

USER'S GUIDE



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DPS3301 Series Wall-Mount **Programmable** **Temperature Monitor**

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SPECIFICATIONS

Typical @ 25 C and rated supply voltage unless otherwise specified.

INPUTS:

- Input types: J,K,T,E,R,S,B t/c, RTD, Voltage, Millivolt, Current & thermistor
- Cold junction compensation error: +/- 0.5C max (10C to 40C)
- Open thermocouple indication: 'OPEN TC' displayed

OPTIONS:

- 240Vac @ 50 Hz Power Supply
- 15Vdc @ 1000ma. Power Supply
- Open Collector output: 6 open collector transistors @ 50ma. sink each
- Relay output: 6 SPST 1 Amp. @ 28Vdc, 0.5 Amp. @ 120Vac (resistive load)
(for 220 Vac units only 0.25Amp.@ 240Vac (resistive load))

ACCURACY:

- Temperature resolution: 1 C/1 F, 0.1C for Thermistor
- 0.1% of Full Scale (Base metal T/C), 0.5% others

ANALOG TO DIGITAL CONVERSION:

- 4 1/2 Digit (20000 count) A/D conversion.
- Dual slope integrating converter.
- Conversion Rate: 7 /sec. typical

POWER REQUIREMENTS:

- 120Vac, 0.2 Amp. @ 60 Hz

DIMENSIONS:

- Case: 7.55"W x 6.29"H x 4.05"D
- IP65 rated plastic enclosure
- Weight: 2.63 lb. (1.19kg.)
- Enclosure: All Plastic enclosure—IP65 Ingress Protection

DISPLAY:

- Red 7-segment LED display, 0.39 inch (10mm) digit height
- Negative polarity indication
- Out of range indication: HELP
- Display Test: Briefly displays 8.8.8.8.8.8. on power up

RELIABILITY:

- Calibration: NIST traceable
- Recalibration: Recommended at 12 months interval

DESCRIPTION

Housed in a wall-mount, water-tight plastic enclosure, the DPS3301 Series is a powerful temperature monitor/indicator. It accepts a single Thermocouple, RTD or Thermistor sensor input and then displays the temperature in either degrees C or F. In addition, it also monitors a number of useful functions such as high and low process readings, process run time, rate of process change etc.

Keys are appropriately labeled, so that the user would not have to memorize their functionality. A passcode requirement keeps unauthorised personel from changing critical parameters such as limits, timers etc.

The DPS3301 also functions as a rate monitor, indicating instantaneous as well as average rate of temperature change. Programmable time base allows the rate to be displayed in per second, minute, hour or any other interval. Also, the unit can be programmed for a rate alarm. This allows control of a process if a predetermined rate is exceeded or not achieved. The time function keeps track of process run time.

Maximum and minimum temperature readings are constantly tracked and can be helpful in quality control or monitoring unattended processes (e.g. overnight).

Various process parameters monitored by the system may be displayed by pushing the appropriate keys on the front panel, e.g. (Rate, Peak etc.). The respective parameter will be displayed as long as the key is kept pressed. Alternately, if the key is pressed and then released, the unit will display a particular parameter briefly and then go back to temperature display mode.

Four process alarms (optional) are also featured, which are programmable over the entire range of selected input type. Also provided are two timers (optional) that work independently or in conjunction with process limits e.g. turning on a fan ten minutes after limit 1 temperature is reached.

Process limit relays may be operated in two different modes:

1. Non-latching mode, in which the relays reset automatically as soon as the temperature falls below the limit (minus the relay dead-band).
2. Latching mode, in which the relays stay energized even after the temperature falls below the programmed limit. In this mode the relays will stay on until manually reset.

THERMOCOUPLE OR RTD SELECTION

DPS3301 instruments ordered for Thermocouples or RTD's can be programmed through the front panel keys to work with one of these specific inputs (Input type or options depend on Model number ordered).

When DPS3301 is first turned on, a 'display segment test' is done by briefly displaying 8.8.8.8.8.8., followed by the software revision number (**rEn X.XX**) and input signal type.

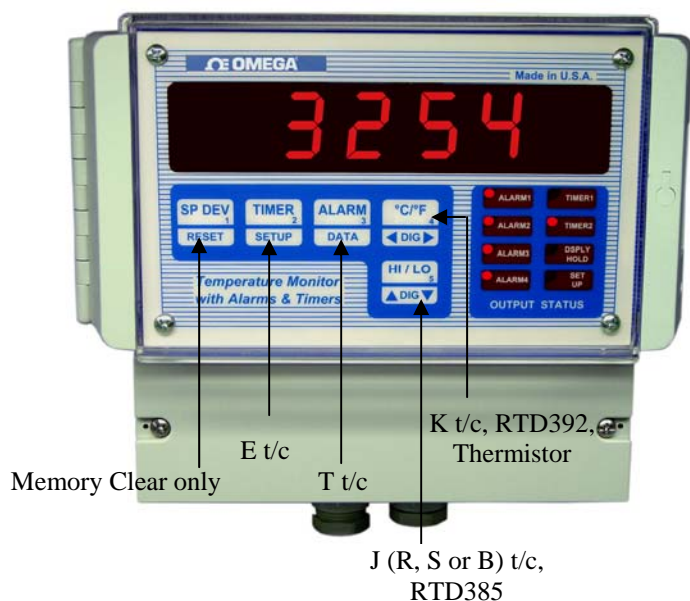
<u>Input type</u>	<u>Display shows:</u>
J (R,S,B, rtd 385, Thermistor, Millivolt, Voltage, Current)	J tC (r, S, B, rtd 385, tHrStor, Lo VoLt, HI VoLt, CurrEnt)
K (rtd 392)	Cr.AL tC (rtd 392)
T	t tC
E	E tC

Factory default thermocouple/RTD selection can be obtained as explained below:

How to Reset and Program Thermocouple Type (or RTD)

A DPS3301-TC that is calibrated for a J, K, T, or E type thermocouple or an RTD model may be programmed for a specific thermocouple, or RTD (385/392) type, by going into SETUP mode (Look under 'SETUP'). Alternately, a thermocouple/RTD may be selected by turning **On** power to the unit while **holding in** the appropriate key (see Figure 1). This procedure also clears the memory and programs factory default values for limits, rate timebase etc. Therefore, after performing Power-up reset, various parameters such as limits, rate time base etc., must be re-programmed to a desired value. However, if done in SETUP mode, no programmed parameters such as limits, Timers etc. are erased from the memory. It is recommended that thermocouple (RTD) selection be done in SETUP. Power-up reset should be performed if it is suspected that program memory may have been corrupted due to power surge, noise on electrical lines etc.

