User's Guide

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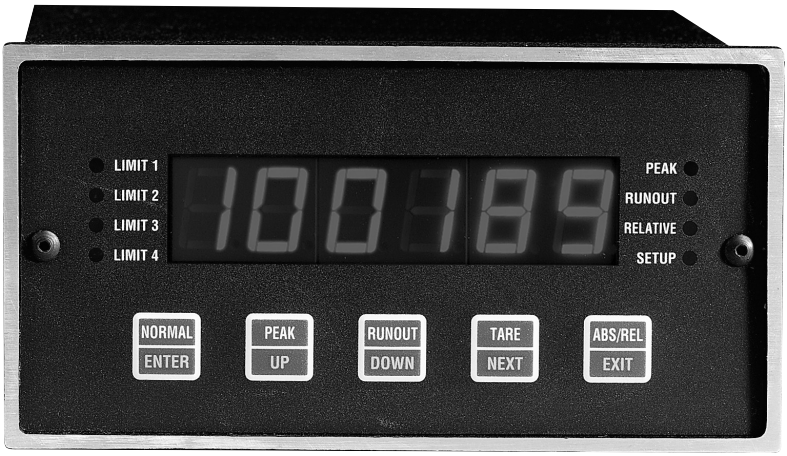

DP-7600
High Speed Strain Gauge Readout

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TABLE OF CONTENTS

DESCRIPTION 1

SWITCH FUNCTIONS 1

LED INDICATORS 3

SETUP 3
- Limit Programming 4
- Limit One Delay 4
- Decimal Point Position 4
- Filter Setup 4
- Baud Rate Selection 4
- Echo Setup 5
- Linefeed Setup 5
- Unit Address Setup 5
- Legend Setup 5
- Continuous Update 5
- Device Code 6
- Serial Command 6

CALIBRATION 6
- Protection Code 6
- Protection Code Programming 6
- Span Number Programming 7
- Dead Weight Zero 7
- Dead Weight Stay 7

SERIAL COMMUNICATIONS 8
- Echo 9
- Line Feed 10
- Address Enable 10
- Address Disable 10
- Read Display 10
- Set Limit 10
- Peak and Runout 10
- Remote Tare 10

TABLE OF CONTENTS

Test Message 11
Continuous Reading 11
Set Legend 11
Remote Serial Command 11
Decimal Position 11
Reading Mode 12
Absolute or Relative 12
Set Filter 12
Calibration Span Number 12
Serial Reading Mode 12
Limit Mode 12

REMOTE INPUTS 13

DP-7600 SENSITIVITY SETTINGS 14

EXCITATION SETTINGS 14

DP-7600 BACK VIEW 14

DP-7600 REAR TERMINATIONS 15

SCHEMATIC (DP-7600 Top Board) 16

SCHEMATIC (DP-7600 Bottom Board) 19

SCHEMATIC (DP-7600 Analog Input Option Board) 21

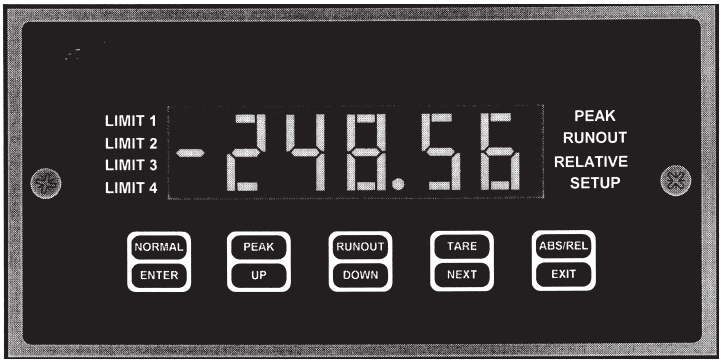
SCHEMATIC (DP-7600 Output Option Board) 22

SCHEMATIC (DP-7600 RS232/RS485 Option Board) 23

DIMENSIONS 24

MOUNTING 25

WARRANTY . . . . . Inside Back Cover



DESCRIPTION:

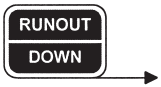
The Model DP-7600 is a high speed, high resolution, strain gauge readout. The unit performs 1000 conversions per second with 15 bits (plus sign) resolution. Limit checking and Peak/Runout tracking are all done at a user selectable rate (from 1 - 500Hz); meanwhile, the display provides a stable 1Hz filtered data reading. Peak and runout data can also be displayed using front panel switches. A tare reading of up to 50% of span can be entered with a single front panel switch press. The tare feature can be enabled or disabled at any time, without losing the tare value itself, using the unit's absolute and relative reading modes. Limit status and display mode settings are always clearly indicated with front panel LED's. Programming of the unit is easily performed using all five of the front panel switches, and calibration requires a security code which prevents unwanted corruption of calibration data. Remote interfacing is available via RS232/RS485 (optional), or active low logic inputs located on the rear of the unit.

SWITCH FUNCTIONS:

There are five switches located behind the front lens of the model DP-7600. The front panel switches appear as shown below. The text located at the top half of each switch (i.e., NORMAL, PEAK, RUNOUT, TARE, ABS/REL) indicates that particular switch's function when the unit is in data acquisition and display mode. The text located in the lower half (i.e., ENTER, UP, DOWN, NEXT, EXIT) indicates the switch's function during setup and calibration. A complete description of each switch is as follows:

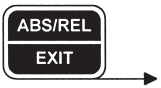
Data Acquisition & Display
: Press to set the display mode for actual reading.
Setup & Calibration Modes
: Press to record a complete setting and advance to the next setup.

Data Acquisition & Display
: Press to set the display mode for peak.
Setup & Calibration Modes
: Press to increment the digit/parameter being set.



Data Acquisition & Display
: Press to set the display mode for runout.
Setup & Calibration Modes
: Press to decrement the digit/parameter being set.

Data Acquisition & Display
: Press to record the current reading as the tare value.
Setup & Calibration Modes
: Press to advance to the next digit to be set.



Data Acquisition & Display
: Press to toggle between absolute and relative reading mode.
Setup & Calibration Modes
: Press to exit the setup or calibration mode at any time (all prior changes are saved).

LED INDICATORS:

Limit 1 Illuminates when the display reading exceeds the set limit, and in the setup mode when establishing the limit.

Limit 2 Illuminates when the display reading exceeds the set limit, and in the setup mode when establishing the limit.

Limit 3 Illuminates when the display reading exceeds the set limit, and in the setup mode when establishing the limit.

Limit 4 Illuminates when the display reading exceeds the set limit, and in the setup mode when establishing the limit.

Peak Illuminates when the display is set in the peak mode.

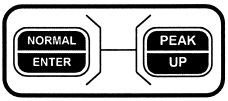
Runout Illuminates when the display is set in the runout mode.

Relative Illuminates when the display is set in the relative mode.

Setup Illuminates when the display is in the setup mode.

SETUP:

Meter setup is accomplished by using all five of the front panel switches. The setup mode is entered by pressing the Normal [Enter] and Peak [Up] switches simultaneously.



will flash on the display for a second and the setup LED indicator will illuminate. While in the setup mode, programming of the meter functions is accomplished by setting individual digits of the various parameters (with the exception of baud rate and decimal point programming). A flashing digit indicates that it is the active digit being set. The flashing digit can be incremented by pressing the UP switch; conversely, it can be decremented by pressing the DOWN switch. Once a particular digit has been set to the desired value the NEXT switch can be pressed to advance to the next digit. Once all the digits have been set to the proper value the ENTER switch can be pressed

to advance to the next parameter. At any time during the setup sequence the EXIT switch can be pressed to leave the setup mode and save the current settings. If the setup sequence is completed the unit will save all settings and automatically return to data acquisition and display mode. If a meter setup is started, and a long period (approximately 100 seconds) of inactivity is detected by the meter, the meter will return to data acquisition and display mode without saving any new settings.

