USER'S GUIDE

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CN1500 SERIES

Multi-Zone Ramp & Soak Controller

SPECIFICATIONS

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

INPUT TYPE:
i) J,K,T,E,R,S,B, thermistor, RTD
ii) 4-20milliamp loop current
iii) 0-10 vdc
iv) 0-100 millivolt
Cold junction error: +/- 0.5 C (10C to 45C)
Open thermocouple indication: **'HELP'** displayed

ACCURACY:
Temperature resolution: 1C/1F, 0.1% of Full Scale
Voltage = 0.05% FS
Current = 0.05% FS

ANALOG TO DIGITAL CONVERSION
20,000 count A/D converter
Dual slope integrating converter.
Conversion rate: Seven conversions/sec (typical)

DISPLAY
Red 7-segment LED display, 0.39 inch (10mm) height
Negative polarity indication
Over-range indication: HELP
Display test: Briefly indicates **8.8.8.8.8.8.8.** on power up

SCAN RATE
Two channels per second
Channel display time: programmable from 1 - 999 seconds

POWER OPTION
120VAC -- 60 Hz (Standard)
220VAC -- 50 HZ (Optional)
15VDC @ 900ma (optional)

SCALE/OFFSET
Scale programmable from 1 - 30000
Offset : 0 - 20.00 (current), 0 - 10.000 (voltage input), 0 - 100.00 (millivolt)
Decimal Point: Programmable No decimal pt, 10th, 100th & 1000th pos.

RATE:
0 - 500 Seconds

PROPORTIONAL BAND:
0 - 100% of span

RESET:
0.00 TO 50.00 repeats per minute

DESCRIPTION

The CN1500 series is a compact unit that offers the features of up to seven ***full blown*** PID controllers in a single 1/8th DIN (cutout) enclosure. Careful design, high functionality and its compactness allows it to offer unmatched cost/performance ratio of any controller in its class.

CN1500 series offers PID control for optimum process stability. Additionally, processes that do not require tight control through complex tuning of PID parameters can be run under simple ON/OFF control.

Programmable from the front keys, the unit will accept signals from many different types of transducers. These include thermocouples, thermistors, RTD's, 4-20ma loop current, 0-10vdc and 0-100mv etc. (Check Model number for specific input types). Input signal for each zone is selected independently. Scaling and offset allows current and voltage signals to be converted to engineering units. Additionally, each zone has its own ramp/soak profile which can be tailored to its specific requirements. ON/OFF as well as PID parameters (Rate, Reset and Proportional band) for each zone are also independent of each other.

Each zone can be programmed for either heating or cooling. Setpoint deviation, positive as well as negative, can be viewed by the push of a key.

The maximum and minimum readings for each zone are also captured. This feature can be helpful in quality control or as a tool in fine tuning the PID parameters.

Any zone can be put on an indefinite hold anywhere along the process profile. Also, a manual mode for setpoint entry is available. Using this feature, a setpoint can be entered without going into the program mode and entering the entire ramp/soak profile for a given zone.

CN1500 KEYS AND FUNCTION

The five CN1500 keys have several functions packed into each key. These Functions are listed below.

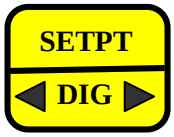
SCN/HLD
RST/EXT

* Pushing this key, while scanning, will place the display in a hold mode. The Display will hold on the current display function until the key is pushed again.
* If the unit is in a display hold mode, push this key to continue scanning between controllers.
* This key is also used to exit Programming Mode, indicated by the word **'SAVInG'** being displayed.

NOTE: HOLD mode places only the display on hold. Internally, all the enabled channels keep on scanning and controlling. The **HLD** led comes on when the unit is placed in a hold mode.

* To select a controller, toggle this key until the unit displays the desired controller number.
* To enter programming mode, push and hold this key, on the desired controller to be programmed, until the unit displays '**EntEr PASSCOdE**'.

* Toggling this key will sequentially display process value for each controller. DATA
* If a controller is selected (by pushing **CTR SEL** key) before pushing this key , it will cause the unit to display the following data for that controller: process value, soak time, deviation, Min/Max readings and rate of process change.



* This key's function is similar to the above (Process/Data) key except that it displays setpoint instead of process for each controller.
* In Programming Mode this key is used to select a digit to be increment or decremented.

* This key functions only after a controller has been selected by pushing **CTR. SEL** key. It is used for displaying and changing the current status of selected controller (RUNNING, HOLDING. STOPPED & ENTER SP).
* In Programming Mode this key is used to increment or decrement a selected digit or to toggle between selections.

The LEDS on the front indicate the controller status. They are turned on when each controller is in auto run (automatic ramping) or in manual setpoint entry mode. The **HLD** led indicates that the display is being held on any one parameter (e.g. controller number 1's process value).

DISPLAY MODES

The CN1500 can be programmed to display in one of the following modes:

Mode	**Display**	**Description**
PROCESS	**PrOCESS**	Display only the process value for the controllers.
SETPOINT	**SEtPt**	Displays only the setpoint value for each controller. (Only those controllers that are in run/hold mode)
PROCESS - SETPOINT	**Pr-StPt**	Displays Process as well as Setpoint Values for each controller that is running a program.

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

PROCESS MODE

Process Display Mode sequentially displays the process value of each controller. Process value is displayed, regardless of whether the controller is running or not. All the controllers that are enabled will be displayed. The display time is as setup during programming.

SETPOINT MODE

This mode displays ONLY the setpoint value for those controllers that are running. If NO controller is running, the unit will scroll the message **'nO CntrL rUnnInG'** on the display. Setpoints are displayed for the programmed amount of display time.

PROCESS-SETPOINT MODE

This mode displays Process as well as Setpoint value for each controller that is in run/hold mode. If no controller is running a profile, the unit will display only the process reading of the controllers that are enabled. If any controllers are being run, then their process value is displayed followed by their setpoint. The display period is as programmed during setup, for example, if display time is 10 seconds, the process will be displayed for ten seconds, followed by setpoint for ten seconds.

PROGRAMMING MODES

Programming mode is used for configuring various parameters of the unit. This is accomplished by first selecting the controller that needs to be programmed (by pushing the **CTR SEL** key), and then holding in the **CTR.SEL** (Controller Select) key until the units displays **'EntEr PASSCOdE'**. At this point, pass code for the system can be entered. The entry code is a four digit number which keeps unauthorized personnel from changing the system parameters. The 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. The pass-code is a combination of these digits and for CN1500 systems it is **3254.**

If, at any time during programming, it is desired to exit, just push the **RESET** key twice (and hold it in till the display reads **'SAVInG'**). First push takes you to the very beginning of the program mode (display shows '**PrG CTr** '), and the second push will exit. Display briefly reads '**SAVING**' to indicate that the data is being saved in nonvolatile memory.

As soon as the correct four digit pass-code is entered, the system is ready for programming. Once in programming mode, one of the following selections can be made:

Display	**Description**
tuninG	Enter PID parameters or hysteresis for ON/OFF control
VErIFY	Verify a previously entered Ramp/Soak profile .
PrOFILE	Program a Ramp/Soak profile for a controller.
PrG CTr	Program Controller parameters.
PrG SYS	Program System parameters

TUNING MODE:

Tuning mode is used for entering relay hysteresis (if controller is programmed for ON/OFF mode) or Rate, Reset and Proportional Band (if the unit is set as a PID controller). This mode is selected in SETUP mode by pushing **PROG** key while the unit is displaying **'tUnIng'.** After this selection, the unit will display any one of the following: **'Cntr 1', 'Cntr 2', 'Cntr 3', 'Cntr 4', 'Cntr 5', 'Cntr 6'**, or **'Cntr 7'**. At this time any controller can be selected by pushing ▲▼ key. LED for selected controller will flash (this provides an easy way to track the controller being programmed). After selecting a controller, use **PROG** key to step through programming. To exit, push **EXT** key.

NOTE: 'TUNING' mode can also be entered by pushing and holding **'DATA'** key till the display reads **'TuninG'**. Once in this mode, any controller can be selected by pushing ▲▼ key. (This procedure can only be done from normal display mode and not frome SETUP). To exit, push & hold **RESET** key.