FIGURE 1. Thermocouple/RTD Selection Keys



<u>KEY</u>	<u>Input Type Selected</u>
HI/LO	J (R, S or B , RTD 385) Thermistor
C/F	K (RTD 392)
ALARM	T
TIMER	E
RESET	Memory cleared – no factory default values programmed.
.	NOTE: All keys, except RESET, clear memory and program necessary factory default values. RESET key clears memory only and programs no default values. However, previous thermocouple type is retained.

DISPLAY MODES

The DPS3301 can be programmed to display in any one of the following modes:

<u>Mode</u>	<u>Display</u>	<u>Description</u>
PROCESS	PrOCCESS	Displays process value.
SETPOINT DEVIATION	SP. DEVN	Displays setpoint deviation.
INSTANTANEOUS RATE	In. rAtE	Displays Instantaneous rate value.
PROCESS HIGH	Pr. HIGH	Displays process' highest reading
PROCESS LOW	Pr. LO	Displays process' lowest reading
ELAPSED TIME	ELPSd. T	Displays elapsed time.
TIMER 1 COUNT DOWN	tr1. Cnt	Display Timer 1 count down value
TIMER 2 COUNT DOWN	tr1. Cnt	Display Timer 2 count down value
SCAN	SCAN	Scans through all the above parameters

SEE SETUP ON HOW TO SELECT ONE OF THE DISPLAY MODES.

RETAINING USER SETTINGS ON POWER DOWN

DPS3301 saves all the programmed parameters in an EEPROM (electrically erasable programmable read only memory). An EEPROM stores the programmed parameters even when the power is removed from the unit. However, it is important to note that if the parameters are being changed during setup, they must be saved in the EEPROM by **pressing and holding** the 'RESET' key (till **SAVING** is displayed) as described under SETUP. If parameters are **NOT** saved and the power is removed from the unit, any newly changed values will be lost (the unit will, however, maintain the old values).

DISPLAY UNITS C/F:

DPS3301 units can display temperature in either degrees Centigrade or Fahrenheit. To switch the display from Fahrenheit to Centigrade or vice versa, simply push the C/F key once. The display will read 'dEGrE F' if the unit enters degrees Fahrenheit mode. It will display 'dEGrE C' if Centigrade mode is enabled. Following the message, the unit will start displaying temperature in selected engineering units.



SETPOINT DEVIATION:

A useful feature of DPS3301 units is tracking of a setpoint relative to process value at any given point in time. To display deviation, push the key labeled 'SP DEV' once. The display will read 'SP DEVN' following which the deviation reading will be shown. A second push on the same key while it is displaying deviation will indicate the current setpoint value.



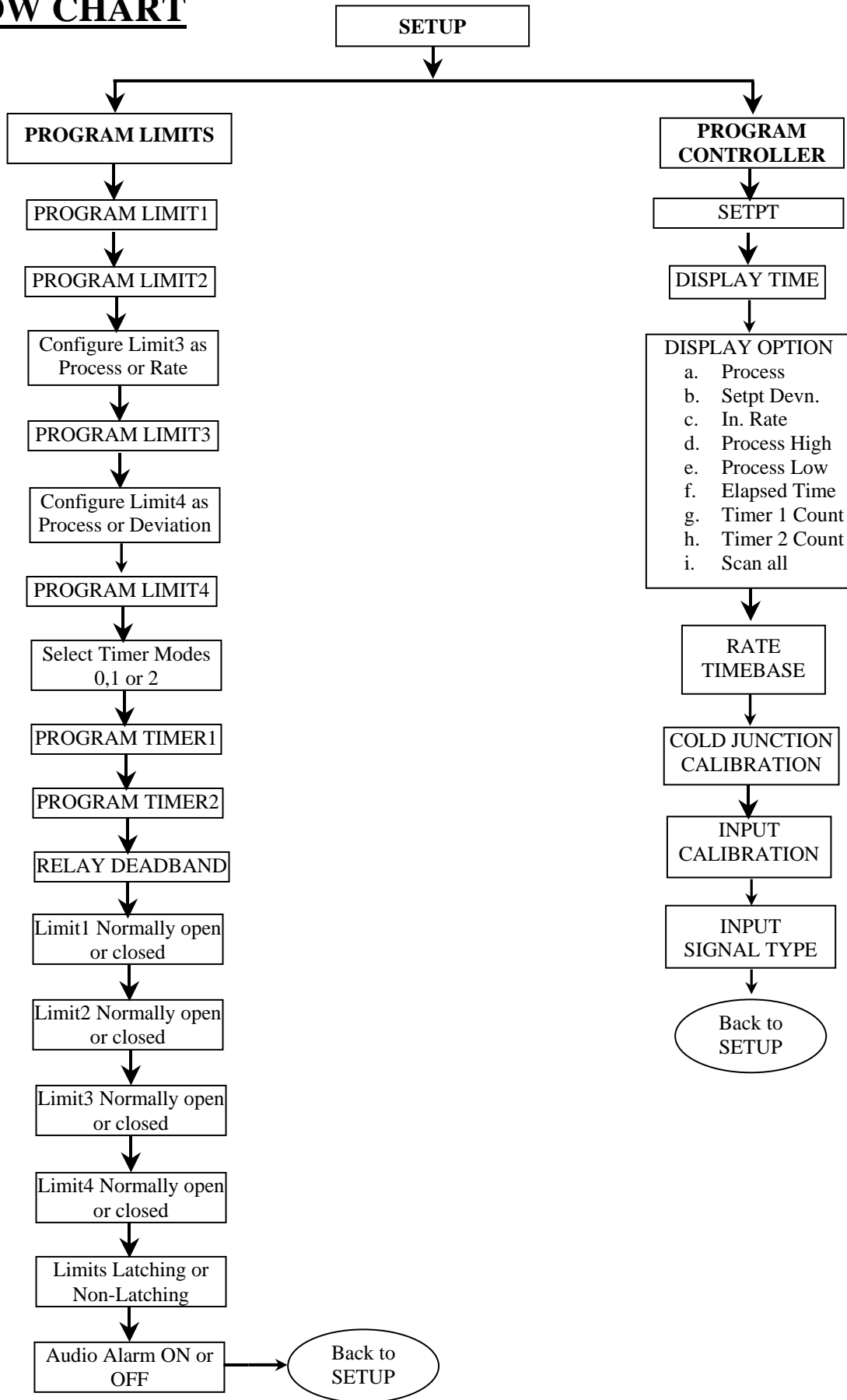
Setpoint value that needs to be tracked can be entered in two different ways. One is during setup mode and the other is using the front key labeled 'SP DEV'. SETUP mode entry is used when a particular value needs to be programmed e.g. 500, 850 and so on. To enter Setpoint in this mode, look under 'SETUP'.