DISPLAY MODE

d-nodE Upon entering the setup mode display will flash "d-node" then the unit will go to one of the following display modes: CH1, CH2, Plus, Minus, Mult or Div. To select a different mode press RUNOUT [down]. To enter selected display mode and to go to the next setup option press NORMAL [ENTER].

Note: If no math functions are desired select CH1 or CH2. *In normal operation mode: pressing* NORMAL [ENTER] *will cycle between the two channels.*

If any math function is selected then all math functions are available as well as CH1 and CH2. *In normal operation mode: pressing* NORMAL [ENTER] *will cycle between the two channels and all math functions.*

LIMIT PROGRAMMING

LiMit All four limits are programmed in succession (1 through 4) immediately after entering the setup mode. The corresponding LED illuminates to indicate which limit is being programmed. All limits can be programmed to any number that is within the display span (as determined by the meter calibration), and are activated when a reading that exceeds the programmed limit number is detected.

LIMIT ONE DELAY

L1 dLY The limit one delay is a programmable delay, from 0 - 100 seconds, between the time a reading exceeding the limit one number is detected and when the limit one output will be activated. Using the delay feature, the limit one output can be tied to the REMOTE RESET input on the rear of the unit to reset the peak reading so that the next peak can be properly detected in a process sequence.

DECIMAL POINT POSITION

dP The calibration span number is displayed with the decimal point shown in its selected position. The decimal point can be moved across the display to the desired position using the UP and DOWN switches.

FILTER SETUP

F iLtEr The digital filter determines the rate at which the limits are checked for output activation, peak/runout tracking, and analog output updates. The digital filter is programmable from 1 to 500Hz. When stability is more an issue than speed the filter should be set closer to 1Hz; conversely, when quick detection and activation is more important the filter should be set closer to 500Hz. **Note: Unless the serial option is installed, the setup sequence is now finished and the unit will return to acquisition and display mode.**

BAUD RATE SELECTION

bAUd Program the desired baud rate using the UP or DOWN switches to toggle through the available settings (300, 600, 1200, 2400, 4800, 9600, 19200, and 38400). Once the proper baud rate is selected press the ENTER switch to advance to the next setup.

ECHO SETUP

ECHO The model DP-7600 can be programmed to automatically re-transmit (echo) characters received on its serial communications input. A value of one enables the echo feature; conversely, programming a zero will disable it.

LINEFEED SETUP

LF The unit can be programmed to transmit linefeed characters in addition to the carriage return that is transmitted at the end of data strings. Programming a one will enable transmission of linefeed characters, while programming a zero will prevent their transmission.

UNIT ADDRESS SETUP

u Addr Multiple DP7600 units can be networked together on a serial bus using the addressing capability of the unit. Each unit can have a unique address from 0 to 250 (Note: 0 disables the address feature since the unit will respond to all incoming commands/queries).

LEGEND SETUP

LEGEnd The DP-7600 can append a user selectable engineering units string to readings transmitted from the unit. This feature allows direct terminal readout in engineering units, or easier unit identification in multi-unit applications. Program the legend number to the number corresponding with desired units as shown in the table below.

Legend Table

0 - No Legend	4 - kpa.
1 - lbs.	5 - mV.
2 - kgs.	6 - mA.
3 - psi.	7 - V.

CONTINUOUS UPDATE

CU The model DP-7600 can be programmed to automatically transmit the display reading at selectable time intervals. The update interval can be programmed from 20 times per second (-1) up to a maximum of 3600 seconds (3600). A value of zero disables the automatic update function.

DEVICE CODE

dC A non-printable device code allows units to take turns on a serial bus when daisy chained to a printer or some other data recording device. A value of one enables transmission of the device code following the reading string; conversely, a value of zero disables transmission of the device code.

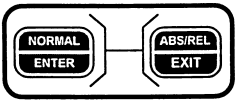
SERIAL COMMAND

SC A serial command can automatically be executed upon receipt of a non-printable code (see device code above). A table of numbers associated with each serial command can be found in the serial communications section of the manual (on page 8). Program to the number associated with the command to be executed when the unit receives a device code character on its serial communications input.

donE

CALIBRATION:

cAL The calibration mode is entered by pressing the Normal [Enter] and ABS/REL [Exit] switches simultaneously. Note: This is the only method to check or change the calibration of this unit externally.



PROTECTION CODE

Before any calibration can be performed on the unit a unique security code must be entered. If the code is not entered correctly the unit will automatically revert to display and acquisition mode; otherwise, the user is allowed to proceed with the calibration sequence. To enter the code use the standard sequence of operations explained in the switch functions and setup at the begining of your manual.

PROTECTION CODE PROGRAMMING

codE A different protection code can be programmed at this time. The code can be anywhere in the range 0 - 255. If a new code is not required simply press ENTER to continue with the calibration sequence.

SPAN NUMBER PROGRAMMING

SPAn The span number is the display reading that is associated with the input obtained during the DEAD WEIGHT STAY portion of the calibration sequence (a display reading of zero is automatically associated with the DEAD WEIGHT ZERO calibration step). The span number can be programmed to a maximum of 32767 display counts. Note: If your deadweight stay calibration will be performed using something less than the actual expected full-scale input, the desired reading for the dead weight stay calibration input should still be used as the span number.
(Example: There's a 10,000 Lbs. load cell but dead weight, the shunt cal resistor available is for only 8000 Lb., calibrate as shown below. Unit will respond to the full scale of 10,000Lbs. even through unit is calibrated at 8000 Lbs.)

DEAD WEIGHT ZERO

dEr0 This is the zero (null) point calibration step. Set the transducer or calibrator for zero output, allow sufficient time for the reading to stabilize, then press the ENTER switch to store the new zero calibration data.

DEAD WEIGHT STAY

F5 This is the span point calibration step. Check to make sure that MV/V setting and excitation is selected to match the transducer. Set the transducer or calibrator for full-scale output, allow sufficient time for the reading to stabilize, then press the ENTER switch to store the new span calibration data.

SERIAL COMMUNICATIONS:

With the serial communications option installed, the model DP-7600 can easily be interfaced to a computer, terminal, or printer. The unit can operate in stand-alone mode or in networked applications. Both RS232 and RS485 serial communication options are available for the DP-7600. The baud rate is user selectable, and can range from 300 to 38.4K baud. The unit uses a N,8,1 character data format (no parity, 8 data bits, 1 stop bit). All data is transmitted/received as ASCII characters. Characters strings are transmitted/received with the leftmost character first and are terminated with a carriage return [CR]. Incoming linefeeds are ignored by the unit, and it is optional to have the unit transmit them. Leading zeros are acceptable for numeric data transmitted to the unit. Decimal points are ignored by the unit, and are transmitted, when required, to conform with the selected display format.

Listed below are the available commands for the model DP-7600 (with the associated command numbers). Following this is a discussion of how commands are interpreted by the unit along with a brief description for each command.