ON/OFF HYSTERESIS (DEAD-BAND)

This step is used for setting up controller deadband or hysteresis and is indicated by the message **'Cntr db'** followed by the display of current deadband value. The flashing digit is the active digit. Pushing ▲▼ key and keeping it pushed, will increment the digit. Releasing ▲▼ key and then pushing it again will decrement the value (▲▼ key works as a toggle -- alternating between increment and decrement). To change the next digit, first push the **<DIG>** key. This will advance the flashing to the following digit. Use ▲▼ key to change the value. After the desired setting is displayed, push **PROG** key. This will take you to the beginning of setup mode (or Tunning Mode)

NOTE: This step comes up for programming only if the unit is programmed to work as ON/OFF controller. If not, Rate, Reset and Proportional Band are programmed.

ENTERING PID VARIABLES

PROPORTIONAL BAND

If PID mode is selected, then next parameter to be programmed is the proportional band. Proportional band, also referred to as gain, determines the output in proportion to the error between setpoint and actual process temperature. It is based on percent error of 1000 degrees if the display units are Centigrade and 2000 degrees if units are Fahrenheit (or scaled for voltage/current inputs). For example, if the proportional band is set to 5.0 and the units are Centigrade, then a process error of 50 degrees between setpoint and temperature will result in an output that will be fully on.To enter a new value for proportional band, use ▲▼ and **<DIG>** keys . Once the value has been entered, push **PROG** key.

RESET

Parameter programmed after proportional band is Reset. As with other functions, this is indicated by the display first showing the message followed by current reset value. The message in this case is **'RESET'**. Again, use ▲▼ key in conjunction with **<DIG>** key to change the value.

Reset is used with proportional band to fine tune the controller. Proportional band alone will bring down the error between setpoint and process up to a certain point only. To reset the differential left by proportional band, the error is integrated slowly over time until setpoint and process coincide. This is done by introducing the reset factor. After programming reset, push **PROG** key to program RATE.

RATE

Rate is the third factor in the PID control. This factor provides the anticipation for the control as to how fast or slow process change is being realized. This factor is usually handy at start ups when, generally, process tends to lag setpoint and a higher output is required. On entering rate mode, the display first reads **'RAtE'** followed by rate value. This value can be change by using ▲▼ and DIG keys.

VERIFY MODE:

The Verify function is used for checking a previously programmed ramp/soak profile. This mode is selected by pushing **PROG** key while the unit is displaying **'VErIFY'.** After this selection, the unit

will display one of the following: **'Cntr 1', 'Cntr 2', 'Cntr 3', 'Cntr 4', 'Cntr 5', 'Cntr 6'**, or **'Cntr 7'**. At this time any one of the controllers can be selected by pushing the ▲▼ key. After selecting a controller, use **PROG** key to step through the profile. To exit **Verify** mode at any time, push **EXT** key. Unlike exiting **'ProFILE'** mode, exiting **VERIFY** at any point does not mark the end of a profile.

NOTE: Verify mode should only be used to **check** or **change** a previously programmed parameter. DO NOT USE THIS MODE TO ENTER A NEW PROFILE. TO ENTER A NEW RAMP/SOAK PROFILE, USE **'PrOFILE'** MODE.

NOTE: Before verifying a profile, all Controllers **must be** in **Stopped** Mode. If not, the unit will scroll the message '**StOP rUnnInG**'

PROFILE MODE (ENTERING RAMP/SOAK):

This programming mode is used for entering process profile for a selected controller. Once in programming mode (after entering pass-code), use ▲▼ key until the unit displays **PrOFILE** (for ramp/soak 'Profile'). Next, push the **PROG** key. The unit will display one of the following with each push on ▲▼ key: **CntrL 1, CntrL 2, CntrL 3, CntrL4, CntrL 5, CntrL 6 or CntrL 7**). After selecting the desired controller, push **PROG** key to select it. A profile can now be programmed in the following manner:

NOTE: Before programming or checking a programmed profile the Controller **Must Be** in the **Stopped** Mode. If not, the unit will scroll the message **"STOP RUNNING**'.

HOW TO ENTER A TYPICAL PROCESS PROFILE

Upon entering the process profile mode, the display will briefly read **Strt SP** (for 'Start Setpoint'), and then the current value of Starting setpoint. Use ▲▼ and **<DIG >** keys to enter a desired value. The ▲▼ key increments and decrements the FLASHING digit, where as the **<DIG>** key selects the digit to increment or decrement. Next, press **SETUP** key to go on to the next function.

At this point the display will briefly read **SetPt 1** and then the current value of Setpoint #1. Use ▲▼ and **<DIG >** keys to enter a desired value. Next, press **'PROG'** key to go to the following function.

The display will now read **EntEr t** (for 'Enter time'), and then show the current time value. Time entered is the time that it takes to ramp to the set point (or soak time, if the previous and current set-points are same). The value shown for time is in minutes. Use ▲▼ and **<DIG >** keys to enter the desired value, and then press **PROG** key to go on to the next function.

Repeat the above steps to program setpoints #2 thru #7. Once all 7 segments have been programmed, the display will revert back to beginning of Programming mode selection. If all the seven segments are not desired, the program can be aborted at any segment by simply pushing the **EXT** key. The segment in which the **EXT** key is pushed is the one that is considered to be the end of the program. During Verify Program mode, that segment and all the following segments are labeled as **'PrG End'**.

NOTE: **DO NOT PUSH 'EXT' KEY IN THE LAST SEGMENT OF YOUR RAMP/SOAK PROFILE. AFTER ENTERING TIME FOR THE LAST SEGMENT GO TO THE NEXT SEGMENT AND THEN HIT THE EXIT KEY. THE UNIT MARKS THE SEGMENT BEING DISPLAYED AT THE TIME OF PUSHING 'EXT' KEY AS THE END OF PROGRAM. THEREFORE, MAKE SURE THAT THE UNIT IS IN THE SEGMENT THAT YOU WISH TO BE CONSIDERED AS THE END OF PROGRAM BEFORE PUSHING 'EXT' KEY.**

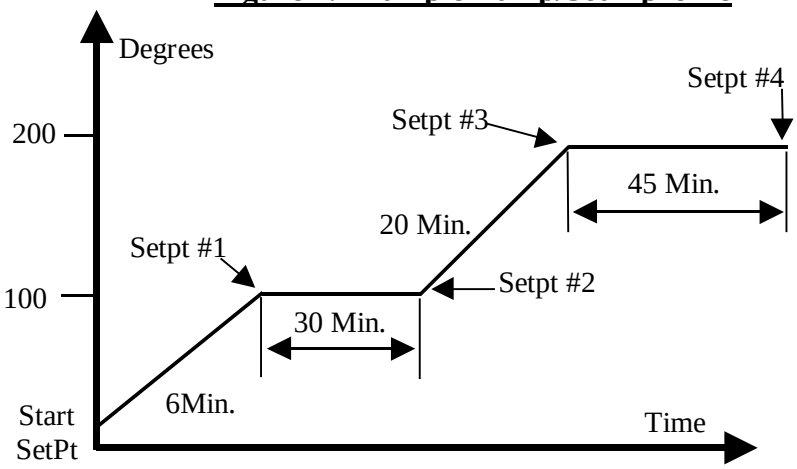
RAMP/SOAK PROFILE EXAMPLE

This is an example of how to program Controller 1 with following parameters.

Ramp for 6 min. to 100 degrees
Soak at 100 for 30 min.
Ramp for 20min. to 200 degrees
Soak at 200 for 45 min.
Shutdown.

This profile would be programmed in the following manner:

Figure 2. Example Ramp/Soak profile



From '**VErIFY**' display press **^v** key
until **'PrOFILE'** (Enter Ramp/Soak) is displayed.

Press **PROG** key. The display will show '**CntrL x**', where **x** is the current Controller Number. Use ▲▼ key to select controller one.

Press **PROG**. The display will briefly show '**SEtPt 1',** and then the current value for Setpoint #1. Use ▲▼ and **<DIG>** keys to set the display to 100 (Setpoint #1 = 100).

Press **PROG**. The display will briefly show '**Entr t**', and then the current value for Time #1. Use ▲▼ and **<DIG>** keys to set the display to 6 (Time #1 = 6 min.).

Press **PROG**. The display will briefly show '**SEtPt 2'** and then the current value for Setpoint #2. Use ▲▼ and **<DIG>** keys to set the display to 100 (Setpoint #2 = 100).

Press **PROG**. The display will briefly show '**Entr t**', and then the current value for Time #2. Use ▲▼ and **<DIG>** keys to set the display to 30 (Time #2 = 30 minutes).