If it is desired to start tracking setpoint deviation from **current process reading** then front key entry mode is used. Assume that current reading on the display is 476 F. To enter this temperature as your setpoint, first push 'SP DEV' key twice (first push displays deviation from current setpoint, and the second push displays current SETPT value). After the second push keep **holding in** the 'SP DEV' key. After a brief delay the display will flash the message 'SETPT' three times. Following the third flash, the unit will take the current process reading and save it as the new SETPOINT. If the process reading is 500, then taking our above example, pushing 'SP DEVN' key will display 24 as your deviation value. Note that if 'SP DEVN' key is released before three flashes of 'SETPT' message, the unit will not enter a new setpoint. However, old setpoint value will be retained in the memory.

DISPLAY HOLD FEATURE:

DPS3301 offers a display hold feature. When ever pins 13 and 14 are shorted together (e.g. through a remote switch), the reading taken at the time of shorting is frozen on the display. The unit will continue displaying this value until the short is removed. This is indicated by the display periodically flashing the message '**Pr HoLD**'. Internally the unit keeps monitoring the actual process and limits and timers will be activated if process exceeds their programmed values. However, the display will indicate the hold temperature.

FLOW CHART



SETUP MODE

Setup is used for configuring various parameters of DPS3301 unit. These parameters include entering limits, timers, dead-bands etc.

Entering and Exiting Setup Mode:

To get into setup mode, press and hold **SETUP** key. The display will show **ELPSd t** and then the value of elapsed time. Keep holding-in '**SETUP**' key till the display shows '**SETUP**' and starts scrolling the message '**EntEr PASSCOde**'.

To return from **SETUP** to normal display/run mode, simply push and hold down the '**RESET**' key. On exiting, the display will briefly show '**SAVING**' to indicate that the new data is being saved in nonvolatile memory (key should be held in until the word '**SAVING**' shows up on the display). Setup mode is also exited automatically if no key action is detected for about 5 minutes. On automatic exit, all the changes made up to that point are saved in the permanent memory.

How To Increase/Decrease Programmable Values in Setup

Once a parameter is displayed (e.g. 01234), the '**^DIG v**' key can then be used for increasing or decreasing the value of the flashing digit. For incrementing, push and hold in '**^DIG v**' key. To decrement, release '**^DIG v**' key and immediately push it (and hold in) again. To move on to the next digit, push '<DIG>' key till the desired digit starts flashing. Again, use '**^DIG v**' key to change its value.

Passcode Entry:

Passcode entry is a four digit number which keeps unauthorized personnel from changing the unit's parameters. Front panel keys are each marked with a small digit in the lower right corner. For the five keys there are five digits --- 1,2,3,4,5. Pass-code is a combination of these digits and for DPS3301 units the pass-code to program *new* parameters is **3254**. Three attempts at entering the correct pass-code are allowed. Anytime a wrong digit is entered, the display will read **HELP**. If correct pass-code is not entered within three attempts, the system will exit **SETUP** and return to normal display mode. To make another attempt, you have to get into setup again by holding in '**SETUP**' key.

As soon as correct four digit pass-code is entered, the unit is ready for setup. At this point the unit will display '**PrG Ctr**' (for 'Program Controller'). Available options at this point are:

1. **PrG Ctr** (for 'Program Controller')
2. **PrOG Lt** (for 'Program Limits')

The unit starts with 'Program Controller' as the active mode (displaying **PrG Ctr**). To select alternate mode, push '**^DIG v**' key. Once the desired mode is displayed, push '**SETUP**' key to select it.



'PROGRAM CONTROLLER' MODE

'PROGRAM CONTROLLER' MODE

Display Time

On entering Program Controller mode, the very first step lets you program is the display time. This determines the length of time (in seconds) that any VALUE is displayed before message, such as 'PROCESS' is flashed.

The unit will first show 'dSPly t' (for Display Time), and then the current setting in seconds. Use '^DIGv' and '<DIG>' key to set the desired display time. Push 'SETUP' key following the selection.

Display Option:

This is indicated by the display briefly reading 'dSP OPT' (for display option) and then the currently selected Option. Use '^DIGv' key to step thru various options. Once the desired option has been selected, push 'SETUP' key to enter it and go on to set Display Time.



Display Mode

Display shows

Description

PROCESS	PrOCCESS	Displays process value.
SETPOINT DEVIATION	SP. DEVN	Displays setpoint deviation.
INSTANTANEOUS RATE	In. rAtE	Displays Instantaneous rate value.
PROCESS HIGH	Pr. HIGH	Displays process' highest reading
PROCESS LOW	Pr. LO	Displays process' lowest reading
ELAPSED TIME	ELPSd. T	Displays elapsed time.
TIMER 1 COUNT DOWN	tr1. Cnt	Display Timer 1 count down value
TIMER 2 COUNT DOWN	tr1. Cnt	Display Timer 2 count down value
SCAN	SCAN	Scans through all the above parameters

Rate Time-Base:

This step is for programming time-base for calculation of Rate. Units of time-base are seconds. Again, the active digit will be flashing. Message displayed before the value is "rATE tb:. To change the value, push ^v key. To activate another digit for change, use <DIG> key. On finishing, push SETUP key.



Cold Junction adjustment:

After setting Heat/Cool mode, the next parameter is the cold junction reference temperature adjustment. The display will first show 'COLd Jn', and then the cold junction temperature will be indicated. Use '^DIGv' key to adjust until the display reads the proper temperature. Once the correct temperature is displayed, push 'SETUP' key to enter that setting and go to temperature Calibration mode.



NOTE 1: The unit comes pre-calibrated from the factory. However, the above procedure can be used if any adjustment is required to the Cold-junction reading.

NOTE 2: Cold-junction temperature is the temperature of the connector that connects the thermocouple to the unit. This temperature is usually higher than ambient temperature, particularly after the unit has been powered for some time. This is due to the heat generated by internal electronics of the unit. For precise calibration, measure the temperature at thermocouple connector and then adjust Cold-junction reading.

NOTE 3: No cold-junction calibration is required for RTD or thermistor units. Therefore, this step is omitted in RTD or Thermistor units.