1	EH	Set Echo Mode
2	LF	Set Line Feed Mode
3	AE	Address Enable
4	AD	Address Disable
5	RD	Read Display
6	NOT USED	
7	NOT USED	
8	S1	Set Limit One
9	S2	Set Limit Two
10	S3	Set Limit Three
11	S4	Set Limit Four
12	SP	Peak and Runout
13	NOT USED	
14	SZ	Remote Tare
15	NOT USED	
16	NOT USED	
17	NOT USED	
18	NOT USED	
19	TM	Test Message
20	NOT USED	
21	NOT USED	
22	CR	Set Continuous Reading Mode
23	NOT USED	
24	NOT USED	
25	NOT USED	
26	LR	Set Legend
27	SC	Remote Serial Command
28	DP	Set Decimal Point Position
29	NOT USED	
34	NOT USED	
35	PV	Set Display Mode
36	AR	Absolute or Relative
37	SF	Program Filter

Each DP-7600 command consists of two upper-case alpha ASCII characters. In most instances, commands can be sent to the unit with a numeric value (ASCII format) attached for parameter setting. When the unit receives and executes a valid command it responds by transmitting "ok[CR]". Commands can also be sent to the unit without a parameter attached to interegate the current setting for the parameter associated with that command. In this instance, the unit responds with the equivalent lower-case characters for that particular command along with an ASCII representation for the numeric value of the parameter in question. The following is an example of a possible exchange sequence between a model DP-7600 and a host computer:

Exchange 1:	HOST SENDS	: "AE0[CR]"
	DP-7600 RESPONDS WITH	: "HELLO ae 0[CR]"
	(Note: The unit address is assumed to be set a zero.)	
Exchange 2:	HOST SENDS	: "RD[CR]"
	DP-7600 RESPONDS WITH	: "99.99lbs[CR]"
(Note: It is assumed the display reading is 99.99 and that the legend is set for lbs.)		
Exchange 3	HOST SENDS	: "S1 1000[CR]"
	DP-7600 RESPONDS WITH	: "ok[CR]"
Exchange 4	HOST SENDS	: "S1[CR]"
	DP-7600 RESPONDS WITH`	: "11 1000[CR]"
Exchange 5	HOST SENDS	: "AD0[CR]"
	DP-7600 RESPONDS WITH	: "BYE ad 0[CR]"

Note: Remember [CR] represents a carriage return character.

The following is a list of the serial commands available on the DP-7600. Each command string is shown in quotes, a parameter/number field is represented by X (first) or Y (second), the sign, where needed, is shown as a lower case s(s). A brief description is given for each command along with any particular programming instructions.

ECHO: "EH X[CR]"

The echo command allows enabling or disabling of the unit's echo feature. When the echo feature is turned on the unit automatically echo's all received characters.

X = 1 echo ON
X = 0 echo OFF

LINE FEED: "LF X[CR]"

The unit can be set to send a line feed character following each transmitted string.

X = 1 line feeds are transmitted.
X = 0 line feeds are not transmitted

ADDRESS ENABLE: "AE XXX[CR]"

The address enable command, in conjunction with the address disable command, can be used to network multiple DP-7600 units. Once a unit's address has been enabled it will respond to all incoming commands until the unit's address is disabled. When the address enabled command is executed by a DP-7600 it responds with "HELLO ae XXX[CR]." Note: a unit address of zero (0) disables the addressing feature and the address enable command is not required.

ADDRESS DISABLE: "AD XXX[CR]", or "AD[CR]"

This command disables the unit at the specified address, or when an address in not attached, all units on the network. When the command is successfully executed the unit will respond with "BYE ad XXX[CR]".

READ DISPLAY: "RD[C.R.]"

Requests transmission of the current DP-7600 display reading. The type of reading returned (i.e. peak, runout, or current input) will depend upon the display reading mode selected. The unit will format the reading with sign and decimal point as needed.

SET LIMIT: "S# XXXXX[CR]"

Allows remote setting of the DP-7600 limit numbers. The # should be replaced in the string with the number of the limit to be set (1 through 4).

PEAK AND RUNOUT: "SP[CR]"

When this command is received the peak and runout reading are then reset.

REMOTE TARE: "SZ X[CR]"

The remote tare command allows tare "capture" similar to that performed by the front panel TARE switch. When a number is attached to the command a new tare value is captured.

TEST MESSAGE: "TM[CR]"

The test message is primarily a diagnostic aid. When the test message command is received the unit will respond by outputting information particular to the model number and software version/revision.

CONTINUOUS READING: "CR XXXX[CR]"

The continuous reading command allows setting of the automatic update feature of the DP-7600.

X = -1 - readings are transmitted 20 times per second
X = 0 - automatic updates disabled
XXXX = 1 - 3600 -number of seconds between updates

SET LEGEND: "LR X[CR]"

The set legend command allows a unit indicator to be attached to readings transmitted by the unit.

X = ? legend number (from table) for reading units

REMOTE SERIAL COMMAND: "SC X YY[CR]"

In data logging applications, involving several units daisy-chained together, a problem arises when it is desired to have several units automatically transmit readings at the same time interval (since contention could result in scrambled data at the printer). To compensate for this, the model DP-7600 allows unit to "take turns" on the same serial bus. This is done by enabling transmission of a special non-printable character at the end of a reading string; which, when received by the following unit will cause it to execute a serial command (RD would be most common). The second unit can have the device code enabled and so on. Note: all units should have the echo function enable so that messages will pass along to the following units in the chain.

DECIMAL POSITION: "DP X[CR]"

The display decimal point can be positioned using this command.

X = 0 88888 (no decimal point)
X = 1 8888.8
X = 2 888.88
X = 3 88.888
X = 4 8.8888
X = 5 .88888

READING MODE: "PV X[CR]"

The display reading mode can be set using this command.

X = 0: Display is set for reading only
X = 1: Display is set for peak
X = 2: Display is set for runout

ABSOLUTE OR RELATIVE "AR X[CR]"

Allows changing of the display mode between absolute and relative.

X = 0 Absolute measurement only (tare is disabled)
X = 1 Relative measurement (tare enabled)

SET FILTER "SF XXX[CR]"

The set filter command can be used to remotely set the rate at which limit detection, peak/runout tracking, and analog output updates are performed.

XXX = 1 - 500 (Hz)

CALIBRATION SPAN NUMBER "SN X YYYY[CR]"

X = Channel number (1 or 2)
YYYY = Calibration span number

SERIAL READING MODE "SM X[CR]"

X = 0 : Serial read outputs channel #1 (display reading)
X = 1 : Serial read outputs channel #2 reading
X = 2 : Serial read outputs channel #2 peak
X = 3 : Serial read outputs channel #2 runout

LIMIT MODE "LM X N[CR]"

X = Limit number
N = Limit mode, bit defined as follows:

Normal - 01	HEX	
Peak	- 02	HEX
Runout	- 03	HEX
Channel #2	- 04	HEX
High limit	- 08	HEX

Example: Assume we want a high limit, normal (reading), active on channel one; then, YY = 01 OR'ed 08 = 09 HEX (NOTE: unlike most serial command parameters, this is not ASCII).

