

# User Manual



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# 1. Introduction

## 1.1 Description:

LCE-MBP-400 is a maintenance bypass switch specifically designed for use with single-phase inverter systems. It permits transfer of AC energy (without interrupting AC to the load for more than a half cycle) when the inverter system needs maintenance.

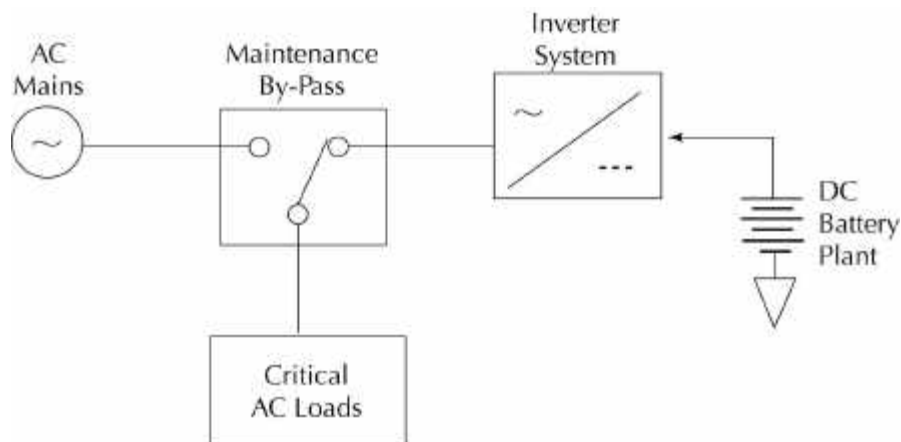


Figure 1a: Inverter Maintenance By-Pass

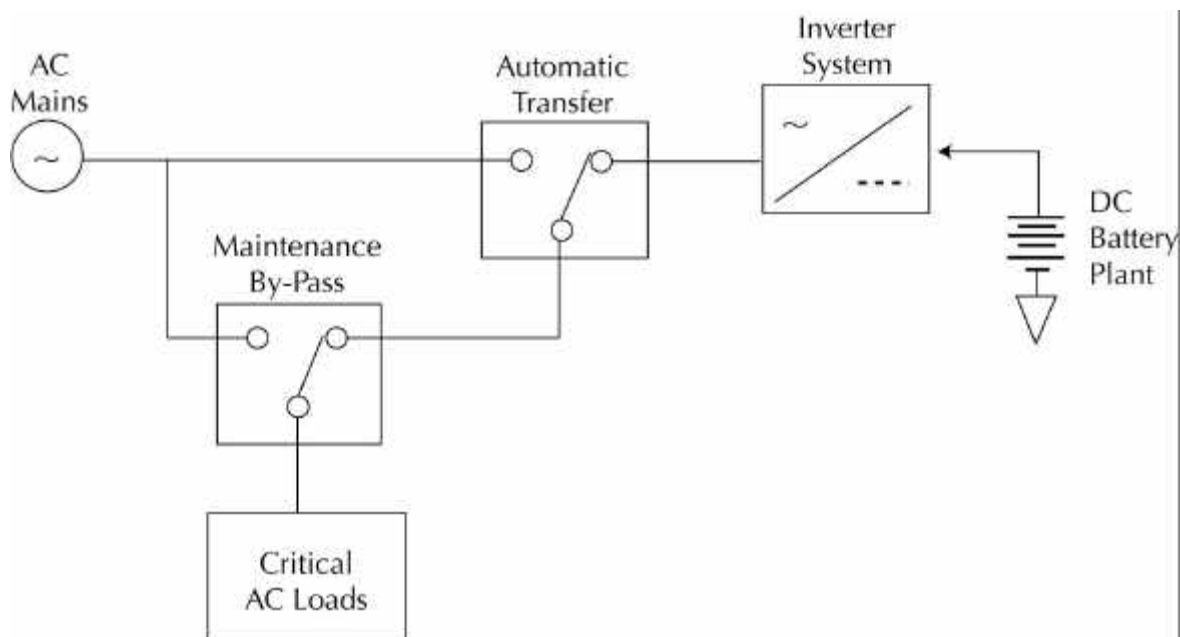


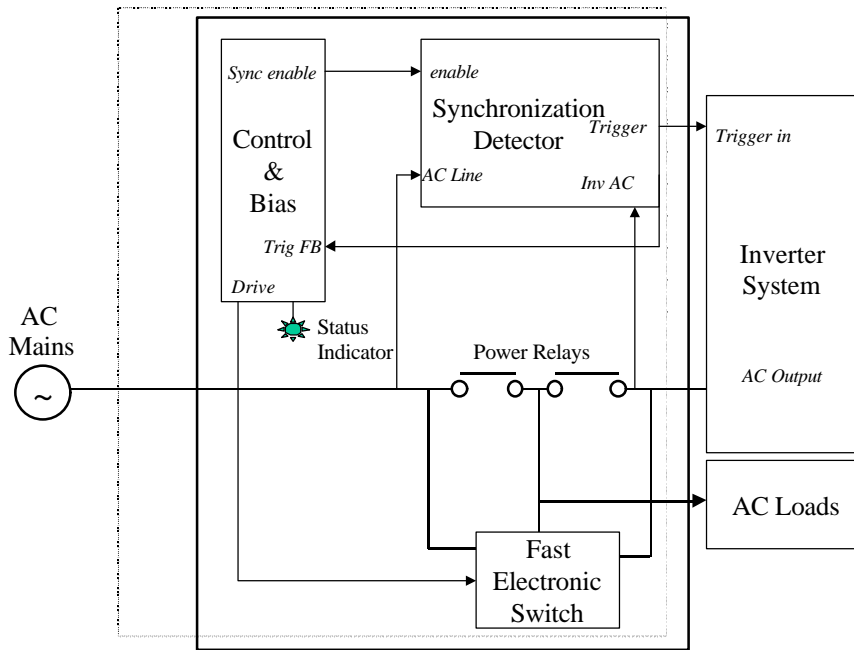
Figure 1b: Inverter Maintenance By-Pass with Optional Automatic Transfer

## 1.2 Block Diagram and Theory of Operation

The LCE-MBP-400 is designed to work specifically with TDI's inverters in single-phase configurations. The system includes (See Figure 2):