Thermocouple Calibration:

For base-metal thermocouples (type J, K, T and E), calibrating one type of thermocouple calibrates all. While calibration can also be performed outside of setup procedure (in main Process display mode), doing this in 'SETUP' eliminates flashing 'PROCESS' message from interrupting the procedure. Also, raw A/D input can be viewed in this mode by pushing 'SETPT' key. This allows for adjusting any offset errors and thus allows for more precise calibration.



Thermocouple Calibration Procedure

Note: Make sure the unit is reading correct cold-junction temperature before calibrating. If incorrect, adjust as described in the " Cold Junction adjustment" section.

For thermocouple calibration (type J T/C), following steps should be performed. Note that only one type of thermocouple need to be calibrated (i.e. J,K,T or E). For example, if the calibration is done for a type K thermocouple, types J, T, and E are automatically calibrated.

1. Connect a thermocouple calibration source to the signal input connector.
2. Dial in 725 degrees centigrade (Note: unit must be programmed for displaying in centigrade).
3. Adjust gain pot on the back of the instrument (ref. Fig. 7, Pg. 21) until the display reads '725'.
4. Short the input connector with a wire or shorting bar (make sure the source is removed so as not to damage it --- shorting the input connector will short the output of the source).
5. Push 'SETPT' key. The display will read 'U 00002' --- or some other value.
6. Adjust offset pot on back of instrument (ref. Fig. 7, Pg. 21) until the display reads '0000'.
7. Push SETUP key once -- the display should read close to Cold Junction temperature.
8. Remove the shorting bar from the input and connect the thermocouple calibrator again.
9. Repeat steps 2 through 7 till the unit reads proper temperature.

NOTE 1: The unit must be powered up for at least ten minutes before any adjustments are made.

NOTE 2: For calibrating units with RTD or Thermistor inputs, connect the source to input connector, dial in a temperature near high end of the scale and adjust gain potentiometer on the back of the unit (See figure 7 for reference).

Thermocouple type Selection:

Next function is the last one in system setup. Here you select the type of thermocouple for which the unit has been calibrated. First the display shows the message **'IP tYPE'** (for 'Input Type') followed by current thermocouple selection. For various thermocouples the unit reads:

Thermocouple type	Display shows
J T/C	J tC
K T/C	Cr.AL tC
T T/C	t tC
E T/C	E tC

For units with RTD input, the selection is between **RTD 392** or **RTD 385**. Thermistor units display **'tHrStOR'** (for 'Thermistor') and units with R, S and B type thermocouples display **'r tC'**, **'S tC'** and **'b tC'** respectively with no selection option (since these units offer only one type of input)

To make an alternate selection, push **'^DIGv'** key. After making the selection, push **'SETUP'** key. This last push will take you to the very beginning of setup mode with the display reading **'PrG Ctr'**. At this point either push **RESET** key to get out of setup or select any other option as described before.

'PROGRAM LIMITS' MODE:

Process Limits (1 thru 4):

If selection made from programming group is for 'PROG LT' then the very first parameter programmed is process limit 1. This is indicated by the message **'PrG. LT1'** followed by pre-programmed value of the limit. Again, use **'<DIG>'** key to move flashing to the next digit and **'^DIGv'** key to increment/decrement value of the flashing digit.

The procedure for programming limits 2,3 and 4 are very similar to limit 1 (provided Limits 3 and 4 are setup as process limits). However, limits 3 and 4 can be configured to work as rate and deviation limits. If such is the case, then, after programming limit 2, the next step takes us into selection of limit 3 as rate or process limit.

Selection of Limit 3 as Process or Rate Limit:

This step comes after programming Limit 2 and is indicated by the message **'LT3 RTE'** (if Limit 3 is setup as Rate limit) or **'LT3 Pr'** (if Limit 3 is setup as Process limit). Alternate selection can be made by pushing **'^DIGv'** key. Push **'SETUP'** key after making the selection.



Programming Limit 3:

As Process Limit:

If Limit 3, in the above step, was configured as a Process limit, then the message displayed on entering this mode will be '**PrG Lt3**'. This will be followed by displaying the current value of Limit 3 . Use '<DIG>' key to move flashing to the next digit and '^DIGv' key to increment/decrement the value of flashing digit.

As Rate Limit:

If Limit 3, in the above step, was configured as a Rate limit, then the message displayed on entering this mode will be '**RATE Lt**'. This will be followed by displaying the current value of Limit 3 . Use '<DIG>' key to move flashing to the next digit and '^DIGv' key to increment/decrement the value of the flashing digit.



Selection of Limit 4 as Process or Deviation Limit:

This step comes after programming Limit 3 and is indicated by the message '**LT4 Pr**' (if Limit 4 is setup as Process limit) or '**LT4 dEN**' (if Limit 4 is setup as deviation limit). Alternate selection can be made by pushing '^DIGv' key. Push **SETUP** key after making the selection.

Programming Limit 4:

As Process Limit:

If Limit 4, in the above step, was configured as a Process limit, then the message displayed on entering this mode will be '**PrG Lt4**'. This will be followed by displaying the current value of Limit 4 . Use '<DIG>' key to move flashing to the next digit and '^DIGv' key to increment/decrement the value of the flashing digit.



As Deviation Limit:

If Limit 4, in the above step, was configured as a Deviation limit, then the message displayed on entering this mode will be '**dEVN Lt**'. This will be followed by displaying the Limit 4 value . Use '<DIG>' key to move flashing to the next digit and '^DIGv' key to increment/decrement the flashing digit.

Configure Timing Mode

DPS3301 is equipped with 2 versatile timers that may be programmed to operate in 3 different modes, referred to as Timer Mode 0, 1, or 2.

Mode 0 is an elapsed time mode in which the timer starts running as soon as the instrument is turned on or the timer is reset. After the programmed amount of time has elapsed, the timer output is



energized.

In Mode 1 the timer is ON for a programmed amount of time **after** a temperature limit is reached (limit 1 for Timer 1 and Limit 2 for Timer 2). When programmed amount of time has elapsed, the timer is de-energized.

Mode 2 is used to produce a programmable time delay after the temperature limit is reached. After the delay, the timer output comes ON and stays ON until reset by the operator. For more details, refer to the **TIMER MODES** section.

This mode is indicated by **tr 0**, **tr 1** or **tr 2** for timer mode 0, 1, or 2. Use **DIG** key to select desired timer mode.

Timers 1 and 2:

This mode lets you enter values for timer 1 and 2. The display will read **TR1 LT** (for timer 1 limit) and **TR2 LT** (for timer 2 limit) followed by current programmed value of each of the timers. To change the value use **<DIG>** key in conjunction with the **^DIGv** key. Once done, push **SETUP** key to go to the following parameter.