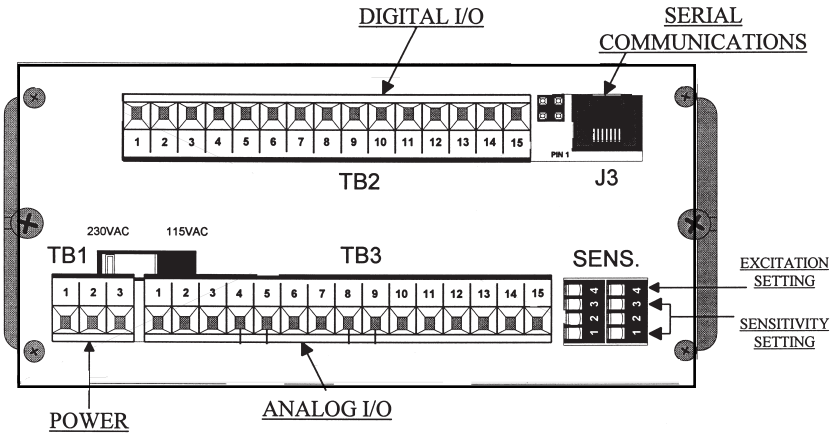
REMOTE INPUTS:

Seven logic level, active-low, remote inputs are located on the rear of the unit for interfacing to programmable logic controllers etc.. The remote inputs can be used to duplicate many of the front panel switch functions of the unit. A brief description of each input follows below:

NORMAL MODE	(remote input #1)	--sets the display mode to reading only.
DATA REQUEST	(remote input #2)	--requests a serial transmission of the display reading
RESET P/R	(remote input #3)	--resets the peak and runout readings
DATA HOLD	(remote input #4)	--A/D samples are ignored while this input is active
RUNOUT MODE	(remote input #5)	--sets the display mode to runout
PEAK MODE	(remote input #6)	--sets the display mode to peak
CAPTURE TARE	(remote input #7)	--sets the tare value to the current display reading

All remote inputs must be active for a minimum of 50mS (with the exception of DATA HOLD which only needs to be held active a minimum of 1mS for detection).

DP-7600 BACK VIEW



EXCITATION SETTINGS

5V

10V

DP-7600 SENSITIVITY SETTINGS

5.1mV

10.2mV

15.3mV

20.0mV

26.3mV

30.6mV

35.1mV

39.2mV

SENSITIVITY PROGRAMMING:

Pick a sensitivity setting that is as close as possible, without going under, the expected full-scale output from the transducer being used.

Example: Assume that a 10,000 pound capacity load cell with an output of .5mV/V full-scale is going to be used with the DP-7600. Also assume that the excitation required 10V; therefore, the full-scale input to the unit will be 5mV at 10,000 pound, and the sensitivity switches located on the rear of the DP-7600 should be set for 5.1mV full-scale (S1 - S3 open).

DP-7600 REAR TERMINATIONS

TB1 (POWER INPUT - BOTTOM BOARD)

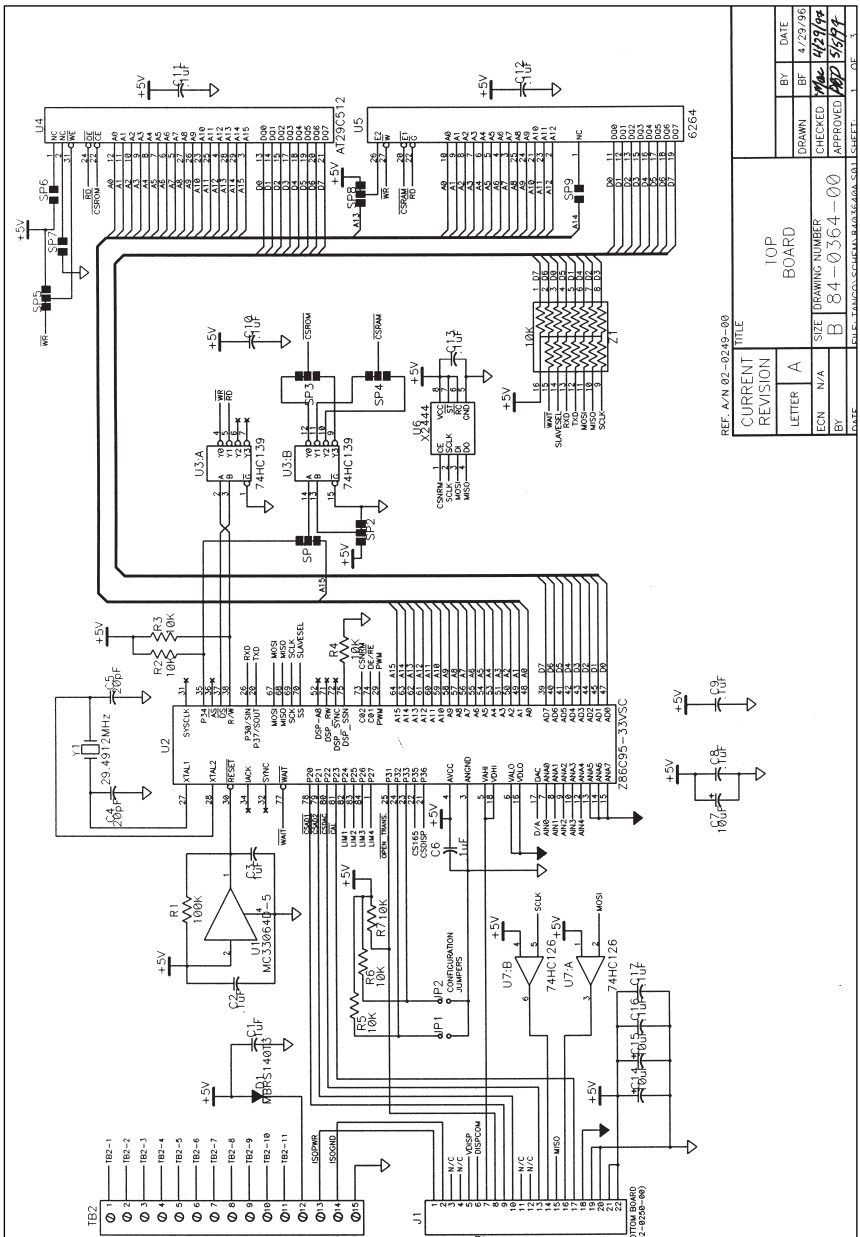
(1)	AC LINE
(2)	AC NEUTRAL
(3)	EARTH GROUND

	TB2 (TOP BOARD)	TB3 (BOTTOM BOARD)
(1)	LIMIT 1	SHIELD
(2)	LIMIT 2	-15V
(3)	LIMIT 3	ANALOG OUTPUT
(4)	LIMIT 4	-RCAL2
(5)	NORMAL MODE	+RCAL2
(6)	DATA REQUEST	-SIGNAL2
(7)	RESET P/R	+SIGNAL2
(8)	DATA HOLD	-RCAL1
(9)	RUNOUT MODE	+RCAL1
(10)	PEAK MODE	-EXCITATION
(11)	CAPTURE TARE	-SENSE
(12)	+5V	-SIGNAL1
(13)	ISOLATED POWER	+SIGNAL1
(14)	ISOLATED GROUND	+SENSE
(15)	INSTRUMENT GROUND	+EXCITATION

