DP500 SERIES DIGITAL STRAIN INDICATORS

MODELS DP500, DP501, DP502, DP503, DP504, DP505, DP506 & DP507

Operator's Manual

OMEGA ENGINEERING, INC.
An OMEGA Group Company

PRELIMINARY INFORMATION

Safety Summary

This instrument is designed to prevent accidental shock to the operator when used properly. However, no engineering design can assure the safety of an instrument used negligently. **Therefore, read this manual carefully and completely prior to operation or adjustment.** Failure to do so could seriously damage the instrument or injure its operator. Standard safety precautions must be followed during installation and operation.

Do not operate this instrument where flammable gases or fumes are present. Parts must be replaced by qualified Omega repair persons only.

WARNING

This instrument is designed to use a three-wire power source. Failure to connect earth Ground (third wire) may cause injury to the operator and/or damage to the instrument. Improper connections could also cause erroneous data.

CMOS Caution

This instrument contains CMOS (complementary-metal-oxide-semiconductor) circuitry which is susceptible to damage by static electricity. Turn off or disconnect all power supplies before making any connections or adjustments, or applying an external signal source.

When solder connections must be made (i.e. replacing zero-Ohm jumpers or component), the soldering device must be properly grounded. Appropriate static ground conditions must be observed (i.e. conductive sheet stock covers for workbenches, ground wrist-straps, etc.).

Important Messages

<WARNING> Denotes a hazardous procedure or condition which, if ignored, could injure or be fatal to the operator.

<CAUTION> Denotes a hazardous procedure or condition which, if ignored, could damage or destroy the instrument.

<IMPORTANT> Denotes a procedure or condition which is essential to the correct operation of the instrument.

<NOTE> Specifies supplementary and perhaps essential information which should be recognized in relation to a particular procedure or condition.

Shock Hazard (Industry Standard)

The definition of "Shock Hazard" (as defined in Underwriters Laboratories Radio and Television Receiving Appliances Standards for Safety, 12th ed., dated June 25, 1969) is provided for the safe operation of the unit.

"Shock hazard shall be considered to exist at any part involving a potential of between 42.4 volts peak and 40 kilovolts peak in the following cases:

A. If the current through a load of not less than 500 ohms exceeds 300 milliamperes after 0.0003 second.
B. If the current through a load of not less than 500 ohms exceeds 5 milliamperes after 0.2 second.
C. If the time required for the current through a load of not less than 500 ohms to decrease to .5 milliamperes is between 0.1 and 0.2 second, and the total quantity of electricity passed through the load up to that time exceeds 4 millicoulombs.
D. If the time required for the current through a load of not less than 500 ohms to decrease to 5 milliamperes is between 0.03 and 0.1 second, and the total quantity of electricity passed through the load up to that time exceeds $75T-350T^2$ millicoulombs, where T is the time in seconds.
E. If the potential is more than 5 kilovolts peak and if the total capacitance of the circuit is more than 3000 microfarads.

NOTE: Additional factors might apply when potentials more than 40 kilovolts peak are present."

About This Manual . . .

Section 1 - INTRODUCTION and DESCRIPTION - Tells you what to do when you first receive your instrument, as well as describing some of its features, options, and specifications.

Section 2 - INSTALLATION - Tells you how to install your instrument, and any options you may have.

Section 3 - OPERATION - Tells you how to set up and use your instrument.

Section 4 - SCHEMATICS, ASSEMBLY DRAWINGS, and PARTS LISTS - Gives you some technical information about your instrument and a listing of replaceable parts, including their part numbers and reference numbers so you can find them on the assembly drawings when ordering parts.

Section 5 - GLOSSARY - Gives you definitions of some of the terms used throughout this manual to describe the meter.

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Section 1 - INTRODUCTION and DESCRIPTION

1.1 Introduction

Section 1 provides the following information:

Section 1.2 Unpacking Instructions
Section 1.3 Serial Number
Section 1.4 Factory Assistance
Section 1.5 Features
Section 1.6 Options
Section 1.7 Terminology
Section 1.8 Specifications

1.2 Unpacking Instructions

While unpacking the instrument, carefully compare the packing list from the shipping carton to the purchase order to account for all items ordered.

Examine the shipping carton and its contents for any damage. If damage is present or suspected, notify the carrier immediately. Save the shipping carton and packing material for future storage or shipping.

After unpacking, be sure to remove the static guard(s) from the back of the PC board(s). Remove both static guards even if you do not plan to use the upper board immediately.

1.3 Serial Number

An instrument's serial number is a valuable reference for your records. The serial number for your panel mount monitor/controller is on a plate located on the bottom of the instrument. Refer to this number if contacting the factory about the instrument.

You may want to write the serial number here for future reference:

Serial Number: _____

1.4 Factory Assistance

Because of the design complexity and use of extensive test fixtures, the panel-mount monitor/controller should not be repaired by anyone but Omega service personnel. If you encounter operating problems, please contact Omega for instructions. Our address, telephone number, and telex number are listed on the title page of this manual. Be prepared to explain any problem as thoroughly as possible. If the problem is a malfunction, indicate the operating mode during which the malfunction occurred.

If the meter needs to be returned to the factory, contact Omega Customer Service Department for an Authorized Return (AR) number, at (203) 359-1660.

IMPORTANT:

The warranty of this instrument is voided if customer modifies the instrument in any way.

1.5 Features

Models DP500, DP501, DP502, DP503, DP504, DP505, DP506, and DP507 are panel-mounted strain gage measurement, display, and control meters which can be used with any full bridge (resistive) transducer having a full scale output rating of 0 to 3mV/V, 5mV/V, 10mV/V, or 50mV/V. The transducer may be driven by an external power supply or by the meter.

All models feature a new 0.5" high vacuum fluorescent, 9-character, alphanumeric display for easier reading, longer life, and lower power consumption.

1.5.1 Autocalibration

Autocalibration measures and automatically compensates for errors due to temperature, drift, and component ageing.

1.5.2 Front Panel Display and Setup Program

Twelve front panel soft keys are integral to the Setup Program that lets you program data variables which will monitor and control your testing, manufacturing, or processing application. Multiple-choice menu prompts are designed to guide the operator step-by-step through the Setup Program.

Front panel soft keys enable direct setup and display of readings, peaks, totals, batch counts, net and gross, and tare amounts.

1.6 Options

Option A: Analog output, 0-10VDC with tracking 4-20mA, 12-bit resolution. Available for interface with strip charts, speed controllers, personal computers.

Option D: Serial data I/O RS-232 and 20mA current loop. Applications requiring data reduction/storage benefit from this option. Output data can be transmitted directly to RS-232 compatible terminals, controllers, disk and tape drives, printers, and other equipment.

230VAC Operation: Unit internally wired for 230 (±10%) VAC. Units NOT ordered this way can be field-modified. Refer to section 2.9 for instructions.

1.7 Terminology

There is a glossary of terms at the back of this manual. Terms which are used in this manual that may require definition are listed in the Glossary.

1.8 Specifications

Model No.	Input Range (mV)	Full Scale Counts	±% of Full Scale ± Counts
DP500	-30 to +30	6000	.016% ±0.5
DP502	0 to +50	5000	.02% ±0.5
DP504	0 to +100	1000	.1% ±0.5
DP506	0 to +500	5000	.02% ±0.5
DP501	-30 to +30	60000	.005% ±0.05
DP503	0 to +50	50000	.006% ±0.05
DP505	0 to +100	10000	.02% ±0.05
DP507	0 to +500	50000	.006% ±0.05

Resolution: 4 digits (Model DP500/DP502/DP504/DP506); 5 digits (Model DP501/DP503/DP505/DP507).
Sensitivity: 1.0µV/count max (Model DP500/DP502/DP504/DP506); 10µV (Model DP501/DP503/DP505/DP507).
Input Filter: 17Hz low-pass.
Zero Control: Full range, front panel setup.
Span Control: Full range, front panel setup.
Gage Factor: Front panel setup.
Excitation: Isolated 5VDC to 15VDC at 115VAC line voltage. 114mA at 10V; 86mA at 15V (115VAC line voltage). Trimpot adjustable.
Connection: 4- or 6-wire plus shield.
Net/Gross: Front panel setup.
Units: Front panel setup.
Total: Weight and batch.
Zero Tracking: 2% full scale or offset; front panel setup.
Display Rounding: Count factor of 1, 2, or 5; front panel setup.
Display Average: 1 to 99 readings; front panel setup.
Control Outputs: Four isolated open collectors; front panel setup of high/low limits with dead band.

Options

- **Option A:** Analog output.
- **Option D:** Serial output.

Analog Input

- **Configuration:** Differential; isolated, floated, and guarded.
- **Impedance:** >10 MΩ.
- **Bias Current:** 15nA typical, 35nA max. at 25°C.
- **Protection:** ±100VDC or AC rms continuous on each input w/o damage.
- **Filter:** Single-pole and integral.
- **Normal Mode Rejection:** 60 dB typical at 60 Hz.
- **Common Mode Voltage:** ±7VDC or AC peak (analog common); ±1500VDC or AC peak (power line).
- **Common Mode Rejection:** 90dB min DC, inputs to analog ground; 120dB min, analog common to earth).

A/D Conversion

- **Type:** Voltage-to-frequency conversion; microprocessor-controlled.
- **Rate:** 2 conversions per second nominal; concurrent processor overhead may alter conversion rate.
- **Integration:** 100 ms nominal (6 AC line cycles).
- **Resolution:** 1μV/count to 10μV/count.
- **Tempco:** DP500/DP502/DP504/DP506 - 50ppm/°C; DP501/DP503/DP505/DP507 - 30ppm/°C.
- **Zero Stability:** Auto zero.
- **Autocalibration:** Once per reading.

Control Outputs

- **Open Collectors:** Isolated; low true logic; each output capable of 500mA sink (50Vceo); solder terminal.
- **Option A:** Isolated, 4-20mA and 0-10VDC, 12-bit resolution; solder terminal connector terminations; 20mA max current limitation (source or sink); 350Ω max load; analog output stability is 1% full scale after 2 hr. warmup.
- **Option D:** Serial I/O data; RS-232-C or 20mA current loop.
  - **Connector:** 18-pin edge connector, dual row.
  - **Baud:** Front panel setup, 110-9600, menu-prompted.
  - **Distance:** 20mA - 10,000 ft. at 300 baud; 4,000 ft. at 1200 baud; RS-232-C - 75 ft.
  - **Data Format:** Front panel setup, 6, 7, or 8 data bits; odd or even parity; 1 or 2 stop bits, all data, date and/or time control characters.
  - **RS-232-C and 20mA Current Loop:** Half duplex, full protocol.
  - **Transmission Sequence:** Each sequence terminated with carriage return, line feed.
  - **Terminations:** Solder terminal connector.
  - **Interrogate Timings:** On the RTS line, a negative pulse 100 nanoseconds min. width, 1 millisecond max. width.
    Print on alarm, high level maintained for 500 milliseconds.

Display

- **Number:** 9 alphanumeric characters.
- **Type:** 16-segment vacuum fluorescent, blue-green, 0.5" (12.7mm) high.
- **Polarity:** Automatic.
- **Decimals:** Front panel setup.
- **Labels:** 4 alphanumeric characters; front panel setup.

Environmental

- **Operating Temperature:** 0 to +50°C (+32°F to 122°F).
- **Storage Temperature:** -20°C to +70°C.
- **Relative Humidity:** 20-80% RH (non-condensing).
- **Case:** Die-cast front panel, extruded aluminum case.
- **Front Panel Seal:** NEMA 12 compliance.
- **Front Panel Controls:** Sealed membrane switches.
- **Non-Volatile Memory:** EAROM data retention 10 yrs. minimum.

Mechanical

- **Dimensions:** DIN; Bezel 72mm x 144mm (2.84" x 5.67"); case 67mm x 136mm x 230mm (2.63" x 5.34" x 9.05").
- **Panel Cut-out:** 68mm x 138mm (2.68" x 5.44").
- **Weight:** Net 4.5 lb. (2.04 kg.); shipping 5 lb. (2.27 kg.).
- **Power:** 115/230VAC ±10%, 50/60 Hz, 20VA.

Section 2 - INSTALLATION

The following information is provided to help you properly install your meter.

2.1 Installation and Assembly

Figure 1 is an assembly/installation guide, illustrating the instrument's cut-out dimensions and connector locations.