Press **PROG**. The display will briefly show '**SEtPt 3',** and then the current value for Setpoint #3. Use ▲▼ and **<DIG>** keys to set the display to 200 (Setpoint #3 = 200).

Press **PROG**. The display will briefly show '**Entr t**', and then the current value for Rate #3. Use ▲▼ and **<DIG>** keys to set the display to 20(Time #3 = 20 min.).

Press **PROG**. The display will briefly show '**SEtPt 4',** and then the current value for Setpoint #4. Use ▲▼ and **<DIG>** keys to set the display to 200 (Setpoint #4 = 200)

Press **PROG**. The display will briefly show '**Entr t**', and then the current value for segment #4. Use ▲▼ and **<DIG>** keys to set the display to 45 (Time #4 = 45 minutes).

Press **PROG**. Then press **EXT** to cause the program to end. The display will show **'VErIFY'.**

At this point the profile has been programmed into CN1500 and may be verified by using VERIFY function.

NOTE: ProFILE mode should only be used for entering new programs. VErIFY mode should be used for program verification and making changes to an existing program.

'PROGRAM CONTROLLER' MODE:

Depending upon input type, following parameters for individual controllers can be programmed:

CURRENT OR VOLTAGE INPUT

1) Controller selection
2) Controller type (ON/OFF or PID)
3) Input Signal type
4) Controller ON/OFF
5) Decimal Point Position
6) High Scale
7) Low Scale
8) Offset
9) Tare
10) Heat/Cool
11) Engineering Units

THERMOCOUPLE INPUT

1) Controller selection
2) Controller type (ON/OFF or PID)
3) Input Signal type
3) Controller ON/OFF
4) Degree F or Degree C
5) Limit
6) Heat/Cool
7) Engineering Units

PROGRAMMING 'VOLTAGE OR CURRENT' INPUT:

CONTROLLER SELECTION

After entering correct pass-code and selecting **'PrG Ctr'** (Program Controller), the display shows **'CntrL x'** ("Controller, where x=controller# "). Use ▲▼ key to display the desired Controller. Once the desired Controller # is selected, push **PROG** key to go on to next parameter. LED for selected controller will start flashing (this provides an easy way to track the controller being programmed).

CONTROLLER TYPE (ON/OFF OR PID):

After selecting a controller for programming, the next step lets you program the type of control i.e. simple ON/OFF or PID. The display will first read **'Ct tYPE'** followed by current selection of either **'PId'** or **'On-OFF'**. Push ▲▼ key to make alternate selection. Push **PROG** key to go to the next step.

'INPUT SIGNAL' TYPE

The display will briefly read **'SIGNAL'** , after which the current input signal type for the selected controller will be displayed. Various signal selections are : J T/C, CR.AL T/C (Chromel Alumel, type K T/C), T T/C, E T/C, CURRENT, or VOLTAGE. If the unit has a noble metal thermocouple option, then only one T/C can be selected i.e. B T/C, R T/C, or S T/C (For thermistor inputs, THRSTOR and RTD 392 or RTD 385 for RTD input units). Use ▲▼ key to select the desired input type. After making the selection, go to the next step by pushing **PROG** key.

NOTE 1: If you have a millivolt input unit (instead of thermocouple), the various types of inputs selectable are **'CURRENT', 'HI VOLT'** (0-10Vdc input) and **'LO VOLT'** (for millivolt input).

NOTE 2: If you have a thermistor or RTD controller (instead of a thermocouple), the various types of inputs selectable are **'CURRENT', 'HI VOLT'** (0-10Vdc input) and **'thrstor'** (for thermistor input) or **rtd 385** or **rtd 392.**

CONTROLLER ON/OFF

After selecting input type, the next parameter for configuration is Controller ON/OFF, which determines whether a Controller is scanned or not. If for any reason a controller is not being used, it must be turned OFF. In this way the unit will not spend any time scanning it. This will also prevent the unit from displaying a **'HELP'** message on a Controller that has nothing connected to its inputs. Use ▲▼

key to select the desired setting. If a Controller is OFF, the display will show **'Ctx OFF'** (x=Controller number), and if the Controller is ON the display is **'Ctx ON'** (x=Controller number).

Use ▲▼ key to select the desired ON/OFF setting, and then push **PROG** key to enter that setting and go on to programming Decimal Point Position.

DECIMAL POINT POSITION

After setting the controller ON or OFF, the next parameter for configuration is setting the decimal point position. This is indicated by the display showing **'dP 9999,** or **dP 999.9,** or **dP 99.99,** or **dP9.999** (dP=decimal point). ▲▼ key moves the decimal point through all the possible positions. After **'9.999',** the display goes to **'9999'** which indicates a display with no decimal point.

Use ▲▼ key to move the decimal point to the desired position, and then push the **PROG** key to enter that setting and go on to High Scale programming.

HIGH SCALE

After setting the Controller's decimal point position, the next parameter to be set is High Scale. This parameter determines what number will be displayed when the transducer puts out its maximum signal. For example, suppose a pressure transducer produces a 0Vdc to 10Vdc signal which corresponds to 0psi to 150psi. It would, therefore, be desired that the unit indicate 150 when 10Vdc is measured. To do this, set Hi Scale = 150.

After pushing the **PROG** key, the display will briefly read **'HI SCLE'** (for "High Scale"), and then show the current High Scale setting. The flashing digit is the active digit. Pushing ▲▼ key and keeping it pushed, will increment the digit. Releasing ▲▼ key and then pushing it again will decrement the value (▲▼ key works as a toggle -- alternating between increment and decrement). To change the next digit, first push the **<DIG>** key. This will advance the flashing to the following digit. Use ▲▼ key to change the value. After the desired High Scale setting is displayed, push the **PROG** key to enter that setting and go on to the programming for Low Scale.

LOW SCALE

After setting controller's High Scale, the next parameter to be set is Low Scale. This parameter determines the number that will be displayed when the transducer puts out its minimum signal. For example, suppose a pressure transducer produces a 0Vdc to 5Vdc signal which corresponds to 10psi to 75psi. In this case the display should read 10 when 0Vdc is measured. To do this, set the Lo Scale=10.

This mode is indicated by a brief display of **'LO SCLE'** (for "Low Scale") followed by the display of previous low scale setting. The flashing digit is the active digit. Use ▲▼ and **<DIG>** keys to change the value. After the desired Low Scale setting is displayed, push **PROG** key to go to the next step.

OFFSET

After setting controller's Low Scale, the next parameter to be set is controller's offset. Offset is used to calibrate a Controller to a specific transducer that outputs a signal other than zero at its low (no excitation state) end. If a transducer happens to output a small signal at its low end excitation, then the OFFSET parameter is used to make the transducer's minimum signal appear to be zero. For instance, suppose a flow transducer outputs a 0.130Vdc to 5.000Vdc signal which corresponds to a flow rate of 0 to 40 gal./min. Then to make the 0.130Vdc correspond to a display of 0, set OFFSET =0.130.

NOTE: If the input type is CURRENT, the Offset value is entered in milli-amps.
If the input type is VOLTAGE, the Offset value is entered in millivolts.

After pushing **PROG** key at the completion of programming Low Scale, the display will briefly read '**OFFSEt**', and then show the current Offset value. The active digit will be flashing. Use ▲▼ and **<DIG>** keys to enter a desired OFFSET value. After the desired OFFSET value is displayed, push the **PROG** key to enter that value and go to programming Tare.

TARE

After entering OFFSET, the next parameter to be set is TARE. TARE is used for subtracting a value from the reading prior to displaying it. For example, suppose a pressure transducer always includes atmospheric pressure of 15 psi, and you only wish to display the pressure differential from atmospheric (a gage reading of 19psi is to be displayed as 4psi). To do this, enter the number you want subtracted from a measurement prior to displaying the measurement.

The display will first show '**tArE**' after which the present TARE value will be displayed. Use ▲▼ and **<DIG>** keys to set desired TARE value. Once the desired TARE value is displayed, push the **PROGRAM** key to enter that value and go to next programming step.

HEAT/COOL

The output for each controller can be programmed to run a heating or a cooling process. Re-configuring the unit to cool instead of heat or visa-versa can be done by simply reprogramming a controllers output.

Heat - If a controller's output is programmed to heat, its output will be activated only when the process is below the setpoint. If the process value is above the setpoint it will be de-energized.

