot 3 and Slot 4 will light up green when corresponding relay is activated/populated. Refer to Figure 3-3 above for location of Slot 1-4.

4.2 Initial Operating Mode

4.2.1 RD-24 Settings

The DIP switches are used to set the Modbus address and are also used to change the communication settings. Valid Modbus addresses for RD-24 are from 193 to 200 where switch 1 is the least significant bit (LSB) and switch 8 is the most significant bit (MSB). Address 254 is used to place the RD-24 in programming mode. Address 255 is used to refresh the configuration of the RD-24.

4.2.2 Programming Mode

When the RD-24 is powered with address set to 254, it enters programming mode. The STATUS LED will be flashing RED and GREEN alternatively every 200 milliseconds to indicate that RD-24 is ready and waiting for the user to enter new communication settings using 8 dip switches. Using the 8 dip switches, the user can change the communication settings like baud rate and parity.

When looking at the switches with “Address” marking on top, the switches are defined from left to right.

- Switch 8, switch 7 and switch 6 are used to modify baud rate
- Switch 5 and switch 4 are used to modify parity
- Switch 1 is used to request to save the new settings
- Switches 3 and 2 are unused and should be left in the ON position.

Switch 8	Switch 7	Switch 6	Description
OFF	OFF	OFF	Default Value (19200 Bd)
OFF	OFF	ON	4800 Bd
OFF	ON	OFF	9600Bd
OFF	ON	ON	19200 Bd (Default value)
ON	OFF	OFF	38400 Bd
ON	OFF	ON	57600 Bd
ON	ON	OFF	115200 Bd
ON	ON	ON	Do not change

Table 4-1 – Baud Rate Configuration

Switch 5	Switch 4	Description
OFF	OFF	Default Parity EVEN (Default Value)
OFF	ON	Parity is ODD
ON	OFF	Parity is NONE
ON	ON	Do not change

Table 4-2 – Parity Configuration

Set the switches to the desired value and then set switch 1 to ON and then OFF, and the new settings will be saved in EEPROM.

The result of saving operation is displayed on STATUS LED. Alternating GREEN/OFF every 200 milliseconds indicates saving new settings passed and alternating RED/OFF every 200 milliseconds indicates that saving new settings failed. Once the new settings have passed, disconnect power from the unit, set the address for the device using the address switches and apply power back to unit.

4.2.3 Configuration Refresh

Upon initial installation, or when the user would like to change the RD-24 configuration (move, swap, or change expansion board type or locations), the following process must be followed. Before making any changes, power off the RD-24. Next, make the preferred changes to the RD-24 configuration. After, set the dip switch address to 255 and power on the RD-24 for at least 3 seconds. The LED below the dip switch should blink green rapidly. After at least 3 seconds, power off the RD-24. Using the dip switch, change the address back to its original setting, or a number between 193 and 200. Power on the RD-24. Last, navigate in the DVP-1200 menu CONFIGURE SYSTEM →MANUAL CONFIGURE →CONFIG. RLYS,SIGNALS,SENSORS,REM. DEV. →REMOTE DEVICES. Select the Remote Device and delete it from the DVP-1200. If the RD-24 is still powered on, the DVP-1200 will automatically find it back and update the configuration. If the DVP-1200 does not find the device after 60 seconds, power cycle the panel and check again.

4.3 Configuration

4.3.1.1 Configure RELAY(S)

Menu path: Main Menu-->CONFIGURE SYSTEM -->MANUAL CONFIGURE -->CONFIGURE ZONES -->ADD/EDIT ZONES-->RELAY(S): -->

NOTE: Programming Configure Relays - The panel has 8 onboard relays so remote relays start at 9. Reference the Remote Device: I/O Chart at the end of this manual.

To add relays to a zone or delete relays assigned from a zone, select “RELAY(S):” from the zone configuration menu and press ENTER. Then, select ADD RELAY or DELETE RELAY as shown below. The bottom box of the display will show any relays assigned to the zone and will get updated as you make changes.

