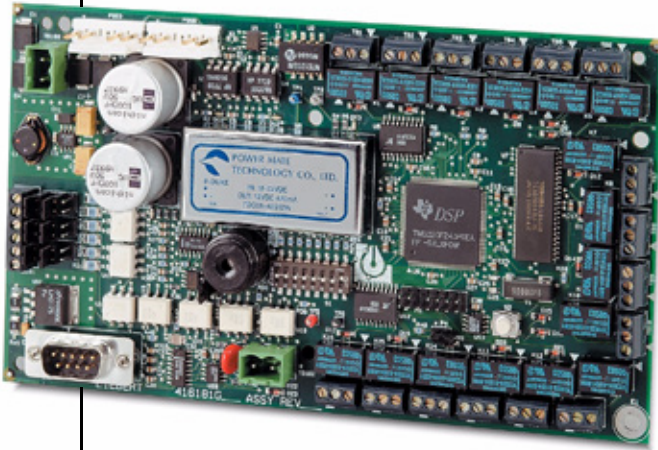


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MONITORING

Environmental Discrete Outputs

USER MANUAL



*Interface
Card*

Note to Our Valued Customers

To help us better serve you, please contact us with any comments you have about this manual or this product in general.

We encourage you to comment and would appreciate your assistance in improving Liebert products.

You may contact the Liebert Monitoring Group Applications Engineering (U.S.) at:

monitoring@liebert.com

A handwritten signature in blue ink, appearing to read "Heath Klein".

Heath Klein, Product Manager

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1.0 INTRODUCTION

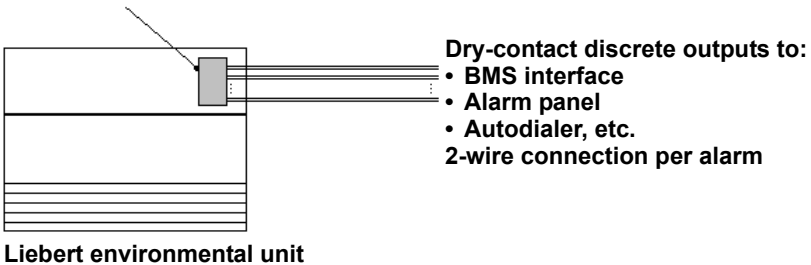
The Liebert Environmental Discrete Outputs (ENV-DO) interface card provides discrete outputs for your Liebert precision environmental conditioner. Operating status is monitored and critical alarms are communicated via contact closure. Any alarm monitor, I/O panel, autodialer or monitoring system can be used to monitor your Liebert unit.

The ENV-DO interface card may be ordered as a factory-installed option, in a kit for field-retrofit to existing Liebert units or as a self-contained unit with its own enclosure.

As a member of the Liebert family of communications and monitoring products, the ENV-DO interface card is backed by the most extensive field service organization in the industry.

Figure 1 Typical system configuration

**Environmental DO (ENV-DO)
interface card**



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1.1 Specifications

Electrical Requirements:

Voltage: 24 VAC or 24 VDC, $\pm 10\%$

50/60 Hz, Single Phase

Power:

10W maximum

Environmental Conditions:

Operating Ambient Temperature: 5°C to 40°C
(41°F to 104°F)

Storage Ambient Temperature: -20°C to 70°C
(-4°F to 158°F)

Relative Humidity: 10% to 95% RH (non-condensing)

Dimensions:

Net: 178 mm x 102 mm x 38 mm, 0.1 kg
(7.0" x 4.0" x 1.5", 0.2 lbs)

As shipped: 248 mm x 178 mm x 64 mm, 0.6 kg
(9.75" x 7.0" x 2.5", 1.3 lbs)

Compatibility:

Environmental units with these microprocessors:

Advanced Graphics (AG)

Advanced Microprocessor (AM)

Standard Microprocessor (SM)

MiniMate2

DataMate

Small Systems Controller (SSC)

Level 10

Level 0

Discrete Outputs:

16 Form-C Contact Closures (SPDT Relays, non-powered)

Rating: 1 A @ 30 VDC

16-24 AWG wiring

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2.0 INSTALLATION

The ENV-DO interface card may be ordered as a factory-installed option, in a kit for field-retrofit to existing Liebert units or as a self-contained unit in its own enclosure.