Relay Deadband:

The parameter programmed after timers is limit deadband. The display will first read **"DEAD BD"** and then show the value of previously programmed dead-band. To change the value of flashing digit, press **^v** key. To move flashing digit, push **<DIG>** key. After programming the desired value of "dead-band" push **SETUP** key to get to the next function.



Configuring Limits Normally Open/Normally Closed:

Following relay deadband, the alarm outputs are configured as normally closed or normally open. This will be indicated as **LT1 N.O.** (if limit 1 is programmed as normally open) or **LT1 N.C.** (if limit 1 is programmed as normally closed). To make an alternate selection, push the **^DIGv** key. After selecting or to retain current setting, push **SETUP** key. The following three steps are similar to the last step and in limits 2,3 and 4 are setup as normally open or normally closed.

Relay Latching/non Latching:

The next function is configuration of relays as latching or non-latching. In non-latching mode, the relays will reset automatically when the process variable drops below the programmed limit. In the latching mode once the relays are energized they have to be reset manually even though the process variable might have fallen below the limit (latching/non-latching mode is only for process, rate and deviation limits). If the system is in latching mode the display will read **LATCH**. Alternately, the display will read **NON LCH** (for "non latching"). To get the alternate mode push **^DIGv** key. To retain present mode push **SETUP** key.



Audio Alarm On/Off:

This unit supports an audio alarm option which comes on when ever a limit value is exceeded. This alarm can be turned On or Off, as desired. The selection is made by pushing '^DIGv' key. If the alarm is ON, the display will read 'ALR ON' (Alarm On). Alternately, it will display 'ALR OFF' (for 'Alarm Off'). Push 'SETUP' key after desired setting is displayed. This last push on SETUP key will also take you back to the very beginning of setup mode.

To get out of SETUP mode at this point (or at any time during setup), simply push and hold RESET key. The display will read 'SAVInG' and then exit setup.



RATE

DPS3301 monitors rate of change of temperature per programmed time base and can be displayed by pushing the 'DATA' key (time base is programmed during SETUP procedure). The unit is capable of displaying instantaneous (calculated over the last time base period) as well as average rate of temperature change. Push DATA key sequentially till the display reads 'In rAtE'. On releasing the DATA key at this point will display instantaneous rate. One more push on DATA key will bring up the unit in Average rate display mode. The unit will display Average rate value preceeded by the message 'AG RATE'. Averaging of the rate can be reset by resetting 'Elapsed Time' (push 'TIME' and 'RESET' keys simultaneously to reset TIME).

Rate Alarm:

Limit 3 has the capability to work either as process alarm or as rate alarm. This configuration is done during setup (look under SETUP). Also entered during setup is the alarm value. Programmed rate alarm value is absolute and it works on negative as well as positive rates e.g. if rate alarm value is 10, then alarm output will get activated if rate exceeds -10 or +10. It should be noted that rate alarm is based on instantaneous rate calculated over last time period (look under SETUP to program time period).

Resetting Rate Alarm:

Once energized, rate alarm can be reset in two different ways --- automatically or manually (non latching or latching). In non latching mode the alarm output will de-energize automatically when rate drops below rate limit value. In latching mode, the output has to be reset manually. For manual reset, first make the display indicate 'rAtE Lt' (for 'Rate Limit') by pushing the 'DATA' key successively (also look under 'Process Alarms'). Next, while keeping the 'DATA' key pushed, go on to push the 'RESET' key. Rate alarm will de-energize and the display will indicate so by displaying RLY RST. Selection of latching or non-latching mode for outputs is done during setup.

SETPOINT DEVIATION ALARM:

Setpoint deviation is the differential between actual process reading and current setpoint. This feature is useful for monitoring how well the process is keeping up with the ramping setpoint. To display deviation, push 'SP DEV' key once. The display will read 'SP DEVN' following which the current deviation of process from the



setpoint will be indicated.

Deviation Alarm:

Limit 4 has the capability to work either as process or as deviation alarm. This configuration is done during setup (look under SETUP). Also entered during setup is the alarm value. Programmed value is absolute and it works on negative as well as positive deviation e.g. if deviation alarm is set to 10, then output will get activated if process deviates -10 or $+10$ from the Setpoint.

Resetting Deviation Alarm:

Deviation alarm can be programmed to reset automatically or manually (non latching or latching). In non latching mode the alarm output will de-energize automatically when deviation drops below deviation limit value. In latching mode, the output has to be reset manually. For manual reset, first make the display indicate 'dEVn Lt' (for 'Deviation Limit') by pushing 'DATA' key successively (also look under 'Process Alarms'). Next, while keeping the 'DATA' key pushed, go on to push the 'RESET' key. Deviation alarm will de-energize and the display will indicate so by displaying RLY RST. Selection of latching or non-latching mode for outputs is done during setup.



PROCESS ALARMS

Displaying:

The DATA key is used for displaying Process Variable limits. Pushing the 'DATA' key sequentially brings up the display of limit 1 through limit 4 value. Display format is 'PR LT1' followed by the value of limit 1. Each consecutive push thereafter will display 'PR LT2' and programmed limit 2 value, 'PR LT3' and its value, 'PR LT4' and its value. If limits 3 and 4 are configured as rate and deviation limits respectively, then the third push will display 'rATE Lt' followed by rate value and the fourth push will display 'dEVn Lt' followed by deviation limit value. The programming of process limits is done during setup procedure (look under SETUP).



Resetting:

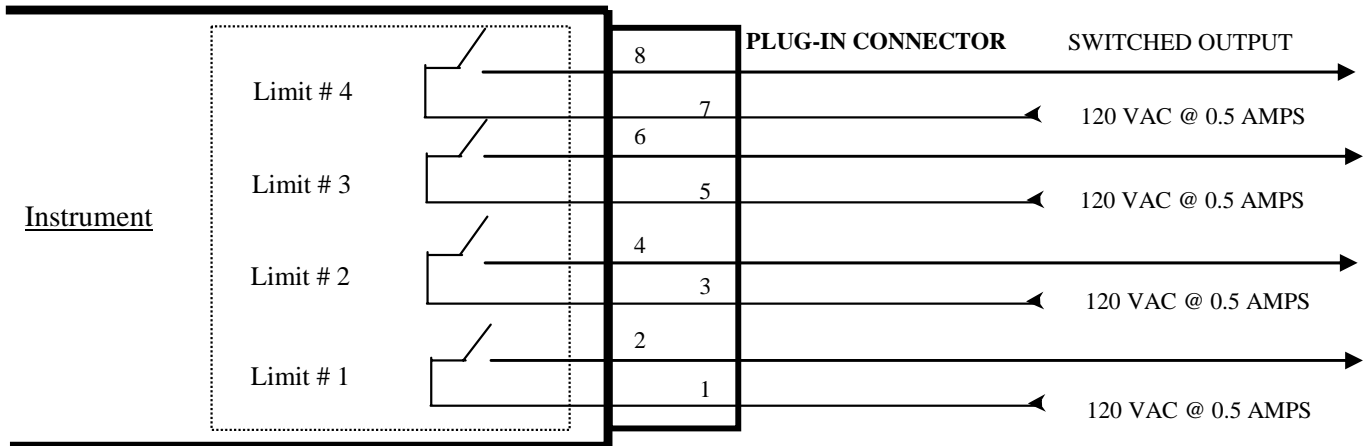
Once energized, alarms can be reset in two different ways --- automatically or manually (non latching or latching). In non latching mode the alarm outputs will de-energize on their own when the process variable drops below the limit value. In the latching mode they stay energized even if the process variable drops below the limit. To reset the energized outputs in latching mode, first make the display indicate the limit that needs to be reset e.g. 'PR LT2', by pushing the 'DATA' key (as described above under 'Displaying'). Next, while keeping the 'DATA' key pushed, go on to push the 'RESET' key. The respective alarm output will de-energize and the system will indicate so by displaying RLY RST. Selection of latching or non-latching mode for outputs is done during setup.

Electro-Mechanical Relay Option

DPS3301 units can be ordered with either open collector outputs or electro-mechanical relays for process

limit alarms. (Check model number printed on the unit for option). If ordered with relays, then these relays are programmed during Setup to operate as Normally Open (NO) or Normally Closed (NC). The default setting is Normally Open. Each of these limit relays provides a switched output whenever a limit is reached. The maximum rating for a 120Vac unit is 120Vac @ 0.5 amp or 28 Vdc @ 1.0 amp.

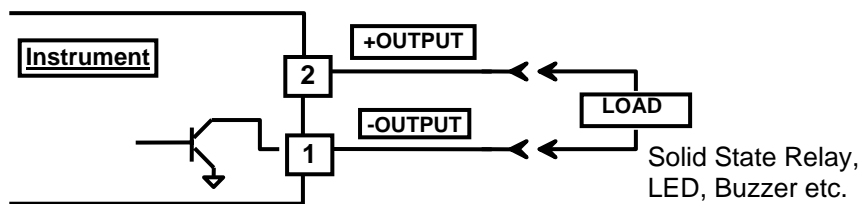
Figure 2. Electro-mechanical Relays Hookup Example



Open Collector Option

Whenever a limit is reached (on units with open collector output option) an open collector output provides a return for 5 Vdc signal at 50ma on the output connector, e.g. Limit 1 provides its 5 volt output signal between pins 1 and 2. A solid state control relay with a 5Vdc coil that draws 50 ma. or less is recommended for use as shown in figure 4 below. The monitor supplies +5Vdc on pin #2 and the open collector switch to ground on pin #1. The control relay should be driven by controller's internal power supply off of pin #2 to avoid introducing ground loops or electrical noise into the unit.

Figure 3. Open Collector Hookup Example



TIMERS

The system features two timers that can be programmed from 1 - 99999 seconds. These timers come in handy when some time-based functions have to be performed. For example, it is possible to start a vacuum pump after a certain amount of preprogrammed time or to shut down a process a certain amount of time after reaching a preprogrammed temperature ,etc. Timers can be programmed to operate in one of three possible modes (see below).



To display Timer #1 value, push the **TIME** key *twice*. The first push shows elapsed time, while the second push will first display 'tr1 Cnt' (for **Timer1** Count) and then Timer 1 value.

To display Timer #2 value, push **TIMER** key *three times*. First two pushes display elapsed time and timer 1 value respectively, while the third push brings up timer 2 value on the display. This is, however, preceded by the message 'tr2 Cnt' (for **Timer 2** Count).

Resetting Timers:

The two Timers can be reset any time and their timing cycle started all over again. To reset Timer 1, push '**TIMER**' key twice and hold it in. This will bring time left on Timer 1 on the display. While this is being displayed, simultaneously push the '**RESET**' key. Timer 1 will reset and its timing cycle will start again (depending on Timer Mode and Process reading i.e. if it is above Limit 1 or below).

Similarly, to reset Timer 2, push '**TIMER**' key three times and hold it in. This will display remaining time on Timer 2. While this is being displayed, simultaneously push the '**RESET**' key. Timer 2 will reset and its timing cycle will start again (depending on Timer Mode and Process reading i.e. if it is above Limit 2 or below).

TIMER MODES

Timer Mode #0

The timer starts timing from the moment the system is either turned on or the timer is reset. After the programmed amount of time has elapsed, the respective timer outputs will energize.

Timer Mode #1

When temperature Limit #1 or Limit #2 has been reached, the corresponding timer output (Timer #1 output for temperature Limit #1 and Timer #2 for temperature Limit #2) will energize and will stay energized for programmed length of time. After this time has elapsed, the output will de-energize.

Timer Mode #2

The timing for respective timers starts after the temperature Limit #1 or Limit #2 has been reached. For example, if temperature Limit #1 and Limit #2 are 500 and 1000 degrees respectively and Timer 1 and Timer 2 are programmed for 30 minutes each, then Timer 1 output will come on 30 minutes after the system reads 500 degrees temperature. Similarly Timer 2 output will come on 30 minutes after 1000 degrees temperature has been reached.

ELAPSED TIME

The system keeps track of process run time since the unit is turned on or the time is last reset. To display elapsed time, press the '**TIME**' key. The display will briefly read 'ELPSd t' (for elapsed time), and then indicate process run time. Display format is HH.MM.SS (HH=hours, MM = minutes, SS = Seconds). Maximum time that can be displayed is 999 hours 59 minutes and 59seconds.

How to reset Elapsed Time

To reset elapsed time and start timing again, press '**TIMER**' key once and while keeping it pressed, push '**RESET**' key. The display will show current elapsed time very briefly, and then reset to 0.

HIGH AND LOW PEAKS

A useful feature provided by the DPS3301 system is its ability to track high and low temperature peaks. This function is useful if a process must be left unattended for a long period of time, and it is necessary to find temperature extremes during the unattended period.