Cool - If a controller's output is programmed to cool, its output will be activated only when the process is above the setpoint. If process value is below the setpoint, it will be de-energized.

To operate the controllers output with a heater push the ▲▼ key until the unit displays '**HEAt**'. To operate the controllers output with a cooler push the▲▼ key until the unit displays '**COOL**'. To save setting and go on to the next step programming Deadband push the **PROG** key.

ENGINEERING UNITS

The next parameter to be set is the 3 letters that follow the process or setpoint values in the display. These 3 letters represent the measurements units for that particular controller. Any desired combination of the following letters may be programmed:

A,B,C,d,E,F,G,H,I,J,L,nO,P,Q,r,S,t,U,Y

The letter selection goes up to '**Y**' and down to '**A**' and from '**A**' down to ' - ' sign. The ' -' sign indicates that the particular digit will be blanked e.g. if the desired engineering unit was feet, then the display can be programmed to show ' **Ft**'. In this case one digit will be blanked out by programming a

' - ' sign in its location. When a thermocouple selection is made the unit automatically enters an **'F'** or **'C'** (Fahrenheit or Centigrade) depending upon the selected display units. However, just like the other inputs, any alternate units may be programmed for thermocouples.

The display will first show **'Cx UNIt'** (x=Controller number) after which the present UNITS setting will be displayed. Use ▲▼ key (ref. Program For High Scale) to program the desired UNITS display. Once the desired UNITS display is achieved, push the **PROG** key to enter that value and go back to the **'VErIFY'** display. **Note: Only analog channels can have engineerng labels.**

Program Examples

Example #1: Use of the OFFSET Parameter

Program for a 4-20ma transducer signal corresponding to 0-500 gallons of fluid (reading in 10th of a gallon resolution):

INPUT TYPE	= CURRENT	OFFSET	= 4.000
CONTROLLER ON/OFF	= ON	TARE	= 0.000
DECIMAL POINT	= 999.9	CONTROLLER LIMIT	= 0.000
HIGH SCALE	= 500.0	DEAD BAND	= 0.000
LOW SCALE	= 000.0	ENGRINEERING UNITS	= GAL

Example #2: Use of the LOW SCALE Parameter

Program for a 4-20ma transducer signal corresponding to 500-2000 degrees Fahrenheit temperature i.e. 500 degrees at 4ma and 2000 degrees at 20ma (one degree resolution):

INPUT TYPE	=CURRENT	OFFSET	= 4.00
CONTROLLER ON/OFF	=ON	TARE	= 0.000
DECIMAL POINT	= 9999	CONTROLLER LIMIT	= 0.000
HIGH SCALE	= 2000	ENGINEERING UNITS	= -C-
LOW SCALE	= 500		

Example #3: Use of the TARE Parameter

Program for a 0-5Vdc transducer signal corresponding to 0-10.00 pounds of material being packaged in a box weighing 0.50 pounds with display reading in 0.01 lb. increments. The CN1500 should display the weight of the material only (not the box as well):

INPUT TYPE	=VOLTAGE	OFFSET	= 0.00
CONTROLLER ON/OFF	=ON	TARE	= 0.50
DECIMAL POINT	= 99.99	CONTROLLER LIMIT	= 0.000
HIGH SCALE	= 10.00	ENGINEERING UNITS	= -LB
LOW SCALE	= 00.00		

PROGRAMMING 'THERMOCOUPLE/ THERMISTOR/ RTD' INPUTS:

CONTROLLER SELECTION

After entering correct pass-code and selecting **'PrG Ctr'** (Program Controller), the display shows **'CntrL x'** ("Controller, where x=controller# "). Use ▲▼ key to display the desired Controller. Once

the desired Controller # is selected, push **PROG** key to go on to next parameter. LED for selected controller will start flashing (this provides an easy way to track the controller being programmed).

CONTROLLER TYPE (ON/OFF OR PID):

After selecting a controller for programming, the next step lets you program the type of control i.e. simple ON/OFF or PID. The display will first read **'Ct tYPE'** followed by current selection of either **'PId'** or **'On-OFF'**. Push ▲▼ key to make alternate selection. Push **PROG** key to go to the next step.

'INPUT SIGNAL' TYPE

The display will briefly read **'SIGnAL'** , after which the current input signal type for the selected controller will be displayed. Various signal selections are : J T/C, CR.AL T/C (Chromel Alumel, type K T/C), T T/C, E T/C, CURRENT, or VOLTAGE. If the unit has a noble metal thermocouple option, then only one T/C can be selected i.e. B T/C, R T/C, or S T/C (For thermistor inputs, THRSTOR and RTD 392 or RTD 385 for RTD input units). Use ▲▼ key to select the desired input type. After making the selection, go to the next step by pushing **PROG** key.

NOTE 1: If you have a millivolt input unit (instead of thermocouple), the various types of inputs selectable are **'CURRENT', 'HI VOLT'** (0-10Vdc input) and **'LO VOLT'** (for millivolt input).

NOTE 2: If you have a thermistor or RTD controller (instead of a thermocouple), the various types of inputs selectable are **'CURRENT', 'HI VOLT'** (0-10Vdc input) and **'thrstor'** (for thermistor input) or **rtd 385** or **rtd 392.**

TURNING CONTROLLER ON/OFF

If the selected option under **'IP tYPE**' is thermocouple, RTD or thermistor, then the next step is turning the Controller ON or OFF. This is done by pushing the ▲▼ key. Once the desired selection has been made, push **PROG** key to go to the next step.

TEMPERATURE UNITS

This parameter configures the display units for selected input type. The display will either shows **"dEGrE C"** or **"dEGrE F"**, depending on previously selected units. Use ▲▼ key to select alternate mode. Once having obtained the desired units, press **PROG** key to go on to the next parameter.

HEAT/COOL

The output for each controller can be programmed to run a heating or a cooling process. Now re-configuring hardware to cool instead of heat or visa-versa can be done by simply reprogramming a controllers output.

Heat - If a controller's output is programmed to heat its output will be activated only when the process is below the setpoint. If the process value is above the setpoint it will be de-energized.

Cool - If a controller's output is programmed to cool its output will be activated only when the process is above the setpoint. If the process value is below the setpoint it will be de-energized

ENGINEERING UNITS

The next parameter to be set is the 3 letters that follow the process or setpoint values in the display. These 3 letters represent the measurements units for that particular controller. Any desired combination of the following letters may be programmed:

A,B,C,d,E,F,G,H,I,J,L,nO,P,Q,r,S,t,U,Y

The letter selection goes up to **'Y'** and down to **'A'** and from **'A'** down to ' - ' sign. The ' -' sign indicates that the particular digit will be blanked e.g. if the desired engineering unit was **'Ft'** (for Feet), then one digit will be blanked out by programming a **'-'** sign in its location.

When a thermocouple selection is made the unit automatically enters an **'F'** or **'C'** (Fahrenheit or Centigrade) depending upon the selected display units. However, just like the other inputs, any alternate units may be programmed for thermocouples.

The display will first show **'Cx UNIt'** (x=Controller #) after which the present UNITS setting will be displayed. Use ▲▼ and <DIG> keys to program the desired UNITS display. Once the desired UNITS display is achieved, push the **PROGRAM** key to enter that value and go back to the **'VErIFY'** display.

'PROGRAM SYSTEM' MODE

After entering correct pass-code and selecting **'PrG SYS'** (ref. PROGRAMMING MODES section), the CN1500 goes into SYSTEM CONFIGURATION mode. This mode allows setting up parameters that affect all the controllers or the instrument in general.

DISPLAY OPTIONS

On pushing **PROG** key while the display shows **PrG SYS** , the display briefly shows **'dSP OPt'** (for display option) and then the current Display Option setting. There are three display options which are as follows; Process, Set Point, and proecess-setpoint. Use ▲▼ key to step thru these options. Once the desired Display Option is shown, push **PROG** key to enter the setting and go to set Display Time.

Option	**Display**	**Description**
PROCESS	**PrOCESS**	Process value for all controllers.
SET POINT	**SEtPt**	Setpoint for only channels that are running.
PROCESS-SETPOPINT	**Pr -StPt**	Set Point & Process for only channels that are running.

NOTE: If either SETPOINT or PROCESS-SETPOINT is selected, the unit will display the values for only those controllers that are currently running a profile. In SETPOINT mode, if no controller is running, the message **'nO CntrL rUnnInG'** is displayed.

