Kim Frankcombe

ZT-20 MANUAL

Read This First

WARNING

Before operating your transmitter, we recommend you read or at least skim the entire manual.

MAXIMUM INPUT VOLTAGE = 32 Volts D.C., i.e., two fully charged 12 volts batteries at 14.7 volts each.

WATCH INPUT POLARITY AT BATTERY CONNECTORS, USE HEAVY GAUGE JUMPER BETWEEN BATTERIES AT LEAST 8 GAUGE WIRE.

THERE IS A FIVE SECOND DELAY AFTER POWER IS TURNED ON FOR CIRCUITS TO STABILIZE, SEE CONTROL INFORMATION.

YOU HAVE TWO SECONDS AFTER RESET TO PUSH TRANSMIT, OTHERWISE YOU MUST PUSH RESET AGAIN.

DO NOT OPERATE INTO A SHORT CIRCUIT, I.E., LESS THAN 0.5 OHMS.

THERE IS INTERNAL RESISTANCE ON THE ORDER OF 0.4 OHM.

DO NOT OPERATE THE TRANSMITTER WITH GREATER THAN A 5 VOLT DIFFERENCE BETWEEN INPUT AND OUTPUT voltage.

SECTION 1
DESCRIPTION OF THE ZT-20 TRANSMITTER

1.1 INTRODUCTION

The ZT-20 Zerotem transmitter is a battery powered transmitter designed to transmit into a loop between 10 and 300 meters with a resistance of 10 ohms or less. It will transmit a time domain signal between DC and thirty-two hertz. It is capable of frequency domain operation over the same range.

The input voltage range is from 10 to 32 volts DC. The transmitter is designed for use in hostile environments and will work over a temperature range of -25°C to 65°C.

It uses individual touch switches for each function which are replaceable at the P.C. board level.

The ZT-20 is a modular device with replaceable P.C. boards to upgrade or repair the instrument. FIG. #2 shows board placement.

1.2 ELECTRICAL & MECHANICAL SPECIFICATIONS

Description: Variable voltage regulated 20 amp are mosfet switched transmitter.

Frequency Range D.C. - 32 Hz.

Survey Capabilities - TEM Loop driver.

Power - 10 to 32 V DC Battery Powered.

Temperture Range - 25^{o}C to + 65^{o}C.

Humidity Range - 0 to 100%

Switching Range - 250 nanoseconds into a resistive load.

Damping Circuit - MOV protected output to damp inductive spikes- 10 ohm resistance switched into loop on turnoff to reduce turnoff time. 60 ohm loop damping resistance switched across loop on turnoff. Clamping MOV's to limit voltage rise to 100 volts or less across output.

Mechanical Specifications:

General

Size: 29x21x19 cm. (11.5x8.5x7.5)

Weight: 6.8 kg (15 lbs.)

Enclosure: Heavy-duty, environmentally sealed aluminum case

Controls and Displays

LCD Voltmeters - Input and Output Voltage, Output Current, Decay Time, and Internal Temperture.

LED Indicators - Damping ON, Power ON, Regulated ON, Transmit ON, Polarity Plus or Minus, Meter Select. Over current, over voltage, over temperature.

Sealed Controls/Keys

Ten Turn Voltage Adjust Potentiometer

1.3 ZEROTEM ZT-20 CASE

1) Case Lid

The case lid provides protection for the front panel of the receiver. The lid is removed by rotating it to the rear and removing from the case. The mil connector caps should be stored in the lid when the transmitter is in use.

2) Front Panel FIG. #3

The front panel contains the liquid crystal displays, the keys for operator interface, and individual LED lamps to report status of the ZT-20.

3) I/O Panel FIG. #4

The back of the case contains the connectors to input power, control the transmitter switching and output power to the loop. The current sense connectors are also here. A 25 amp fuse for circuit protection is mounted in a waterproof fuse holder.