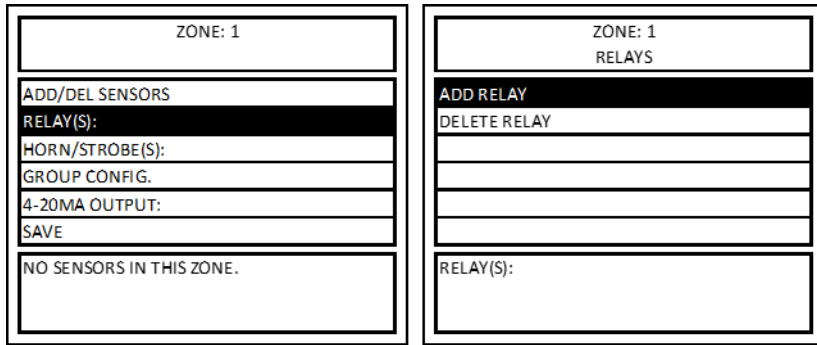


Figure 4-1 – Zone Relay Menu

To assign a relay to the zone, select ADD RELAY and press ENTER. Input the relay number and press ENTER. The relay will be added to the zone and the display will return to the RELAYS menu with the bottom box of the display updated to reflect the changes made.

To delete a relay, select DELETE RELAY from the RELAYS menu and press ENTER. Input the relay number to delete and press ENTER (to delete all relays assigned to the zone, input “0” and press ENTER). The relay(s) will be deleted from the zone and the display will return to the RELAY menu with the bottom box of the display updated to reflect the change made.

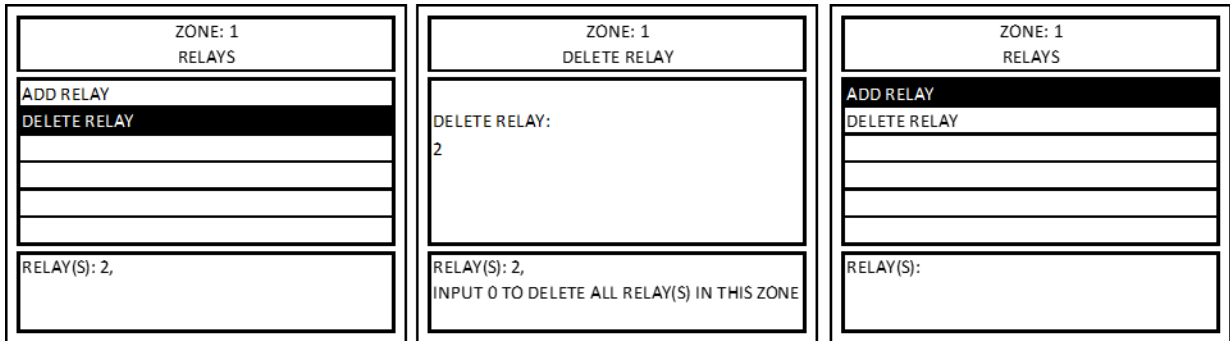


Figure 4-2 – Zone Delete Relay Menu

Relay assigned as Alarm Relay cannot be added to a zone. If an attempt to add an alarm relay to a zone is made, then it will display an error message “CANNOT ADD RELAY. DEDICATED FOR ALARM” as shown in Figure 4-21.

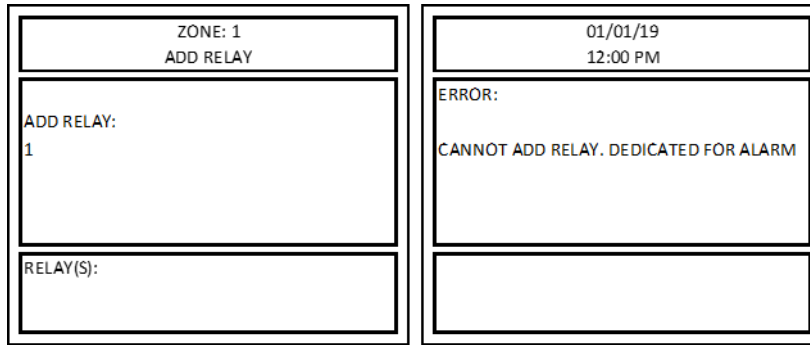


Figure 4-3 Zone Add Relay Error

Figure 4-21 – Zone Add Relay Error

4.3.1.2 Configure 4-20mA OUTPUT or Analog Output

Menu path: Main Menu-->CONFIGURE SYSTEM -->MANUAL CONFIGURE -->CONFIGURE ZONES -->ADD/EDIT ZONES-->4-20MA OUTPUT: -->

NOTE: Assigning Analog Output - The panel has 3 onboard analog outputs so remote analog inputs start at 4. Reference the Remote Device: I/O Chart at the end of this manual.