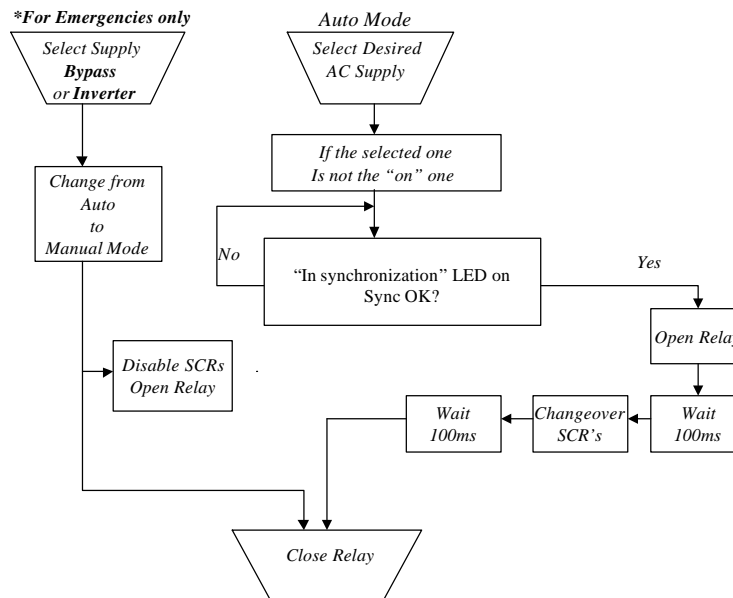
- Power Relays: Two high current contactors, each capable of handling all steady state and peak operating parameters, provide steady state connection from Load to selected AC source.
- Fast Electronic Switch: Two thyristor modules, capable of: switching in less than a half cycle, handling the steady state operating parameters for up to 10 seconds, and handling all peak operating parameters, provide connection from Load to AC source during switching sequence.

- Synchronization Detector: Synchronizes the Inverter output to the AC mains.
- Control & Bias: Produces all bias voltages necessary for operation and controls all elements of the unit as prescribed.