1.4 FRONT PANEL
SEE FIG. #3

The front panel contains the displays, control keys and voltage adjust potentiometer. Operator control of the ZT-20 is through the front panel.

1) Liquid Crystal Displays: There are two displays for transmitter status. The left most display will indicate the battery input voltage at all times. The right display indicates different parameters as selected by the meter select switch. This meter can display regulated voltage to the output, output current, decay time in microseconds, and regulator heatsink temperature.

2) Transmitter ON and OFF

[ON] [OFF] These keys control power to the transmitter. After the transmitter is connected to the battery, pressing the ON key will energize the internal power supply. Pressing the OFF key at any time will reset the transmitter and turn off power to the internal supplies. The transmitter generates an internal 5 second delay each time it is turned on to allow the power supply to stabilize. The control circuits remain reset until this times out.

3) Regulated/Unregulated

[REG/ UNREG] This key controls the selection of regulated or unregulated operation. It is provided in order to avoid a voltage drop across the regulator in low battery conditions. The output current will be an average value when in the unregulated mode. In the regulated mode the Voltage Adjustment potentiometer adjusts the output voltage to a selected value.

4) TRANSMIT and RESET

[RESET] [XMIT] These keys control the output of the transmitter. RESET must be pushed before Transmit. You have two seconds after RESET to press TRXMIT. This is to avoid an unwanted transmit if the key is accidently pressed. Any fault condition will generate a reset condition.

5) METER SELECT

This key controls which function is displayed on the DATA DISPLAY. It will cycle through the different functions and return to the top function each time.

A) VOLTS: This is the voltage at the input to the output switch. It will be greater than the voltage across the loop due to the resistance of the devices in the output bridge.

B) CURRENT: This is the actual output current measured across the output current sense resistor. It is sampled right before turnoff and sent to a true RMS convertor. The output is buffered and sent to the DATA DISPLAY.

C) DECAY MicroSEC: This displays the time it takes for the current to reach zero after the output is turned off. It displays the time in microseconds.

D) TEMPERATURE: This displays the temperature in degrees centigrade at the regulator heat sink. The maximum temperature for operation is 65 degrees centigrade. A reset will be generated above 65 degrees.

6) DAMPING

This key controls the damping circuits. When the light is on the damping circuits are energized. This places a 10 ohm resistor in series with the output on turnoff to decrease the turnoff time. It also places a 60 ohm resistor across the output to dampen any oscillations in the loop as the current reaches zero.

7) POLARITY:

These lamps represent the polarity of the output to the loop. When they are indicating, it shows that the output is switching.

8) OVERCURRENT:

This lamp lights when the output current has exceeded twenty-five amps. It also indicates that the transmitter has turned off. Push reset to clear the indicator and either increase the loop resistance or decrease the regulated output voltage.

9) BATTERY VOLTS:

This lamp indicates an under or overvoltage condition which is set for less than ten volts or greater than 36 volts. It will also reset the transmitter and must be cleared by pushing reset before operation can resume. Check for proper battery condition or voltage.

10) OVERTEMP:

This lamp comes on when the temperature of the regulator heat sink exceeds 65°C. and resets the transmitter. The temperature must fall below 65°C. before operation can be resumed. If OVERTEMP occurs, use a lower current, add resistance to the loop or lower the input voltage.

1.5 INPUT OUTPUT PANEL
Rear of Case
SEE FIG. #4

1) POWER: This connector is for the DC input to the transmitter. The transmitter accepts voltages from 10 to 30 volts DC

2) FUSE: This is a twenty-five amp fuse type KAA-25 used to protect the transmitter against reverse voltages or internal short circuits.

3) EXTERNAL CONTROL: This input connector accepts signals from the XMT-16 or the GDP-16 to control the ZT-20. It accepts signals for period and duty cycle.