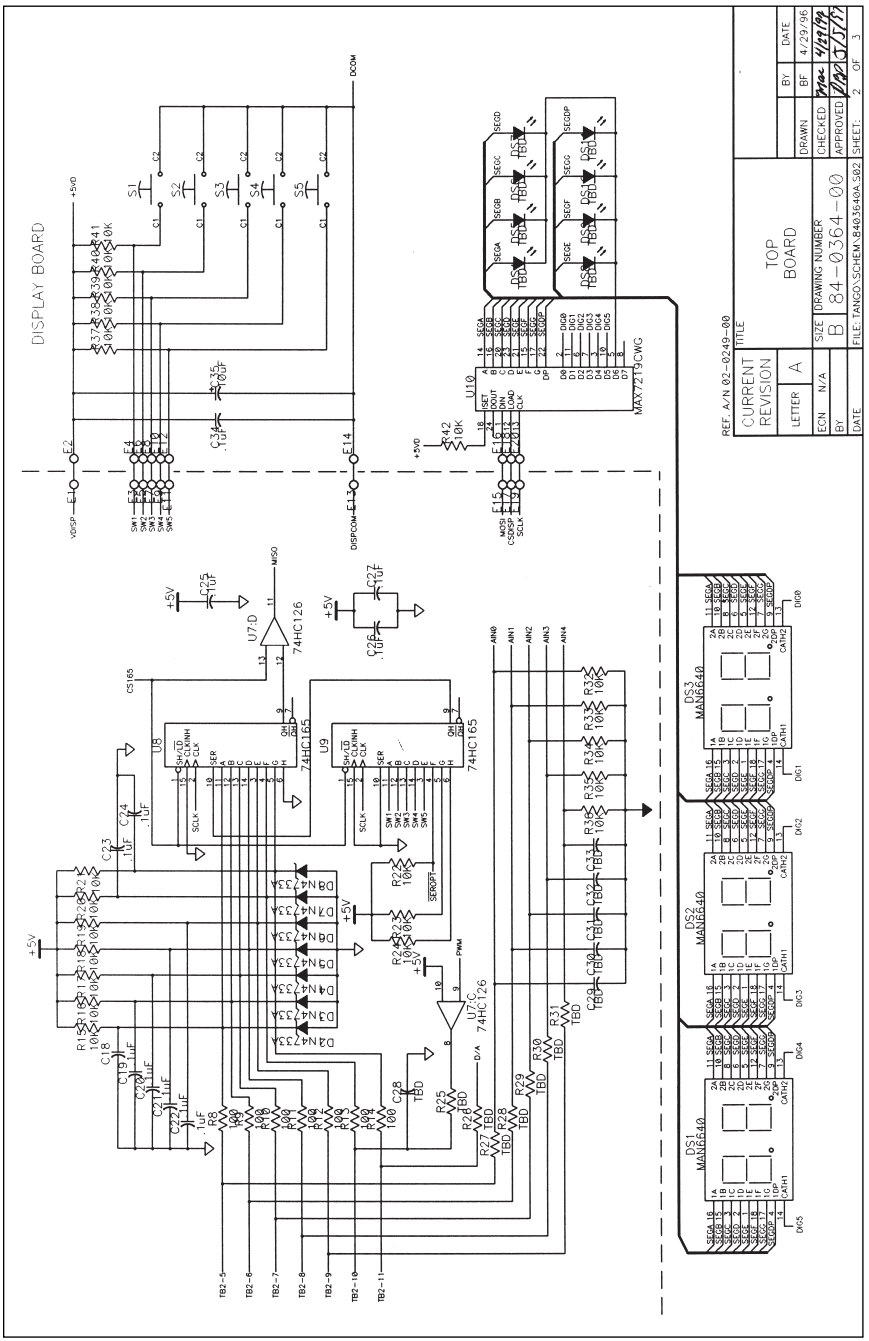
J3 (RJ11 - TOP BOARD)

(1)	RS485 SERIAL
(2)	RS485 TERMINATION RESISTOR
(3)	RS232 RX
(4)	RS232 TX
(5)	RS232 - GROUND
(6)	RS485 ~SERIAL

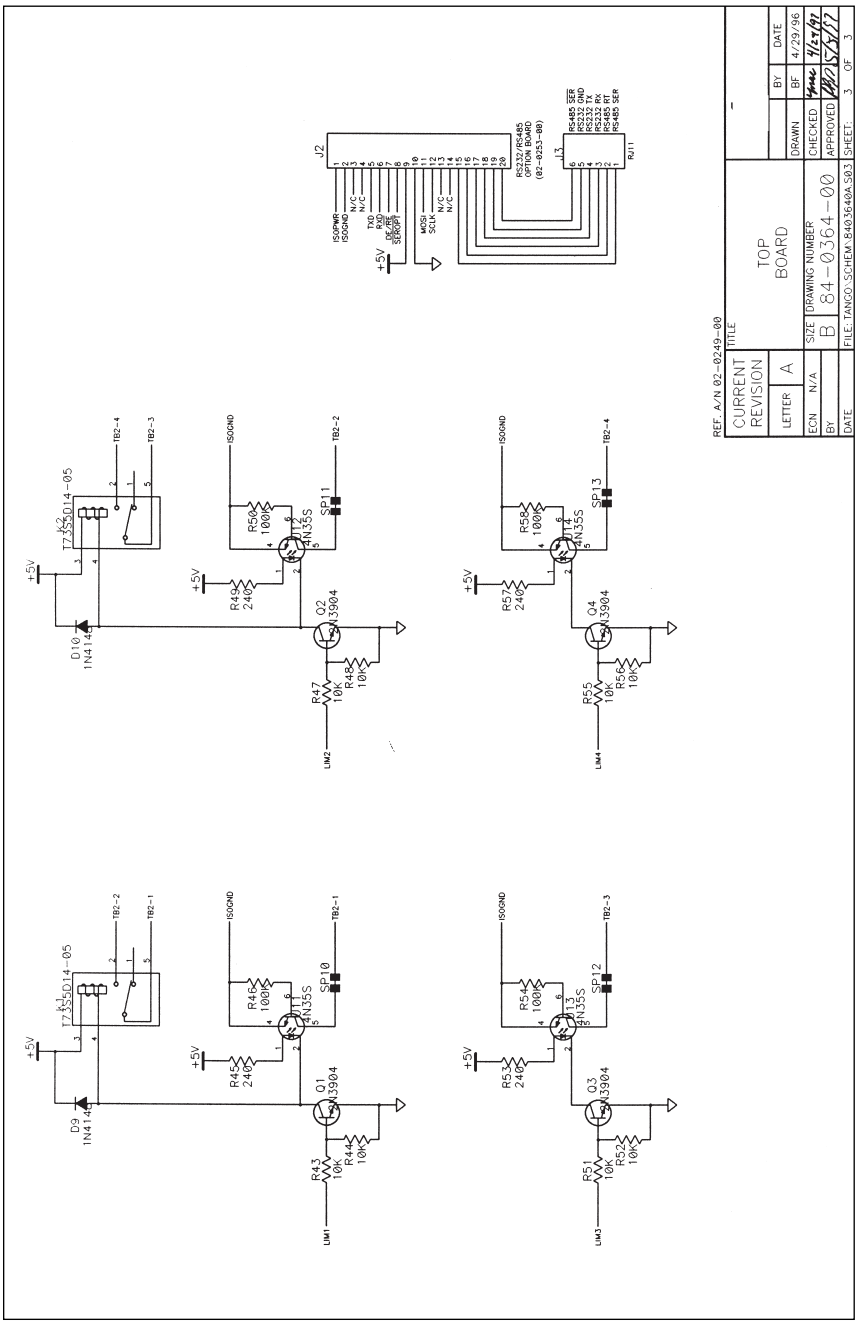
SCHEMATIC (DP-7600 Top Board)