DISPALY TIME

After setting the Display Option, the next parameter to be set is DISPLAY TIME. This determines the time (in seconds) that a controller's reading is displayed before scanning to the next parameter.

The unit will first show **'dSPLy t'** (for Display Time), and then the current setting in seconds. Use▲▼

and **<DIG>** key to set the desired DISPLAY TIME value. Once the desired DISPLAY TIME value is displayed, push **PROG** key to enter that value and go to the next step.

PROFILE STARTING POINT:

Ramp and soak profile can be made to start controlling (when RUN/STOP key is pushed for running a selected controller) at the programmed 'START SETPOINT' or from the current process reading. If **'Strt SP'** mode is selected, the ramp and soak program starts ramping from the starting setpoint that was entered during **'PROFILE'** mode. However, if , for example, the furnace temperature is already high up and there is no need for the controller to spend time ramping up the setpoint to the current process temperature, then in that case, select **'Strt Pr'** mode. This will cause the controller to start ramping from the current furnace temperature. Alternate selection can be made by pushing ▲▼ key. After making a selection, push the '**PROG'** key.

RATE TIME-BASE:

This step is for programming time-base for calculation of Rate. Units of time-base are seconds. The display will read **'rAtE tb'** followed by current value with the active digit be flashing. To change the value, push ▲▼ key. To activate another digit, use **'DATA'** key. On finishing, push **PROG** key.

COLD JUNCTION SETTING

The next parameter is the cold junction reference temperature. The display will first show **'COLd JN'**, and then the cold junction temperature will be indicated. **IF NECESSARY**, use ▲▼ key to adjust until the display reads proper temperature. Once the correct temperature is displayed, push **PROG** key to enter that setting and go to Controller Calibration.

NOTE 1: The unit should be powered up for at least fifteen to twenty minutes before any adjustments are made to the cold junction reading.

NOTE2: Cold Junction temperature is the temperature at the connector where thermocouple connects (and forms the juntion) into the unit. IT IS NOT THE AMBIENT TEMPERATURE.

CALIBRATION MODE

After setting the Cold Junction Reference temperature, the next step is calibration of controllers. This allows easy calibration of each controller without the instrument scanning to the next controller. The display will show controller input reading in the form **'x-nnnnn'** (where x=controller number and nnnnn is the controller reading).

NOTE 1: ONLY channels that are turned ON will be displayed at this time!

NOTE 2: **If any controller is in RUN mode, it must be first stopped before attempting calibration.**

INPUT RANGE (CURRENT AND VOLTAGE)

VOLTAGE RANGE (0-10VDC)

After all the enabled channels have been displayed, the VOLTAGE range may be programmed. The

display will briefly show **'V rAnGE'** (for "Voltage Range"). Then the display will show the present setting. Use ▲▼ and **<DIG>** keys to set the desired VOLTAGE value. Once the desired VOLTAGE value is displayed, push the **PROGRAM** key to enter that value and go to the next step.

VOLTAGE RANGE (MILLIVOLT INPUTS)

For Millivolt input units, the display first shows **'HV rnGE'** (for "High Voltage Range"). After the High Voltage range is set, the display shows **'LV rnGE'** (for "Low Voltage Range"). Enter values for respective inputs.

CURRENT RANGE

After the VOLTAGE range has been set, the CURRENT range can be entered. The display will briefly show **'C RAnGE'** (for "Current Range"). The display will then show the present setting. Use ▲▼ and **<DIG>** keys to set the desired CURRENT value. Once the correct CURRENT range is displayed, push the **PROG** key to enter that value and return to the **'VErIFY'** display.

CORRECT RANGE SETTINGS

The following RANGE values should be entered for the various inputs:

Input	RANGE Value
0-10 Vdc	10.000
0-100 Mv	100.0
4-20 Ma. (loop current)	20.00

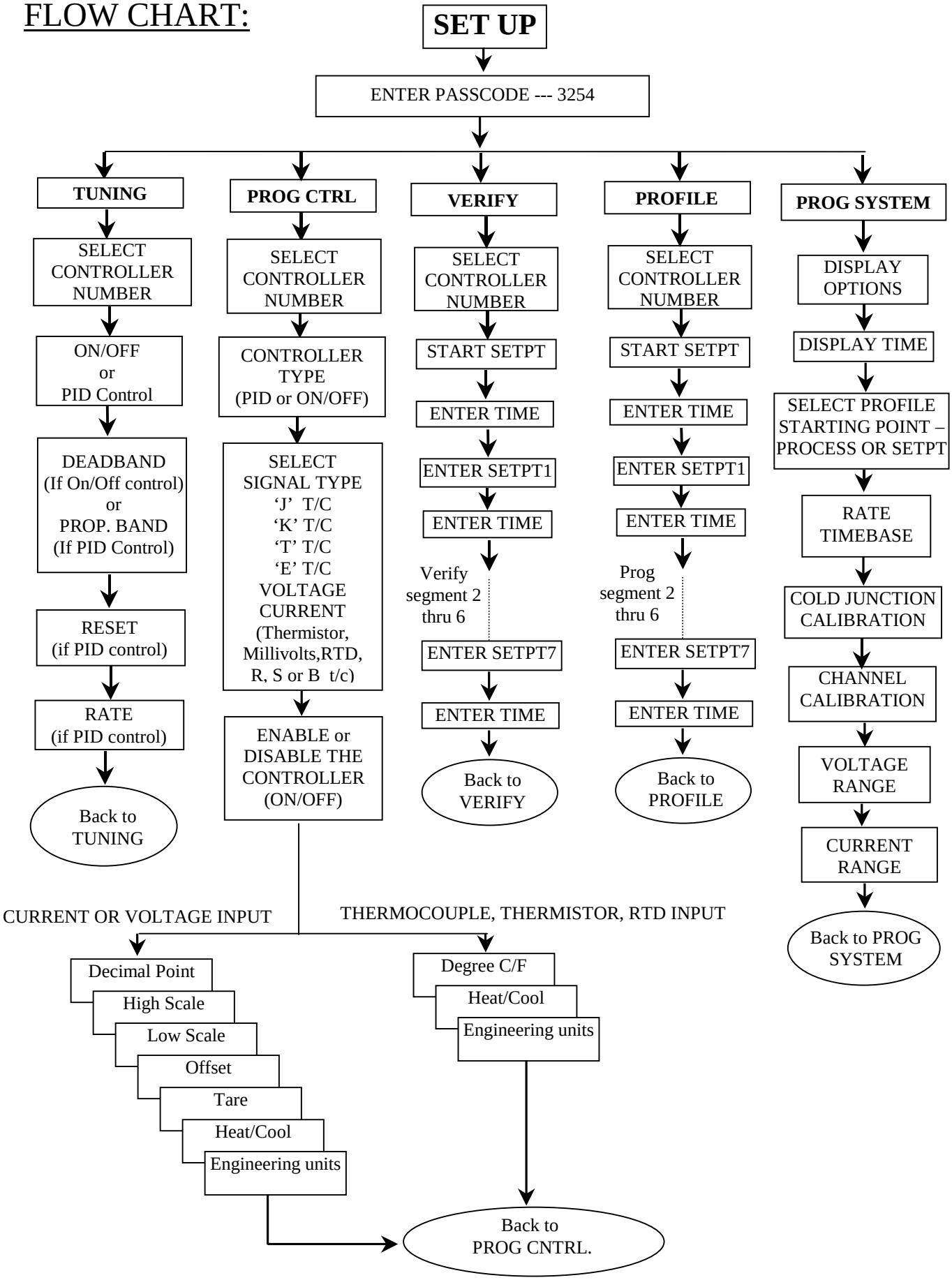
THERMOCOUPLE CALIBRATION PROCEDURE

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

For a thermocouple Controller calibration, the following steps should be performed. Note that calibrating any controller automatically sets the calibration for all controller inputs. Also, only one type of thermocouple input needs 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 Controller.
2. Dial in 1100 degrees centigrade (Note: unit must be programmed for displaying in centigrade).
3. Adjust the gain pot (see diagram of rear view of instrument) on the back of the instrument until the display reads '1100'.
4. Short Controller #1's input with a wire or shorting bar.
5. Push DATA key. The display will read '0002' --- or some other value.
6. Adjust offset pot on back of instrument (ref. Fig. 5) until the display reads '0000'.
7. Push PROGRAM key -- the display will show Cold Junction temperature.
8. Remove the shorting bar from Controller one input and connect the thermocouple calibrator again.
9. Repeat steps 2 through 7 till the unit reads proper temperature. Press **'PROG'** key to step the display to the next Controller reading.