4) CURRENT SENSE: These jacks provide an output from the current sense resistor. They are measure across the 0.1 ohm current sense resistor and provide an accurate current signal. There is 200V isolation from the output circuit and the current sense is referenced to battery ground.

5) OUTPUT: These jacks are rated at 25 amps and provide connection to the loop. Good wiring must be used to avoid any voltage drop across the connections.

2.1 OPERATING SUMMARY

This summary is intended to provide a basic startup procedure to enable the operator to try the basic functions of the transmitter without having to be fully conversant in its operation.

TRANSMITTER START UP

To power up the transmiter, first connect the power cable to the transmitter and then connect to a twelve volt battery of at least 20 amp per hour capacity.

NOTE: A smaller capacity battery can be used for testing.

Press the ON switch, the control LED lamps should light in the following sequence.

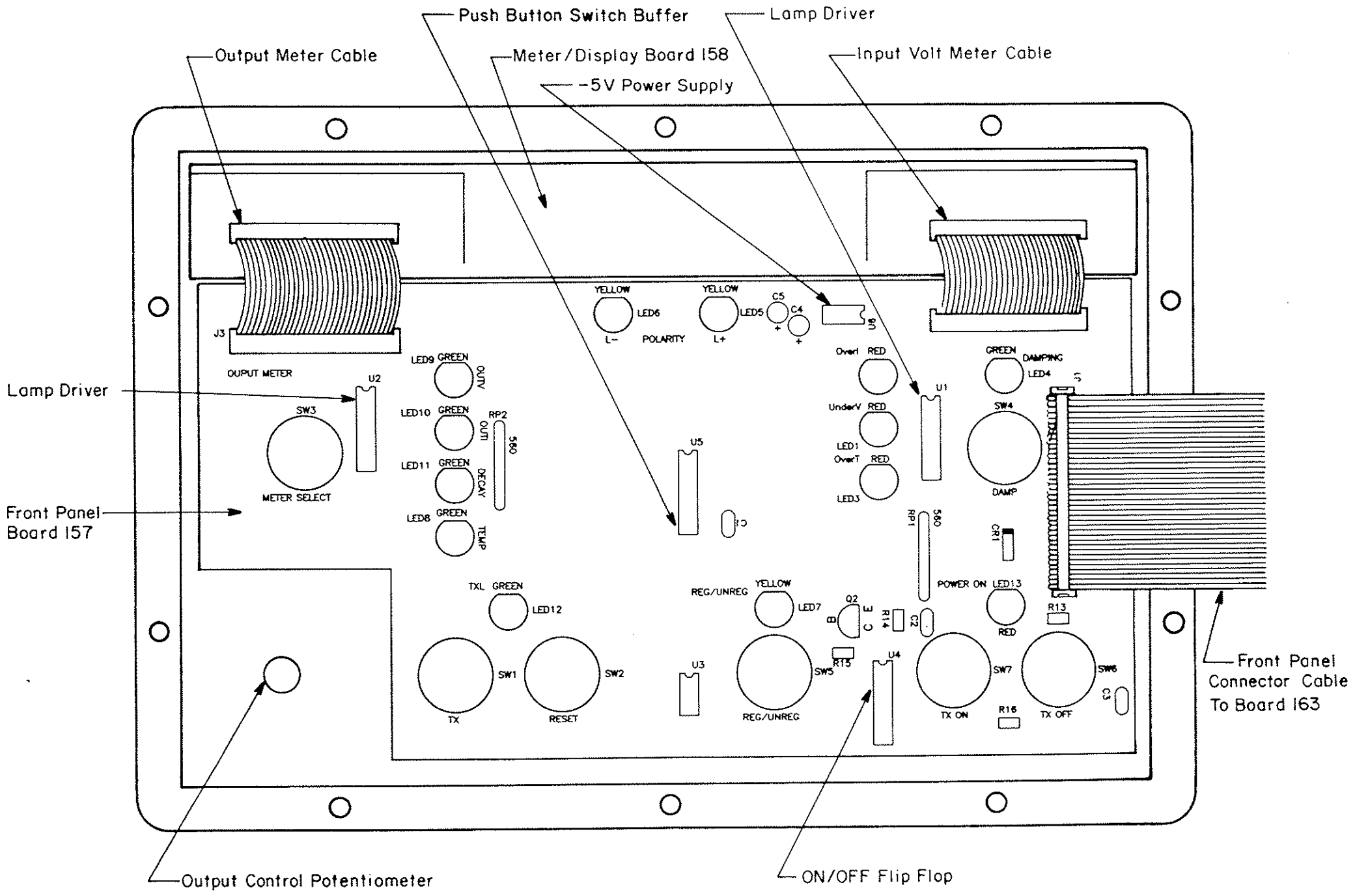
Damping ON, Reg ON, Power ON, and one of the meter select lamps, if any of the fault lamps are on, press reset. This will power up the transmitter. The input voltage should be displayed in the left hand display. At this time the circuits will be activated and a delay of five seconds is generated to allow for circuits to stabilize. If all fault lamps are extinguished, the transmitter is ready to transmit. Use a digital voltmeter to check your loop resistance and make sure of continuity and a low loop resistance. Make sure the transmitter controller is connected to external control and is on. Plug in the loop to the output jacks using the supplied connectors to minimize contact resistance. Set the meter select to VOLTS. Adjust the voltage control to minimum and press RESET. Within two seconds press XMIT, the contactor should drop in and the output voltage should indicate. Depending on the output current needed, adjust the output voltage to within 4 volts of the input voltage.