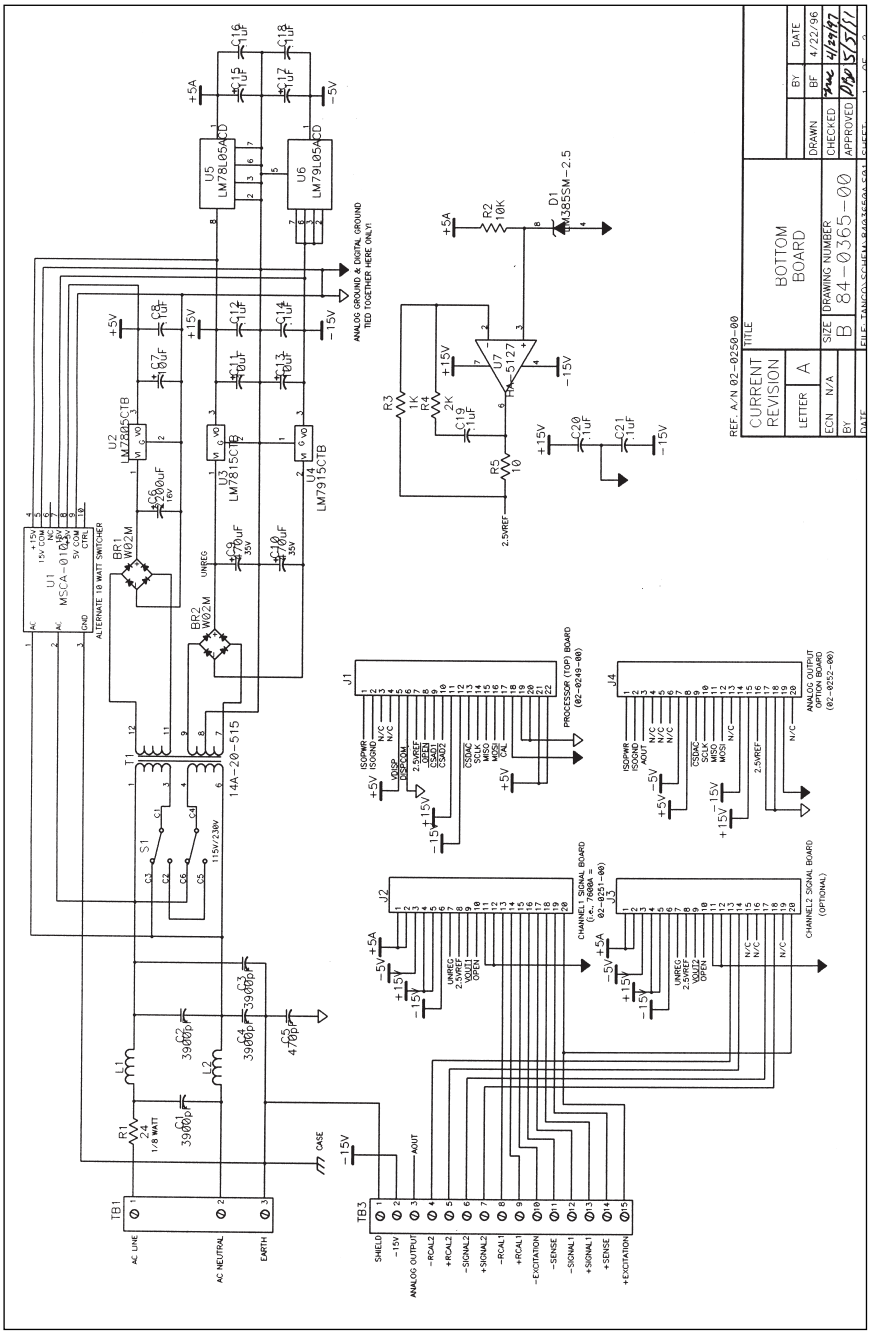
SCHEMATIC (DP-7600 Top Board)



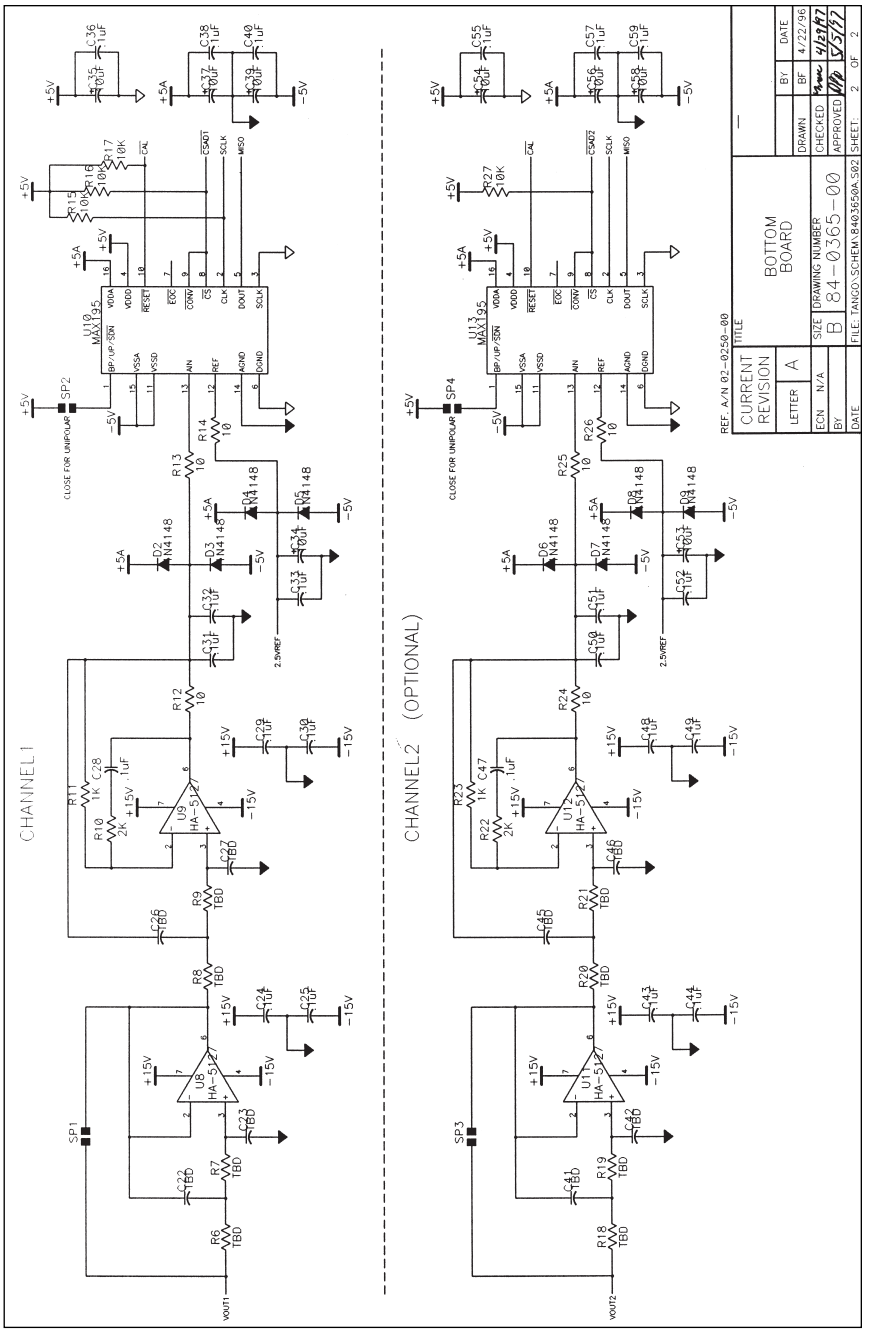
SCHEMATIC (DP-7600 Top Board)