FLOW CHART:


SET UP
ENTER PASSCODE --- 3254
TUNING
SELECT CONTROLLER NUMBER
ON/OFF or PID Control
DEADBAND (If On/Off control) or PROP. BAND (If PID Control)
RESET (if PID control)
RATE (if PID control)
Back to TUNING
PROG CTRL
SELECT CONTROLLER NUMBER
CONTROLLER TYPE (PID or ON/OFF)
SELECT SIGNAL TYPE 'J' T/C 'K' T/C 'T' T/C 'E' T/C VOLTAGE CURRENT (Thermistor, Millivolts,RTD, R, S or B t/c)
ENABLE or DISABLE THE CONTROLLER (ON/OFF)
VERIFY
SELECT CONTROLLER NUMBER
START SETPT
ENTER TIME
ENTER SETPT1
ENTER TIME
Verify segment 2 thru 6
ENTER SETPT7
ENTER TIME
Back to VERIFY
PROFILE
SELECT CONTROLLER NUMBER
START SETPT
ENTER TIME
ENTER SETPT1
ENTER TIME
Prog segment 2 thru 6
ENTER SETPT7
ENTER TIME
Back to PROFILE
PROG SYSTEM
DISPLAY OPTIONS
DISPLAY TIME
SELECT PROFILE STARTING POINT – PROCESS OR SETPT
RATE TIMEBASE
COLD JUNCTION CALIBRATION
CHANNEL CALIBRATION
VOLTAGE RANGE
CURRENT RANGE
Back to PROG SYSTEM
CURRENT OR VOLTAGE INPUT
Decimal Point
High Scale
Low Scale
Offset
Tare
Heat/Cool
Engineering units
THERMOCOUPLE, THERMISTOR, RTD INPUT
Degree C/F
Heat/Cool
Engineering units
Back to PROG CNTRL.

SAVING PARAMETER

CN1500 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 program, they ***MUST*** be saved in the EEPROM by pressing the RESET key as described under PROGRAM. If the parameters are ***NOT*** saved and the power is removed from the unit, any newly changed values will be lost (the unit will maintain the old values).

OPERATING CONTROLLER

There are FOUR modes of operation for the CN1500. These modes of operation are RUN, STOP, HOLD and ENTER SP (manual setpoint mode). The CN1500 requires that programming of the controller be completed first before operating the unit in any one of above mentioned modes.

RUN MODE

After programming the ramp & soak profile, each controller can be run. To run a controller, first select it by pushing **CNT SEL** key followed by a push on **RUN/STP** key.

On pushing **CNT SEL** key, the unit will display **CntrL 1** (for controller #1) . To select any other controller, toggle the **CTR. SEL** key until the desired controller is displayed. Display format will be:

Display	Controller	Display	Controller
CntrL 1	Controller #1	**CntrL 5**	Controller #5
CntrL 2	Controller #2	**CntrL 6**	Controller #6
CntrL 3	Controller #3	**CntrL 7**	Controller #7
CntrL 4	Controller #4		

Once the desired controller has been selected, push RUN/STP key. This will display the current operating status of the respective controller (RUNNING or HOLDING or STOPPED or ENTER SP). The messages that appear on the display are in the following format:

Display	Operating Mode	Description
rUnnInG	(Running Mode)	Controller is already running.
HOLdinG	(Holding Mode)	Controller is holding .
STOPPEd	(Stopped Mode)	Controller is stopped .
ENTR SP	(Enter setpoint manually)	Manually enter the setpoint.

To run controller's profile push the **RUN STP** key until the unit displays **Ctr. rUn** (Controller RUN). At this point the desired controller will be running its programmed profile. Once running, the controller can be put into an indefinite hold, if desired, or stopped, as described below.

STOP MODE

This mode is used for stopping a controller that has been put in a run mode (as described above). To accomplish this, first select the controller that needs to be stopped (Use the **CTR. SEL** key to select the desired Controller). Following the selection of the controller, push **RUN/STP** key once. This will

indicate the current status of the controller (e.g. RUNNING if the controller is in run mode, STOPPED , if it is stopped, HOLDING, if in hold mode or ENTER SP if it is in manual setpoint entry mode). To stop the controller, release the **RUN/STP** key and immediately press it again. The controller will be stopped and will be indicated by the display reading 'STOPPED'.

HOLD MODE

To indefinitely hold a controller at any setpoint, select the desired controller and place it in hold mode. This is accomplished by using the **CTR. SEL** key to select the controller and the **SCN/HLD** to hold it.

First push the **CTR SEL** key until the unit displays the desired Controller and ***hold*** the **CTR SEL** key pushed in. Now, ***simultaneously,*** push the **SCN/HLD** key. The unit will display one of the following messages; **C# HOLd** (Controller, # refers to controller number) or **CntrL nOt rUnnInG** (Controller is in Stop Mode). The controller (if in RUN mode) will hold at this point until the unit is placed back in run mode (see Run Mode).

NOTE: To place a controller on hold, it must be in run mode. If it is not, the display will indicate the message "CNTRL NOT RUNNING" and the key command will be ignored.

MANUAL SETPOINT OPERATION

Each controller can be operated in a manual setpoint mode. In this mode, instead of entering an entire ramp/soak profile, a single setpoint can be entered manually. The controller will operate and control around this setpoint.

To be placed in a manual setpoint mode, the controller must be in STOPPED mode i.e. it should not be running an automatic ramp/soak profile. If it is running a ramp/soak profile, and an attempt is made at entering a setpoint manually, the unit will display **'rUnnInG'** and ignore the key command. To turn off the controller, first use **CTR. SEL** key to select the controller and then **RUN/STP** key to stop it.

To program a manual setpoint for any controller, first select the controller (by pushing **CTR SEL** key). Once the desired controller has been selected, **keep the CTR SEL** key pushed. Next, simultaneously push the **SETPT** key. Upon entering manual setpoint mode, the unit will display **'Entr SP'** followed by setpoint value, with the active digit flashing. Use ▲▼ and **<DIG>** key to enter a desired value. After new setpoint value has been programmed, push EXT or PROG key to exit to normal display mode.

QUICK STOP

The CN1500 has a feature where all the running controllers can be stopped immediately. This is accomplished by pushing **Ctr. SEL** and **RUN/STP** keys simultaneously.

DISPLAY SCAN/HOLD MODE

CN1500 series can be made to continuously scan process and setpoint values for all controllers on the display or just hold on only one value for any selected controller. While scanning, each parameter is displayed for programmed amount of display time (display time is entered during system setup mode). Scanning of various parameters depends on the selected display option. These options are as follows:

PROCESS	Scans and displays process value for all controllers.
SETPOINT	Displays setpoint value only for controllers that are running.

PROCESS - SETPOINT Displays both, Process and Setpoint Values, for only those controllers that are running. First the Process value is displayed followed by the setpoint value.

DISPLAY SCAN

When the unit is in scan mode, the display will scan from one controller to the next, displaying parameters for each controller. If the selected display option is SETPOINT, the unit will display the following message when no controller is running, **'nO CntrL rUnnInG'.** If the unit is in HOLD mode, scanning can be started by pushing the **SCN/HLD** key.

DISPLAY HOLD

When the unit is in display hold mode, it will only display the controller parameter that it is held on. To place the unit in 'display hold' mode, push **SCN/HLD** key until the display reads **'HOLd'.** To hold the display on any other controller's process or setpoint, push the **SETPT** or **PROCESS** key till the desired parameter shows up on the display. From there on, the display will hold on that particular parameter until another one is selected.

NOTE: THIS HOLD FUNCTION ***DOES NOT EFFECT*** THE RUNNING OF A CONTROLLER. IT ONLY EFFECTS THE DISPLAYING OF PARAMETERS.

DISPLAYING PROCESS

If, at any point, it is desired to see process value of any given controller, use the **PROCESS** key. This key is used to toggle between process values of each channel. The display format is as follows:

Display	**Description**		**Display**	**Description**
Ctr1 Pr	Controller 1 Process	then	####	process value for controller 1.
Ctr2 Pr	Controller 2 Process	then	####	process value for controller 2.
Ctr3 Pr	Controller 3 Process	then	####	process value for controller 3.
Ctr4 Pr	Controller 4 Process	then	####	process value for controller 4.
Ctr5 Pr	Controller 5 Process	then	####	process value for controller 5.
Ctr6 Pr	Controller 6 Process	then	####	process value for controller 6.
Ctr7 Pr	Controller 7 Process	then	####	process value for controller 7.

where #### denotes the value displayed

The first push displays Controller 1's process. The next push displays Controller 2's process, and so on. Keep toggling the Process key to step through each controller's process. To exit at any time push any other key, or if no key is pushed for approximately 10 seconds the unit will revert back to scan mode.