To assign 4-20mA output to a zone, select “4-20MA OUTPUT:” from the zone configuration menu and press ENTER. Then select “OUTPUT NUMBER:” and press ENTER.

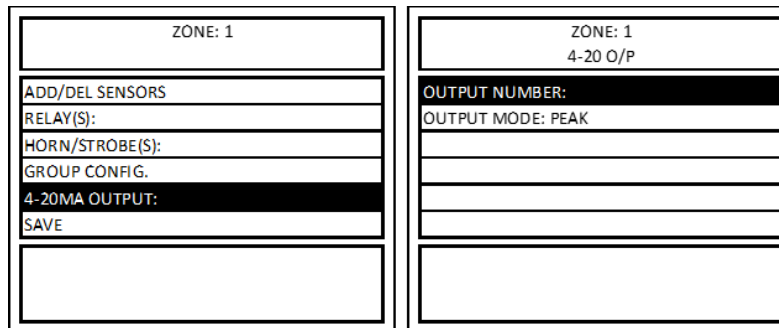


Figure 4-4 – Zone 4-20mA Output Menu

Input the 4-20mA output number to assign it to the zone. The display will return to the 4-20 O/P menu screen and show the currently assigned 4-20 mA output in the OUTPUT NUMBER field.

NOTE: A zone can be assigned only one 4-20mA output, and a 4-20mA output can only be assigned to one zone. 4-20mA output once assigned to a zone can be re-assigned to a different zone or can be deleted from the zone.

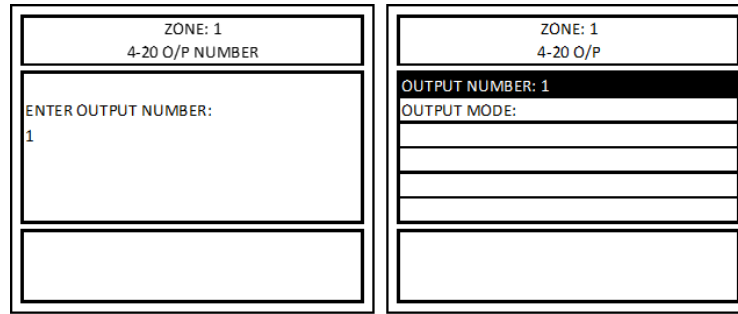


Figure 4-5 – Zone 4-20mA Output Number Menu

NOTE: Oxygen sensor readings are excluded for 4-20mA output i.e., oxygen sensor readings are not considered while computing output value for 4-20mA output.

Next, the output mode can be set to PEAK or SCALE.

PEAK – In this mode, the gas reading active in the zone (except for oxygen) corresponding to highest mA output is used to control the analog output assigned to the specific zone. In this case, any active gas reading, that is part of the zone will be taken into consideration, and the sensor reading corresponding to highest mA output will be used to control the analog output. E.g. If a CO and NO2 sensor is assigned to a zone and CO Sensor reading is 50ppm (which corresponds to 8mA) and NO2 sensor reading is 10.0ppm (which corresponds to 12mA) then the 4-20mA or “Analog” output assigned to the zone will output 12mA.

SCALE – In this mode, the 4-20mA value for all detectors added to a zone are computed (for all sensor types except oxygen), and the output is the average of the 4-20mA value for all detectors assigned to the zone. E.g. If a CO and NO2 sensor is assigned to a zone and CO Sensor reading is 50ppm (which corresponds to 8mA) and NO2 sensor reading is 10.0ppm (which corresponds to 12mA) then the 4-20mA or “Analog” output assigned to the zone will output 10mA.

To select the output mode for 4-20mA output, select OUTPUT MODE from the 4-20 O/P menu and press ENTER. Then, select PEAK or SCALE from the 4-20 O/P MODE menu and press ENTER. The display will return to the 4-20 O/P menu and the output mode selection will be updated as shown in Figure 4-29.

When the status of the zone is TROUBLE then 4-20mA output assigned to corresponding zone will switch the output to 20mA.