**Figure 2: Block Diagram**

For seamless transfer either from AC mains to inverters or from inverters to AC mains, it is necessary to execute a prescribed set of actions. The flow chart below guides this sequence of events. It also outlines the transfer operation under an emergency transfer condition (e.g. loss of a supply). This emergency transfer mode will involve a loss of supply to the load as the power relays change over.



**Figure 3: Flow Chart**

This sequence is identical for transfers from AC Mains to Inverter or from Inverter to AC Mains.

### 1.3 Features:

- Voltage rating: For 120VAC, 100-145VAC; For 220VAC, 190-250VAC .
- Current rating: 400AAC steady state, 2.8 Crest Factor
- Frequency: 50 or 60Hz  $\pm$ 1%
- Phase loss on load Bus: within half a cycle (**See Figure 4**)
- Peak Current: 3X rated power for 10 seconds
- Operating Temperature: -20 to +55°C
- Storage Temperature:-30 to +8°C
- Humidity: 0% to 95%
- Altitude: -200ft to 13000ft
- Safety Agency: UL, TUV/CE
- MTBF>100,000 Hours

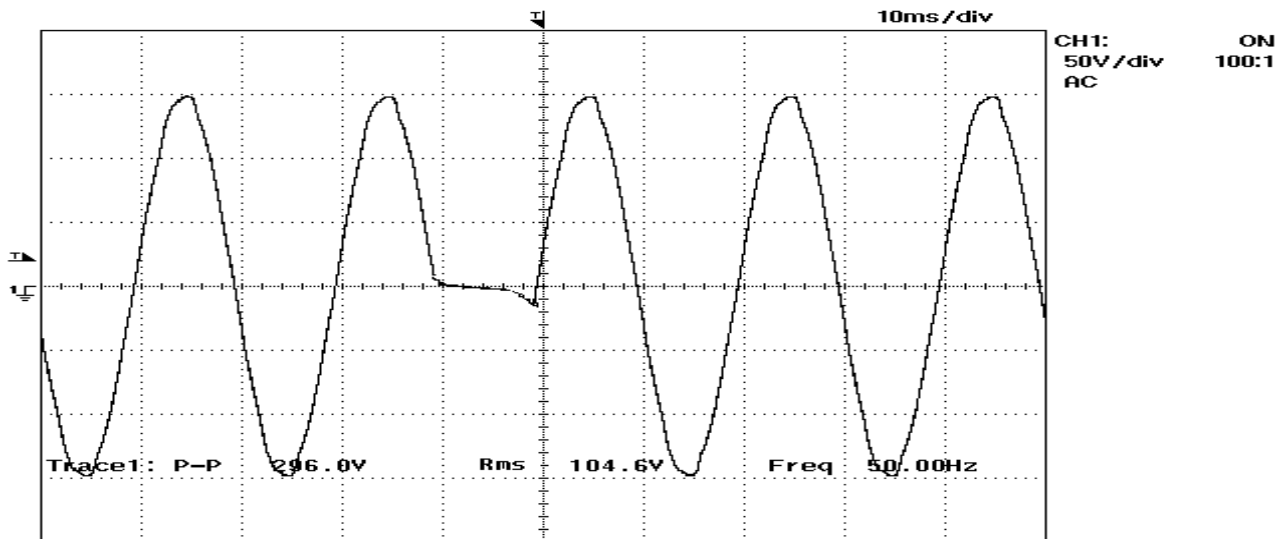
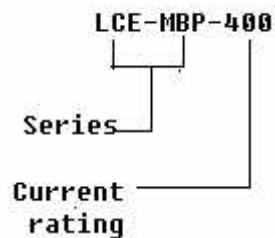


Figure 4: Waveform of Load Bus During Switching

### 1.4 Order Part Number



### 1.5 Important Considerations

**Caution: Before applying power, the Voltage Select Switch S1 (120VAC/220VAC) on the bias board inside the enclosure MUST be appropriately set for your system voltage!**