WARNING

DO NOT OPERATE THE TRANSMITTER WITH GREATER THAN A FIVE VOLT DIFFERENTIAL BETWEEN INPUT AND OUTPUT IN THE REGULATED MODE.

The regulators will heat up at a rapid rate and shut down will occur at 65 degrees centigrade.

It is permissable to operate up to 65^{o}C.


Push Button Switch Buffer
Lamp Driver
Output Meter Cable
Meter/Display Board 158
Input Volt Meter Cable
-5V Power Supply
Lamp Driver
Front Panel
Board 157
Front Panel
Connector Cable
To Board 163
Output Control Potentiometer
ON/OFF Flip Flop
J3
OUPUT METER
U2
SW3
METER SELECT
LED9 GREEN OUTV
LED10 GREEN OUTI
LED11 GREEN DECAY
LED8 GREEN TEMP
RP2
560
YELLOW LED6 L-
POLARITY
YELLOW LED5 L+
C5
C4
J5
U5
Over RED
UnderV RED
LED1
OverT RED
LED3
U1
GREEN DAMPING LED4
SW4
DAMP
RP1
560
CR1
TXL GREEN LED12
SW1
TX
SW2
RESET
U3
REG/UNREG YELLOW LED7
Q2
R14
C2
SW5
REG/UNREG
R15
U4
POWER ON LED13
RED
R13
SW7
TX ON
R16
SW6
TX OFF
C3