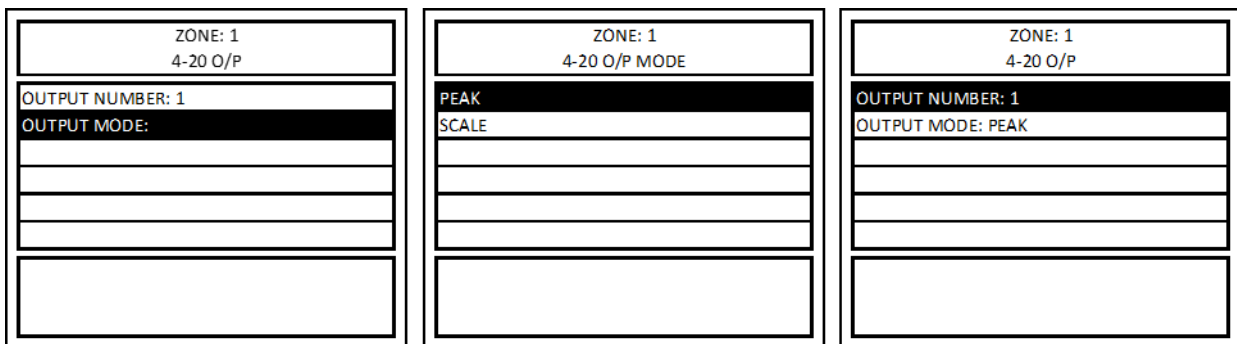


Figure 4-6 – Zone 4-20mA Output Mode Menu

4.3.1.3 *Configure 4-20mA Input or Analog Input*

Analog Inputs read gas sensors connected to RD-24 and will work the same as digital sensors readings, which are the sensors with MRS-485 connected to DVP-1200 through the RS-485 network using the Modbus protocol.

Sensors connected to RD-24 should be displayed to the user as “RD-24 #address.#analog_input”.

#analog_input has a range from 1 to 16, as each RD-24 can have up to 4 expansion boards connected, and each analog input expansion board has 4 analog inputs.

DVP-1200 has the capability to connect to up to 192 sensors. By default, DVP-1200 is configured to connect to 192 digital sensors.

Each RD-24 that is discovered by DVP-1200 and has analog inputs will cause the controller to internally map the RD-24 analog inputs to one of the 192 sensors and automatically adjust the limit of digital sensors that can be connected to the controller.

The sensor mapping will be done from top to bottom. It grows from sensor #192 all the way to 128.

By default, DVP-1200 allocates space to connect to 192 digital sensors. If an RD-24 with analog inputs is connected to the controller, DVP-1200 will automatically allocate sensor addresses from the list of 192 in the following order:

- The first RD-24 connected to DVP-1200 will occupy sensor addresses 177 thru 192 in order and as needed. For example: Slot 1, input 1 will occupy address 177 and Slot 4, input 4 will occupy address 192.
- The second RD-24 connected to DVP-1200 will occupy sensor addresses 161 thru 176 in order and as needed.
- The third RD-24 connected to DVP-1200 will occupy sensor addresses 145 thru 160 in order and as needed
- The fourth RD-24 connected to DVP-1200 will occupy sensor addresses 129 thru 144 in order and as needed

NOTE: The addresses have been allocated to the exact locations as described – they do not change based on the number of analog input expansion boards installed into any number of RD-24 units. For a full list of addresses and slot designations, see “Remote Device I/O Chart” below.

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6 Appendix B – Modbus Registry