**Warning: Applying power while this switch is set incorrectly may cause unit failure!**

## 2. Electrical Specifications:

<b>Electrical Characteristics</b>	
Nominal working voltage	120VAC/220VAC selectable
Max Start-up Voltage (For both Bypass and Inverter input)	190VAC (For 220VAC application) 100VAC (For 120VAC application)
AC input working voltage range	190-250VAC (for 220VAC application) 100-145VAC (for 120VAC application)
Operating current	400A, steady state
Operating Frequency	50 or 60Hz +- 1%
Peak operating Current	3 X Rated Current for 10 Seconds
Transfer Time	200ms
<b>Environmental</b>	
Operating Temperature	-20 to 55° C
Storage Temperature	-30 to +85° C
Altitude	-200 to 13000 Ft
Humidity	0 to 95%
<b>Regulatory Agency Compliance</b>	
<b>EMC</b>	
<b>Emissions:</b>	
RF disturbance	EN55022 CLASS A
Harmonics	EN61000-3-2
Voltage Flicker	EN61000-3-3
<b>Immunity:</b>	
Surge Immunity	EN61000-4-5 to 2000V
Fast Transient Immunity	EN61000-4-4 to 4KV
<b>Safety</b>	
Safety	TUV/CE, UL

## 3. Mechanical Specifications:

### 3.1 Dimensions:

The dimension of the MBP are 14.17" (360mm) High x 15.75" (400mm) Wide x 7.87" (200mm) Deep

### 3.2 Weight:

27.56 lbs. (12.5 Kg)

## 4. Set up and Installation:

### 4.1 Mounting:

Two Keyholes are provided for mounting on the wall. For hole size details, see outline drawing Figure 8 at the end of this manual.



Figure 5

## 4.2 Cabling Inlet and Outlet:

Two symmetrical holes are provided for cabling going in and out either from the bottom or the top panel. For hole size details see Figure 8 at the end of this manual.