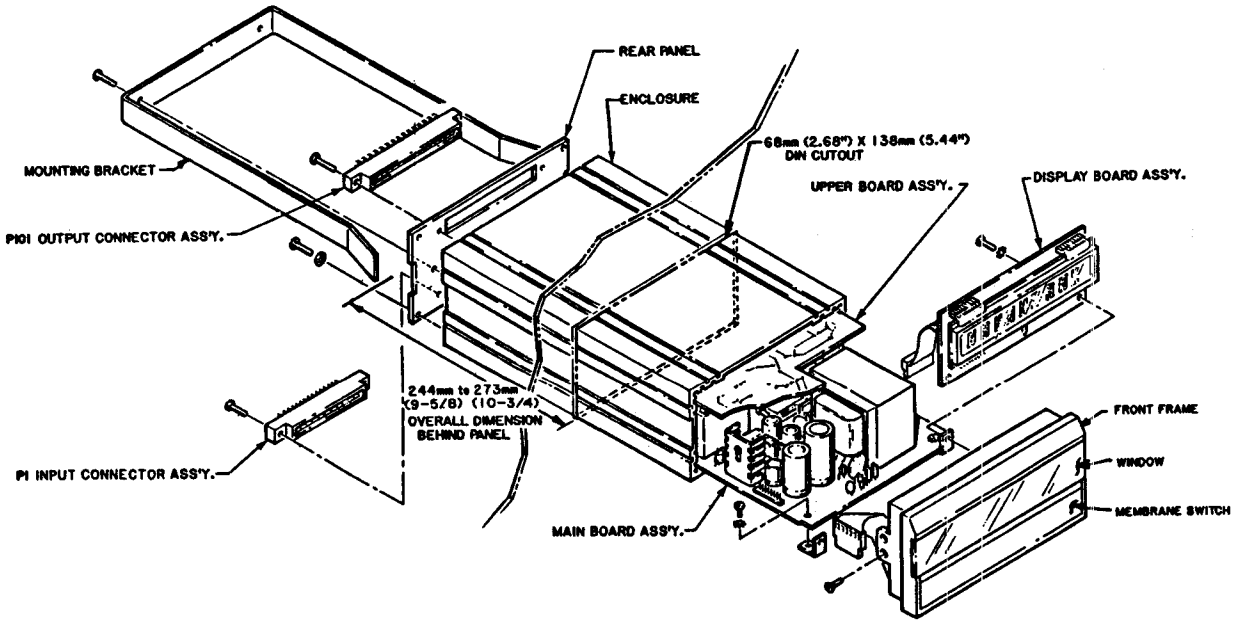


Figure 1. Unit Installation and Assembly

2.2 P1 Connector Pin-Outs

WARNING: Connections to any pins other than those listed here could severely damage the instrument or injure its operator.

Pin No.	Function
A	AC (HI).
2	Earth Ground.
C	AC (LO).
5	No connection.
6	Reset Ground.
7	(+) sense.
8	OC 1, Limit 1 and Limit 2.
9	RESET IN (used to reset from external switch, normally not used).
10	Alarm Common.
11	OC 2, Limit 3 and Limit 4.
12	(+) input.
13	No connection.
R	No connection.
P	GUARD (can be connected to shield, if shield used).
N	(-) input.
M	(-) sense return.
J	Short to Pin K for remote read in Manual Read Submode; short to Pin L for calibration.
K	Short to Pin J for remote read in Manual Read Submode; short to Pin H to clear tare.
L	Short to Pin J for calibration; short to Pin H to take tare; short to Pin F for interrogate operation.
H	Short to Pin K to clear tare; short to Pin L to take tare.
F	Short to Pin L for interrogate operation.

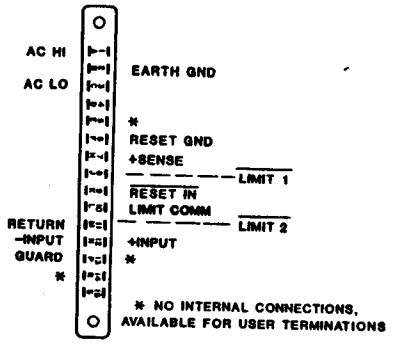


Figure 2. P1 Connector Pin-Outs

2.3 P101 Connector Pin-Outs (Upper PC Board)

Pin No.	Function
2	DTR.
3	RTS.
5	GND (used for RS-232-C).
6	(+) Excitation.
7	(-) Excitation.
8	Open collector output 4, Limit 4.
9	Common (open collector).
10	Open collector output 3, Limit 3.
11	Unused.
12	Unused.
13	RXD/TTY TXD (20mA Current Loop).
14	4-20mA (analog output).
15	-10V reference (adjustment for analog output).
16	DCR (+12V level).
17	Print on alarm.
18	-12V level.
A	Earth GND.
R	0-10V (analog output).
U	Common (analog output).

2.4 Strain Gage/Load Cell Connections

For 4-Wire or 6-Wire configuration, use Figures 3A and 3B as connection guides.

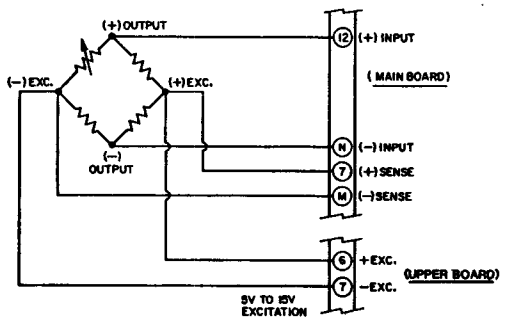


Figure 3A. 4-Wire Configuration

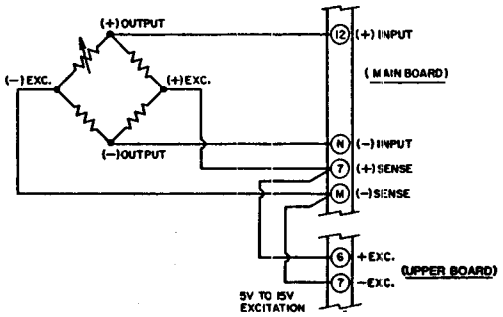


Figure 3B. 6-Wire Configuration

2.5 Supply Excitation Voltage

Excitation voltage can be supplied externally or internally at 114mA maximum current (at 10V).

Excitation voltage is supplied internally from the instrument's Upper PC Board and may be adjusted from 5VDC to 15VDC using R102 (potentiometer on the rear panel). Maximum current decreases as voltage increases. Maximum current is 114mA at 10VDC and 86mA at 15VDC (115VAC line voltage).

The power supply terminals are P101, Pin 6 (+) and Pin 7 (-). The power supply is factory-set at 10V. To adjust the voltage, connect a voltmeter across Pins 6 (+) and 7 (-) and adjust R102 (potentiometer on the rear panel) to the desired voltage.

2.6 Open Collector Output Connections (refer to Figure 4)

2.6.1 Standard Open Collector Outputs

Four programmable limits with dead band control four open collector outputs (OC1, OC2, OC3, OC4). When the input exceeds a limit setpoint, the display will flash the limit exceeded, and the open collector output will be activated.

Open Collector Output Assignments

Output	Limit	Pin	Common	Connector	PC Board
OC1	Limit 1	8	10	P1	main
OC2	Limit 2	11	10	P1	main
OC3	Limit 3	10	9	P101	upper
OC4	Limit 4	8	9	P101	upper

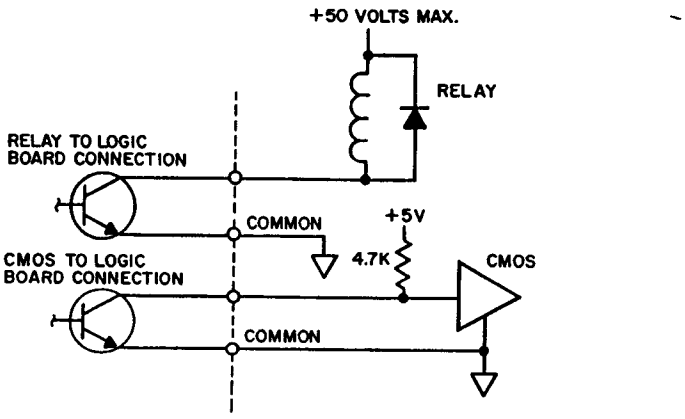


Figure 4. Relay Connections

2.6.2 Connections to Print Data During an Alarm Condition

When connected to a printer (Figure 5), the meter can cause the printer to print data during an alarm (out-of-limit) condition, recording every measurement in the alarm range. When connected to a printer with a real time clock, time and date can also be printed. If the open collector output is **latched**, the printer will continue to print until the alarm condition is acknowledged (press and hold <ENTER> and press <5>). The meter must be utilizing Interrogate Operation feature for this.

The normal method of using the print on alarm feature is to connect the collector to P101, Pin 16 (DCR) and the emmitter to P101, Pin 17 (print on alarm). If a long cable is used to remotely activate the print on alarm feature, it is possible for ambient noise to cause false data outputs. Pin 18 can be used to increase noise immunity (if necessary) by connecting it to Pin 17.

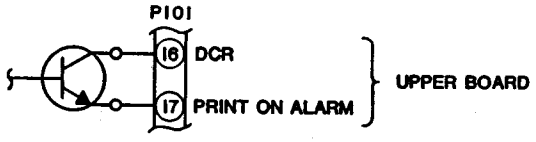


Figure 5. Print Data During Alarm

2.7 Option A Connections (Analog Output) (refer to Figure 6)

Option A is a 12 bit, D/A converter, enabling the meter to interface with analog devices, programmable speed controllers, strip charts, or personal computers.

Different pin connections are required for **Unipolar Operation** than **4-20mA Control.** For greater output accuracy, R136 (potentiometer on the rear panel) can be adjusted.

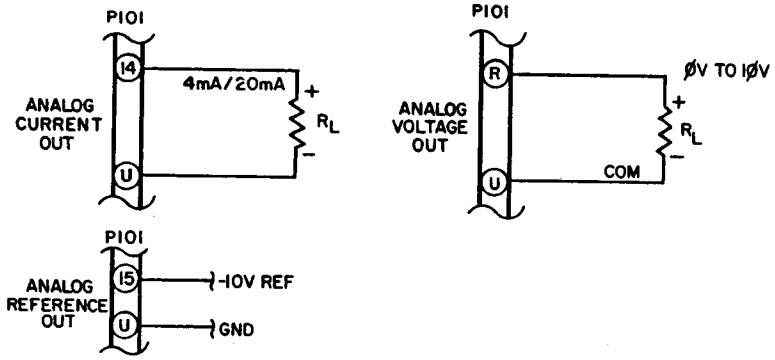


Figure 6. Analog Output Connections

2.7.1 0-10V Unipolar Operation

(+) output is available at P101, Pin R and (-) at Pin U.

2.7.2 4-20mA Control

(+) output is available at P101, Pin 14 and (-) at Pin U.

2.7.3 Analog Reference Adjustment

For best overall accuracy, the analog reference is factory-set to -10V. For greater output accuracy, R136 can be adjusted.

2.8 Option D Connections (Serial Output) (refer to Figure 9)

Applications requiring data reduction or storage can benefit from the optional RS-232-C/20mA serial port available on all DP500 models. Output data can be transmitted directly to RS-232-C compatible terminals, controllers, disk and tape drives, printers, and other peripheral equipment.

In normal operation, the meter attempts to output a serial data set each time it takes a measurement. In Manual or Auto Read Submode, the unit outputs only after a read sequence is executed if all data is selected.

2.8.1 Option D Pin Descriptions

Pin 2 - DTR is a handshake input line. A high level input (3-15V) is required for transmission.
Pin 3 - RTS is a handshake input line. A high level input (3-15V) is required for transmission. In interrogate operation, a low pulse may be used to initiate a serial transmission. If it is not trying to transmit, the meter checks this line approximately 2 to 4 times per second.

The pulse on this line may be longer than specified (see section 1.8), however, the following conditions should be observed. The unit will not output data if either of the handshake lines is in a false state. If the unit times out before any characters are transmitted, the serial data will be updated before the next attempt at transmission. If the pulse intended to start transmission lasts for 5 seconds, data that is current at the end of the pulse (rather than the beginning of the pulse) will be transmitted.

Pin 5 - GND. This is the ground line for RS-232 or the return line for 20mA current loop output.
Pin 13 - TXD. This is the RS-232 and 20mA current loop output. Range of output is ±12VDC.
Pin 16 - DCR (+12V Level). This pin may be used as a high tie point for the handshake lines.
Pin 17 - Print on alarm. This input is used to initiate a data transmission sequence when the meter is in interrogate operation. This is a level sensitive, positive true input. A 3 to 15 volt level will cause an output. This input is polled 2 to 5 times per second, depending on options, processor load, etc. Therefore, a short pulse may initiate an output, however, you should check the specifications (section 1.8) for exact timing.

2.8.2 Installation

Locate jumpers W106 and W105 on the Upper PC Board (Figure 10). These jumpers determine RS-232-C or 20mA operation. Install jumper W106 for RS-232-C operation (default, factory setting). Install jumper W105 for 20mA operation. Solder bridges SP104 and SP107-SP110 are not used. The current loop is established between P101 Pins 13 (+) and 5 (GND). **NOTE:** Baud rate is selected during the Setup Mode (Section 3.1).

2.8.3 Interrogate Operation

When Pins L and F on the P1 connector are wired together, the serial port operation is altered.

There are two ways to cause the serial port to output data. Both methods can be used simultaneously. A HIGH on the Print On Alarm line will enable outputs. This is a level activated input. The second method is to connect the meter RTS line to the RTS line of a printer. An interval pulse from the printer will cause an interval output. The shortest recommended interval period is 5 seconds.

