

## 2. DESCRIPTION OF THE GDP-32<sup>II</sup> RECEIVER

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## 2.1 OVERVIEW

The GDP-32<sup>II</sup> Geophysical Data Processor is a universal, multi-channel receiver designed to acquire virtually any type of electromagnetic or electrical data within the DC to 8 kHz bandwidth. The GDP-32<sup>II</sup> design is the result of over 25 years experience with its predecessors, the GDP-12, GDP-16 and GDP-32. Its design emphasizes software flexibility, optimum data quality, practicality and ruggedness for harsh field conditions.

The GDP-32<sup>II</sup> is supported by a complete set of geophysical services at Zonge Engineering. These services include:

- Equipment sales and rentals
- Geophysical consulting and training
- Turn-key data processing
- Custom Modeling and Processing Software
- Contract field surveys

## 2.2 SPECIFICATIONS

The GDP-32<sup>II</sup> is designed for high quality data acquisition in harsh environments. Measurable parameters include:

- Resistivity
- Induced Polarization (frequency or time domain)
- Complex Resistivity (CR)
- Controlled Source Audio Frequency Magnetotellurics (CSAMT)
- Harmonic CSAMT (HACSAMT)
- Frequency Domain EM (FEM)
- Transient EM (TEM)
- NanoTEM (a very early time TEM program)
- Continuous NanoTEM
- Natural Source MT
- Natural Source AMT

Programs are stored on an internal flash disk and are software-selectable. Users can also develop custom survey applications using the C programming language. However, this is a complicated undertaking and should only be attempted with assistance from Zonge Engineering.

The GDP-32<sup>II</sup> operates in both the Frequency Domain and Time Domain. Twenty six (26) frequencies can be selected in binary intervals between 0.000121 Hz and 8 kHz.

The GDP-32<sup>II</sup> is designed for multi-channel data acquisition. The large case GDP-32<sup>II</sup> can accommodate up to sixteen channels for simultaneous measurements from DC to 8 kHz. Multiple receivers can also be used together for n-channel acquisition.

The small case GDP-32<sup>II</sup>T accepts a maximum of 6 analog channels. These channels can be a mixture of high-speed NanoTEM acquisition boards (BD194) and the standard analog boards (BD183). In either case, a maximum of 3 high-speed NanoTEM channels can be installed.

## ELECTRICAL SPECIFICATIONS

### General

- Description: Broadband, Multi-channel digital Electromagnetic receiver
- Frequency Range: DC to 8 kHz
- Numbers of Channels: 16 (maximum)
- Survey Capabilities: Resistivity, IP (time and frequency domain), FEM, MMR, CR, CSAMT, HACSAMT, TEM, NanoTEM, AMT, MT
- Software Language: C and assembly
- Power: 12V rechargeable batteries
- Temperature Range: -40° to 60° C (-40° to 140° F)
- Humidity Range: 0 to 90%
- Time Base: Crystal clock with  $5 \times 10^{-10}$  per 24 hours aging rate

### Analog Section

- Input Impedance: 10 M $\Omega$  at DC
- Dynamic range: 190 dB
- Min detectable signal:  $\pm 0.03 \mu\text{V}$
- Max input voltage:  $\pm 32\text{V}$
- SP offset adjustment:  $\pm 2.25\text{V}$  in 69  $\mu\text{v}$  steps (automatic)
- Automatic gain setting: manual override, in binary steps from 1/8 to  $2^{16}$ .
- Signal Attenuator: Selectable 8:1
- Calibration signal generation: Internal/external
- Duty cycle selection: 50%, 100%

### Filter Section

- All filters are software controlled
- Anti-alias filter, four-pole Bessel
- Quad-notch filter: 50/150, 60/180 Hz; 50/150/250/450 Hz, 60/180/300/540 Hz, or other user specified ranges
- Digital telluric filter

### Analog to Digital Converter (Standard Analog Channel)

- Resolution: 16 bits  $\pm 1/2$  LSB
- Conversion Time: 17  $\mu\text{sec}$
- Digitization Rate: 32 kHz maximum, per channel
- One A/D per channel for maximum speed and phase accuracy

## Digital Section

- Microprocessors: 586 CPU
- Memory: 16 Mb dRAM
- Mass Storage: 32 Mb flash disk (256 Mb optional) (program and data)  
Hard disk drives with capacities to 4.1 Gb.
- Serial Ports: 2 RS-232C ports (16650) standard
- Parallel Port: 1 SPP and EPP compatible printer port
- Network Adapter: 10-baseT Ethernet adapter standard (1 Mb/sec)
- Crystal Clock: Optional GPS-Disciplined
- Optional Ports: Mouse, CRT (VGA), standard Keyboard.
- Operating System: MS-DOS and Windows-95 standard.