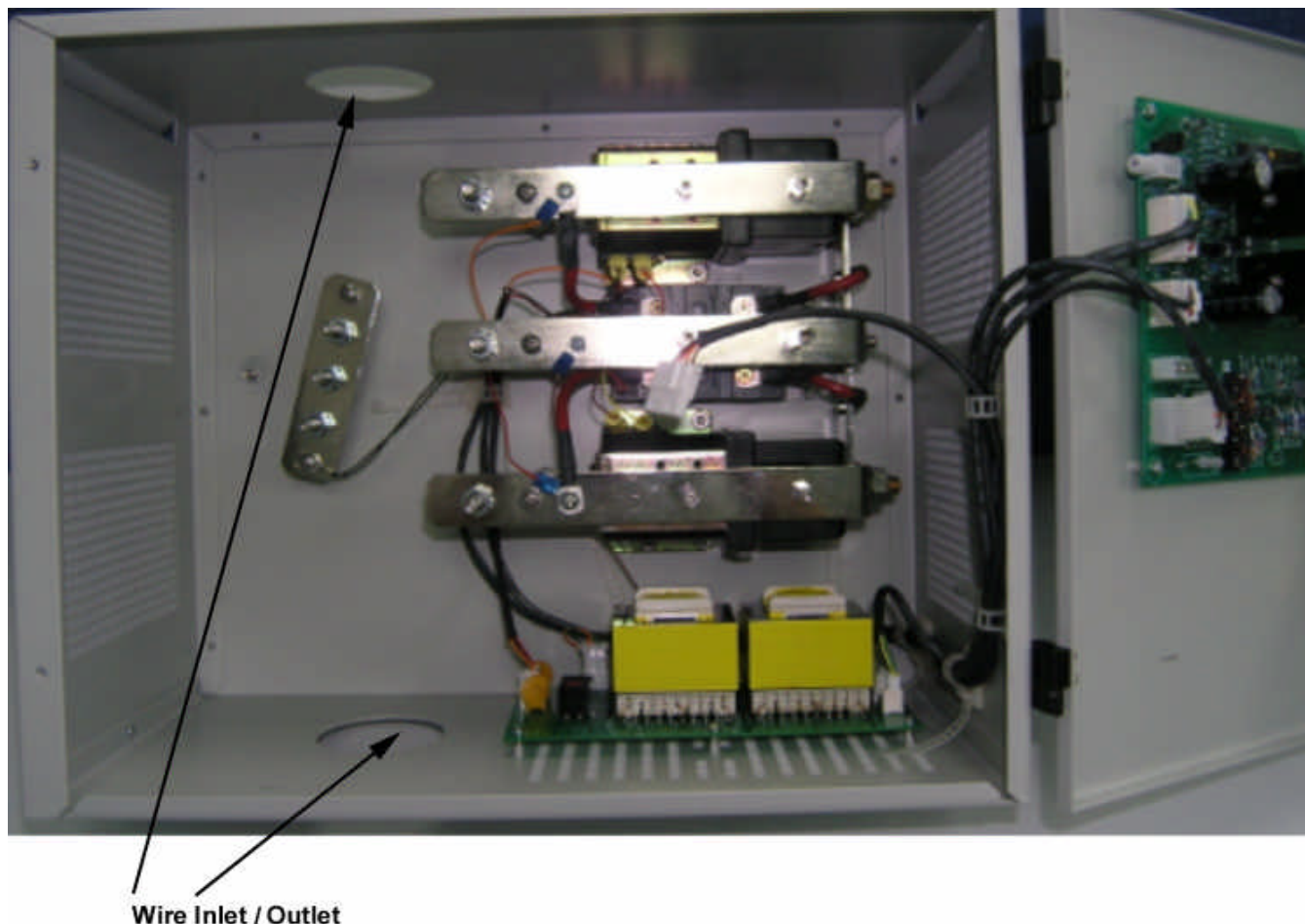


Figure 6

## 4.3 Connection:

There are 6 connections that must be made inside the enclosure for proper and safe operation. When the front door is open all connection points are clearly visible. **Figure 7** below shows the position of each connection.

- By-Pass line Bus: One STUD #0518 is provided for BYPASS line input connection ( $400A_{rms}$ ).
- Inverter line Bus: One STUD #0518 is provided for Inverter line input connection ( $400A_{rms}$ ).
- Load line Bus: One STUD #0518 is provided for Load output line connection ( $400A_{rms}$ ).
- Neutral Bus: Three STUD #0518 are provided for Inverter Neutral, BYPASS Neutral and Load Neutral ( $400A_{rms}$ ).
- Ground: one STUD #032 is provided.
- SYNC signal: an SFH757(fiber port) and a 70543-0001 (electrical port) are provided for SYNC output.

**Notes: For SYNC signal, the fiber port is recommended for optimum noise immunity.**

**Caution: Before applying power, the voltage select switch S1(120VAC/220VAC) on the bias board inside the enclosure MUST be appropriately set for your system voltage!**