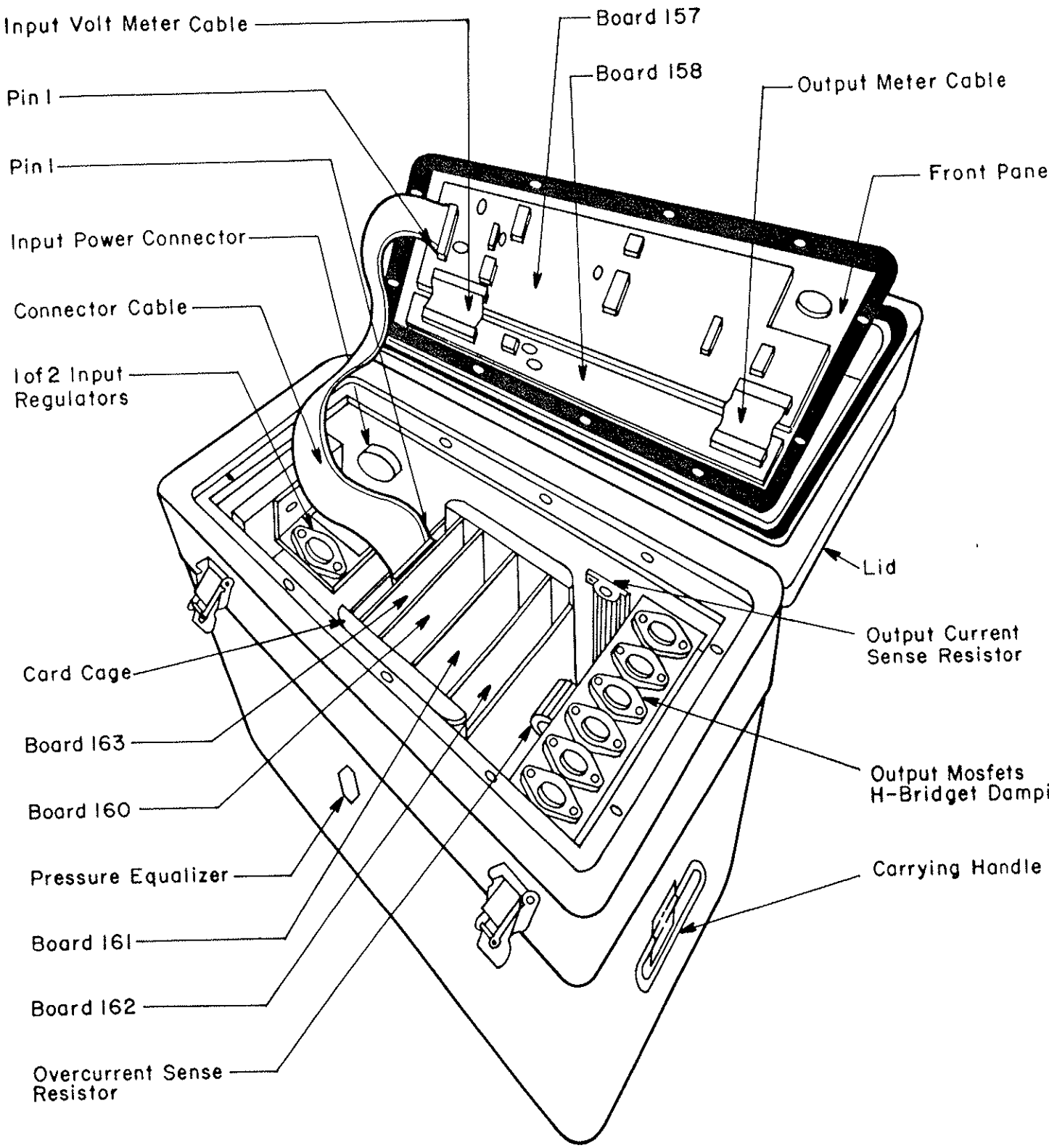

Input Volt Meter Cable
Pin 1
Pin 1
Input Power Connector
Connector Cable
1 of 2 Input Regulators
Card Cage
Board 163
Board 160
Pressure Equalizer
Board 161
Board 162
Overcurrent Sense Resistor
Board 157
Board 158
Output Meter Cable
Front Pane
Lid
Output Current Sense Resistor
Output Mosfets H-Bridget Dampi
Carrying Handle