DISPLAYING SETPOINT

To display a setpoint for any controller, use the SET PT key. This key is used to toggle between the value of the setpoint for each controller. The display format is as follows:

Display	Description		Display	Description
Ctr1 SP	Controller 1 Setpoint	then	####	Setpoint Value for controller 1.
Ctr2 SP	Controller 2 Setpoint	then	####	Setpoint Value for controller 2.
Ctr3 SP	Controller 3 Setpoint	then	####	Setpoint Value for controller 3.
Ctr4 SP	Controller 4 Setpoint	then	####	Setpoint Value for controller 4.
Ctr5 SP	Controller 5 Setpoint	then	####	Setpoint Value for controller 5.
Ctr6 SP	Controller 6 Setpoint	then	####	Setpoint Value for controller 6.
Ctr 7 SP	Controller 7 Setpoint	then	####	Setpoint Value for controller 7.

where #### denotes the value displayed

The first push displays Controller 1's setpoint. The next push displays Controller 2's setpoint. Keep toggling the **SET PT** key to step through each controller's setpoint. To exit at any time push any other key, or if no key is push for approximately 10 seconds the unit will revert back to scan/hold mode.

DISPLAYING DATA

To display data for any controller, fist select the controller by using **CTR. SEL** (Controller Select) key. After selecting the desired controller, push **DATA** key to step through the data in the following format:

Display	Description		Display	Description
Ctr # Pr	Process Value	then	****	Process Value
Ctr # St	Soak Time	then	****	Amount of soak time left
Ctr # dEn	Deviation	then	****	Amount of deviation
Ctr # HI	Hi Peak	then	****	Value of high peak
Ctr # LO	Lo Peak	then	****	Value of then low peak
C#-rAtE	Rate	then	****	Value of the rate of change
#- controller number		*where **** denotes the value displayed*		

To exit at any time push any other key, or if no key is push for approximately 10 seconds the unit will revert back to display scan/hold mode.

DATA DESCRIPTION

Ctr # Pr (Process Value) Current Process value of the selected controller.

C# STOP (Controller Stopped) If the Controller is not running then, at this point in the Data Display mode, the unit will Display **'C# STOP'**.

-or-

Ctr # St (Soak Time) This is the amount of soak time left, if a controller is in soak period. If the selected controller is ramping, then there is no soak time and the unit will display **'nO St'** .

Ctr # dEn (Deviation) Refers to difference between the setpoint and theprocess value.

Ctr # HI (High Peak) This is the highest reading monitored by the controller. To reset this value, hold in **DATA** key and push the **RST** key (while high peak is still being displayed). The display will show **'rESEt'** briefly and then the current highest input reading.

Ctr # LO (Low Peak) This is the lowest reading monitored by the controller. To reset this value, hold in **DATA** key and push the **RST** key (while low peak is still being displayed). The display will show **'rESEt'** briefly and then the current lowest input reading.

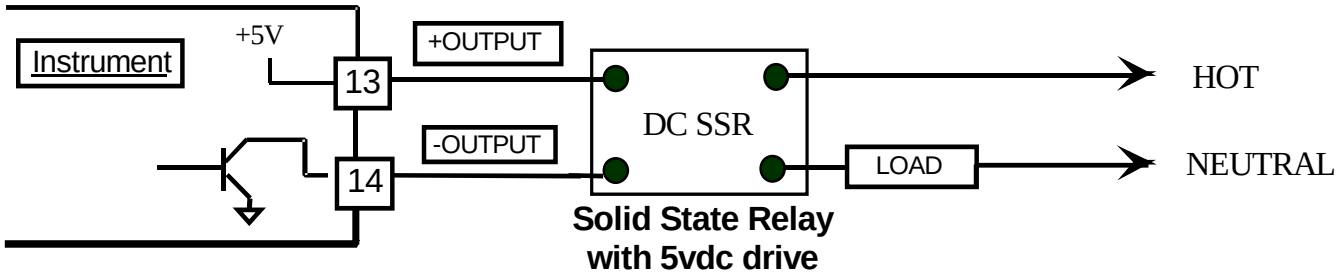
C#-rAtE (Rate) This refers to the rate of change of process value in one minute.

Where # refers to the controller's number.

EXTERNAL CONTROL RELAY INSTALLATION

The CN1500 uses its seven individual outputs to control each RAMP/SOAK function. These outputs are open collector transistors capable of handling 50ma of DC current. A control relay with 5Vdc coil that draws 50 ma. or less must be used (see figures below for solid state or mechanical relay hookup).

FIGURE 3. SOLID STATE RELAY HOOKUP TO A CONTROLLER OUTPUT



ERROR MESSAGES AND SOLUTIONS

ERROR MESSAGE	ERROR CONDITION	SOLUTION
'EE EROR'	The unit was unable to save programmed value in EEPROM -- possible failure of EEPROM.	1. If the message keeps coming up, unplug the unit and reapply power. If the unit still displays the error message, send it in for repair. 2. If the error message followed by 8.8.8.8.8.8. and the revision number are displayed occasionally, it is an indication that the power line is very noisy and needs a power line filter.
'CARD ER'	Problem with Scanner Card	1. Scanner card defective -- send in for repair. 2. Cable to scanner Card is unplugged.

POWER

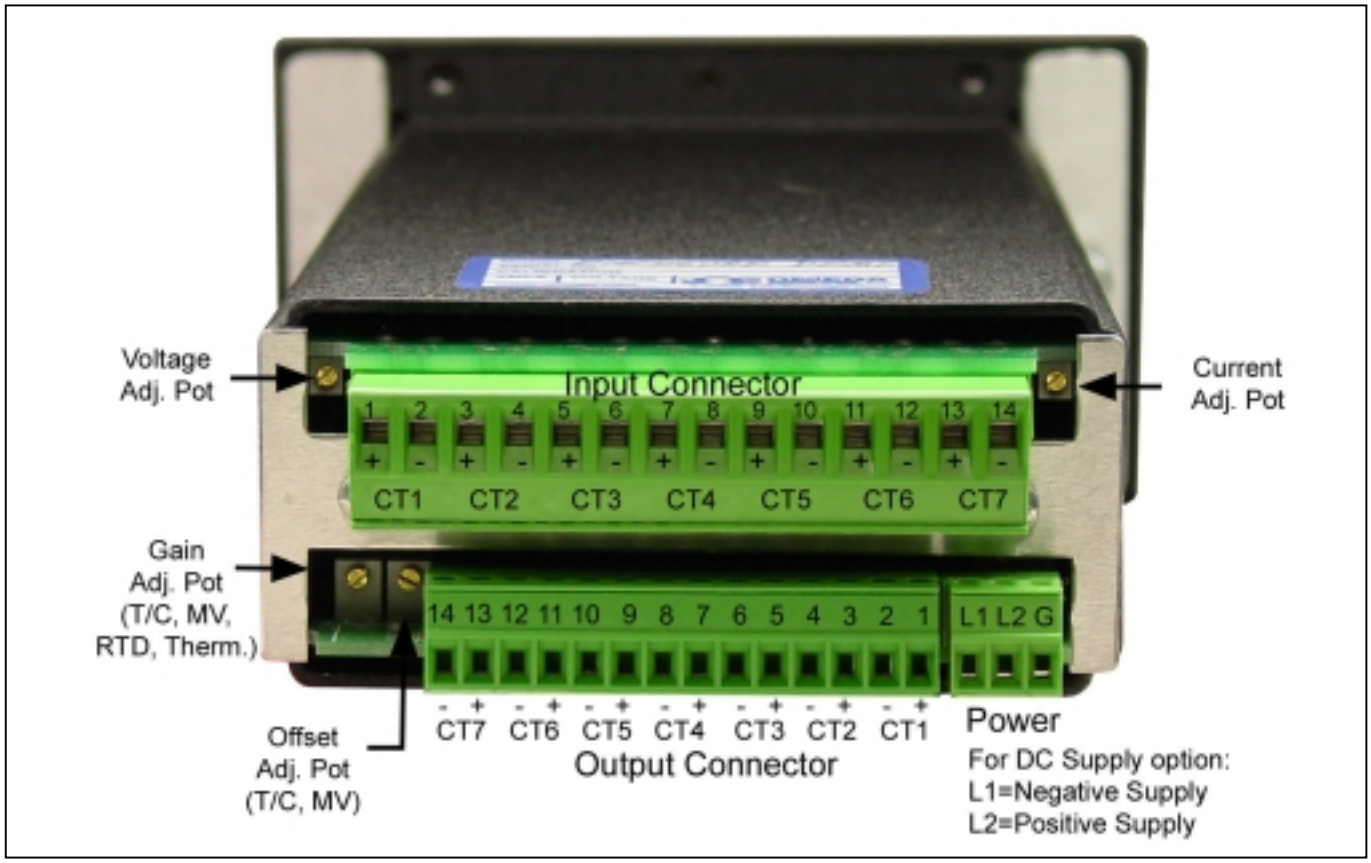
Power connection should be made to the 3 terminal Connector marked **AC POWER** along its side on the printed circuit board. Also make note that it is very important that the power LINE inputs and the power GROUND are not switched. Doing so will permanently damage the instrument. Refer to the schematic for proper connections. For convenience, the printed circuit board is labeled **L1 L2 GND** on the underside of the connector.