Interrogate timings are listed in section 1.8 Specifications, under Control Outputs.

2.9 230VAC Operation

Units NOT ordered with this can be field-modified for 230V operation by:

1. Removing W1 and W2 from the Main PC Board (see Figures 7 and 8), inserting W6 as shown in Figure 8, replacing F1 with a 1/4 amp, 250 volt fuse; and
2. Removing W101 and W102 from the Upper PC Board and installing W103 (see Figures 9 and 10), replacing F102 with a 1/8 amp 250 volt fuse.

Section 3 - OPERATION

A Brief Overview . . .

All DP500 meters have four distinct operating modes: the **Setup Mode** (3.1), the **Continuous Measurement Mode** (3.2), the **Controlled Measurement Mode** (3.3), and the **Hold Mode** (3.4).

I. During the Setup Mode you can select/change:

- o Limit Setpoints
- o Dead Band (for each limit)
- o Limit High or Low
- o Latched or unlatched open collector output
- o Option D (serial output) parameters
- o Option A (analog output) parameters
- o Controlled Measurement Mode Setup
- o Total Scale and Total Label
- o Digits, Rounding Factor, and Net Label
- o Setup for Auto Read Submode or Manual Read Submode
- o Span, Digital Balance, and Calibrated Load (Calibrating Unit to Strain Gage Input or mV/V)

II. During the Continuous Measurement Mode you can:

- o Clear open collector output latch/display alarm
- o Display limit setpoints, peak readings, total (value, label, and cycles), current tare value, and gross measure
- o Reset tare to zero, reset peak to net, reset totals and cycles to zero
- o Take a new tare
- o Enter any of the other operating modes

III. During the Controlled Measurement Mode you can:

- o Manually control all readings (Manual Read Submode)
- o Automatically control all readings using programmed setpoint (Auto Read Submode)
- o Totalize and Scale Readings

IV. During the Hold Mode you can:

- o Suspend the front panel display; disable all outputs
- o Check or modify mechanical processes without affecting limits, averaged data, or measurement data

3.1 Setup Mode

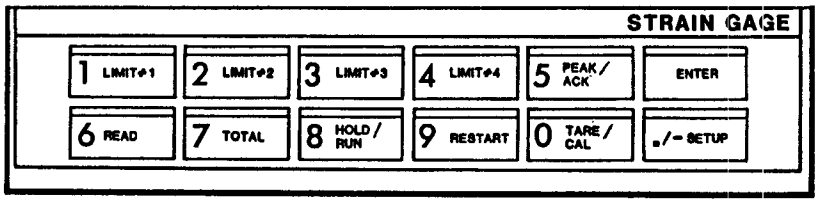
During Setup, system parameters can be set or changed using the instrument's front panel menu-prompted Setup Program. You program the instrument's parameters by responding to the prompts, using the twelve front panel soft (membrane) keys. These values are retained when the unit is turned off.

3.1.1 Front Panel Soft Keypad

There are 12 front panel keys. Each key, when pressed, enables you to do the following:

Key	Function
<1>	Set Limit 1
<2>	Set Limit 2
<3>	Set Limit 3
<4>	Set Limit 4
<5>	Select Option D parameters (Serial Output)
<6>	Controlled Measurement Mode Setup and Select
<7>	Select label displayed with Total; set total scale factor
<8>	Select Option A parameters (Analog Output)
<9>	Select label displayed with Net; select number of significant digits (3,4 for Model DP500/DP502/DP504/DP506; 3,4,5 for Model DP501/DP503/DP505/DP507); select Rounding Factor
<0>	Set Span, Digital Balance, Calibrated Load, mV/V
<SETUP>	Enter Setup Mode, decimals, negatives, or return to the SETUP prompt.
<ENTER>	Enter new, or retain existing selection/setpoint. Press and hold this key to scroll through the program menu to find the variable you want to change.
<SETUP> and <ENTER>	Press these keys simultaneously to exit the Setup Mode.

NOTE: Throughout this manual, front panel keys (except <SETUP> and <ENTER>) are referred to by number only, i. e, press <1>, press <5>, etc.



Front Panel Keypad

3.1.2 Default Settings

After a rear panel calibration, setup parameters return to their default settings. These default settings are listed below. During the Setup Program, a blinking display indicates the present setting or value.

Parameter	Default Setting
Limits	None
Dead Band	0
Limit Type	High
Latched Output	No
Label	Net
Average Count	1
Settling Time	0
Auto Read	No
Digits	4 (DP500/DP502/DP504/DP506); 5 (DP501/DP503/DP505/DP507)
Rounding	1
Full Scale	0
Span	No
Balance	0
Calibrate Load	No
Enter Load	0
mV/V	0
Option D	
Baud Rate	300
Parity (Yes/No)	Yes
Parity (Odd/Even)	Odd
Data Bits	7
Stop Bits	1
All Data	No
Transmit Date	No
Transmit Time	No
Option A	
DC OUT FS	30.000
DC ZERO	0

3.1.3 How to Enter/Exit the Setup Program

To enter the Setup Mode . . .

1. Simultaneously press <SETUP> and <ENTER>.
2. Enter the LOCK OUT CODE <1065> then press <ENTER> (Display: SETUP).

IMPORTANT: The Lock Out Code cannot be changed. If an incorrect or partial lock out code is entered, the Setup Mode is automatically terminated in 3 seconds, returning to the Run Mode.

To exit the Setup Mode . . .

When SETUP is displayed, press <SETUP> and <ENTER>.

3.1.4 How to Clear or Correct an Entry

1. To clear an incorrect entry which has been selected **but not yet been entered,** press <SETUP> twice. This returns the display to the previous menu prompt.
2. To clear an incorrect entry which **has been entered,** press <ENTER> repeatedly until "SETUP" appears on the front panel display, then repeat the procedure.

3.1.5 The Setup Program

3.1.5.1 Calibrating Unit to Strain Gage Input

There are two methods of calibrating the meter to a strain gage:

1. Method 1 calibrates unit to certified weight;
2. Method 2 calibrates unit to mV/V (when certified weight not available).

NOTE: Method 2 is less accurate than Method 1.

METHOD 1 - SCALE to CERTIFIED WEIGHT

CAUTION: Do not attempt this procedure unless you plan to use a weight as described in step 8. If you do not have a weight on the platform in step 8, the meter will not function properly.

1. Attach the instrument to a load cell platform. Allow 30-minute warmup period for 4 digit instruments; 90-minute warmup period for 5 digit instruments.
2. Enter the Setup Mode (press <SETUP> and <ENTER> simultaneously, then enter <1065> lock out code and press <ENTER>; Display: SETUP).
3. Press <0> (Display: SET FS/previous setting).
4. Enter the full scale reading* and press <ENTER> (Display: SET SPAN/YES-1,NO-2).
5. Press <1> to set SPAN* (Display: BALANCE/previous setting*).
6. Place the load cell platform in a no load situation and set the display to the desired reading at that input. Then press <ENTER> (Display: CAL LOAD/YES-1,NO-2).
7. Press <1> to calibrate using a certified weight (Display: ENTR LOAD/previous setting).
8. Place the weight on the load cell platform, then enter the desired reading (use numeric keys to enter numbers), and then press <ENTER> (Display: SETUP).

   NOTE: Better accuracy is achieved if a weight close to full scale is used.

IMPORTANT: When calibrated this way, the instrument displays the value (desired reading) entered when the weight was on the platform. When no load is on the platform, the instrument displays the value entered as BALANCE.

METHOD 2 - SCALE to mV/V

1. Attach the instrument to a load cell platform. Allow 30-minute warmup period for 4 digit instruments; 90-minute warmup period for 5 digit instruments.
2. Enter the Setup Mode (press <SETUP> and <ENTER> simultaneously, then enter <1065> lock out code and press <ENTER>; Display: SETUP).
3. Press <0> (Display: SET FS/previous setting).
4. Enter the full scale reading* and press <ENTER> (Display: SET SPAN/YES-1,NO-2).
5. Press <1> to set SPAN* (Display: BALANCE/previous setting*).
6. Place the load cell platform in a no load situation and set the display to the desired reading at that input. Then press <ENTER> (Display: CAL LOAD/YES-1,NO-2).
7. Press <2> to indicate no calibrated load (Display: MV/V at FS/previous setting).
8. Enter the transducer's mV/V rating at full load and press <ENTER> (Display: SETUP). Each transducer has its own rating specification (see transducer's specification sheet).

IMPORTANT: When calibrated this way, the instrument displays the value (desired reading) entered when the programmed mV/V rating is applied. When no load is on the platform, the instrument displays the value entered as BALANCE. If, due to transducer specification variances, the meter does not read accurately, you can "tweak" the rating that you give the meter (in step 8) to compensate for transducer inconsistency. For example, if the meter reads 1050 when it should read 1000, and the transducer is rated at 3mV/V, enter a slightly higher (i. e., 3.01) rating in step 8; conversely, if the meter reads 950 when it should read 1000, enter a slightly lower rating in step 8. You may have to repeat this until you arrive at the actual mV/V output of the transducer.

RECALIBRATING the BALANCE

This procedure allows you to correct/change the balance point without changing the other calibration parameters.

Follow steps 1 through 4 in Method 2, then do the following:

5. Press <2> to change only the balance point (Display: BALANCE/previous setting).
6. Place the load cell platform in a no load situation and set the display to the desired reading at that input. Press <ENTER> (Display: SETUP).

*** Refer to the Glossary of Terms at the back of this manual for definitions/explanations of these terms.**

VERIFYING CALIBRATION

The shunt calibration resistor technique is a common method used to verify strain gage calibration. By placing a known resistor across one leg of the bridge, an applied load or weight is simulated. In this way, calibration can be verified without using a known weight.

Procedure

1. Calculate R_{cal} using the following formula:

$$R_{cal} = 1/2\ (R_b/2NF - R_b)$$

where R_b = Bridge Resistance, in ohms

N = Number of display counts to be simulated by R_{cal}

F = Strain Gage output (expressed in volts, i. e., 3mV/V would be .003V/V) divided by input units

2. Calibrate the meter per Method 2, described earlier in this section.
3. Install R_{cal} in series with a N. O. switch between P1 Pins 7 and 12.
4. With the strain gage in a no load situation and close the N. O. switch. Meter should display the "N" variable used in the formula in step 1.

Example

Strain Gage Rating: 3mV/V at 2000 lbs.
Sensitivity Factor (F): .003/2000 = 0.0000015
Bridge Resistance (R_b): 350 Ohms
Simulated Weight (N): 1500 lbs.

Substituting these values in the formula for R_{cal} . . .

$$\begin{aligned} R_{cal} &= 1/2\ [(350/2 \cdot 1500 \cdot 0.0000015) - 350] \\ &= 1/2\ (350/0.0045 - 350) \\ &= 1/2\ (77{,}778 - 350) \\ &= 38{,}714\ \text{Ohms} \end{aligned}$$

Next, you would calibrate the meter using Method 2 in this section and, in step 4 of that procedure, enter 2000 as the full scale reading. With the platform cleared, you apply the 38.714K resistor and close the switch, and the meter should read 1500. After this verification, remove the resistor and switch, or leave the switch open for normal operation.

3.1.5.2 Set Limit Setpoints

(Display: SETUP)

1. Press <1>, <2>, <3>, or <4> to display the LIMIT followed by its current setting.
2. To keep the current setting press <ENTER> (Display: DEAD BAND/previous setting), or . . .

   To change the limit, enter its new value and press <ENTER> (Display: DEAD BAND/previous setting), or . . .

   To enter NONE, to indicate no limit setting, press <SETUP>, then press <ENTER> (Display: SETUP). If NONE is entered, no Dead Band or Open Collector Output parameters are set.

   IMPORTANT: If a Limit value has a decimal point, it must be preceded by a digit when entered. Press <SETUP> after a digit to enter a decimal.

NOTE

(1) Limits are prioritized from high to low (Limit 1 being the highest) as follows: Limit 1, Limit 2, Limit 3, Limit 4. Priority does not affect the state of any open collector output. It only determines the display and serial output message if more than one limit is exceeded.

(2) When a limit is exceeded, the display alternates between the reading and the limit that was exceeded. The corresponding open collector is activated also.

Example: Limit 1 is a high limit of 100; Limit 2 is a high limit of 75. If the net reading rises above 75, the unit will go into an alert condition and display the input reading and LIMIT 2. If the net reading rises above 100, the unit will display the reading and LIMIT 1. Both open collectors will be activated.

3.1.5.3 Enter DEAD BAND, Select HI/LO Limit

Explanation

Dead Band is the number of counts above or below a limit setpoint that deactivates the open collector output in order to prevent it from oscillating.

Example

Limit 1 is a low limit of 95, and the Dead Band is set at 5. As soon as the input reaches 95, the "LIMIT 1" warning would be displayed and the open collector output would be activated. As soon as the output reached 101 (one count over the limit setting plus the dead band number of counts), the display alarm would stop and the output would be de-activated.

Similarly, if Limit 4 is a high limit of 95, and Dead Band is set at 5, the LIMIT 4 warning would stop and the open collector output would de-activate when the input reading reached 89 or lower.