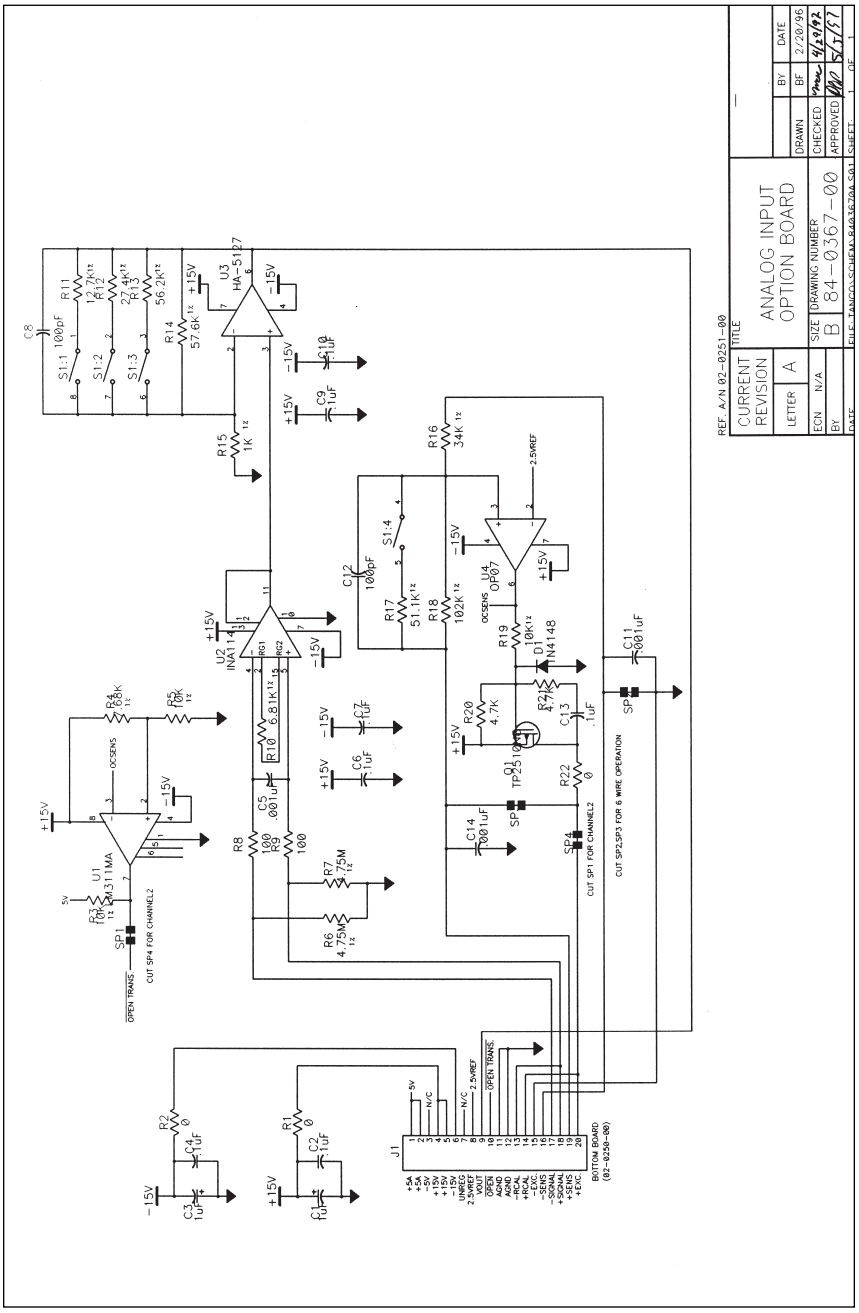
SCHEMATIC (DP-7600 Bottom Board)



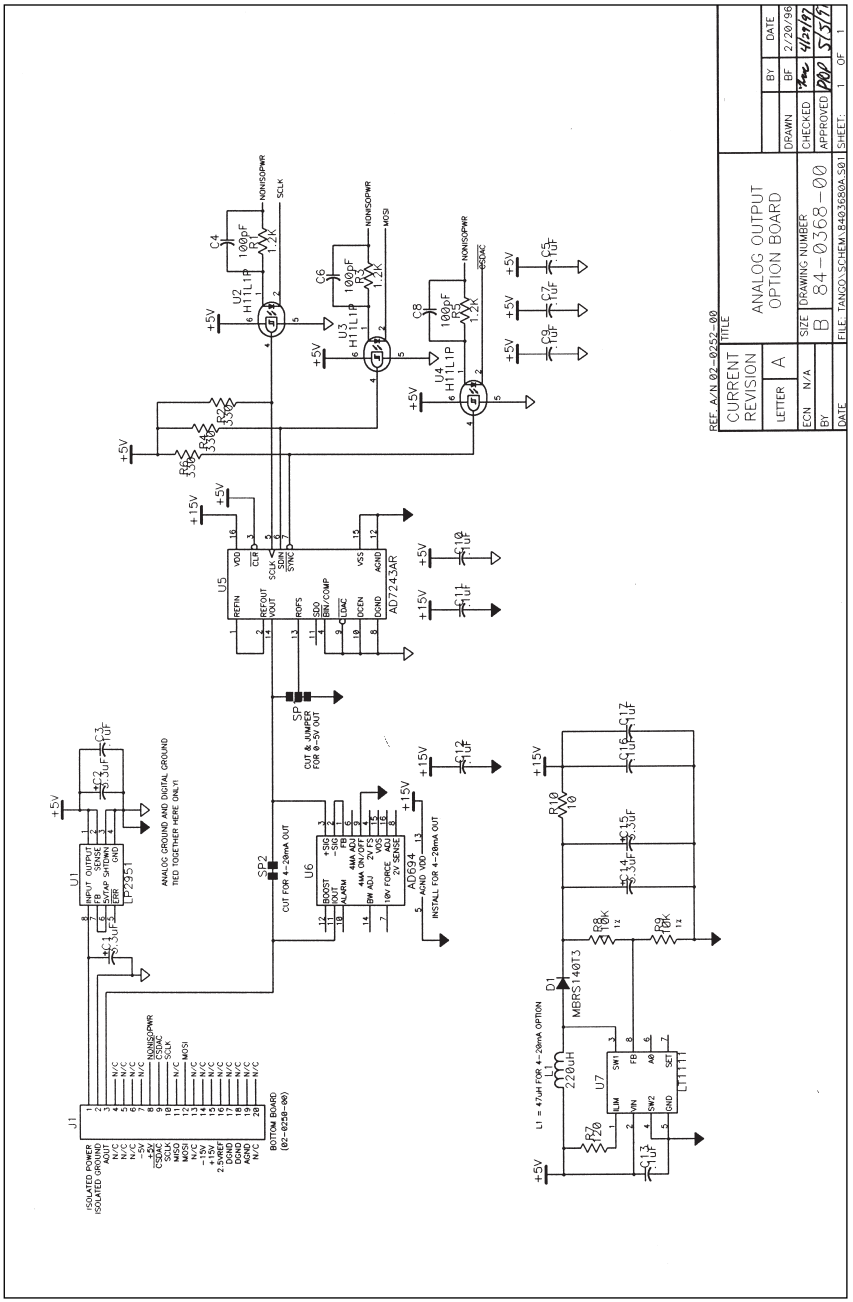
SCHEMATIC (DP-7600 Bottom Board)