If ordered as a factory-installed option, proceed directly to **3.0 - Configuration**.

As a retrofit kit, the circuit board is secured to a metal mounting plate. The mounting plate is then attached to a flat metal surface in a low-voltage section of the Liebert unit.

The self-contained model packages the ENV-DO interface card inside a steel enclosure for mounting external to the Liebert unit. A low-voltage transformer is also provided.

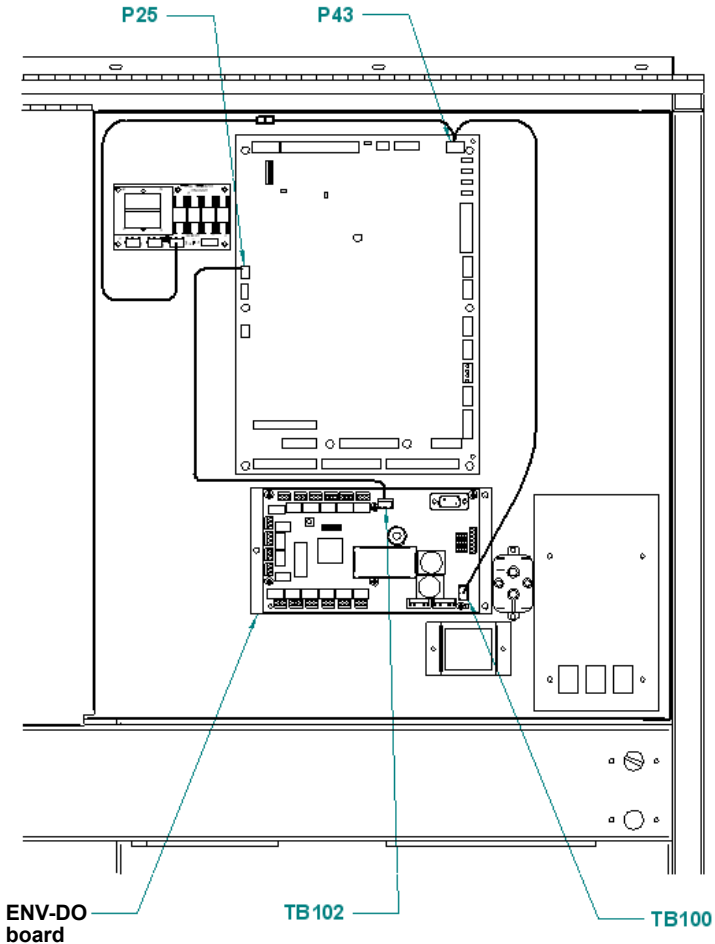
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2.1 Retrofit Installation

2.1.1 Environmental Installation

Position the ENV-DO interface card in the low voltage/control cavity of the Liebert unit. Refer to **Figures 2** through **6**. Use three #8 x 3/8" sheet metal screws to affix the mounting plate to the Environmental unit.

Figure 2 Deluxe System/3 board location



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Figure 3 Deluxe System/3, chilled water, board location