Procedure

1. Enter the Dead Band amount and press <ENTER>, or press <ENTER> to retain the current dead band setting (Display: HI OR LO/HI-1,LO-2).
2. Select <1> or <2>, or press <ENTER> to keep the previous selection (Display: LATCHED/YES-1,NO-2).

3.1.5.4 Select LATCHED/NONLATCHED Open Collector Output

Explanation

During an alarm condition (when input exceeds limit setpoints), the assigned open collector output and the display alarm are activated. A latched alarm maintains the alarm condition even when input returns to within the limit.

Latched Output

When input exceeds a limit setpoint, the open collector output is activated and the display alternates between the LIMIT affected and the input reading.

To acknowledge an alarm condition and clear the open collector output latch, depress and hold <ENTER>, and press <5> (Display: ACK OK). When input is no longer out-of-range, the display returns to normal.

Nonlatched Output

When input exceeds a limit setpoint, the display alternates between the LIMIT and the input reading. When input is no longer out-of-range, the display and open collector output return to normal.

Procedure

(Display: LATCHED/YES-1,NO-2)

1. Press <1> for latched output, <2> for nonlatched output (Display: SETUP).

3.1.5.5 Option D Setup (Serial Output)

When Option D is installed, additional parameters must be selected. These parameters can be selected only if Option D is installed on your meter.

Explanation

Data transmitted by the meter depends on which mode of operation the meter is in. Depending on how you have Option D set up and the mode of operation, from one to three lines of data will be transmitted. If the meter has been set up to transmit both time and date, they will occupy the first line of printed data, the display (including any exceeded limit) will occupy the second line of printed data, and, if the meter is in the Controlled Measurement mode and the ALL DATA option has been selected, this information will occupy the last line of printed data. Each line of data is ended with a carriage return/line feed (CR/LF). If the ALL DATA option is selected, the last line will be ended with two CR/LF.

Example 1

This example shows what will be printed if the meter is in the Continuous Measurement mode or if it is in the Controlled Measurement mode and the ALL DATA option is not selected.

If the display shows "1000. NET"/"LIMIT 1" (Limit 1 exceeded) and the meter is programmed to transmit date and time commands, printed data would be as follows:

```
1000. NET LIMIT 1      (This is line 2)
13:30:00 06/01/86      (This is line 1)
```

Remember, both lines are ended with a carriage return/line feed.

If the display shows "13500. NET" and the meter is not programmed to transmit date or time, printed data would be as follows.

```
13500. NET
```

NOTE: If the meter is set up to transmit the date and/or time, it transmits the control characters (1BH 44H, 1BH 54H) that tell a device to print date and/or time from its own real time clock. The meter transmits these characters (if selected) during all serial operations.

Example 2

This example shows what will be printed if the meter is in the Controlled Measurement mode and the ALL DATA option is selected.

The ALL DATA is active only in either of the Controlled Measurement Mode's submodes (Manual Read and Auto Read). ALL DATA causes the serial port to update data once per reading taken. The serial port outputs the net reading, the net label, and the limit (if one is present, and if so sends out a carriage return and a line feed), the number of cycles, and the total with the total label.

If the meter is programmed to transmit the date or time commands (not both) or neither, and no limit has been exceeded, the data will be transmitted as one line as follows:

```
06/01/86  13500 NET  2 CYC  27000 TOT
```

If the meter is programmed to transmit both the date and time commands, or a limit has been exceeded, the data will be transmitted as two lines as follows:

```
13500 NET  2 CYC  27000 TOT      (This is line 2)
06/01/86  13:30:00               (This is line 1)

                    -or-

2 CYC  27000 TOT       (This is line 2)
13500 NET  LIMIT 1     (This is line 1)
```

If the meter is programmed to transmit both the date and time commands, and a limit has been exceeded, the data will be transmitted as three lines as follows:

```
2 CYC  27000 TOT       (This is line 3)
13500 NET  LIMIT 1     (This is line 2)
06/01/86  13:30:00     (This is line 1)
```

NOTE: If the meter is set up to transmit the date and/or time, it transmits the control characters (1BH 44H, 1BH 54H) that tell a device to print date and/or time from its own real time clock. The meter transmits these characters (if selected) during all serial operations.

Procedure

(Display: SETUP)

1. Press <5> (Display: BAUD RATE/current baud).
2. Enter the baud rate (Display: DATA BITS/6,7,8).

   NOTE: Only baud rates of 0110, 0300, 0600, 1200, 2400, 4800, or 9600 can be entered. If the baud entered is incorrect, the unit will display ERROR, and return to the previous prompt.

   IMPORTANT: Baud rates must be entered as 4-digit numbers. Therefore, baud rates 110, 300, and 600 are entered with a leading zero.

3. Enter <6>, <7>, or <8> data bits and press <ENTER> (Display: PARITY/YES-1,NO-2).
4. Select <1> or <2> (Display: PARITY/ODD1,EVEN2).
5. Select <1> or <2> (Display: STOP BITS/1 OR 2).
6. Select <1> or <2> (Display: ALL DATA/YES-1,NO-2).
7. Select <1> to output the Net reading, Total, and Cycles (batch and wt.). Select <2> to **continuously** output displayed data (Display: XMIT DATE/YES-1,NO-2).
8. Press <1> if you want the meter to transmit date commands, <2> if you do not want it to transmit date. (Display: XMIT TIME/YES-1,NO-2).
9. Press <1> if you want the meter to transmit time commands, <2> if you do not want it to transmit time (Display: SETUP).

3.1.5.6 Setup Parameters for CONTROLLED MEASUREMENT MODE

The Controlled Measurement Mode determines whether the unit will take a reading automatically (using Auto Read Submode) or manually (using Manual Read Submode).

NOTE: During the settling time period, open collector outputs, serial data, analog output, and the display are suspended. During the averaging period, all outputs are suspended except analog output (Option A).

Procedure

(Display: SETUP)

1. Press <6> (Display: AVG COUNT/previous setting).
2. Press <ENTER> to retain previous setting or use numeric keys to change setting (Display: SETL TIME/previous setting).
3. Press <ENTER> to keep the previous setting or use numeric keys to change setting (Display: AUTO READ/YES-1,NO-2).
4. Press <1> to select the Auto Read Submode or press <2> to select the Manual Read Submode (Display: SETUP). When <1> is selected, NUL POINT is displayed. Proceed with steps 5 and 6.

Auto Read Submode Only

5. Press <ENTER> to keep the previous setting, or enter some new value and press <ENTER> (Display: ZERO TRK/YES-1,NO-2).
6. Zero tracking automatically re-zeroes (balances) the unit if the input is less than 2% of full scale for 2 minutes.

   Example: If full scale is 10,000, a residual weight of 199 or less will be reset to zero and that value will be subtracted from any subsequent readings. The meter does not show you what this value is.

Select <1> or <2>, or press <ENTER> to keep the previous setting (Display: SETUP).

3.1.5.7 Set TOTAL SCALE and TOTAL LABEL

Total is the sum of measurements taken in Auto or Manual Read Submode. Total Scale allows you to totalize in units other than those displayed, e. g., measure and display pounds but keep a total in tons.

In calculating the total, a common scale factor is used, known as the Total Scale Factor.

Example

After the total is cleared, three readings are taken. The sum of these readings is the Intermediate Total. The Intermediate Total is multiplied by the Total Scale Factor, to update the total value.

Clear Totals --> 0 lbs.
1st rdg. --> 10 lbs.
2nd rdg. --> 14 lbs.
3rd rdg. --> 22 lbs.

Intermediate Total = 46 lbs.

The intermediate total is multiplied by the total scale factor. If the total scale factor was 1, total would be 46 lbs; if Total Scale was 2, total would be 92 lbs.; etc.

Total scale factor should not cause the total to exceed 9,999,999.

NOTE: The TOTAL automatically accumulates in the Controlled Measurement Mode only.

Procedure

(Display: SETUP)

1. Press <7> (Display: TOT SCALE).
2. Enter the Scale Factor or press <ENTER> to keep the previous setting (Display: LABEL_TOT, with first character flashing). **NOTE:** Total Scale should not cause display overflow.
3. Press <9> to scroll through the alphanumeric characters. Release <9> when the desired character appears. Press <ENTER>. Repeat the "press 9, release, ENTER" procedure to enter all label characters. When the last label character has been entered, the display will read SETUP.

NOTE: If your label has less than 4 characters, select an underline (_) for the blank space.

3.1.5.8 Option A Setup (Analog Output)

When Option A is installed, additional parameters must be selected: DC OUT FS (full scale output), and DC ZERO (offset). **NOTE:** These parameters can be selected only if Option A is installed on your meter.

DC OUT FS refers to the display reading at (and above) which a 10V (or 20mA) analog output will be produced. DC ZERO refers to the display reading at (and below) which a 0V (or 4mA) analog output will be produced.

Procedure

(Display: SETUP)

1. Press <8> (Display: DC OUT FS/ current full scale value).
2. Enter new full scale value (max output) and press <ENTER> (Display: DC ZERO/current offset value).
3. Enter new offset value (zero amount) and press <ENTER> (Display: SETUP).

Example: If Full Scale is set at 2000 counts, then enter 2000 for DC OUT FS. If Offset is 0, then enter 0 for DC ZERO. The analog output will track from 0-10V (or 4-20mA) when input is run from 0 to 2000 counts.

NOTE: During the Setup and Hold Modes, the analog output voltage and 4-20mA output are in their off conditions, 0V and 4mA.

3.1.5.9 Select DIGITS, ROUNDING FACTOR, and NET LABEL

Procedure

(Display: SETUP)

1. Press <9> (Display: DIGITS/3,4 (DP500/502/504/506); DIGITS/3,4,5 (DP501/503/505/507)).
2. Select number of digits required (Display: ROUNDING/1,2,5).
3. Select <1>, <2>, or <5> to round the last display digit (Display: LABEL_NET). A rounding factor of 2 or 5 can prevent the display from oscillating by rounding the last digit in increments of 2 or 5.
4. Press <9> to scan the field of available label characters. Release <9> when the desired label character appears. Press <ENTER>. Repeat the procedure for the remaining label characters. After the last label character has been entered, the instrument will display, SETUP.

   NOTE: If your label has less than 4 characters, select an underline (_) for the blank space.

To exit the Setup Mode and return to the Continuous Measurement Mode, simultaneously press <SETUP> and <ENTER>.

3.2 Run Mode

The Run Mode is made up of two modes, the Continuous Measurement Mode and the Controlled Measurement Mode. In the Continuous Measurement Mode, the meter takes readings constantly. In the Controlled Measurement Mode, the meter takes readings at selected intervals, either automatically or manually.

When turned on, the instrument is in the Continuous Measurement Mode. During this mode:

- Input is continuously measured and scaled according to the previous setup;
- Tare can be subtracted;
- Net is formulated and displayed with a 4-position, alphanumeric, user-specified label;
- Limits are monitored and updated;
- Open collector output is activated if necessary;
- Analog output and serial output are activated (if installed as options);
- Peak reading is monitored and updated if necessary.

During the Run Mode, the front panel keys are used to:

- Display limit setpoints, peak readings, total value, total label, total cycles, current tare value, and gross measure;
- Reset tare to zero, reset peak to net, reset totals and cycles to zero;
- Take a new tare and an average reading;
- Return to this mode when any other mode is exited;
- Enter any other mode from this mode.

3.2.1 Front Panel Key Functions

The functions of the front panel keys used during the Run Mode differ slightly from the their functions during the Setup Mode. Both single-key and double-key commands are used. To execute a double-key command, you depress and hold a control key while pressing a second key.

SINGLE-KEY COMMANDS

Press Key	Function
<1><2><3>or<4>	Display setting of Limits 1 thru 4.
<5>	Display peak reading.
<6>	Initiate read sequence in manual operation.
<7>	Display total, total label, and cycles (number of readings accumulated). Press <8> to return to net display.
<8>	Return to net display after total, peak, and gross settings have been displayed.
<0>	Display current tare.

DOUBLE-KEY COMMANDS

Control Key	Press Key	Function
<5>	<9>	Reset peak to displayed net amount.
<5>	<8>	Displays peak until <8> is pressed.
<7>	<9>	Reset total accumulated and the number of cycles to zero.
<0>	<9>	Reset tare to zero.
<0>	<6>	Take new tare measure.
<0>	<7>	Display gross measure until <8> is pressed.
<6>	<8>	Press simultaneously to enter the Controlled Measurement Mode. Will then display MAN READ or AUTO READ submode.
<SETUP>	<ENTER>	Blank screen. Press simultaneously to enter lock out codes (1065 for Setup Mode; 1234 for Hold Mode).
<ENTER>	<5>	Acknowledge a limit alert condition. Reset open collector limits if latched.
<8>	<9>	Exit Controlled Measurement Mode.

3.3 Controlled Measurement Mode

The Controlled Measurement Mode is the operating mode which instructs the unit to take readings using either the Manual Read Submode or the Auto Read Submode.

3.3.1 Enter Controlled Measurement Mode

To enter this mode . . .