**Warning: Applying power while this switch is set incorrectly may cause unit failure!**

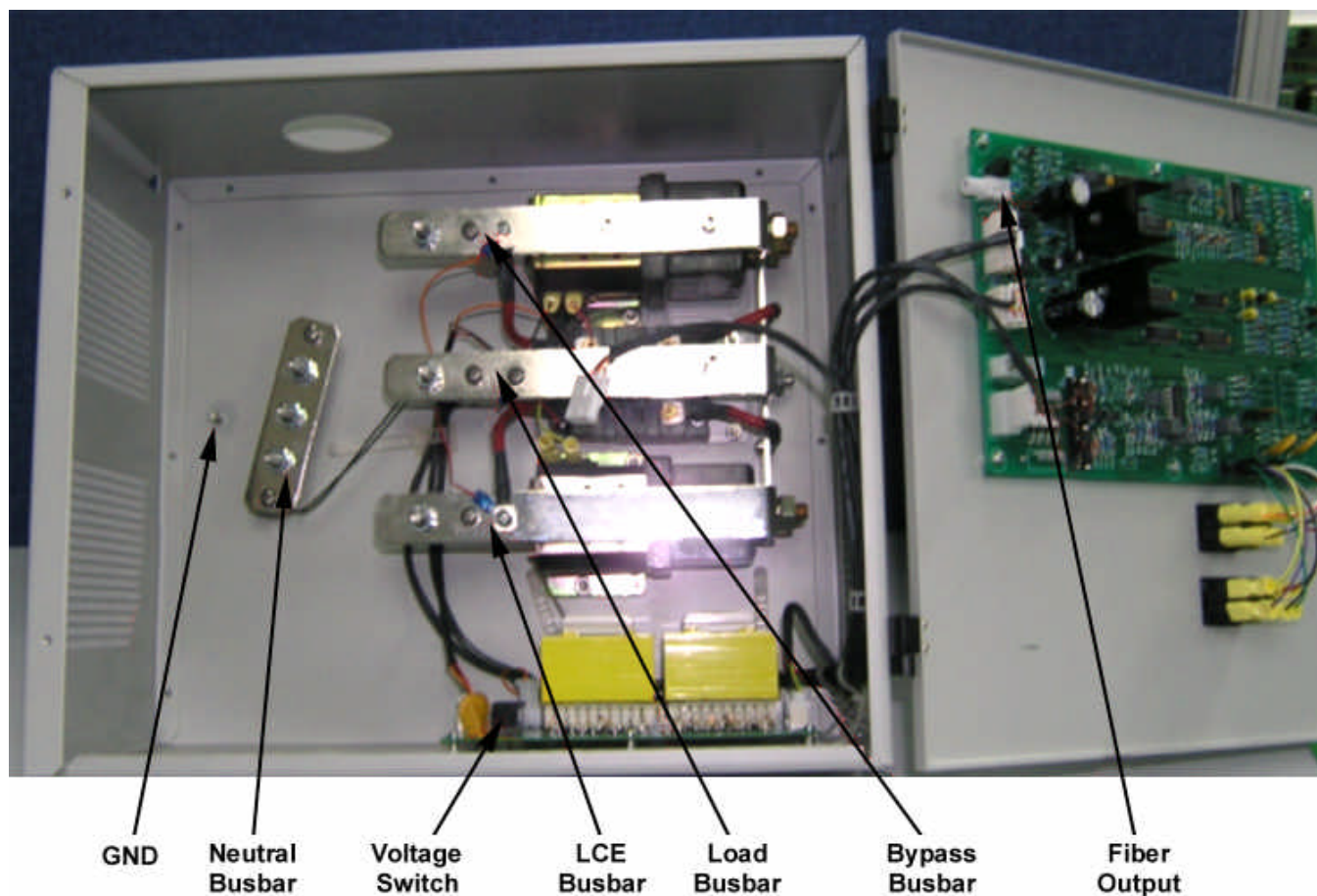


Figure 7

#### 4.4 Voltage Selector:

Before applying power, the appropriate system voltage, 110VAC or 220VAC, should be set on the voltage selector switch S1 on the bias board inside the enclosure. The setting can be read from the switch's silkscreen.

**Warning: Applying power to the MBP with the Voltage Selector in the wrong position will cause unit failure.**

## 5. MBP Operation:

### 5.1 Switches:

- “Select” Switch: This switch is used to select which AC source the load will draw its power from: Inverter (right) or Bypass (left).
- “Emergency” Switch: This switch is used to toggle the system between Emergency mode (right) and Synchronization mode (left). In Emergency Mode the red “Emergency Mode” LED will be turned on and the system will run in emergency-transferring mode. If the switch toggled to left side, the red “Emergency Mode” led will be turned off and the system will run in synchronization-transferring mode.

## 5.2 Indications:

- Inverter OK: A green LED indicates the voltage on the INVERTER line input bus is higher than the minimum voltage.

Inverter "OK" LED	For 220VAC application	For 120Vac application
ON	Higher than 190VAC	Higher than 100VAC
OFF	Lower than 190VAC	Lower than 100VAC

- Bypass "OK": A green LED indicates the voltage on the BYPASS line input bus is higher than the minimum voltage.

BYPASS "OK" LED	For 220VAC application	For 120Vac application
ON	Higher than 190VAC	Higher than 100VAC
OFF	Lower than 190VAC	Lower than 100VAC

- Bypass "ON" and Inverter "ON": Two green LEDs indicate whether the BYPASS or the INVERTER source is supplying power to the load.

BYPASS "ON" LED	INVERTER "ON" LED	LOAD POWERED BY
ON	OFF	BYPASS
OFF	ON	INVERTER

- Emergency Mode: A Red LED is lit when the system is running in Emergency Transfer mode and is off when the system is running in Synchronization Transfer mode.