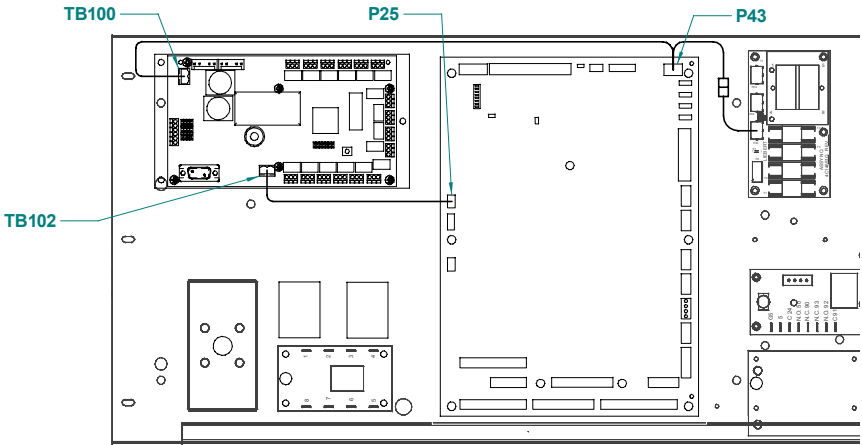
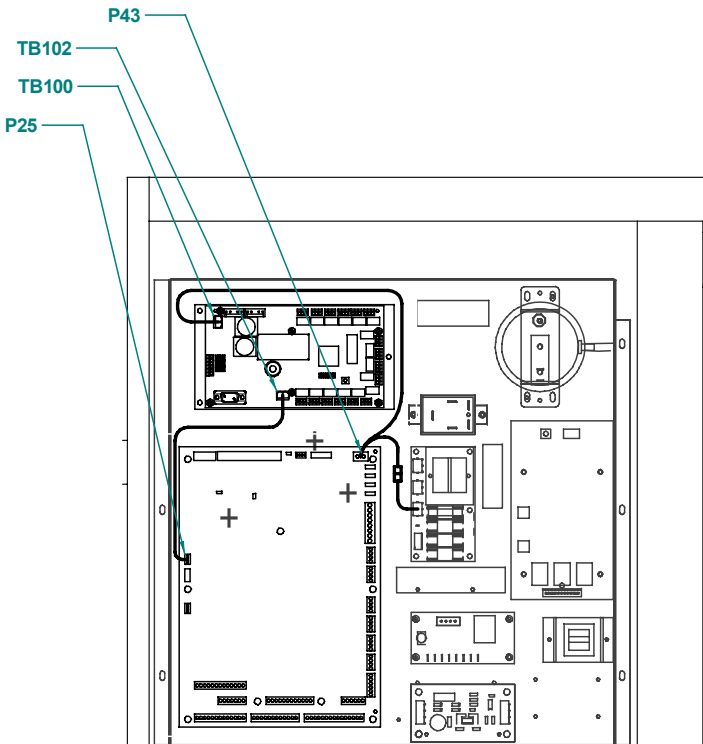


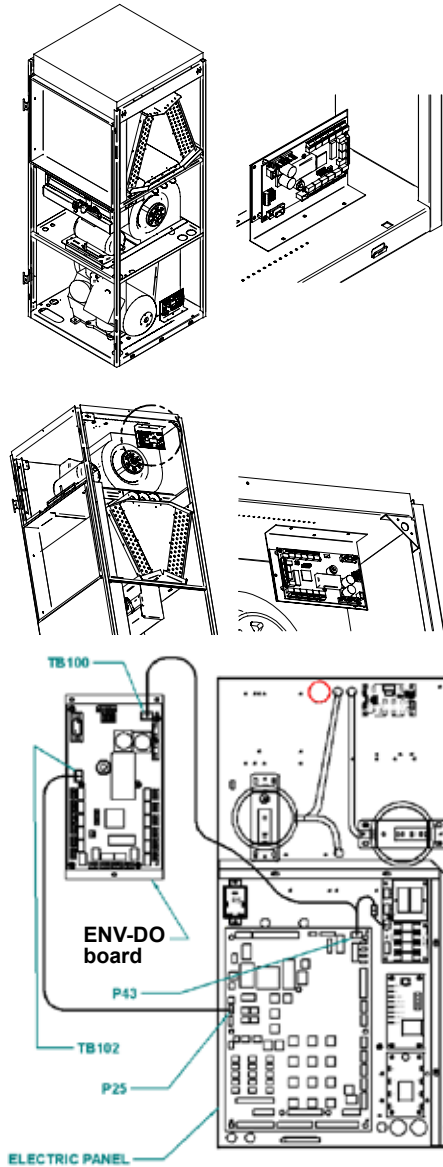
Figure 4 Industrial Cooling Series (ICS) board location