Press <6> and <8> simultaneously from the Continuous Measurement Mode. The front panel will display either MAN READ or AUTO READ, depending on which submode was selected during the Setup Program for Controlled Measurement Mode (see Section 3.1.5.7).

3.3.2 Operation of the AUTO READ SUBMODE

The Auto Read Submode operates automatically and requires no input from the operator. When the net reading exceeds the Null Point value set during the Setup Mode, settling is done, all readings are averaged, and the display, total, cycle count, and all outputs are updated. If the net reading falls 10% below the Null Point value for 5 consecutive readings, the unit resets itself for the next measurement.

3.3.3 Operation of the MANUAL READ SUBMODE

When Manual Read has been selected during the Setup Mode, measurements and readings are initiated by the user via front panel keys or an external contact closure.

In this submode, the user can (1) take a measurement, (2) read the total, and (3) read the tare.

(1) To take a measurement, press <6> (Display: SETTLING/AVERAGING/(amt.)NET).

(2) To read the total, press <7> (Display: TOTAL/(amt.)TOT/CYC). To return to the net display, press <8>.

(3) To read the tare, press <0>. If the tare amount is entered manually, it will be displayed for 3 seconds, then return to the net display.

3.3.4 Exit the Controlled Measurement Mode

To return to the Continuous Measurement Mode, simultaneously press <8> and <9>.

3.4 Hold Mode

During the Hold Mode you can:

- Suspend the display readout and hold (disable) all outputs.
- Check and/or modify external processes (without affecting limits, totals, or measurement data).

3.4.1 How to Enter/Exit the Hold Mode

To enter the Hold Mode . . .

1. Simultaneously press <SETUP> and <ENTER> (blank display).
2. Enter the LOCK OUT CODE <1234>, and press <ENTER> (Display: HOLD MODE). The display freezes until you exit the Hold Mode.

To exit the Hold Mode . . .

1. Simultaneously press <SETUP> and <ENTER> to return to the Run Mode.

3.5 External Inputs

The following three operations can be initiated by connecting the specified rear connector pins together on the P1 connector. The status of these pins is checked only once during a measurement cycle, therefore, to guarantee recognition, the connection may have to be established for as long as 450 milliseconds. Conversely, any connection lasting longer than (approximately) 500 milliseconds could be read twice, causing two such operations where only one was desired.

External Read causes the same action as using manual read (key <6>) if the meter is in the Manual Read Submode. Pins K and J should be tied together for this operation.

A **Clear Tare** operation can be invoked by connecting Pins K and H. Clear tare is identical to using keys <0> and <9> on the front panel.

Taking a Tare can be done by connecting Pins L and H. This is the same as using keys <0> and <6> on the front panel.

The following two operations can only be done via the rear panel connector but have different timing requirements than those mentioned above.

Resetting the meter without disconnecting the AC power can be done by momentarily connecting Pins 6 and 9.

Rear-Panel Recalibration Procedure

All DP500 instruments can be recalibrated in the field. Rear panel calibration is useful for only two functions: (1) It reloads default values for limits and labels (and others) into non-volatile memory; (2) it sets full scale for the instrument to the full scale input. It does not measure zero; this must be done for maximum accuracy (see Section 3.1 Recalibrating Unit to Strain Gage Input Value before attempting this procedure).

Procedure

1. Turn unit ON and allow a warmup period of at least 30 minutes for 4 digit meters, and a minimum of 90 minutes for 5 digit meters.
2. Apply 30mV (DP500/DP501) 50mV (DP502/DP503), 100mV (DP504/DP505), or 500mV (DP506/DP507) to ±input, Pins 12 and N. Apply 10V (std.) to ±sense input, Pins 7 and M.
3. Strap GND's of each standard together (Pins M and N).
4. Install a temporary jumper between P1 Pins J and L.
5. Momentarily connect P1 Pins 6 and 9. This will reset the instrument.
6. When display reads, CAL DONE, remove jumper between Pins J and L.

Section 4 - SCHEMATICS, ASSEMBLY DRAWINGS, and PARTS LISTS

IMPORTANT: Replacement of certain parts may require factory or field recalibration of the meter.

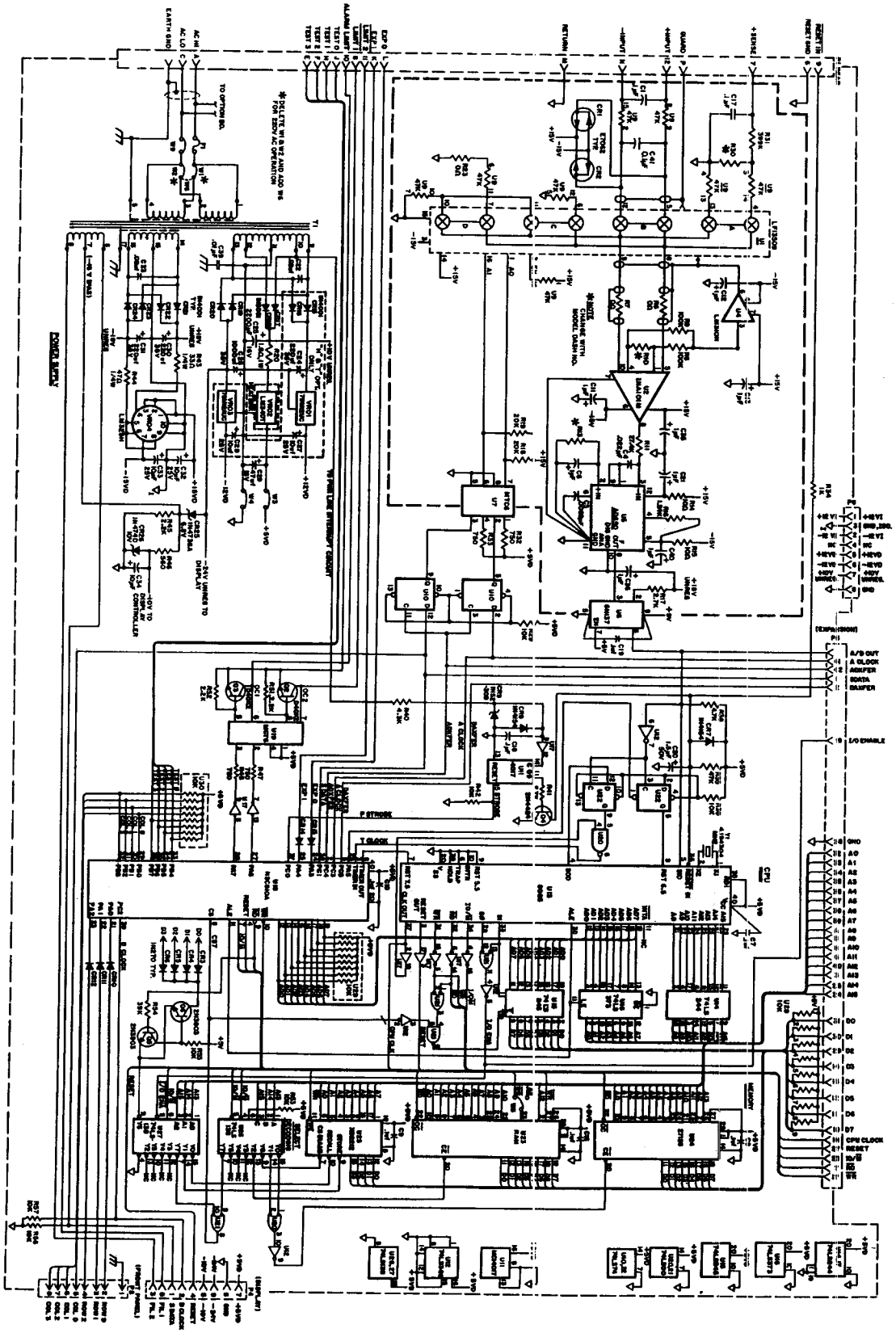


Figure 7. Main P. C. Board Schematic

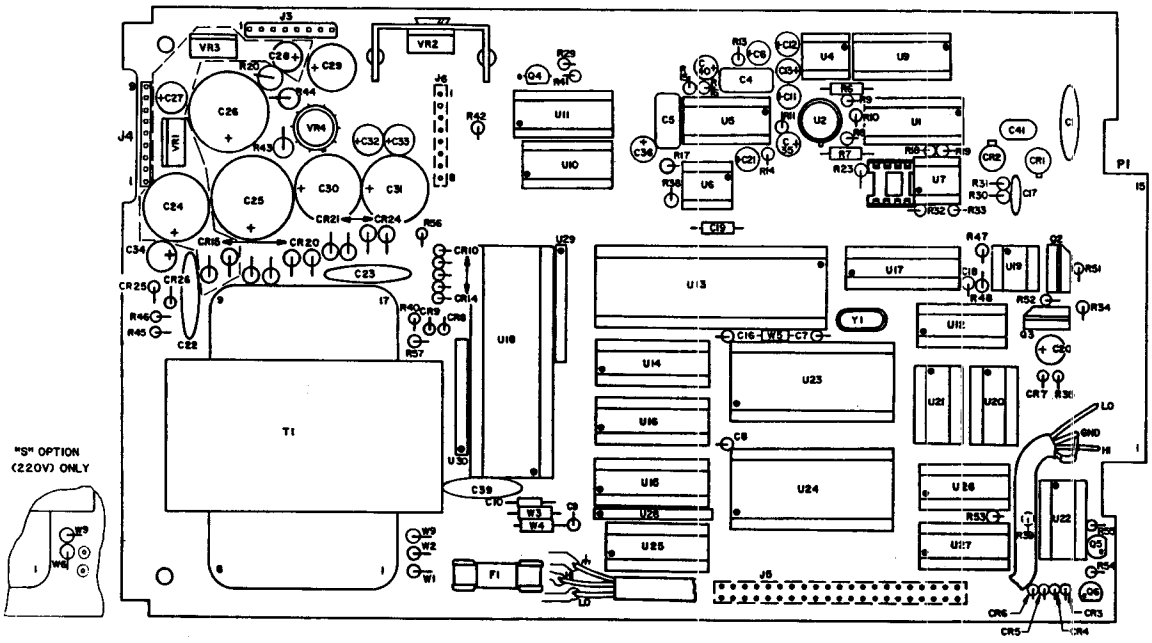


Figure 8. Main P. C. Board Assembly

Main P. C. Board Parts List

*Reference Number	Omega P/N	Description	Vendor
C4	56-22492D223K1	Capacitor, Poly., .022μF , 100V	Wesco
C5	56-23244D682KR5	Capacitor, Ceramic, .0068μF, 50V, 10%	Corning
C6	56-12731B105N35	Capacitor, Tant., 1μF, 35V	NEC
C7	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C8	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C9	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C10	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C11	56-12731B105N35	Capacitor, Tant., 1μF, 35V	NEC
C12	56-12731B105N35	Capacitor, Tant., 1μF, 35V	NEC
C13	56-12731B105N35	Capacitor, Tant., 1μF, 35V	NEC
C16	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C17	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C18	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C19	56-22254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%	Corning, Z5U
C20	56-12731D155N50	Capacitor, Tant., 1.5μF, 50V	NEC
C21	56-12731B105N35	Capacitor, Tant., 1μF, 35V	NEC
C22	56-10215N203KP1	Capacitor, Ceramic, .02μF, 1000V, 20%	International
C23	56-10215N203KP1	Capacitor, Ceramic, .02μF, 1000V, 20%	International
*A C24	56-10203-227N35	Capacitor, Electro., 220μF, 35V	Nichicon

* Reference Number can be found on the corresponding Assembly Drawing
*A Models with Option A and/or Option D
*B Models DP504, DP505
*C Models DP502, DP503
*D Models DP506, DP507
*E Models DP500, DP501
*F Models DP502, DP503, DP504, DP505, DP506, DP507

Main P. C. Board Parts List (cont.)