Figure # 2

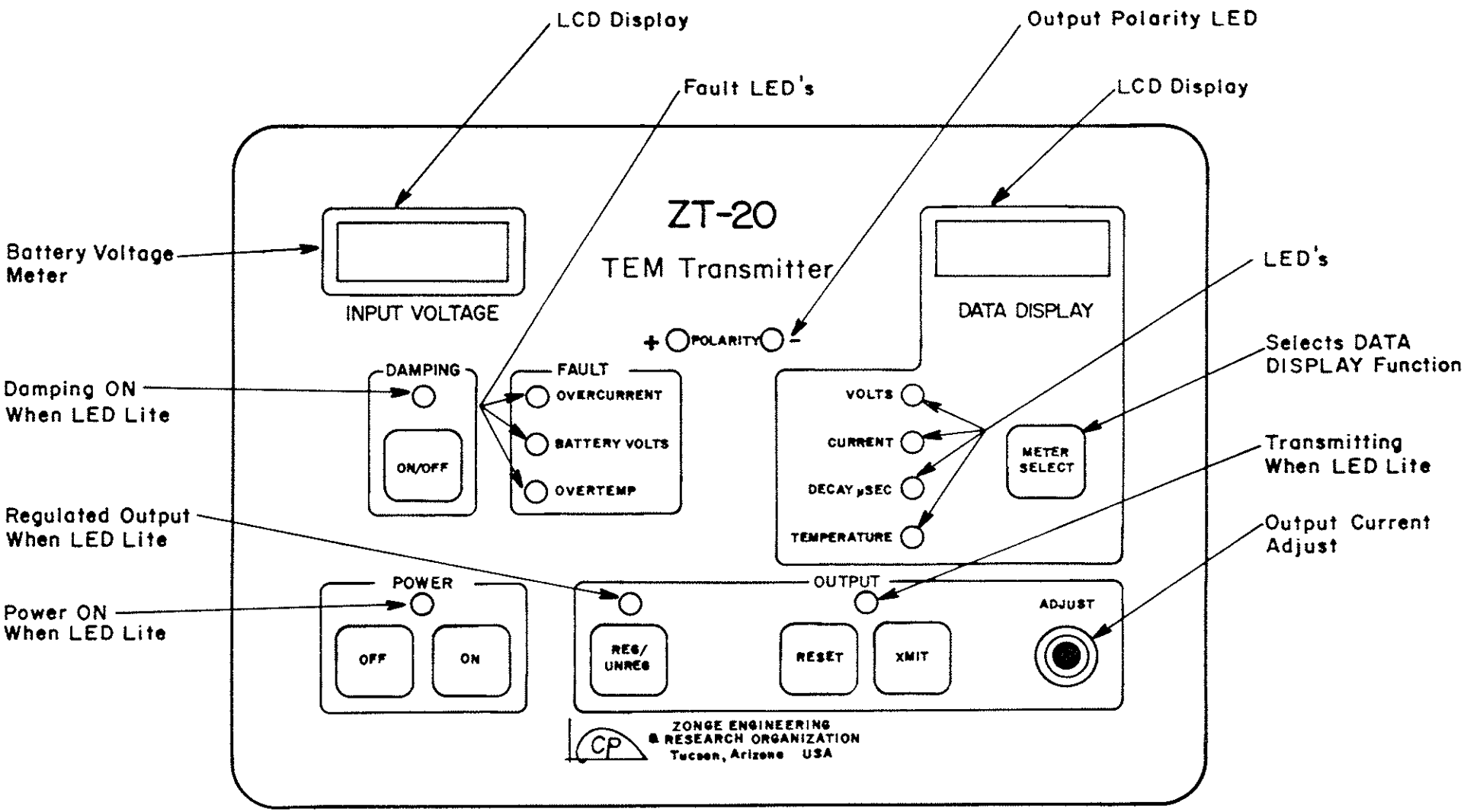

LCD Display
Output Polarity LED
Fault LED's
LCD Display
ZT-20
TEM Transmitter
Battery Voltage Meter
INPUT VOLTAGE
DATA DISPLAY
LED's
+ POLARITY -
Selects DATA DISPLAY Function
DAMPING
FAULT
Damping ON When LED Lite
ON/OFF
OVERCURRENT
BATTERY VOLTS
OVERTEMP
VOLTS
CURRENT
DECAY μSEC
TEMPERATURE
METER SELECT
Transmitting When LED Lite
Regulated Output When LED Lite
Output Current Adjust
POWER
OUTPUT
ADJUST
Power ON When LED Lite
OFF
ON
REG/ UNREG
RESET
XMIT
ZONGE ENGINEERING & RESEARCH ORGANIZATION
Tucson, Arizona USA