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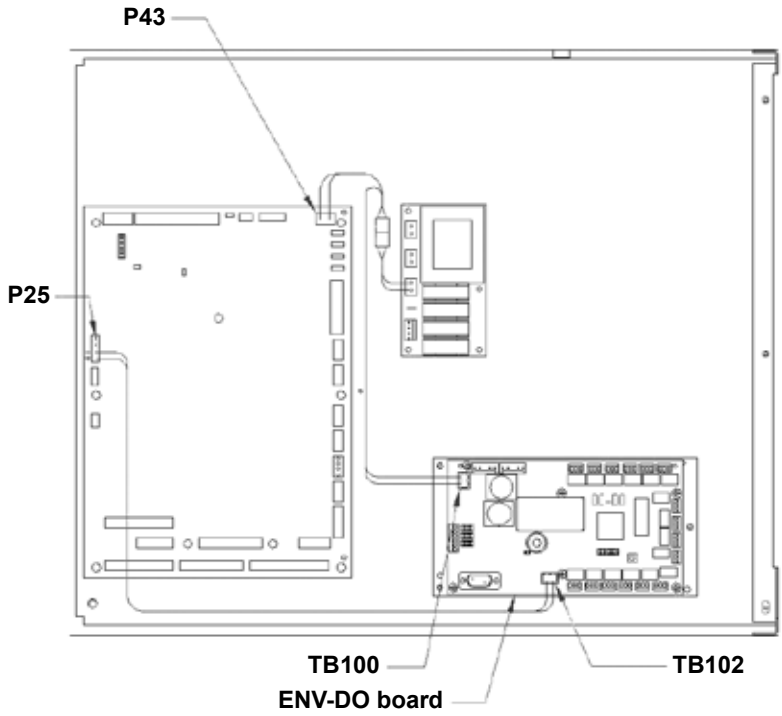
The ENV-DO interface card mounts to the L-plate for Challenger units, as shown in **Figure 5**.

Figure 5 Challenger board location



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Figure 6 Himod board location



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2.1.2 System Wiring (SM, AM, AG Microprocessors)

Two wiring harnesses are included with the retrofit kit, one for the power connection and a second for communications. They are of sufficient length for use with the Deluxe System/3, Himod and ICS units for the SM, AM and AG microprocessors. For the Challenger product series, use the longer wiring harness included with the ENV-DO Challenger kit.



NOTE

Board illustrations are shown only for location of connections. Board location and wire length will change depending upon the specific installation.

Power Connection: SM, AM, AG Microprocessors

The harness supplied with the ENV-DO interface card (P/N 159084G1) is equipped with three connectors, one at either end of the harness and one in the middle. The harness taps power from the 24 VAC input to the control board of the environmental unit.

To connect this power to the ENV-DO interface card:

1. Locate the connector containing the two red wires plugged into P43 on the control board and unplug it. Reconnect it to the connector in the middle of the supplied harness.
2. Plug one end of this harness into P43 on the control board and the other end into TB100 of the ENV-DO interface card.



NOTE

Do not tap power from the auxiliary 24VAC terminals T5/G5 on the SM/AM/AG environmental controllers. Damage to the controller and interface card may occur.

Power Connection: Level 0 and Level 10 Microprocessors

To connect power to the ENV-DO interface card, wire as described above in **Power Connection: SM, AM, AG Microprocessors**.

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In addition, some field modification of the wiring harnesses is necessary for connection to legacy systems:

- **Level 0** - Remove the power connector normally plugged into P43 and wire to terminal connections 1-5 (24V)/1-10 (ground).
- **Level 10** - Remove power connector normally plugged into P43 and wire to terminal connections TB1-5 (ground) and TB1-8 (24VAC).

Communications Connection: SM, AM, AG Microprocessors

The second wiring harness provided (P/N 159083G1) has a connector fitted at either end and is the communications connection between the unit microprocessor and the ENV-DO interface card.

To put it in the system:

1. Remove the existing wire located on P25 of the environmental controller and cut off the connector.
2. Connect one end of the wire harness to TB102 of the ENV-DO interface card, the other end connects to P25 of the environmental controller (pin 1 negative, pin 2 positive).
3. Connect the existing wire from P25 with the cut off connector to TB102 of the ENV-DO interface card.



NOTE

There should be two pairs of wires connected to TB102 when completed.

Communications Connection: Level 0 and Level 10 Microprocessors

To connect the communications wire to the ENV-DO interface card, wire as described in **Communications Connection: SM, AM, AG Microprocessors**.