High and low process peaks are displayed by pushing 'HI/LO' key. Pushing this key once will display the message 'HIGH Pt' (for High Point) and then the value of the highest temperature monitored by the unit. Similarly, to display the lowest reading monitored, press 'HI/LO' key a second time. The display will read 'LO Pt' (for 'LOW POINT') followed by the value of the lowest monitored reading.



How to Reset High & Low Peak readings

To reset high peak to current temperature, display the value of high peak as described above. While keeping the 'HI/LO' key pushed (as the high peak value is displayed), simultaneously push the **RESET** key. On resetting, the display will indicate the new high peak value.

To reset low peak to current temperature, push 'HI/LO' key twice (first push displays high peak value). While low peak value is being displayed, simultaneously push the **RESET** key. On resetting, the display will indicate the new low peak value.

OUTPUT STATUS:

The system has optional process and timer alarm outputs that are activated when the limit is achieved. Alarms can be programmed as normally open or normally closed (see SETUP). The status of these is indicated by LEDs on the front panel. When ever an alarm is activated the respective LED is turned on.

POWER

Power connection should be made to the 3 terminal Connector as shown in figure 7. It should be noted that it is very important that while making the connection, the power LINE inputs and the power GROUND are not switched. Doing so will permanently damage the instrument. Refer to Figure 7 for proper connections. For convenience, the printed circuit board is labeled **L1 L2 GND** on the solder as well as component side of the board.

On DC units, L1 = DC Ground and L2 = + DC Supply.

NOTE: Do not switch power LINE and power GROUND while making connection to the AC power terminal. This will result in permanent damage to the instrument.

DOUBLE CHECK THE CONNECTIONS BEFORE APPLYING POWER!!

SIGNAL CONNECTION

Thermocouple (RTD, Thermistor) connection should be made to the 2 input terminal connectors labeled

'SIGNAL CONNECTOR' in figure 4. Also indicated are the input signal's positive and negative polarities for thermocouple connection. These markings are also on the printed circuit board in front of the connector. Care should be taken to connect the positive and negative legs of the signal source to the proper terminals on the connector. A wrong connection will result in incorrect process readings. (No polarity is necessary for RTD or thermistor).

OUTPUT CONNECTOR PIN ASSIGNMENT

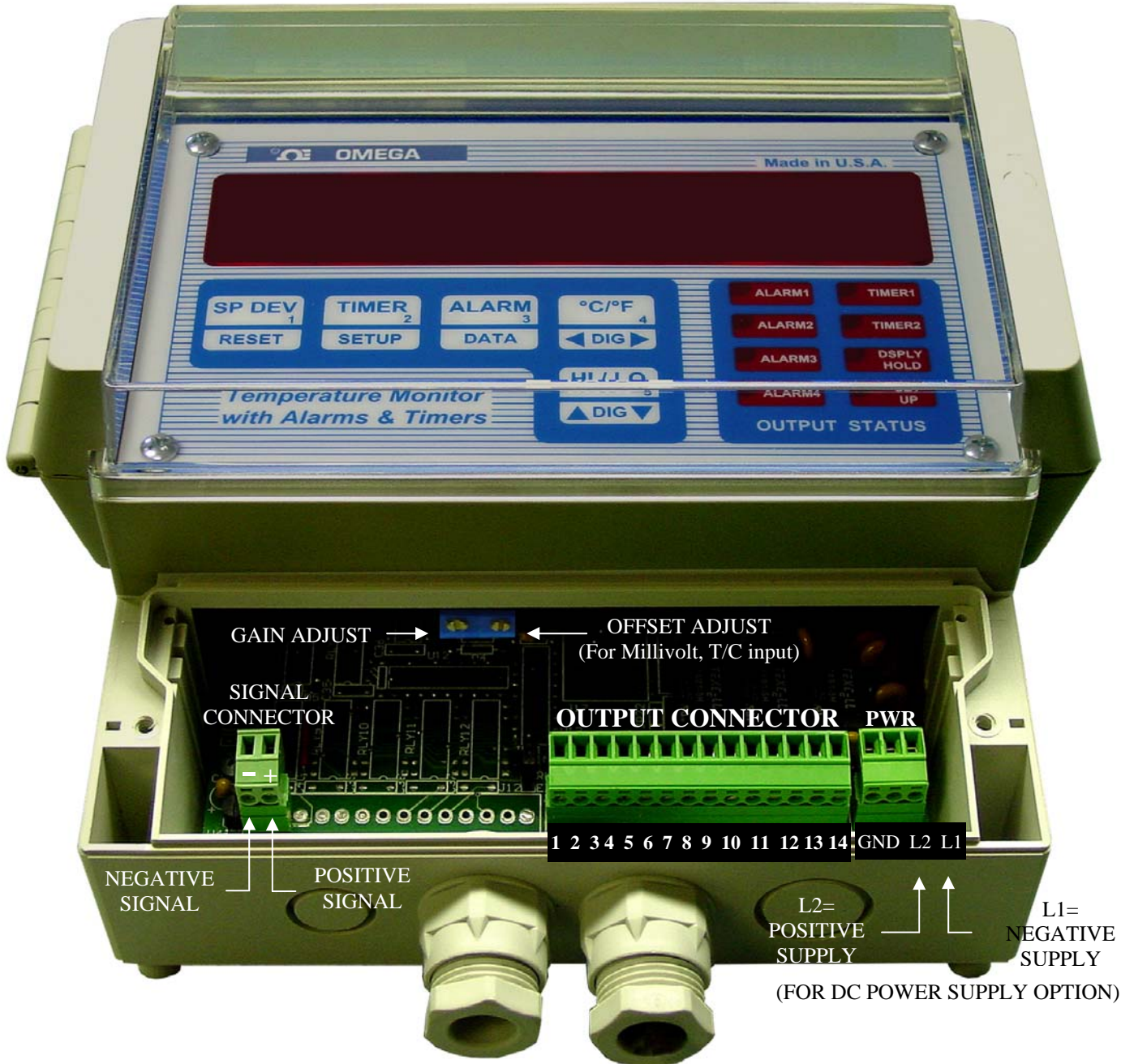
Table 1 shows the output connector pin numbers and signal description. For convenience, the printed circuit board is labeled **R1 through R7**. Additionally, positive and negative outputs for open collector outputs are also indicated.