## MECHANICAL SPECIFICATIONS

### General

#### Large Case

- Size: 43 x 41 x 22 cm (17 x 16 x 8.7 in)
- Weight: 8-channel, 10 A-h battery pack: 16.6 kg (36.5 lb)  
8-channel, 20 A-h battery pack: 20.5 kg (45 lb)  
16-channel, 10 A-h battery pack: 19.1 kg (42 lb)
- Enclosure: Heavy-duty, environmentally sealed aluminum case

#### Small Case

- Size: 43 x 31 x 22 cm (17 x 12.2 x 8.7 in)
- Weight: 6-channel, 10 A-h battery pack: 13.7kg (29 lb)
- Enclosure: Heavy-duty, environmentally sealed aluminum case

### Controls & Displays

- LCD alphanumeric/graphic display, 480 x 320 pixels ( $\frac{1}{2}$  VGA), with viewing contrast adjustment
- Sealed keyboard with 37 alpha-numeric keys and 30 function keys
- Analog signal meters and analog outputs
- Power Off/On

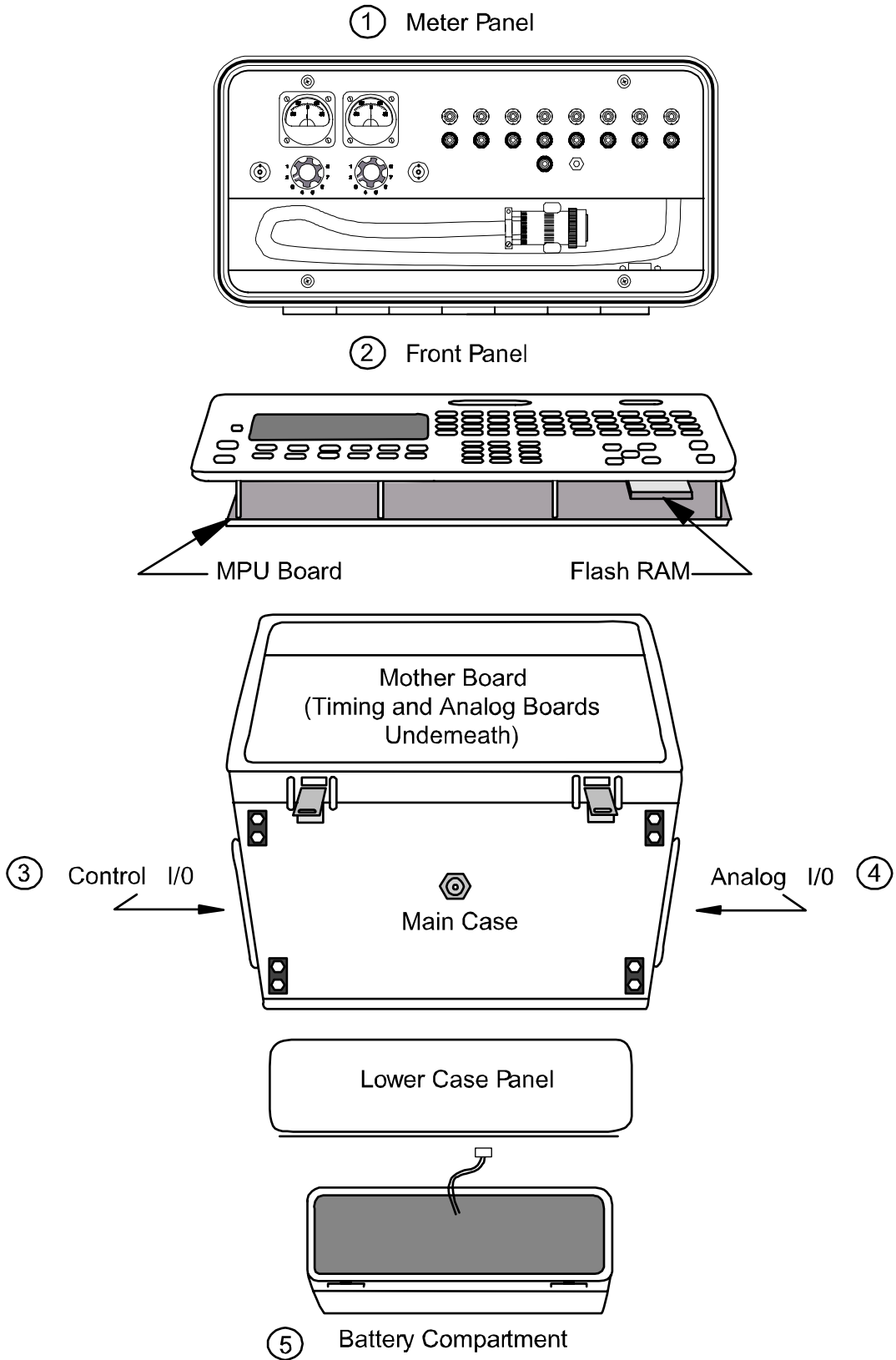
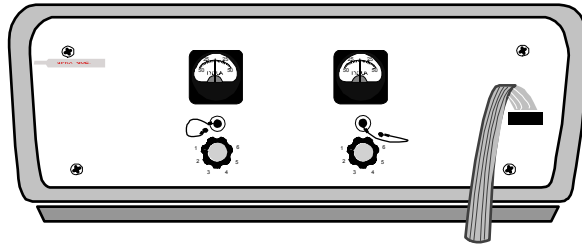