In addition, some field modifications of the wiring harnesses is necessary for connection to legacy systems:

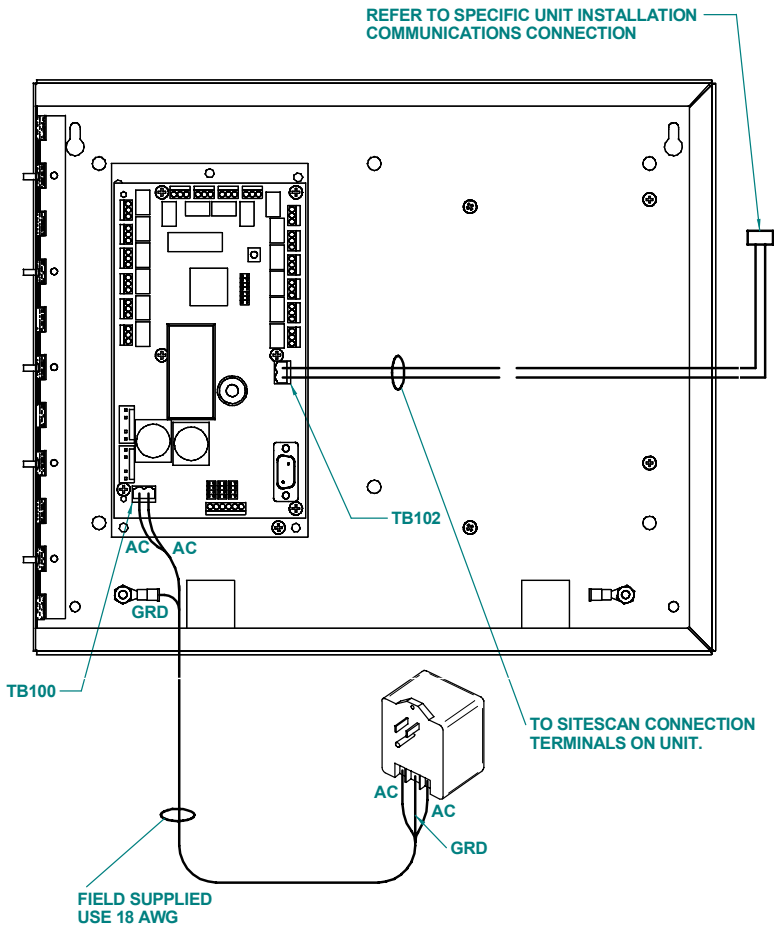
- Cut off the red connector on the ENV-DO wiring harness and wire to the terminal connection P25.

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2.1.3 MiniMate2, DataMate & Units Where Internal Mounting is Not Feasible

An enclosure is recommended for use with ceiling-mounted environmental units or where internal mounting of the ENV-DO Interface Card is not feasible. Older-generation Deluxe and Challenger units may require external mounting.

Figure 7 ENV-DO-ENCL1 internal view



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Power Connection for External Enclosures

Power for the ENV-DO interface card should be sourced from the supplied wall-plug transformer and connected to TB100 on the ENV-DO interface card. Minimum recommended wire size is 18 AWG. Use field-supplied wiring to connect the outer terminals on the transformer to the screw connectors at TB100 (connector) on the ENV-DO interface card. A field-supplied ground wire attaches to the center terminal on the transformer and connects to the grounding stud in the lower corner of the enclosure. Ensure that the transformer and enclosure are properly grounded.

Communications Connection for External Enclosures

All wiring must be field supplied as there are no harnesses furnished with the enclosure.

MiniMate2, 1-5 Ton

Connect TB102-1 (positive) of the ENV-DO interface card to TB4-1 (positive) of the MiniMate2 control board and TB102-2 (negative) of the ENV-DO interface card to TB4-2 (negative) of the MiniMate2 control board.

All Other Environmental Units

The wiring is the same as ENV-DO interface cards internally mounted in units.

Refer to the appropriate section in **2.1.2 - System Wiring (SM, AM, AG Microprocessors)** for the respective unit:

- **Communications Connection: SM, AM, AG Microprocessors** or
- **Communications Connection: Level 0 and Level 10 Microprocessors**

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3.0 CONFIGURATION

The ENV-DO interface card can function in two different modes. One mode is if the Environmental unit is only connected to an ENV-DO interface board (this is the factory default). The second mode is if the Environmental unit is connected to an ENV-DO interface board and a Liebert SiteLink module. The ENV-DO interface card must be user-configured if the Environmental unit is connected to a SiteLink module.

3.1 DIP Switch Settings

An eight-position DIP switch, S-1, is provided on the ENV-DO interface board. The DIP switch serves three purposes:

- Selects regular operation (attached to Environmental unit) or service terminal/diagnostic mode.
- Selects whether the Environmental unit is connected to a SiteLink.
- Selects the unit address to be used in diagnostic mode.

The factory default is all positions OFF(0). Refer to the tables below.