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.

FIGURE 5. REAR VIEW OF CN1500 INSTRUMENT



INPUT/OUTPUT CONNECTORS PIN ASSIGNMENTS

PIN NO	OUTPUT CONNECTOR	INPUT CONNECTOR
1	Controller 1 Output (Open collector Positive, +5vdc)	Controller 1 Positive Input
2	Controller 1 Output (Open collector Negative)	Controller 1 Negative Input
3	Controller 2 Output (Open collector Positive, +5vdc)	Controller 2 Positive Input
4	Controller 2 Output (Open collector Negative)	Controller 2 Negative Input
5	Controller 3 Output (Open collector Positive, +5vdc)	Controller 3 Positive Input
6	Controller 3 Output (Open collector Negative)	Controller 3 Negative Input
7	Controller 4 Output (Open collector Positive, +5vdc)	Controller 4 Positive Input
8	Controller 4 Output (Open collector Negative)	Controller 4 Negative Input
9	Controller 5 Output (Open collector Positive, +5vdc)	Controller 5 Positive Input
10	Controller 5 Output (Open collector Negative)	Controller 5 Negative Input
11	Controller 6 Output (Open collector Positive, +5vdc)	Controller 6 Positive Input
12	Controller 6 Output (Open collector Negative)	Controller 6 Negative Input
13	Controller 7 Output (Open collector Positive, +5vdc)	Controller 7 Positive Input
14	Controller 7 Output (Open collector Negative)	Controller 7 Negative Input

NOTE: PROPER CONNECTION AND CORRECT ORIENTATION OF THE CONNECTORS IS NECESSARY TO AVOID MALFUNCTION OR PERMANENT DAMAGE TO THE INSTRUMENT.

MOUNTING

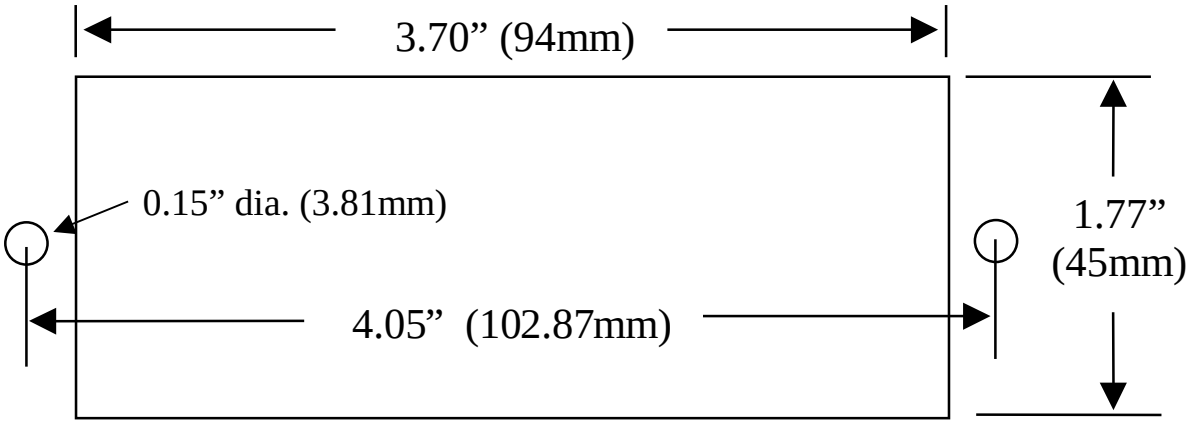
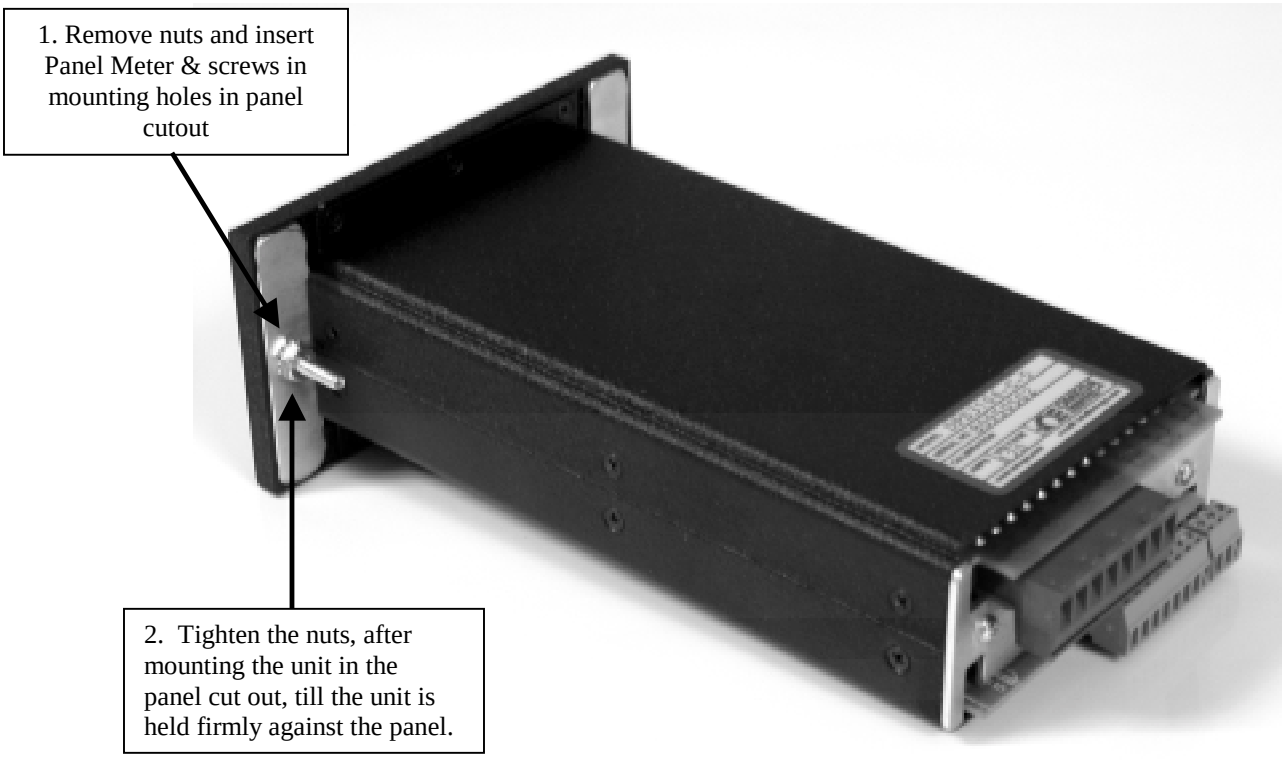


Figure 8. Panel Cutout and mounting hole dimensions

1. Cut out Panel and mounting hole dimensions as shown in the figure 8.
2. Remove the nuts from the mounting screws on the Panel Meter.
3. Insert panel meter into the hole until it is flush with the panel.
4. Install the nuts and tighten them till the unit is held firmly against the panel.



MADE IN
USA

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.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's 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. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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