Figure 2.1 - Large Case GDP-32<sup>II</sup>

① Meter Panel



② Front Panel

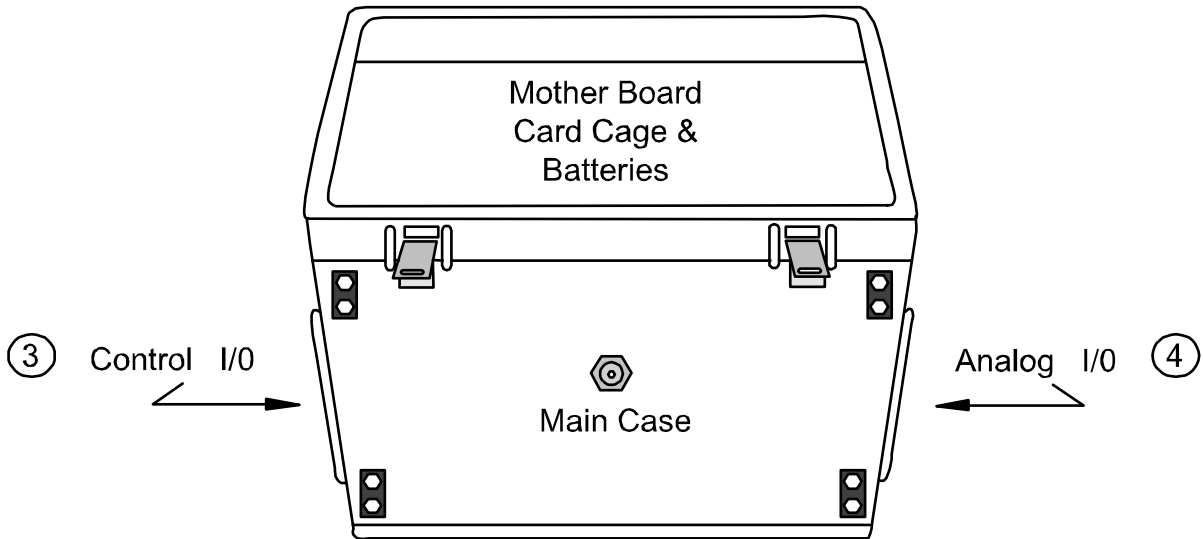
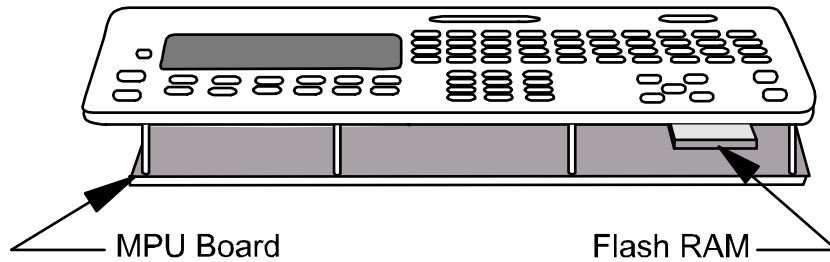


Figure 2.2 - Small Case GDP-32<sup>II</sup>T

## 2.3 GDP-32<sup>II</sup> CASE

The GDP-32<sup>II</sup> is available in two case sizes. The large case GDP-32<sup>II</sup> (Figure 2.1) permits the installation of up to sixteen analog channels for the DC to 8 kHz range. The small case GDP-32<sup>II</sup> (Figure 2.2) permits the installation of up to six channels. The central portion of the case contains the analog cards and timing/calibrate card. Input and output ports are mounted on side panels. The keyboard and display are mounted on the receiver's front panel.

### 1. Case Lid - Meter and I/O Panels

The case lid protects the front panel of the receiver and contains the meter/connection panel. Three different Meter and I/O panels are available. The particular Meter and I/O panel installed depends on the number of analog channels included in the GDP-32<sup>II</sup>. See Figure 2.3.

### 2. Front Panel

The front panel contains the graphics liquid crystal display (LCD), the keypad, an analog signal output connector, and the crystal oscillator power light. The 586 microprocessor, hard disk, and SRAM boards are attached to the underside of the front panel. See Figure 2.4.

### 3. Control I/O Side Panel

The **Control I/O** panel, located on the left side of the GDP-32<sup>II</sup> receiver, is used to interface the GDP-32<sup>II</sup> with external devices. It contains: a serial RS-232C port; a bi-directional IBM-PC compatible parallel port; an external battery/charger port; an ON/OFF button; and a transmitter control I/O port. See Figure 2.6.

### 4. Analog I/O Side Panel

The **Analog I/O** panel, located on the right side of the GDP-32<sup>II</sup>, provides connection points for analog signal inputs, calibrator outputs, and both system and case grounds. See Figure 2.7.

### 5. Battery Compartment - Large Case

The battery compartment is located on the bottom of the large case GDP-32<sup>II</sup>. It may be removed by opening the clips holding the compartment to the main unit, and tilting it back on its hinges.