TABLE 1. Output Connector Pin Assignment

SCREW TERMINAL OUTPUT CONNECTOR														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
<u>PIN NO</u>														<u>DESCRIPTION</u>
1														LIMIT 1 COMMON/OPEN COLLECTOR POSITIVE
2														LIMIT 1 NORMALLY OPEN/OPEN COLLECTOR NEGATIVE
3														LIMIT 2 COMMON/OPEN COLLECTOR POSITIVE
4														LIMIT 2 NORMALLY OPEN/OPEN COLLECTOR NEGATIVE
5														LIMIT 3 COMMON/OPEN COLLECTOR POSITIVE
6														LIMIT 3 NORMALLY OPEN/OPEN COLLECTOR NEGATIVE
7														LIMIT 4 COMMON/OPEN COLLECTOR POSITIVE
8														LIMIT 4 NORMALLY OPEN/OPEN COLLECTOR NEGATIVE
9														TIMER 1 COMMON/OPEN COLLECTOR POSITIVE
10														TIMER 1 NORMALLY OPEN/OPEN COLLECTOR NEGATIVE
11														TIMER 2 COMMON/OPEN COLLECTOR POSITIVE
12														TIMER 2 NORMALLY OPEN/OPEN COLLECTOR POSITIVE
13														DISPLAY HOLD SWITCH CONNECITON
14														DISPLAY HOLD SWITCH CONNECTION

NOTE: Pins on the connector other than those designated in table 1 must NEVER be connected to any other signal under any circumstances. Also, proper connection and correct orientation of the connector are necessary to avoid malfunction or permanent damage to the instrument.

FIG 4. DPS3301 Series TERMINAL COMPARTMENT



DIRECT INTERFACE TO UNIVERSAL RELAY MODULE

For high amperage loads, DPS3300 series units can be used in conjunction with Universal Relay Module (Model RELAY-URM400/800) which provide up to eight 15 ampere relays. Both open collector and relay models can be interfaced directly to RELAY-URM400/800 units.

RELAY-URM400/800 series relay module is a very versatile instrument that is used for switching up to eight 15 ampere loads. In addition to the DPS3300 direct interface, RELAY-URM400/800 series relay module accepts low level input signals from PLCs, process controllers, indicators, motor starters, etc. Selectable input allows activation of output relays on direct acting or reverse acting signal. In addition to working with control/logic level signals, another very useful feature of RELAY-URM400/800 is activation of output relays on contact closure. The use of the RELAY-URM400/800 allows heavy loads requiring up to 15 amps to be controlled by the DPS3300 with minimal equipment & wiring.

Input and output connections for the RELAY-URM400/800 are made through euro style pluggable connectors which are conveniently located on the top and bottom of the unit. Screw in terminals allow for quick connect/disconnect of wires. The unit is housed in a versatile enclosure that can be configured for mounting on a DIN rail or on a wall. If desired, the same enclosure can be panel mounted with relay, AC and DC supply status visible on the front. LEDs on the front panel turn on when a relay is energized. Two different versions are offered in this series. First one is RELAY-URM400 that has four relay outputs. The second one is RELAY-URM800 that has eight relay outputs. (*Future versions will also include 4-15A solid state relays*). Both units come with a built-in universal power supply. It operates from 100vac to 240vac. This power supply provides power not only to the internal electronics and relays but has up to 20watts (5vdc) available for external applications by the user.



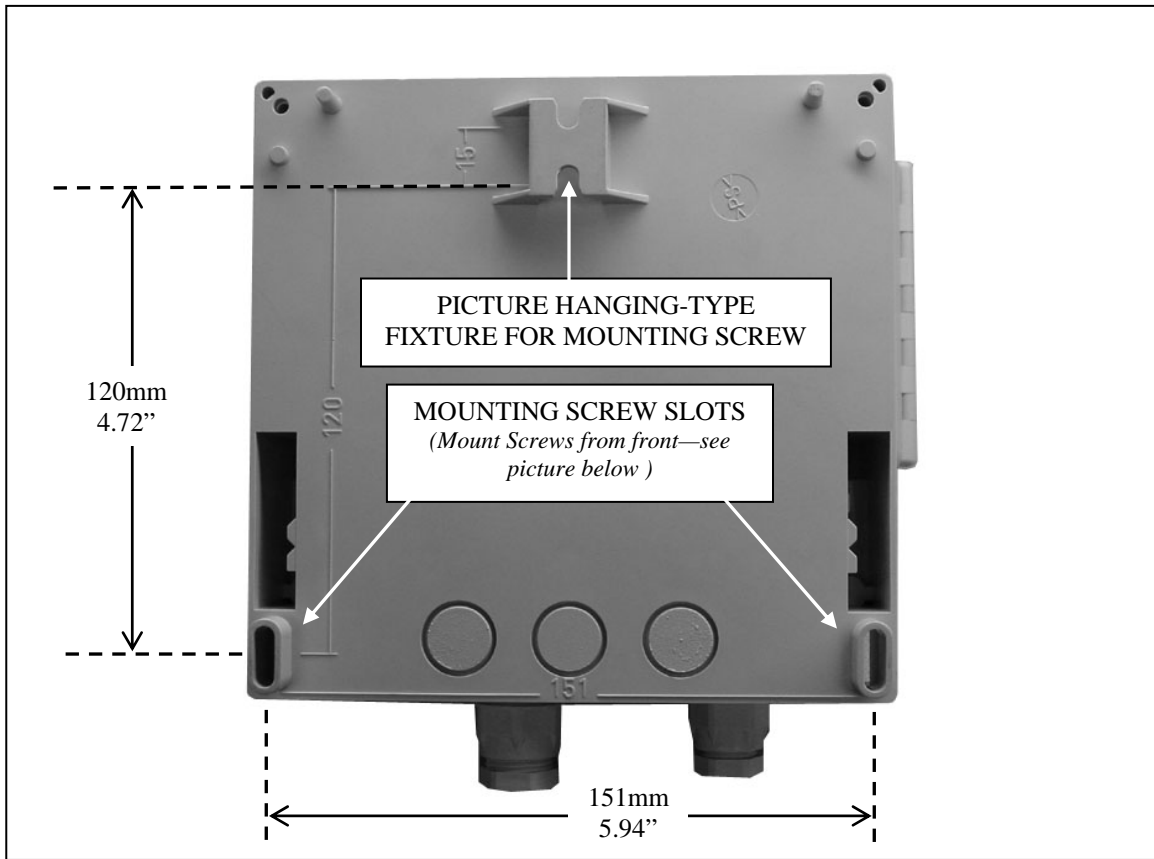
**Direct Interface to
Relay-URM 400/800**



DPS3301 TERMINAL COMPARTMENT



MOUNTING



SLOTS IN TERMINAL COMPARTMENT
FOR MOUNTING SCREWS

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's 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 OMEGA's customers receive maximum coverage on each product.

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