Description	Pos 1	Pos 2	Pos 3
Address 100	0	0	0
Address 101	0	0	1
Address 102	0	1	0
Address 103	0	1	1
Address 104	1	0	0
Address 105	1	0	1
Address 106	1	1	0
Address 107	1	1	1

Description	Pos 8
Env Unit (normal mode)	0
Service Terminal / Diagnostic	1

Description	Pos 4
Env Unit and ENV-DO	0
Env Unit, ENV-DO and SiteLink	1

Positions 5 through 7 are not used. Note that DIP switches are read only on power-up and manual resets (via pushbutton S2 with the jumper connecting the two pins of P4).

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3.2 Verification of Operation

When the switch for Pos 8 is OFF (0) and the switch for Pos 4 is OFF (0), the LED indicators labeled DS1 and DS2 located on the ENV-DO board will be flashing. When the switch for Pos 8 is OFF (0) and the switch for Pos 4 is ON (1), the LED indicator DS1 will be flashing and DS2 will not be flashing. See **Table 1 in Section 4.2 - Diagnostic LEDs.**

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4.0 TESTING AND DIAGNOSTICS

4.1 Service Terminal

A serial port is available on the interface card (J232) for service terminal/diagnostic operation. In this mode, the output contacts are disassociated from the Environmental unit. Instead, the outputs are manually triggered via serial port. This capability may be especially useful during installation and check-out, as the physical connections can be manual and thoroughly tested.

To configure the interface card for service terminal operation, position 8 on the DIP Switch must be in the ON (1) position. The card must be rebooted before the new DIP Switch settings take effect. Press and hold the Reset pushbutton S2 to force a reboot.

A serial cable must also be connected from J232 to a PC or VDT. The remainder of the instructions in this section will assume a typical notebook computer running the Microsoft Windows® operating system is used.

4.1.1 Physical Connection

Because the serial port on the ENV-DO interface card is configured as DTE port, a DB9F-to-DB9F null modem cable is required to connect from the computer's serial port to the ENV-DO interface card. A cable commonly referred to as a "laplink cable" is suitable.

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4.1.2 Software Configuration

No special software on the PC is needed—the terminal emulation application “HyperTerminal” that ships with Windows is sufficient. Other terminal emulation applications are equally suitable. Determine the correct COM port setting for your computer (typically COM1 on notebook computers).

Configure the communications settings to:

9600	bits per second
8	data bits
none	parity
1	stop bit
none	flow control

Refer to the operating instructions of the software application you are using to determine how this configuration is accomplished.

To set up HyperTerminal, perform these steps:

1. Open a new HyperTerminal window session
2. In the “Connection Description window that pops up, enter a name, such as “ENV-DO” and click OK.
3. In the “Connect To” window that pops up, choose the desired COM port in the “Connect Using” window and click OK.
4. In the “COM# Properties” window that pops up, set the communications settings to the values defined previously, then click OK.
5. From the menu bar in the HyperTerminal window, select File>Properties. In the Properties that pops up, click on the “Settings” tab. In the “Emulation” window bar, select “VT100” then select the “ASCII set up...” toggle bar.
6. In the “ASCII Setup” window, toggle on the following items: “Send line ends with line feeds,” “Echo typed characters locally,” “Append line feeds to incoming line ends” and “Wrap lines that exceed terminal width.”
7. Click OK to close the Properties window.

HyperTerminal is now configured to communicate with the ENV-DO board.

4.1.3 Commands

Once properly connected and the terminal emulation session started, pressing the Enter key should provide a carriage return-line feed sequence. If not, re-check cabling and configuration.

The basic syntax of the diagnostic commands is:

```
xxx: [CMD] [n] <terminator>
```

where:

xxx represents the address of the interface card as configured by DIP switch positions 1 through 3;
 : (colon) is a separator between the address and the data;
 [CMD] and [n] are the command and possible parameter;
 <terminator> is the carriage return-line feed sequence.

The following table lists the commands and valid parameters.

Command	Parameter	Description
AS?		Queries current status of outputs. Replies with 16-digit value, denoting status of each output. MSB is Output 1; LSB is Output 16.
AON	Valid parameters 1 to 16	Energizes the designated output.
AOFF	Valid parameters 1 to 16	De-energizes the designated output.