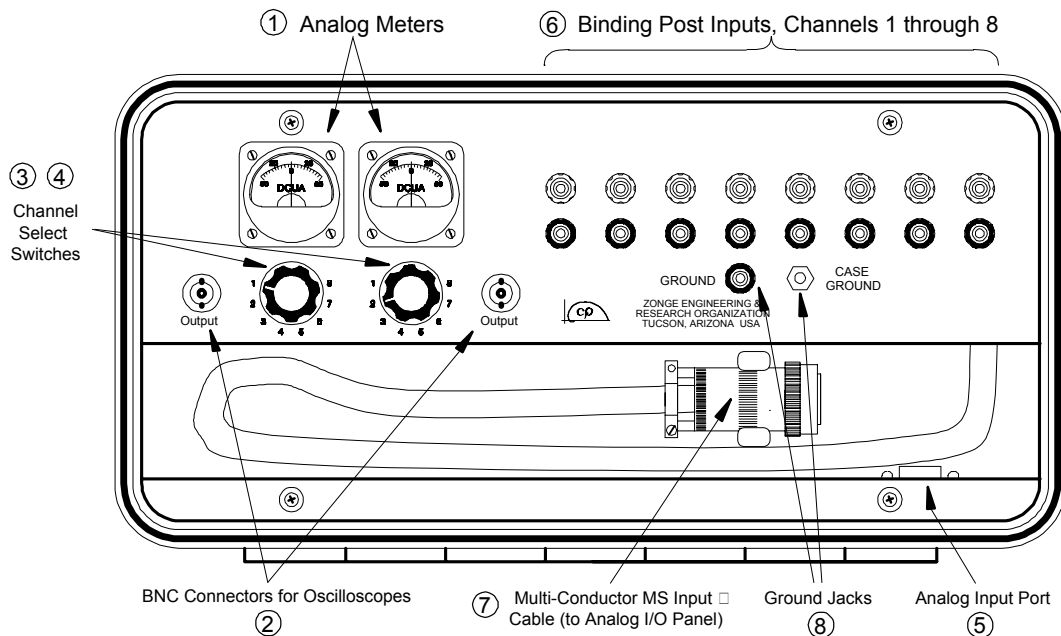
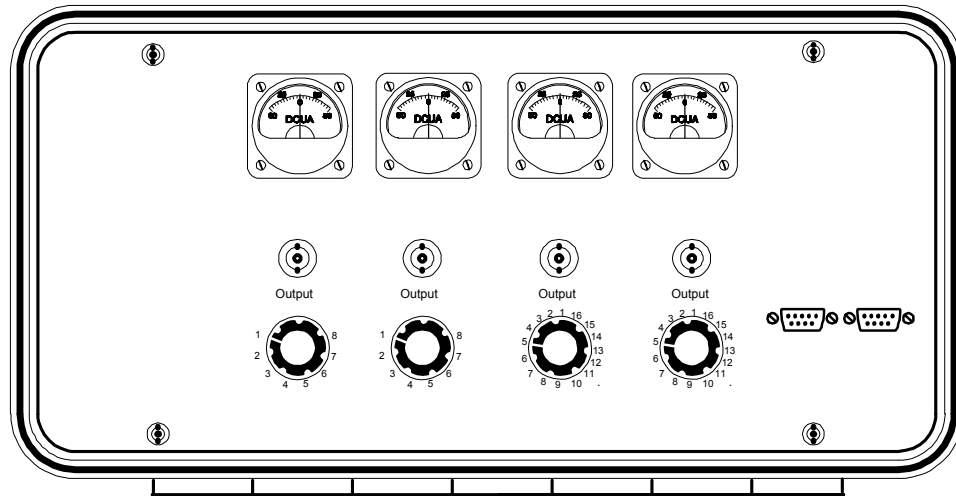
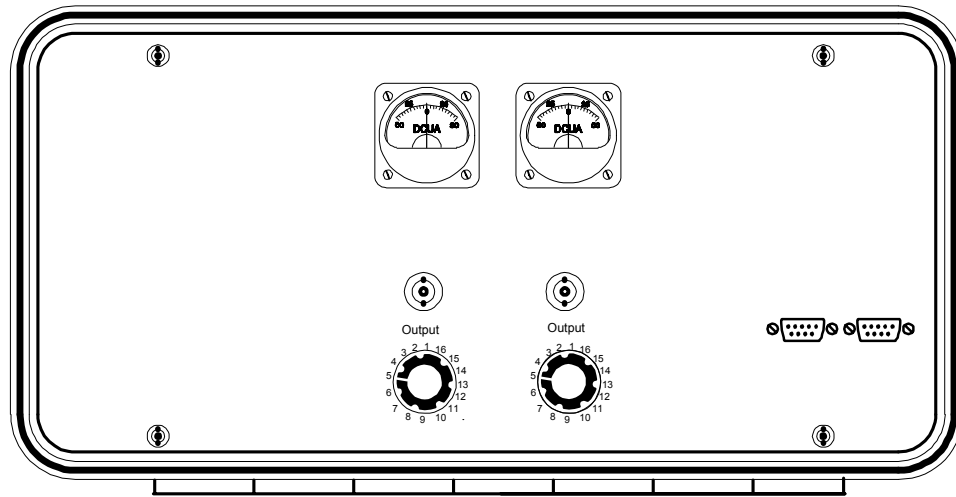


Figure 2.3(a), (b), (c) – Meter and I/O Panels

## **CASE LID - METER AND I/O PANELS**

The Meter and I/O Panels, mounted on the inside of the case lids, are used for monitoring multi-channel signals. While these panels are not required for receiver operation, they provide more versatility in the field. Each GDP-32<sup>II</sup> is configured with an appropriate Meter and I/O panel based on the number of channels specified at purchase.

Figure 2.3(a) shows a small case 2-channel Meter Panel. Figure 2.3(b) shows a large case 16-channel Meter Panel. Figure 2.3(c) shows the large case 8-channel combined meter and input/output panel.

### **1. Analog Meters**

Zero-center,  $\pm 5$  volt analog meters monitor analog channel output. The meters are used to determine SP levels at all frequencies, and to monitor signals at frequencies below 1 Hz.

### **2. BNC Output Jacks**

Output jacks direct the signal to an external device (e.g. oscilloscope). The output jacks are connected to the channel select switches on the I/O panel. The monitored signal is identical to the signal presented to the ADC on each analog board.