*Reference Number	Omega P/N	Description	Vendor
C25	56-20588-228M16	Capacitor, Electro., 2200µF, 16V, 20%	Panasonic, Z
C26	56-10203-108N35	Capacitor, Electro., 1000µF, 35V	Nichicon
*A C27	56-12731D106N25	Capacitor, Tant., 10µF, 25V	NEC
*A C28	56-12731D106N25	Capacitor, Tant., 10µF, 25V	NEC
C29	56-10203-476N35	Capacitor, Electro., 47µF, 35V	Nichicon
C30	56-10203-227N35	Capacitor, Electro., 220µF, 35V	Nichicon
C31	56-10203-227N35	Capacitor, Electro., 220µF, 35V	Nichicon
C32	56-12731D106N25	Capacitor, Tant., 10µF, 25V	NEC
C33	56-12731D106N25	Capacitor, Tant., 10µF, 25V	NEC
C34	56-12731D106N25	Capacitor, Tant., 10µF, 25V	NEC
C35	56-12731B105N35	Capacitor, Tant., 1µF, 35V	NEC
C36	56-12731B105N35	Capacitor, Tant., 1µF, 35V	NEC
C39	56-10215D103KT10	Capacitor, Disc, .01µF, 100V, 20%	International
C40	56-12731B105N35	Capacitor, Tant., 1µF, 35V	NEC
C41	56-23273D104K1	Capacitor, Ceramic, X7R 0.1µF, 100V	Murata-Erie
CR1	40-16800	Diode, Dual, Low Leakage, E7062	Siliconix
CR2	40-16800	Diode, Dual, Low Leakage, E7062	Siliconix
CR3	40-20298	Diode, Signal, 1N270	ITT
CR7	40-09297	Diode, Signal, 1N4154	Motorola
CR8	40-09297	Diode, Signal, 1N4154	Motorola
CR9	40-09436	Diode, Zener, 4.7V, 1N5230B	Fairchild
CR10	40-09297	Diode, Signal, 1N4154	Motorola
CR11	40-09297	Diode, Signal, 1N4154	Motorola
CR12	40-09297	Diode, Signal, 1N4154	Motorola
CR13	40-09297	Diode, Signal, 1N4154	Motorola
CR14	40-09297	Diode, Signal, 1N4154	Motorola
*A CR15	40-07787-01	Diode, Signal, 1N4001	ITT
*A CR16	40-07787-01	Diode, Signal, 1N4001	ITT
CR17	40-09463	Diode, Rectifier, 1N5061	GE
CR18	40-09463	Diode, Rectifier, 1N5061	GE
CR19	40-07787-01	Diode, Rectifier, 1N4001	ITT
CR20	40-07787-01	Diode, Rectifier, 1N4001	ITT
CR21	40-07787-01	Diode, Rectifier, 1N4001	ITT
CR22	40-07787-01	Diode, Rectifier, 1N4001	ITT
CR23	40-07787-01	Diode, Rectifier, 1N4001	ITT
CR24	40-07787-01	Diode, Rectifier, 1N4001	ITT
CR25	40-22192	Diode, Zener, 6.8V, 1N4736A	Motorola
CR26	40-22193	Diode, Zener, 10V, 1N4740	Motorola
F1	52-22395-07	Fuse, Subminiature, Fast Acting, 1/2A (115V)	LittleFuse, 216.500
F1	52-22395-04	Fuse, Subminiature, Fast Acting, 1/4A (230V)	LittleFuse, 216.250
J3	51-15204-08	Header, Berg, Straight	Berg Electronics
J4	51-15204-09	Header, Berg, Straight	Berg Electronics
Q2	40-22188	Transistor, NPN, D40K2	National
Q3	40-22188	Transistor, NPN, D40K2	National
Q4	40-11439	Transistor, NPN, 2N4424	GE
Q5	40-22523	Transistor, NPN, 2N3903	Motorola
Q6	40-22523	Transistor, NPN, 2N3903	Motorola
R6	50-07657	Jumper, Zero Ohm	IRC
R7	50-07657	Jumper, Zero Ohm	IRC
R8	55-10168EGK100	Resistor, F. F., 100K Ohm, 1/8W, 1%	Dale
R9	55-10168EGK100	Resistor, F. F., 100K Ohm, 1/8W, 1%	Dale
*B R10	55-10168EGA825	Resistor, F. F., 825 Ohm, 1/8W, 1%, 25 ppm	Dale
*C R10	55-10168EGA402	Resistor, F. F., 402 Ohm, 1/8W, 1%, 25 ppm	Dale
*D R10	55-10168EGK004R02	Resistor, F. F., 4.02K Ohm, 1/8W, 1%, 25 ppm	Dale
*E R10	55-10168EGA402	Resistor, F. F., 402 Ohm, 1/8W, 1%, 25 ppm	Dale
R11	55-10168EGK27R4	Resistor, F. F., 27.4K Ohm, 1/8W, 1%	Dale
*E R13	55-10168EGK006R81	Resistor, F. F., 6.81K Ohm, 1/8W, 1%, 25 ppm	Dale

* Reference Number can be found on the corresponding Assembly Drawing
*A Models with Option A and/or Option D
*B Models DP504, DP505
*C Models DP502, DP503
*D Models DP506, DP507
*E Models DP500, DP501
*F Models DP502, DP503, DP504, DP505, DP506, DP507

Main P. C. Board Parts List (cont.)

*Reference Number	Omega P/N	Description	Vendor
*F R13	55-19168EGK001R24	Resistor, F. F., 1.24K Ohm, 1/8W, 1%, 25 ppm....	Dale
R14	55-10101HA010	Resistor, C. F., 10 Ohm, 1/4W, 5%.....	IRC
R15	55-10101HA010	Resistor, C. F., 10 Ohm, 1/4W, 5%.....	IRC
R16	55-10168EGK001R24	Resistor, F. F., 1.24K Ohm, 1/8W, 1%.....	Dale
R17	55-10101HK002R7	Resistor, C. C., 2.7K Ohm, 1/4W, 5%.....	IRC
R18	55-10101HK020	Resistor, C. C., 20K Ohm, 1/4W, 5%.....	IRC
R19	55-10101HK020	Resistor, C. C., 20K Ohm, 1/4W, 5%.....	IRC
R20	55-10103HA001R8	Resistor, C. C., 1.8 Ohm, 1W, 5%.....	Ohmite
R23	50-07657	Resistor, 0 Ohm.....	IRC
R29	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
*B R30	55-10168BGK004R02	Resistor, F. F., 4.02K Ohm, 1/8W, .1%, 25 ppm...	Dale
*C R30	55-10168EGK002R15	Resistor, F. F., 2.15K Ohm, 1/8W, 1%, 25 ppm....	Dale
*D R30	55-10168BGK020	Resistor, F. F., 20K Ohm, 1/8W, 1%, 25 ppm.....	Dale
*E R30	55-10168BGA999R95	Resistor, F. F., 999.95 Ohm, 1/8W, .1%, 25 ppm..	Dale
R31	55-10168BGK399	Resistor, F. F., 399K Ohm, 1/8W, .1%, 25 ppm....	Dale
R32	55-10101HA750	Resistor, C. C., 750 Ohm, 1/4W, 5%.....	IRC
R33	55-10101HA750	Resistor, C. C., 750 Ohm, 1/4W, 5%.....	IRC
R34	55-10101HK001	Resistor, C. C., 1K Ohm, 1/4W, 5%.....	IRC
R35	55-10101HK047	Resistor, C. C., 47K Ohm, 1/4W, 5%.....	IRC
R38	55-10101HK004R7	Resistor, C. C., 4.7K Ohm, 1/4W, 5%.....	IRC
R39	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R40	55-10101HK004R3	Resistor, C. C., 4.3K Ohm, 1/4W, 5%.....	IRC
R41	55-10101HK002R7	Resistor, C. C., 2.7K Ohm, 1/4W, 5%.....	IRC
R42	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R43	55-10101HA033	Resistor, C. C., 33 Ohm, 1/4W, 5%.....	IRC
R44	55-10101HA047	Resistor, C. C., 47 Ohm, 1/4W, 5%.....	IRC
R45	55-10101HK002R2	Resistor, C. C., 2.2K Ohm, 1/4W, 5%.....	IRC
R46	55-10101HA560	Resistor, C. C., 560 Ohm, 1/4W, 5%.....	IRC
R47	55-10101HA750	Resistor, C. C., 750 Ohm, 1/4W, 5%.....	IRC
R48	55-10101HA750	Resistor, C. C., 750 Ohm, 1/4W, 5%.....	IRC
R51	55-10101HK002R2	Resistor, C. C., 2.2K Ohm, 1/4W, 5%.....	IRC
R52	55-10101HK002R2	Resistor, C. C., 2.2K Ohm, 1/4W, 5%.....	IRC
R53	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R54	55-10101HK039	Resistor, C. C., 39K Ohm, 1/4W, 5%.....	IRC
R55	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R56	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R57	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
T1	42-22199	Transformer, Power.....	Omega
U1	40-23104	IC, Analog Multiplexer.....	Harris
U2	40-23106	IC, Op-Amp, 1NA101M.....	Burr-Brown
U4	40-23107	IC, Op-Amp, LM310N.....	National Semiconductor
U5	40-22196	IC, V to F Converter, AD650.....	Analog Devices
U6	40-18209	IC, High Speed Opto Coupler, 6N137.....	NEC
U7	40-14875	IC, Dual Opto Isolator, MCT6.....	General Instruments
U9	55-23236FGK047	Resistor Network, 47K Ohm, 2%.....	TRW
U10	40-15459	IC, Flip-Flop, 74LS74.....	Motorola
U11	40-16945	IC, Decade Counter, 4017.....	Fairchild
U12	40-18742	IC, 3 State Hex Inverter, 74LS368.....	Motorola
U13	40-18827	IC, 8 Bit Microprocessor, 8085.....	Intel
U14	40-20187	IC, Buffer Line Driver, 74LS244.....	National
U15	40-20188	IC, Octal Bus Tranceiver, 74LS245.....	National
U16	40-20096	IC, Octal Transparent Latch, 74LS373.....	National
U17	40-20187	IC, Buffer Line Driver, 74LS244.....	National
U18	40-22953	IC, RAM, I/O Timer, NSC810AN.....	National
U19	40-14875	IC, Dual Opto Isolator, MCT6.....	General Instruments
U20	40-15460	IC, Quad, 2 In NAND, 74LS00.....	Motorola
U21	40-15460	IC, Quad, 2 In NAND, 74LS00.....	Motorola

* Reference Number can be found on the corresponding Assembly Drawing
*A Models with Option A and/or Option D
*B Models DP504, DP505
*C Models DP502, DP503
*D Models DP506, DP507
*E Models DP500, DP501
*F Models DP502, DP503, DP504, DP505, DP506, DP507

Main P. C. Board Parts List (cont.)

*Reference Number	Omega P/N	Description	Vendor
U22	40-15459	IC, Flip-Flop, 74LS74	Motorola
U23	40-21628	IC, CMOS Static RAM, 2K by 8	OKI Semiconductor
U24	07-23145	EPROM, Programmed	Omega
U25	40-22224-02	IC, RAM, Non-volatile, X2212	NCR
U26	40-17928	IC, Decoder/Demultiplexer, 74LS138	Motorola
U27	40-17928	IC, Decoder/Demultiplexer, 74LS138	Motorola
U28	55-20163FJK010	Resistor Network, 10K, SIP, 2%	Beckman
U29	55-20163FJK010	Resistor Network, 10K, SIP, 2%	Beckman
U30	55-20163FJK010	Resistor Network, 10K, SIP, 2%	Beckman
*A VR1	40-16082	Regulator, Voltage, +12V, 78M12UC	National
VR2	40-14607	IC, Voltage Regulator, +5V, LM340T	Fairchild
*A VR3	40-16081	Regulator, Voltage, -12V, 79M12AUC	Fairchild
VR4	40-23153	Regulator, Dual Tracking, LM325H	National Semiconductor
W1	50-07657	Jumper, Zero Ohm	IRC
W2	50-07657	Jumper, Zero Ohm	IRC
W3	50-07657	Jumper, Zero Ohm	IRC
W4	50-07657	Jumper, Zero Ohm	IRC
W5	50-07657	Jumper, Zero Ohm	IRC
W9	50-07657	Jumper, Zero Ohm	IRC
Y1	40-19735-03	Crystal, 4.194304 MHz	M-Tron

* Reference Number can be found on the corresponding Assembly Drawing
*A Models with Option A and/or Option D
*B Models DP504, DP505
*C Models DP502, DP503
*D Models DP506, DP507
*E Models DP500, DP501
*F Models DP502, DP503, DP504, DP505, DP506, DP507