EMERGENCY MODE LED	TRANSFERRING MODE
ON	EMERGENCY MODE
OFF	SYNCHRONIZATION MODE

### 6. Outline Drawing (Figure 8):

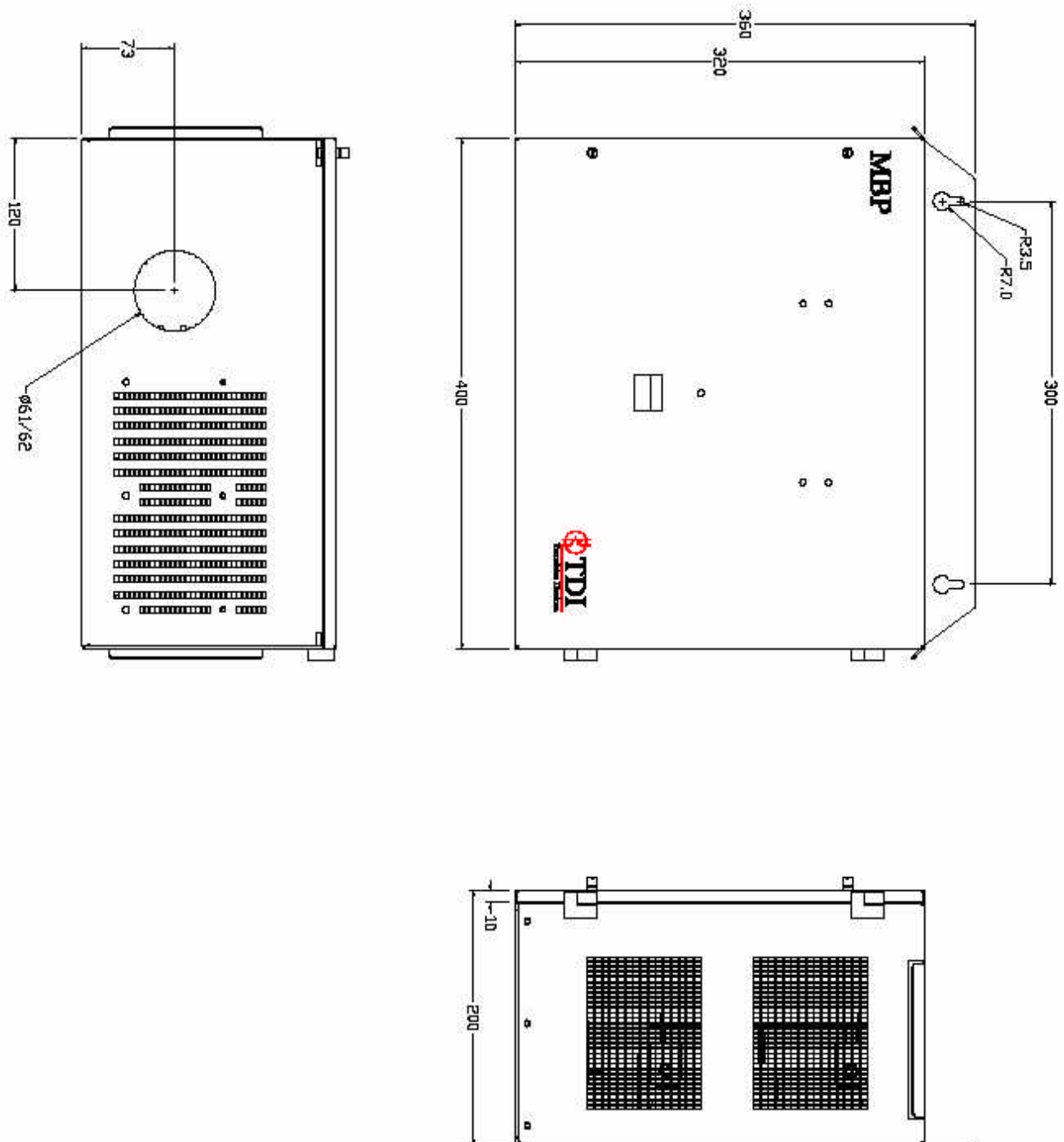


Figure 8