### **3–4. Channel A and B Selectors**

Select the channels for Meters A and B to monitor.

### **5. Analog Input Port**

This 9-pin “D” connector connects the meter panel with analog voltages from the main chassis.

### **6. Channel Input Connectors**

The analog binding posts provide a convenient method for connecting up to eight receiver channels to external signals.

### **7. MS Connector Cable**

Connector cable for attachment to the Analog I/O panel.

### **8. Ground Jacks**

An analog ground reference post and a case ground jack.

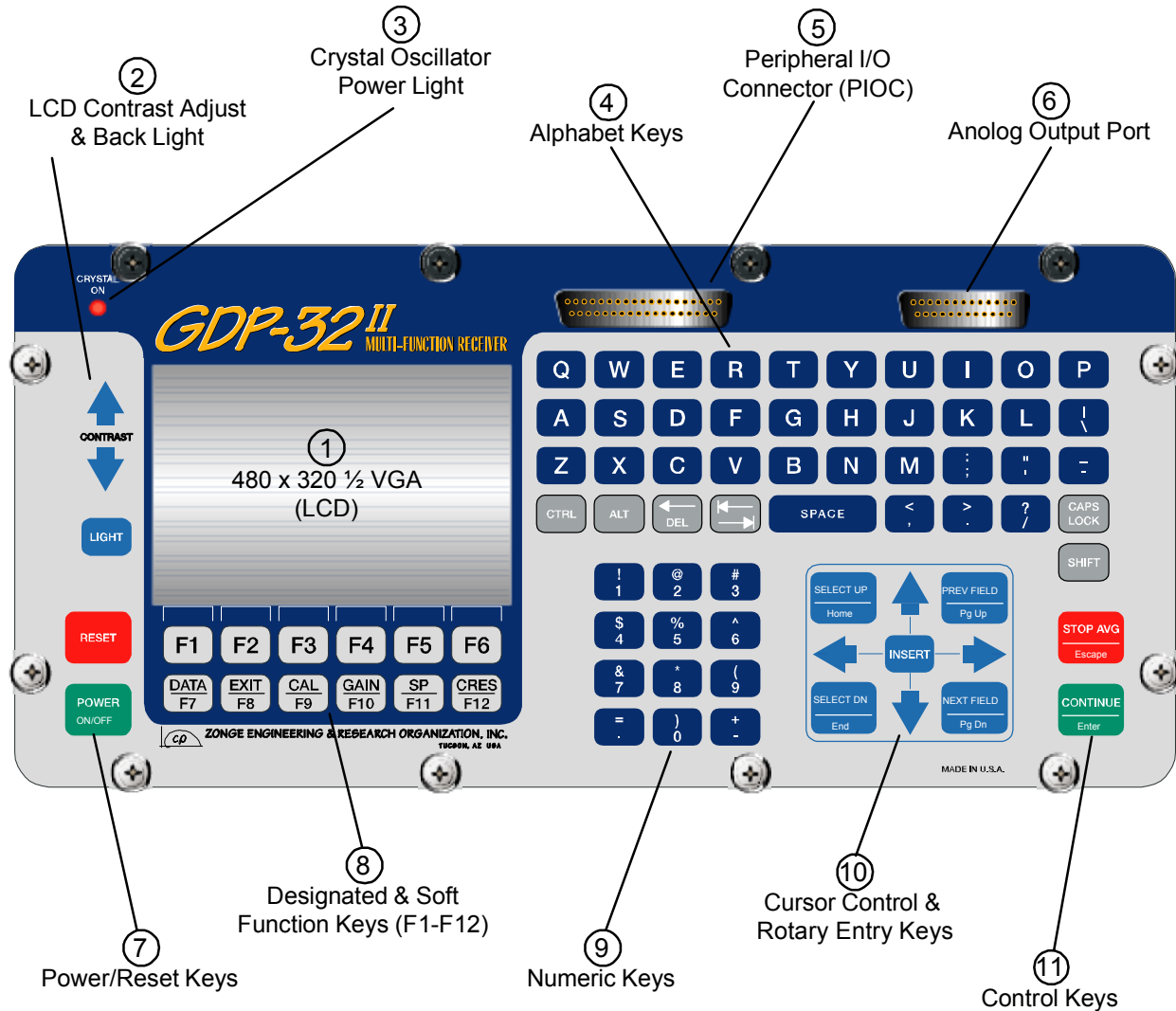


Figure 2.4 - GDP-32<sup>II</sup> Front Panel

## FRONT PANEL

The front panel contains the display, keyboard, peripherals I/O and analog output port for the lid meter panel. Operator communication with the internal machine is provided through this panel.




### 1. Liquid Crystal Display (LCD)

The 480 by 320 pixel, 1/2 VGA LCD presents GDP-32<sup>II</sup> information to the operator. The LCD by default displays the upper left quarter of a normal 640 x 480 display. To view

other quarters of the screen, press  followed by one of the rotary entry keys.

### 2. LCD Contrast Adjustment Keys and Backlight

The contrast control adjusts the bias voltage applied to the LCD to maximize the screen contrast. The voltage is continuously variable. If the screen is too light or dark, press

 or  until the desired contrast is found. Pressing  turns on the LCD backlight.

### 3. Crystal Oscillator Power Light

This light indicates that power is being supplied to the crystal oscillator.