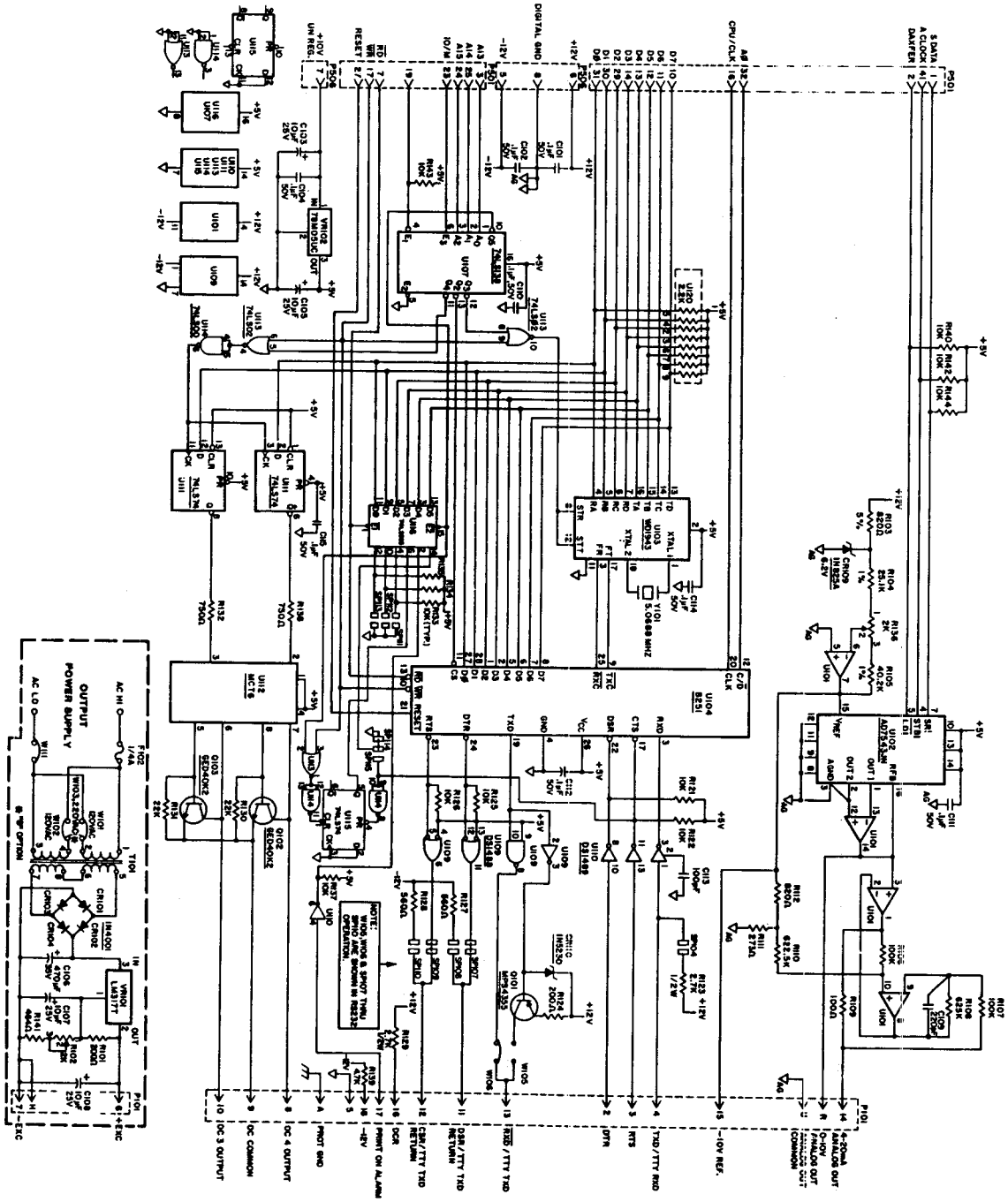


Figure 9. Upper P. C. Board Schematic

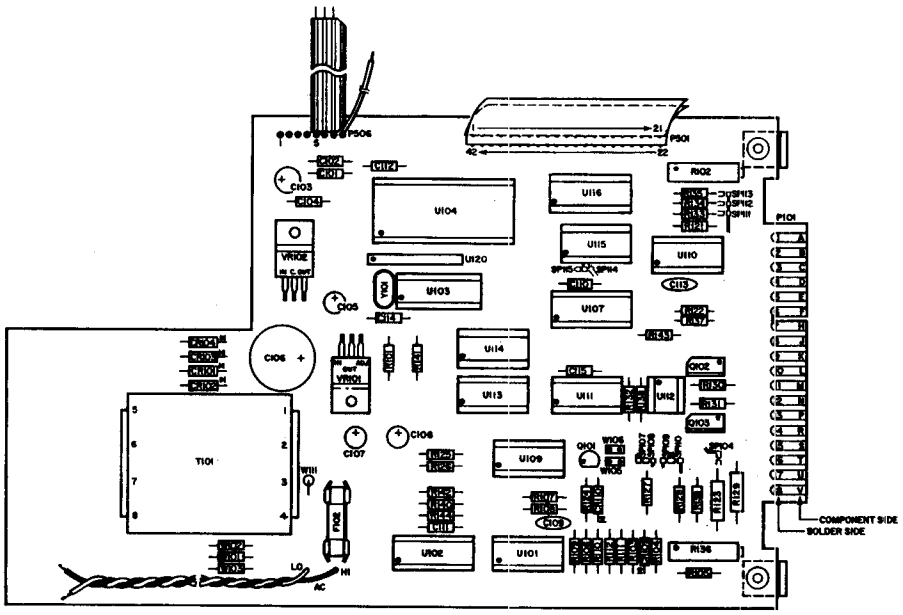


Figure 10. Upper P. C. Board Assembly

Upper P. C. Board Parts List

*Reference Number	Omega P/N	Description	Vendor
C101	56-222254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
C102	56-222254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
C103	56-12731D106N25	Capacitor, Tant., 10µF, 25V.....	NEC
C104	56-222254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
C105	56-12731D106N25	Capacitor, Tant., 10µF, 25V.....	NEC
C106	56-10203-447N35	Capacitor, Electro, 470µF, 35V.....	Nichicon
C107	56-12731D106N25	Capacitor, Tant., 10µF, 25V.....	NEC
C108	56-12731D106N25	Capacitor, Tant., 10µF, 25V.....	NEC
C109	56-10215F221JC10	Capacitor, Disc., 220pF, 1KV, 20%, 1/8W, 1%.....	International
C110	56-222254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
C111	56-22254B104KR50	Capacitor, Ceramic, .1µF, 50V, 20%, 1/8W, 1%....	Corning, Z5U
C112	56-22254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
C113	56-10215F101JB10	Capacitor, Disc., 100pF, 1KV, 10%.....	International
C114	56-22254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
C115	56-22254B104KR5	Capacitor, Ceramic, .1µF, 50V, 20%.....	Corning, Z5U
CR101	40-07787-01	Diode, Rectifier, 1N4001.....	ITT
CR102	40-07787-01	Diode, Rectifier, 1N4001.....	ITT
CR103	40-07787	Diode, Rectifier, 1N4001.....	ITT
CR104	40-07787-01	Diode, Rectifier, 1N4001.....	ITT
CR109	40-14859	Diode, Zener, 6.2V, 1N825A.....	Components Devices
CR110	40-09436	Diode, Zener, 4.7V, 1N5230.....	Fairchild
F102	52-22395-04	Fuse, Subminiature, Fast Acting, 1/4A.....	LittleFuse, 216.250
F102	52-22395-02	Fuse, Subminiature, Fast Acting, 1/8A.....	LittleFuse, 216.125
Q101	40-16253	Transistor, PNP, MPS4355.....	Motorola
Q102	40-22188	Transistor, NPN, D40K2.....	National
Q103	40-22188	Transistor, NPN, D40K2.....	National
R101	55-10168ELA200	Resistor, F. F., 200 Ohm, 1/8W, 1%.....	Dale, MFF

* Reference Number can be found on the corresponding Assembly Drawing

Upper P. C. Board Parts List (cont.)

*Reference Number	Omega P/N	Description	Vendor
R102	41-11611-08	Potentiometer, 2K, 10 Turn	Dale, MFF
R103	55-10101HA820	Resistor, C. C., 820 Ohm, 1/4W, 5%	IRC, GBT 1/4
R104	55-10168ELK025R1	Resistor, M. F., 25.1K Ohm, 1/8W, 1%	Dale, MFF
R105	55-10168ELK040R2	Resistor, M. F., 40.2K Ohm, 1/8W, 1%	Dale, MFF
R106	55-10168ELK100	Resistor, M. F., 100K Ohm, 1/8W, 1%	Dale, MFF
R107	55-10168ELK100	Resistor, M. F., 100K Ohm, 1/8W, 1%	Dale, MFF
R108	55-10168ELK625	Resistor, M. F., 625K Ohm, 1/8W, 1%	Dale, MFF
R109	55-10168ELA100	Resistor, M. F., 100 Ohm, 1/8W, 1%	Dale, MFF
R110	55-10168ELK622R5	Resistor, M. F., 622.5K Ohm, 1/8W, 1%	Dale, MFF
R111	55-10168ELA273	Resistor, M. F., 273 Ohm, 1/8W, 1%	Dale, MFF
R112	55-10168ELA820	Resistor, M. F., 820 Ohm, 1/8W, 1%	Dale, MFF
R121	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R122	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R123	55-10102HK002R7	Resistor, C. C., 2.7K Ohm, 1/2W, 5%	Piher
R124	55-10101HA200	Resistor, C. C., 200 Ohm, 1/4W, 5%	IRC, GBT 1/4
R125	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R126	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R127	55-10101HA560	Resistor, C. C., 560 Ohm, 1/4W, 5%	IRC, GBT 1/4
R128	55-10101HA560	Resistor, C. C., 560 Ohm, 1/4W, 5%	IRC, GBT 1/4
R129	55-10102HK002R7	Resistor, C. C., 2.7K Ohm, 1/2W, 5%	Piher
R130	55-10101HK022	Resistor, C. C., 22K Ohm, 1/4W, 5%	IRC, GBT 1/4
R131	55-10101HK022	Resistor, C. C., 22K Ohm, 1/4W, 5%	IRC, GBT 1/4
R132	55-10101HA750	Resistor, C. C., 750 Ohm, 1/4W, 5%	IRC, GBT 1/4
R133	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R134	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R135	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R136	41-11611-08	Potentiometer, 2K, 10 Turn	Dale
R137	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R138	55-10101HA750	Resistor, C. C., 750 Ohm, 1/4W, 5%	IRC, GBT 1/4
R139	55-10102HK004R7	Resistor, C. C., 4.7K Ohm, 1/2W, 5%	Piher
R140	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R141	55-10168ELA464	Resistor, F. F., 464 Ohm, 1/8W, 1%	Dale, MFF
R142	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R143	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
R144	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%	IRC, GBT 1/4
T101	42-22567	Transformer, Power	Omega
U101	40-16665	IC, Quad OP AMP, LM325	Motorola
U102	40-22253	IC, D/A Converter, AD7543JN	Analog Devices
U103	40-22280	IC, Dual Baud Rate Clock, WD1943	Western Digital
U104	40-18104	IC, USART, 8251	AMD
U107	40-17928	IC, Decoder/Demultiplexer, 74LS138	Motorola
U109	40-18308	IC, Line Driver, DS1488	Signetics
U110	40-18492	IC, Line Receiver, DS1489	Motorola
U111	40-15459	IC, Dual D Flip-Flop, 74LS74	Motorola
U112	40-14875	IC, Dual Opto Coupler, MCT6	General Instruments
U113	40-14934	IC, Quad Nor Gate, 74LS02	Fairchild
U114	40-15460	IC, Quad NAND, 74LS00	Motorola
U115	40-15459	IC, Dual D Flip-Flop 74LS74	Motorola
U116	40-20097	IC, Tri State Buffer, 74LS365	National
U120	55-20163FJK002R2	Resistor Network, 2.2K SIP	Beckman
VR101	40-22189	IC, Var. Voltage Regulator, LM317T	National
VR102	40-14607	Regulator, Voltage, 5V, 78M05UC	Fairchild
W101	50-07657	Jumper, Zero Ohm	IRC
W102	50-07657	Jumper, Zero Ohm	IRC
W105	51-13287-01-02	Connector, Straight Header	Berg Electronics
W106	51-13287-01-02	Connector, Straight Header	Berg Electronics
W111	50-07657	Jumper, Zero Ohm	IRC
Y101	40-19735-06	Crystal, 5.0688MHz	M-Tron