Function Code	Register Address	Register	Parameter	Description / Comments	Command/Response (HEX)
0x03	1	1	Map version	Returns map version in ASCII "1"	C: 01 03 00 00 00 01 84 0A R: 01 03 02 00 31 79 90
0x03	2	4	Vendor name	Returns vendor name in ASCII "MACURCO"	C: 01 03 00 01 00 04 15 C9 R: 01 03 08 4D 41 43 55 52 43 4F 00 D6 D9
0x03	6	8	Product code	Returns product code in ASCII "70X---"	C: 01 03 00 05 00 08 54 0D R: 01 03 10 37 30 58 2D 2D 2D 00 00 00 00 00 00 00 00 00 00 4B DE
0x03	1 4	8	Revision number	Returns revision number in ASCII "V1.00"	C: 01 03 00 0D 00 08 D5 CF R: 01 03 10 56 31 2E 30 30 00 00 00 00 00 00 00 00 00 00 00 85 4D
0x03	2 2	8	Vendor url	Returns vendor url in ASCII "www.macurco.com"	C: 01 03 00 15 00 08 55 C8 R: 01 03 10 77 77 77 2E 6D 61 63 75 72 63 6F 2E 63 6F 6D 00 A2 D6
0x03	3 0	4	Product name	Returns product name in ASCII "RD-24"	C: 01 03 00 1D 00 04 D4 0F R: 01 03 08 52 52 2D 32 34 00 00 00 53 7E
0x06	3 4	1	Fail safe	Writes failsafe configuration Payload: (high byte first) bit11-bit0 (timeout value) bit12 = 1 state ON, state OFF bit13 = 1 failsafe active, 0 failsafe inactive	C: 01 06 00 21 3A AF 8B 1C R: 01 06 00 21 3A AF 8B 1C timeout = 0xA AF = 2735 state = ON failsafe=active
0x06	3 5	1	Command Relays	Command control relays Payload: (high byte first) 00 = turn off relays K1/K2 01 = turn on relay K1, turn off relay K2 02 = turn off relay K1, turn on relay K2 11 = turn on relay K1/K2	C: 01 06 00 22 00 00 29 C0 R: 01 06 00 22 00 00 29 C0 C:01 06 00 22 00 01 E8 00 R:01 06 00 22 00 01 E8 00

6.1 Read Configuration

Device configuration is indicated by 2 bytes.

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit9	bit8	bit 7	bit6	bit5	bit4	bit 3	bit2	bit1	bit0
Module # 4				Module #3				Module #2				Module #1			
0000 = relays				0000 = relays				0000 = relays				0000 = relays			
0001 = analog outputs				0001 = analog outputs				0001 = analog outputs				0001 = analog outputs			
0010 = analog inputs				0010 = analog inputs				0010 = analog inputs				0010 = analog inputs			
0011 to 1110 - future				0011 to 1110 - future				0011 to 1110 - future				0011 to 1110 - future			
1111 = No exp. board				1111 = No exp. board				1111 = No exp. board				1111 = No exp. board			

6.2 Fail-safe

Device fail safe configuration uses 4 bytes.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Fail safe timer value 30 to 3600 (seconds)												state 0=OFF 1=ON	Active 0=NO 1=YES	x	x

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Analog Output value when in fail safe condition: (mA x 100) 0 = 0mA 2000 = 20.00mA												x	x	x	x

6.3 Configure Analog Outputs Range

Expansion Board #4				Expansion Board #3				Expansion Board #2				Expansion Board #1			
bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DAC2		DAC1		DAC2		DAC1		DAC2		DAC1		DAC2		DAC1	
x	rng	x	rng	x	rng	x	rng	x	rng	x	rng	x	rng	x	rng
rng: '0' – 4 to 20 mA (2 to 10V), '1' 0 to 20mA (0 to 10V)															

6.4 Multipurpose command

Multipurpose command uses 2 bytes, and can be used on the following situations:

- Control all relays of a remote driver (RD-24) device.
- Control all analog outputs of remote drivers with same value.
- Control remote drivers with analog outputs and relays with same output values for relays and same output values for analog outputs.
- Command to prevent a failsafe timeout when there is no change in the state of the outputs.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
module#			device#	relay	Analog value (mA x 100)										
or															
					x	x	x	rly8	rly7	rly6	rly5	rly4	rly3	rly2	rly1

bit15	bit14	bit13	Description
0	0	0	Module #1
0	0	1	Module #2
0	1	0	Module #3
0	1	1	Module #4
1	0	0	Reserved – future use
1	0	1	Reserved – future use
1	1	0	Do not apply command. Dummy message
1	1	1	Apply to all 4 modules in the remote device, bit11 sets the state of the relays and bits10-0 analog value to be used by DACs (Analog Outputs)

bit12	Each remote driver can have up to 4 modules connected. Each module has two relays or two Analog outputs. Bit12 defines which output to be controlled 0 – output1, 1- output 2
bit11	Defines the state of relays, 0 – OFF, and 1 - ON
bit10	Value to be written to the analog output (DAC). 0 – 2000. 0 = 0mA, 2000 = 20mA Value to be written to relays. bits7-0.

➔ **NOTE:** Only “dummy message” command has been implemented on this command.