*Note: If the Crystal Oscillator Power Light does not come on when the power switch is turned on, the electronic circuit breaker may have been tripped due to a low battery condition.*

### 4. Alphabet Keys

**A** – The GDP-32<sup>II</sup> permits input of alpha-characters for certain labels in headers such as *Operator*, *Tx ID*, *Line*, *Job*, and *Spread*.

### 5. Peripheral I/O Connector (PIOC)

This 37-pin D-style connector is used to plug in external devices such as a mouse, keyboard, larger display, etc. See Figure 2.5.

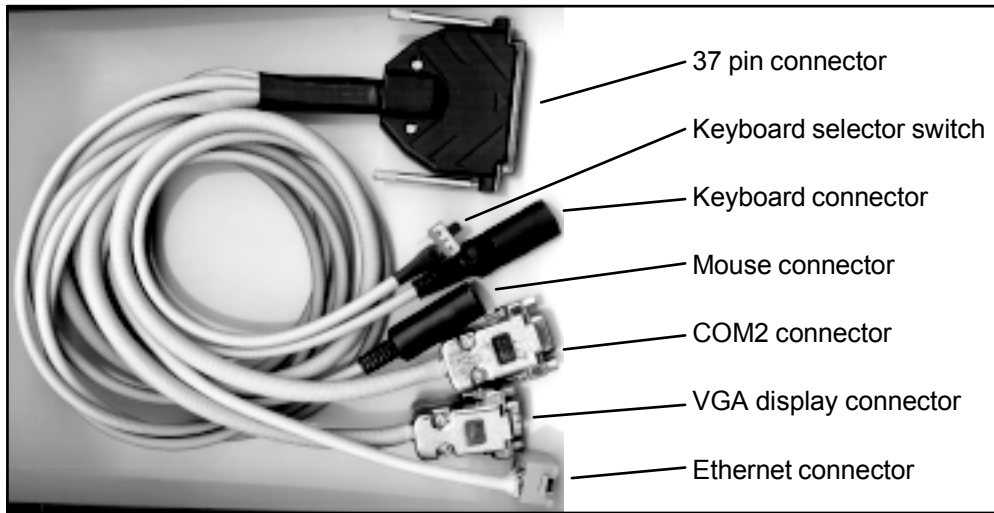


Figure 2.5 – Peripheral I/O Cable

### 6. Analog Output Port

This 25-pin D-style connector is used to connect the lid panel with the analog output voltage from each channel.

### 7. Power / Reset Keys

Press **POWER ON/OFF** to turn on the receiver, after pressing the main power button on the I/O panel on the left side of the GDP-32<sup>II</sup> case. To turn off the GDP, press this key and hold down until you hear a series of single “beeps”. See *Sections 3.2 and 3.3*.

**RESET** resets the GDP-32<sup>II</sup>, when pressed for more than 3 seconds. Pressing **CTRL** **ALT** **DEL** in sequence also resets the GDP-32<sup>II</sup>. This key combination is usually used only when the computer locks up and other keys will not work.

## 8. Designated-Function and Soft-Function Keys

There are six fixed-function keys located beneath the Soft Function Keys below the LCD screen.



– Places the receiver in Data Mode. See *Section 7 - Handling Data*.



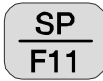
– Exits Data or Acquisition Mode and returns to the **Main Program Menu**.



– Enters the Calibrate and System Checking program from the Data Acquisition Menu of a survey program. See *Section 6.1 – Calibration*.



– Enters the Automatic or Manual Gain Setting and SP Adjustment Menu from the Data Acquisition Menu of a survey program. See *Section 6.4 – Setting Gains*. This menu also permits the user to select the number of repeat data acquisitions.



– Automatically bucks out any self-potential (SP) or amplifier offset, for all enabled channels when pressed while in the Data Acquisition Menu of a survey program.




– Measures the contact resistance or coil output resistance. See *Section 6.3 - Measuring Contact Resistance*.



through are specific software-controlled keys. The function of these keys change and they are undefined at times. When a Special Function key is active, the bottom line of the LCD displays its current purpose.

## 9. Numeric Entry Keys

This portion of the data entry keypad is used to enter numeric values.  changes the sign of the numeric value. The space available in each field determines the number of digits that can be entered. The decimal point is input as a numeric character.

## 10. Cursor Control and Rotary Entry Keys

This key group moves the cursor within the screen.



and move the cursor, up or down one line.



and move the cursor, one character at a time within a field.



and move the cursor to the beginning of the next or previous field, or displays the data in the data cache, up or down one page at a time.



- Parameters contained in certain fields have a set number of pre-selected values. These values are contained in a “Rotary Table” and are accessed by using the select keys. Note that these keys do not move the cursor but only select a value found in the rotary table. An example of using these keys would be selecting frequency and cycle count in binary increments, or stepping through the choices for line designation in menu 2: N, E, S, W, NE, SE, SW, NW. These keys are also used to page through the data and calibrate cache, one block or one frequency at a time.

## 11. Control Keys

This group contains frequently used keys that control the operation of the receiver.



– Locks in parameters in the current screen and moves to the next screen or engages a function after all parameters have been set.



– Used to terminate data collection before the full number of stacks have been acquired.



– Used to double the function of certain panel keys. This key is latched, so it is not necessary to hold it down while pressing the second key.

## CONTROL I/O PANEL (LEFT SIDE)

The Control I/O Panel is used to charge the batteries, cycle power to the receiver, control the transmitter, and communicate with external devices.