* Reference Number can be found on the corresponding Assembly Drawing

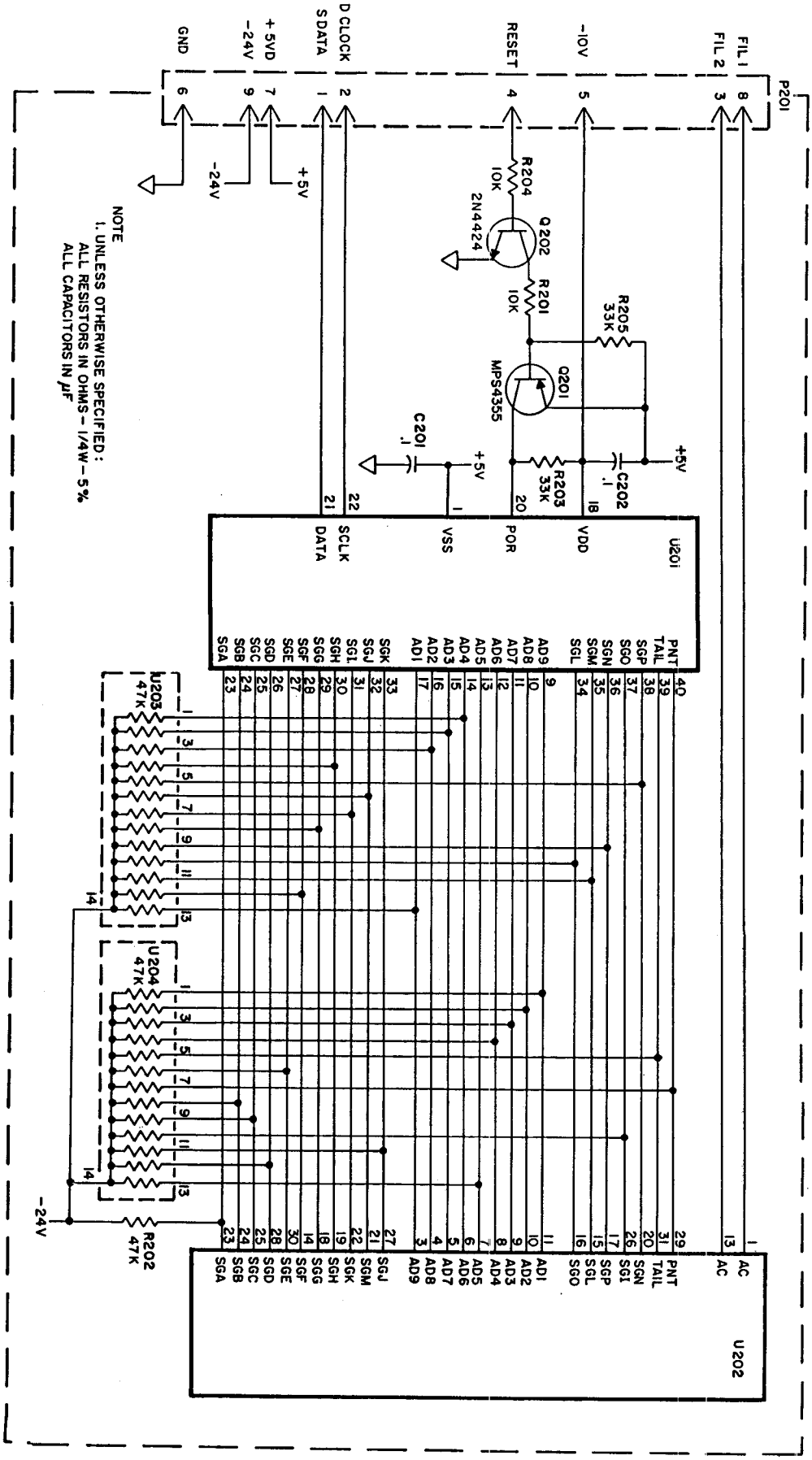


Figure 11. Display P. C. Board Schematic

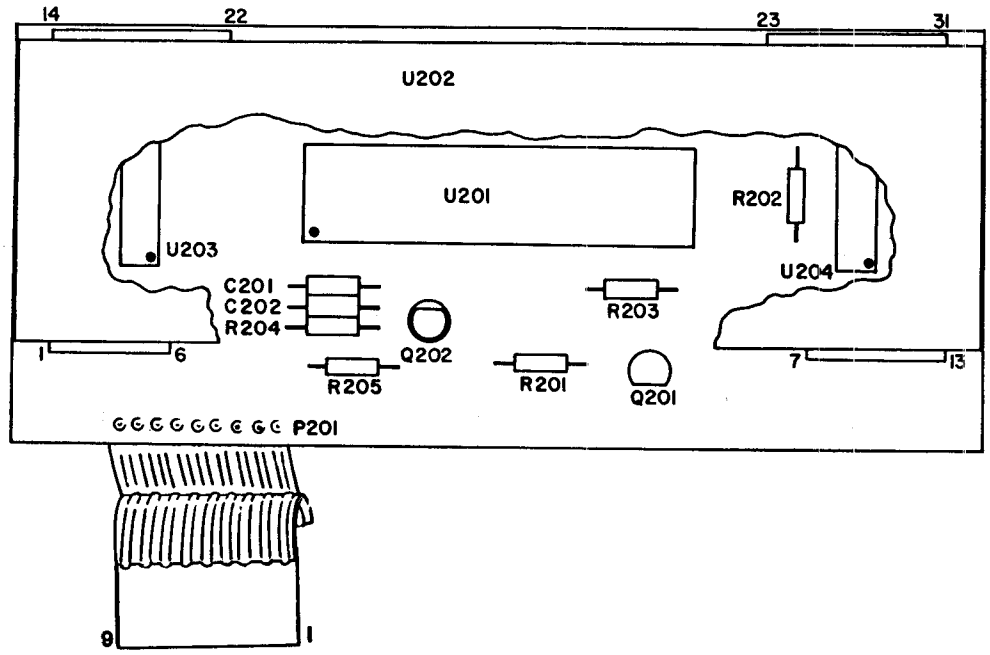


Figure 12. Display P. C. Board Assembly

Display P. C. Board Parts List

*Reference Number	Omega P/N	Description	Vendor
C201	56-222254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%.....	Corning, Z5U
C202	56-222254B104KR5	Capacitor, Ceramic, 0.1μF, 50V, 20%.....	Corning, Z5U
P201	53-23336	Cable Assy.....	Omega
Q201	40-16253	Transistor, PNP, MPS4355.....	Motorola
Q202	40-11439	Transistor, NPN, 2N4424.....	GE
R201	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R202	55-10101HK047	Resistor, C. C., 47K Ohm, 1/4W, 5%.....	IRC
R203	55-10101HK033	Resistor, C. C., 33K Ohm, 1/4W, 5%.....	IRC
R204	55-10101HK010	Resistor, C. C., 10K Ohm, 1/4W, 5%.....	IRC
R205	55-10101HK033	Resistor, C. C., 33K Ohm, 1/4W, 5%.....	IRC
U201	40-22184-03	IC, Display Controller, 10937-40.....	Rockwell
U202	40-22185	Display, 9 Char., 16 Segment, FG912B2.....	Omega
U203	55-15249HJK047	Resistor Network, DIP, 47K Ohm.....	Dale
U204	55-15249HJK047	Resistor Network, DIP, 47K Ohm.....	Dale

* Reference Number can be found on the corresponding Assembly Drawing

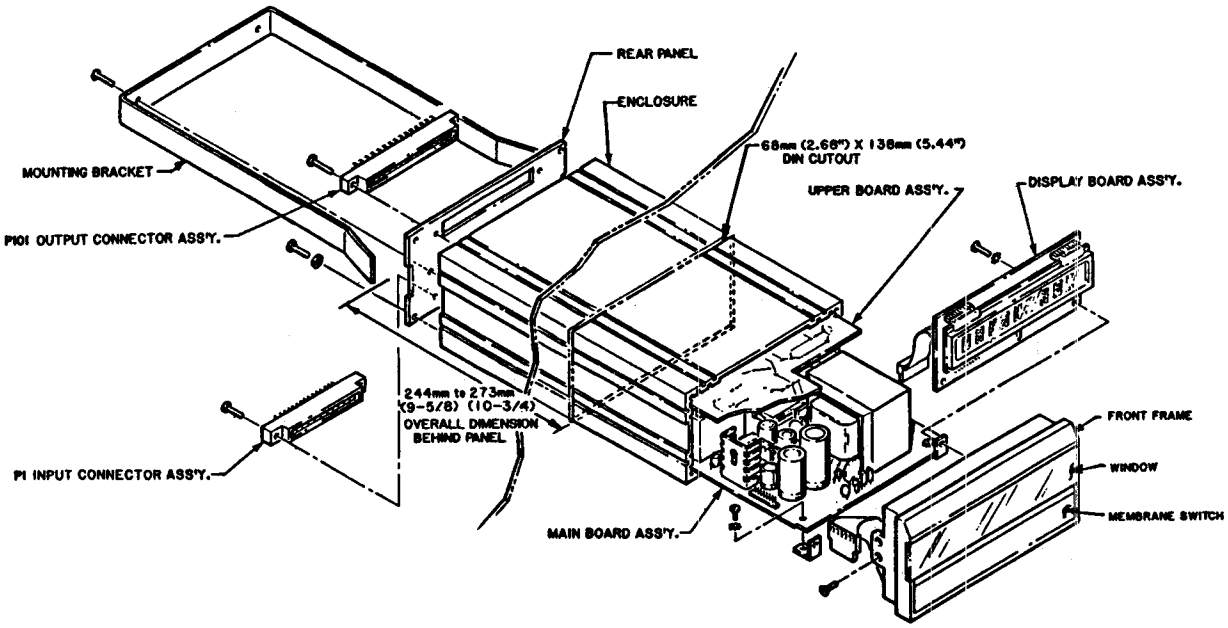


Figure 13. Miscellaneous Parts

Miscellaneous Parts List

Omega P/N	Description	Vendor
30-22109	Enclosure	Omega
16-22364	Gasket	Omega
25-22361	Front Frame	Omega
31-22351-04	Membrane Switch Panel	Omega
34-22362	Mounting Bracket	Omega
30-22363	Rear Panel	Omega
32-22358	Window	Omega
04-23188	Input Connector	Omega
04-23192	Optional Input Connector	Omega
04-23189	Output Connector	Omega
04-23198	Optional Output Connector	Omega

Section 5 - GLOSSARY

The following terms are used throughout this manual and provided to help you better understand your instrument.

Auto Read Submode

One of two submodes used to control the operation of the meter. The Auto Read Submode enables the instrument to automatically take readings (measurements) based on a pre-set null point value.

Average Count

Average Count determines the number of readings to be taken and averaged for a measurement during the Controlled Measurement Mode.

NOTE: Each individual reading does not update the display, peak, total, or limit outputs. When a reading is taken, it is added to all readings previously taken. The sum of the readings is divided by the number of readings taken to equal an 'average' which is the measurement used to update displays and outputs or to dampen oscillating signals.

Balance

Balance is the low point of SPAN. This is the value entered during front panel calibration (Setup Mode) that you want the meter to display when the strain gage is in a no load situation. You can enter a permanent tare (if desired), of 1 pound (for example) by placing a one pound load on the strain gage and entering zero as the BALANCE.

Cycle

A cycle is a series of readings, settling time, averaging, etc. that make up a measurement in the Controlled Measurement mode.

Full Scale Reading

Full Scale Reading is the value entered during front panel calibration (Setup Mode) that you want the meter to display when strain gage output to the meter is at its maximum. If, during calibration, you opt to "set span" and subsequently establish a span-to-input ratio (see definition of Span), the full scale reading that you enter will be scaled and displayed accordingly.

Gross

Gross is the measure of raw input before the tare amount is subtracted. The gross measurement is calibrated in user units (pounds, µstrains, grams, psi, etc.).

Manual Read Submode

One of two submodes used to control the instrument. The Manual Read Submode requires the operator to initiate measurements manually.

Net

Net is the remaining amount after a tare has been subtracted from the gross weight. This instrument displays net in the Continuous Measurement Mode (normal run mode) and in the Controlled Measurement Mode. **NOTE:** If tare is zero, then net will equal gross.

Null Point

The Null Point is a pre-set value used in the Auto Read Submode. If the net reading exceeds the null point value, the instrument will automatically take a measurement. If the net reading falls 10% below the null point for 5 consecutive readings, the unit resets itself to zero. Null point is set in the Setup Mode.

Peak

Peak is the maximum net reading to occur since the unit has been turned on or the peak value reset.

Span

Span is the display range that you want the meter to cover. When calibrating to strain gage input (Setup Mode), you can "set span" by entering the "balance" (low) point (zero for example) with no load on the strain gage and then, with a certified (known) load on the strain gage, entering the value that you want displayed as a result of that load. For greater accuracy, the certified load should be near the expected maximum.

The meter is thus calibrated over the SPAN, i. e., when the meter receives strain gage input equal to the no load situation, it displays the BALANCE and, when it receives strain gage input equal to that of the certified load, it displays that value entered during calibration. All displays will be scaled based on the span-to-input ratio (if any) established during calibration.

Settling Time

Settling Time is a parameter used in the Controlled Measurement Mode. Settling Time (a number of seconds ranging from 0 to 99) is the time the unit delays before taking a measurement to allow the load to stabilize.

Settling Time applies whether taking readings manually or automatically.

Tare

Tare is the weight of a container or packing materials which must be subtracted to give the net weight of the goods inside. For example: to buy a bushel of potatoes, you first set the empty bushel basket on the scale and adjust the scale to zero. **This is called taking a tare,** which means subtracting the stored weight (tare) from all future measurements.

Total

Total is the sum of measurements taken in Auto or Manual Read Submode.

In calculating the total, a common scale factor is used, known as the Total Scale Factor.

Example

After the total is cleared, three measurements are taken. The sum of these measurements is the Intermediate Total. The Intermediate Total is multiplied by the Total Scale Factor, and stored as the total value.

Clear Totals --> 0 lbs.
1st rdg. --> 10 lbs.
2nd rdg. --> 14 lbs.
3rd rdg. --> 22 lbs.

Intermediate Total = 46 lbs.

The intermediate total is multiplied by the total scale factor. If the total scale factor was 1, total would be 46 lbs; if Total Scale was 2, total would be 92 lbs.; etc.

NOTE: Total scale factor should not cause the total to exceed 9,999,999.

Zero Tracking

Zero tracking is an automatic zeroing feature. When the instrument is programmed for Auto Read Submode, zero tracking will automatically clear the scale to zero when the net reading drops to less than 2% of the full scale value. This occurs every 2 minutes, unless the unit is in the process of taking a measurement. This feature compensates for any residue which may accumulate on the scale.

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WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of 13 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive current, heat, moisture, vibration, or misuse. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department, telephone number (203) 359-1660. Before returning any instrument, please contact the OMEGA Customer Service Department to obtain an authorized return (AR) number. The designated AR number should then be marked on the outside of the return package.

To avoid processing delays, also please be sure to include:

1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

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