Figure # 3

ZEROTEM ZT-20
Control Panel , case back

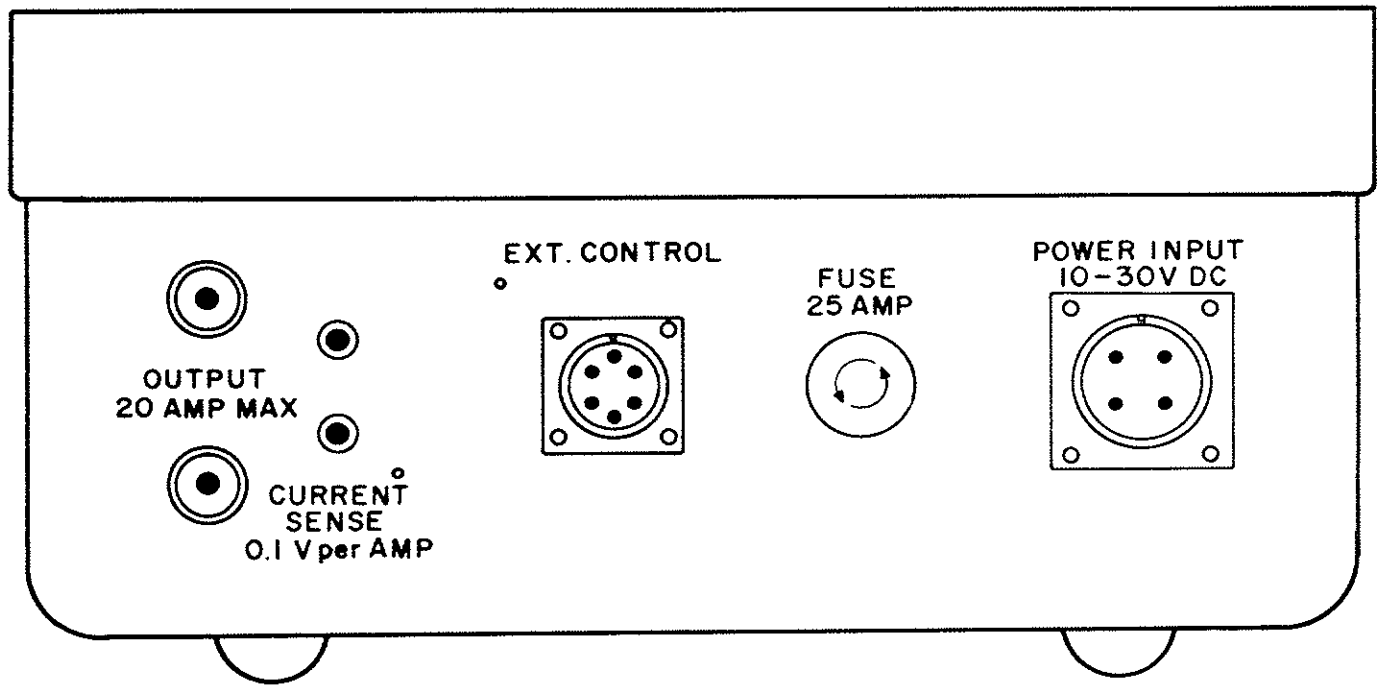