All ports are MS (military spec) connectors. Cable attachment is made by:

- Lining up the slots on the cable plug with the keys on the outside of the panel connectors.
- Pushing in the cable plug.
- Twisting the knurled ring to the right.

Only the battery connector is female, while the others are male. The connectors are different sizes to avoid misconnection.

### 1. TRANSMITTER I/O


Provides digital signals used to directly control a transmitter or to synchronize with an XMT-series transmitter controller. To synchronize the GDP-32<sup>II</sup> with an XMT controller, the internal crystal oscillator in both instruments must be precisely matched in frequency and their counter chains must be reset to a common starting point. See **Section 6.2** for more information.

### 2. POWER ON/OFF

The main power control to the receiver.

**To turn ON the GDP-32<sup>II</sup>:**

- Press the **POWER ON/OFF** button on the side panel.

- Press  on the Front Panel. There will be a short delay and several menus will be displayed during the warm-up sequence.

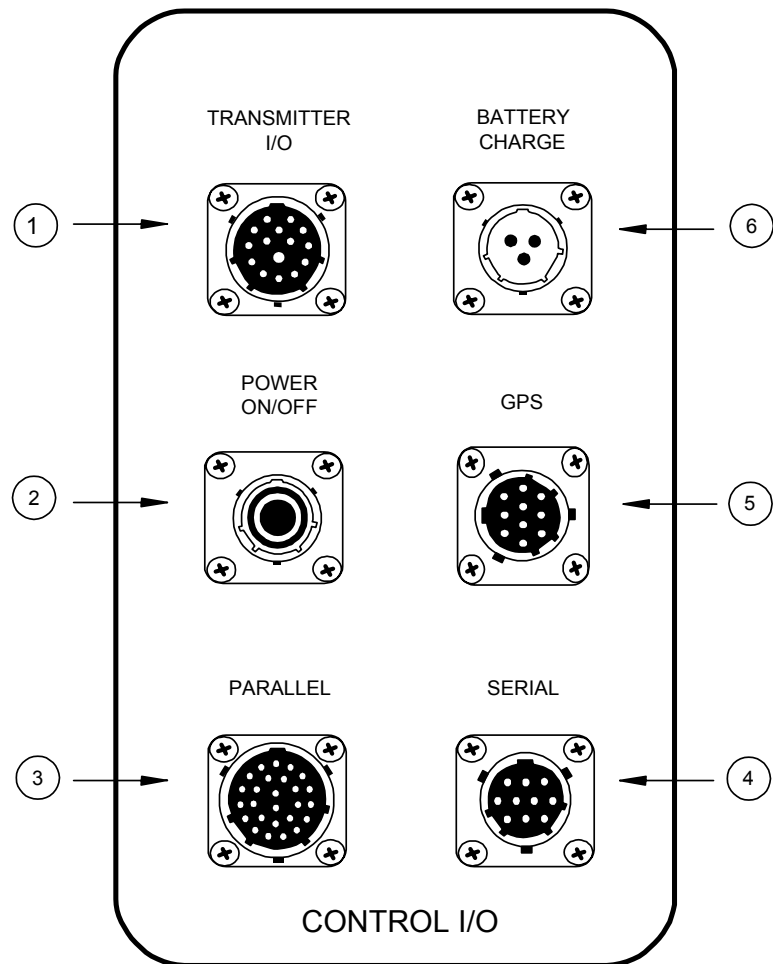







Figure 2.6 – Control I/O Panel

**To turn OFF the GDP-32<sup>II</sup>:**

- Press  to return to the **Main** menu.
- Press  to access the **Utilities** menu.
- Press  – Turn Power Off

The display now shows:

**Press CONTINUE to turn off power.  
Any other key to return to Main Menu.**

- Press . Wait for the receiver to shut down all of the analog cards and the Zonge logo is displayed.
- Press and hold  until the screen goes blank and you hear a series of single “beeps”. See **Section 3.3**.
- Press the **POWER ON/OFF** button on the Control I/O side panel. The Crystal Oscillator power light will turn off.

*NOTE – Turning the receiver completely off causes the synchronization between the receiver and the transmitter controller to be lost.*

**3. PARALLEL**

The bi-directional parallel port is used to transfer data from the LCD screen to a printer, or from the hard disk to a computer, printer, or other output device.

**4. SERIAL**

The RS-232C serial port is used to output data to a computer, or to input calibration data. This connector is compatible with a standard IBM-PC compatible COM port. (Default transfer values are: 9600 baud, no parity, 8 data bits, 1 stop bit.)

**5. GPS OPTION**

Optional equipment on the GDP-32<sup>II</sup>, an internal GPS receiver.

**6. BATTERY CHARGE**

The Battery Charge port connects the GDP-32<sup>II</sup> to a battery charger or to an external 12-volt DC power supply.