The commands are case-insensitive. Incorrect syntax is ignored altogether as is incorrect addressing. Partial entries will be ignored after one minute of inactivity. A reply is sent only if the command specifies a response. The reply would echo its address, along with the colon separator.

By default, output 16 is energized automatically in diagnostic mode. For example, if the card is addressed as 107 (DIP switch positions 1 to 3 are in the ON position), and the status is queried, the complete entry would be:

```
107:AS?
```

with the reply:

```
107:0000000000000001
```

showing that output 16 only is energized. A terminator sequence is implied at the end of each line above.



NOTE

No confirmation of success or failure is provided after the AON or AOFF commands. Therefore, it is good practice to follow these commands with the AS? query to verify that the expected action did indeed occur.

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4.1.4 Piezoelectric Horn

The jumper, P5, located adjacent to the piezoelectric buzzer, is used to enable or disable operation of the audible alarm (buzzer is disabled from factory). With the jumper connecting the two pins of P5, the audible alarm is enabled. The buzzer will be activated whenever there is an alarm for TB1-TB15. If there is a loss of communication (TB16), the alarm will not be activated.



NOTE

The buzzer should normally be disabled. The buzzer should only be enabled as a tool for troubleshooting.

4.2 Diagnostic LEDs

LEDs are provided on the interface card to provide information for diagnostic purposes. The following table summarizes their indications:

Table 1 Diagnostic LED indications

LED Identifier	Description
DS1	IGM Receive Active
DS2	IGM Transmit Active
DS3	+12 V Isolated Power On
DS4	24 VAC or 24 VDC Power Supply On
DS5	+5 V Logic Power On

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5.0 OUTPUTS - STATUS AND ALARMS

A three-position screw terminal block is provided for each Form-C contact closure output. The wiring connection is uniform for all sixteen outputs:

Position 1: Common

Position 2: Normally Closed

Position 3: Normally Open

Position 1 is the left-most connection, and is marked by a triangular symbol on the circuit board. The outputs are not-supervised (except as noted below); thus, the N.O. contact would be energized only upon an active/alarm condition.

Refer to **Table 2** for the standard mapping of status and alarms.



NOTE

If you are using a meter to verify the status of a contact closure you CANNOT use the top of the screw terminals. You must obtain contact with the meter at the terminal block in the openings where the wires are inserted.

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Table 2 Standard mapping of status & alarms

Terminal Block	Description	AM AG	SM	MM2 8T	MM2 ≤5T	SSC
TB1	Cooling Status	✓	✓	✓	✓	✓
TB2	Heating Status	✓	✓	✓	✓	✓
TB3	Humidifying Status	✓	✓	✓	✓	✓
TB4	Dehumidifying Status	✓	✓	✓	✓	✓
TB5	High Temperature	✓	✓	✓	✓	✓
TB6	High Humidity	✓	✓	✓	✓	✓
TB7	Low Temperature	✓	✓	✓	✓	✓
TB8	Low Humidity	✓	✓	✓	✓	✓
TB9	High Head Pressure	✓	✓	✓	✓	
TB10	Loss of Airflow	✓	✓	✓	✓	
TB11	Change Filters	✓	✓	✓		
TB12	Water Detected/Customer Alarm 1	✓	✓	✓	✓	
TB13	Customer Alarm 2	✓		✓		
TB14	Glycool Status	✓	✓	✓	✓	✓
TB15	Unit On	✓	✓	✓	✓	✓
TB16	Loss of Communication	✓	✓	✓	✓	✓

Notes

AM = Advanced Microprocessor
 AG = Advanced Microprocessor
 with Graphics

SM = Standard Microprocessor
 MM2 = MiniMate2 & DataMate
 SSC = Small System Controller

**NOTE**

Older-generation units with Level 0 or Level 10 function as follows:

- **Level 10** provides equivalent functionality to AM/AG controls except Unit On status is not available.
- **Level 0** provides equivalent functionality to SM controls except Unit On status is not available.

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MONITORING

Environmental Discrete Outputs

USER MANUAL

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With over a million installations around the globe, Liebert is the world leader in computer protection systems. Since its founding in 1965, Liebert has developed a complete range of support and protection systems for sensitive electronics:

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- Power conditioning and UPS with power ranges from 300 VA to more than 1000 kVA
- Integrated systems that provide both environmental and power protection in a single, flexible package
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