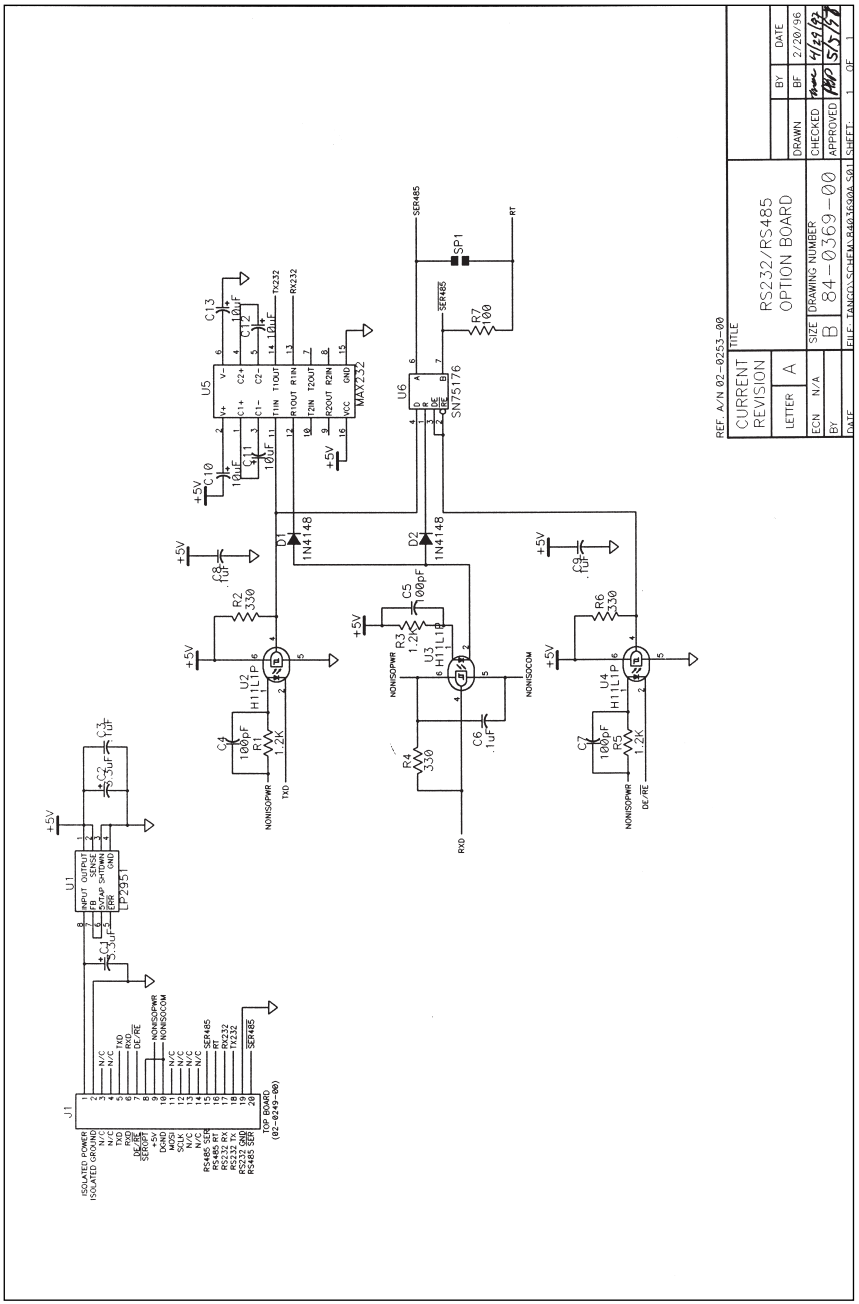
SCHEMATIC (DP-7600 Analog Input Option Board)



SCHEMATIC (DP-7600 Output Option Board)

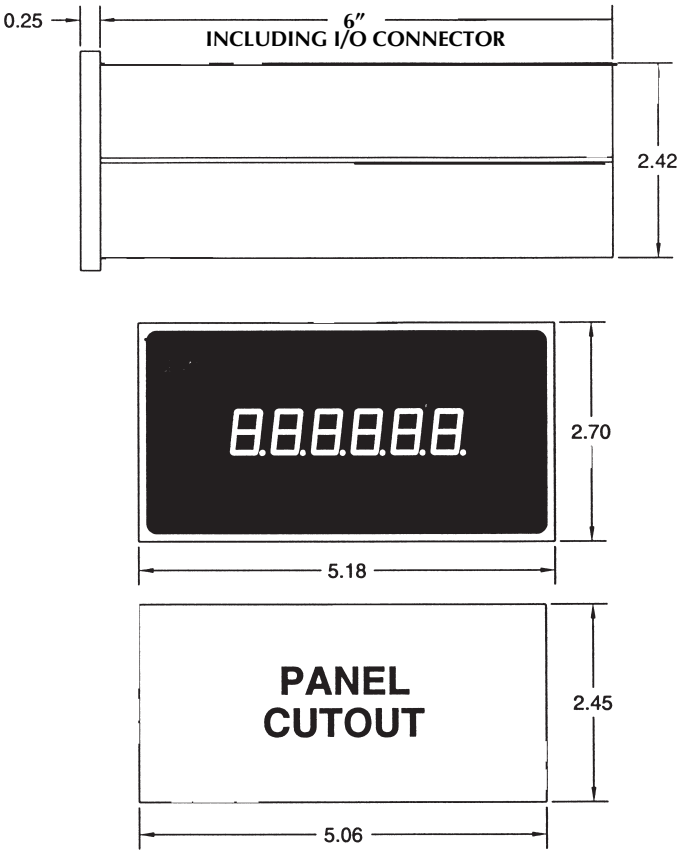


SCHEMATIC (DP-7600 RS232/RS485 Option Board)

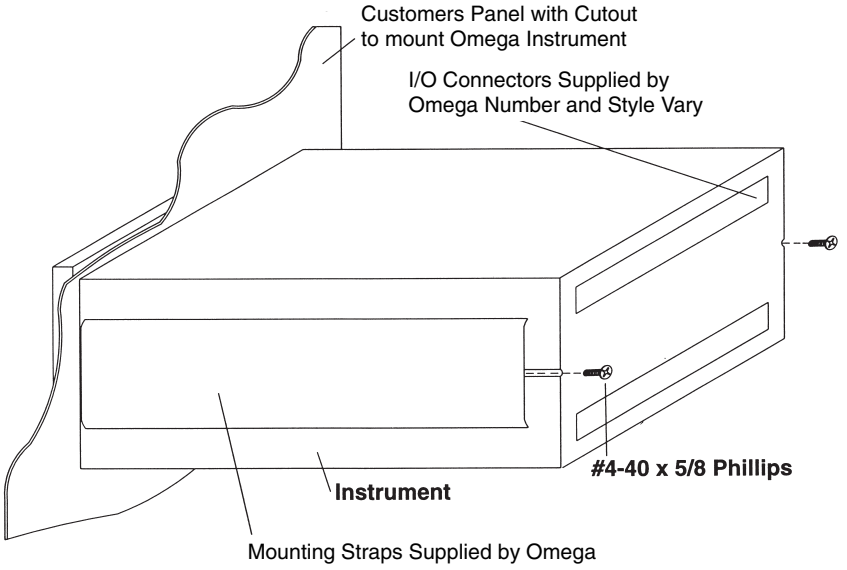


DIMENSIONS

CASE SIZE B



MOUNTING



Note: Use Corner Screw of Case for Case Ground

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