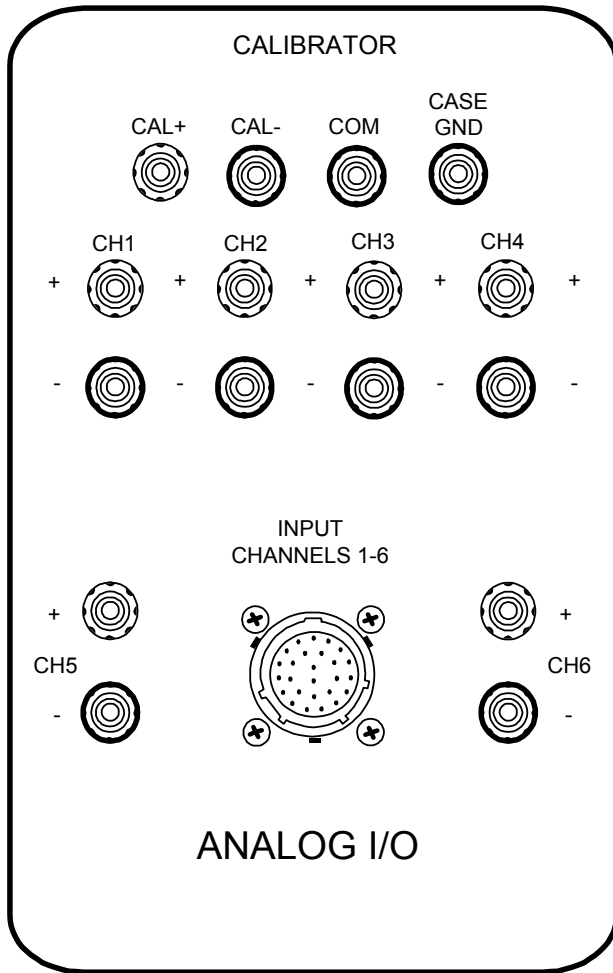


Figure 2.7 (a) - Analog I/O Panel for the small case GDP-32<sup>II</sup>T

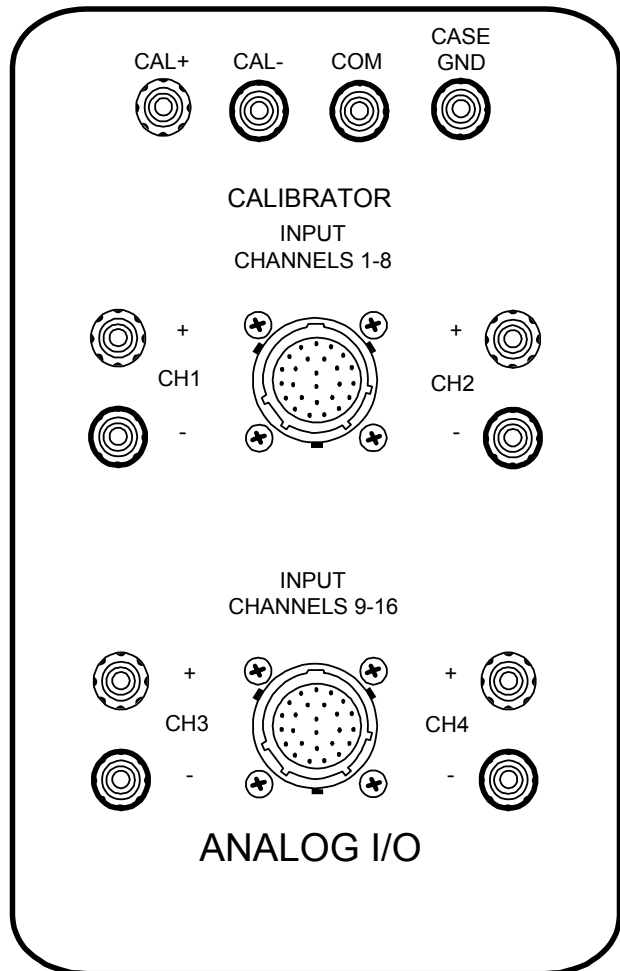


Figure 2.7 (b) - Analog I/O Panel for the large case GDP-32<sup>II</sup>

## ANALOG I/O PANEL

The Analog I/O Panel is located on the right side of the receiver. The small case GDP-32<sup>II</sup> is configured for six-channel input and the large case for sixteen-channel input. Figure 2.7(a) shows the small case Analog I/O panel. Figure 2.7(b) shows the large case Analog I/O panel.

### 1. ANALOG INPUT – CH 1, CH2, CH3, CH4, (CH5, CH6)

The analog binding posts provide a convenient way to connect external input signals to the first four channels in the large case GDP, or all six channels in the small case GDP. The channel notation indicates the appropriate receiver channel and polarity. The upper (+) terminal is for “high” input and the lower (-) terminal is used as the “low” input.

Additional channel input is handled through the two 26 pin MS connectors described below

### 2. CALIBRATOR – CAL+, CAL-, COM, and CASE GROUND

The two **CAL** terminals provide external differential calibration signals. Output levels and period (frequency) are selectable by the operator, from the *Diagnostics* program or the *Field Survey* programs.

**CAL+** and **CAL-** terminals provide a balanced differential signal for calibration and system checkout.

**COM** is the electrical common terminal for the entire receiver and serves as a zero-volt reference for common mode.

**CASE GND** is the case ground, which is isolated from the electronics ground. This is the only common point between the electronics and the case. It is often beneficial in high-noise areas and at high frequencies to connect analog ground to case ground. See the *Field Survey* program sections for further information. During normal operation **COM** and **CASE GND** are connected together.

### 3. INPUT CHANNELS

26 pin MS connectors are used to connect cable arrays, the lid patch panel, the IN-32 connection panel, the SC-8 Signal Conditioner, or the MX-30 Multiplexer Box to the analog input. The small case GDP-32<sup>II</sup> has one input connector for up to 6 channels. The large case GDP-32<sup>II</sup> has two input connectors for channels 1 – 8 and 9 – 16.