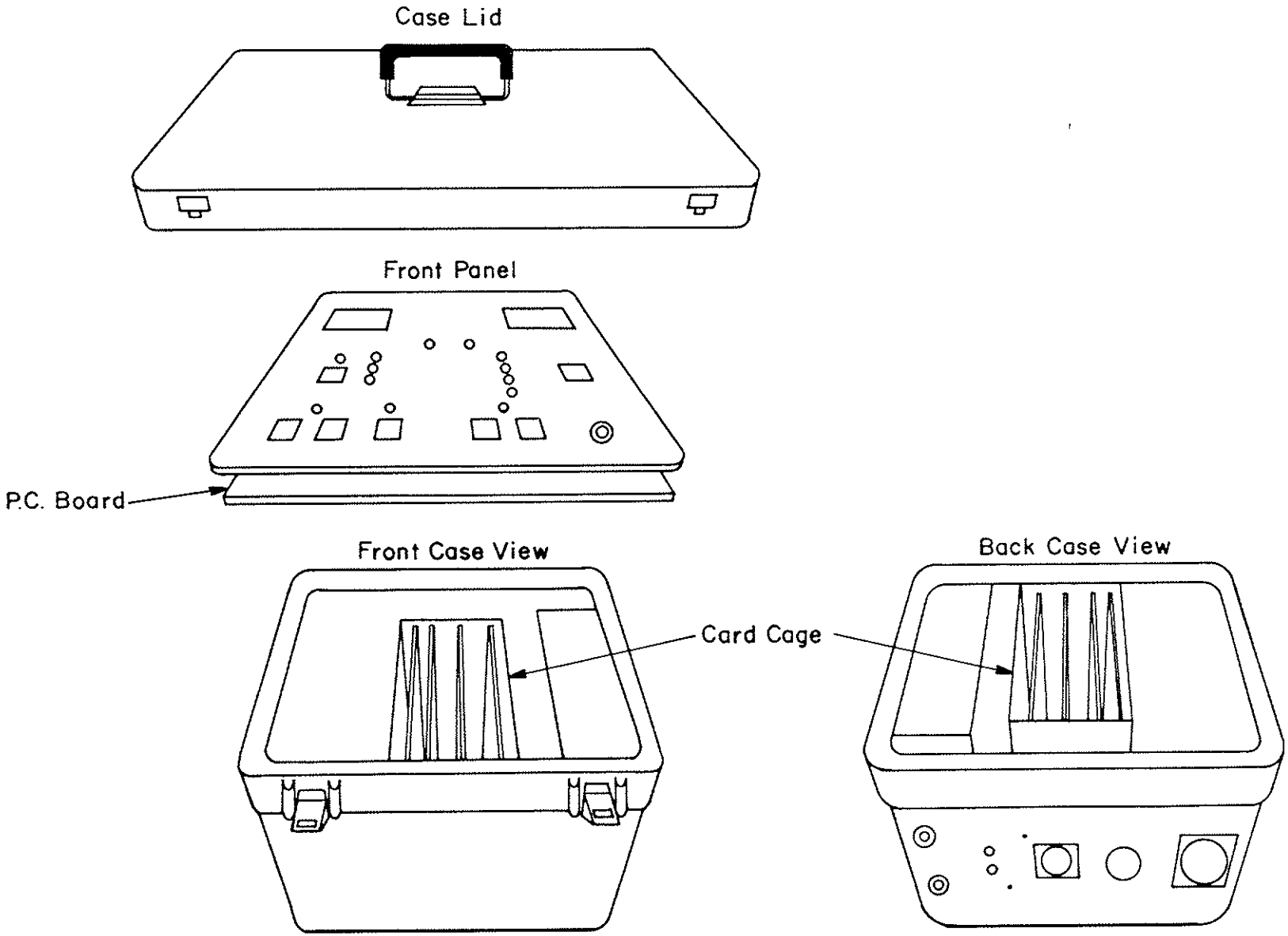


Figure # 4


Case Lid
Front Panel
P.C. Board
Front Case View
Card Cage
Back Case View