6.5 Write Output Command Expansion Boards #1, #2, #3 and #4

Command to write to expansion board # has 4 bytes.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
x	x	x	x	rly#1	Analog value#1 (0 – 2000)										

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
x	x	x	x	rly#2	Analog value#2 (0 – 2000)										

Note: If failsafe is active, then the remote relay must receive a message in a period equal to or less than the failsafe timeout, otherwise relays will be placed in the failsafe position.

Appendix C – Setup Record

Record network parameters and keep them in a safe place to assist with installation and future troubleshooting will be simplified.

Date of Install: _____ Serial Number: _____

Location of Install: _____ Installed by: _____

Remote Device: I/O Chart				
Relay connection	Connected device	Zone Configured	Delay	Runtime
Relay 9				
Relay 10				
Relay 11				
Relay 12				
Relay 13				
Relay 14				
Relay 15				
Relay 16				
Relay 17				
Relay 18				
Relay 19				
Relay 20				
Relay 21				
Relay 22				
Relay 23				
Relay 24				
Relay 25				
Relay 26				
Relay 27				
Relay 28				
Relay 29				
Relay 30				
Relay 31				
Relay 32				
Relay 33				
Relay 34				
Relay 35				
Relay 36				

Relay 37				
Relay 38				
Relay 39				
Relay 40				
4-20mA output 4				
4-20mA output 5				
4-20mA output 6				
4-20mA output 7				
4-20mA output 8				
4-20mA output 9				
4-20mA output 10				
4-20mA output 11				
4-20mA output 12				
4-20mA output 13				
4-20mA output 14				
4-20mA output 15				
4-20mA output 16				
4-20mA output 17				
4-20mA output 18				
4-20mA output 19				
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4-20mA output 24				
4-20mA output 25				
4-20mA output 26				
4-20mA output 27				
4-20mA output 28				
4-20mA output 29				
4-20mA output 30				
4-20mA output 31				
4-20mA output 32				
4-20mA output 33				
4-20mA output 34				
4-20mA output 35				
	Remote Device	Sensor Type	Sensor Location	Modbus Address

4-20mA input 1	1		177
4-20mA input 2	1		178
4-20mA input 3	1		179
4-20mA input 4	1		180
4-20mA input 5	1		181
4-20mA input 6	1		182
4-20mA input 7	1		183
4-20mA input 8	1		184
4-20mA input 9	1		185
4-20mA input 10	1		186
4-20mA input 11	1		187
4-20mA input 12	1		188
4-20mA input 13	1		189
4-20mA input 14	1		190
4-20mA input 15	1		191
4-20mA input 16	1		192
4-20mA input 17	2		161
4-20mA input 18	2		162
4-20mA input 19	2		163
4-20mA input 20	2		164
4-20mA input 21	2		165
4-20mA input 22	2		166
4-20mA input 23	2		167
4-20mA input 24	2		168
4-20mA input 25	2		169
4-20mA input 26	2		170
4-20mA input 27	2		171
4-20mA input 28	2		172
4-20mA input 29	2		173
4-20mA input 30	2		174
4-20mA input 31	2		175
4-20mA input 32	2		176
4-20mA input 33	3		145
4-20mA input 34	3		146
4-20mA input 35	3		147
4-20mA input 36	3		148
4-20mA input 37	3		149
4-20mA input 38	3		150
4-20mA input 39	3		151
4-20mA input 40	3		152
4-20mA input 41	3		153

4-20mA input 42	3			154
4-20mA input 43	3			155
4-20mA input 44	3			156
4-20mA input 45	3			157
4-20mA input 46	3			158
4-20mA input 47	3			159
4-20mA input 48	3			160
4-20mA input 49	4			129
4-20mA input 50	4			130
4-20mA input 51	4			131
4-20mA input 52	4			132
4-20mA input 53	4			133
4-20mA input 54	4			134
4-20mA input 55	4			135
4-20mA input 56	4			136
4-20mA input 57	4			137
4-20mA input 58	4			138
4-20mA input 59	4			139
4-20mA input 60	4			140
4-20mA input 61	4			141
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4-20mA input 63	4			143
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Notes:

7 Macurco Gas Detection Product limited warranty

Macurco warrants the RD-24 gas detector will be free from defective materials and workmanship for a period of two (2) years from the date of manufacture (indicated on inside cover of the RD-24), provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations or liabilities. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM THE PURCHASE DATE. Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. The manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are the return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.

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