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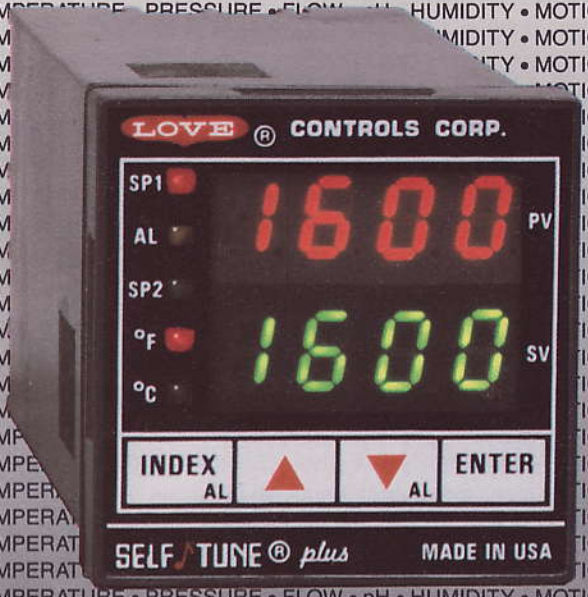
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Find the *Dwyer Instruments / Love Controls 16010* at our website: *Click HERE*

TEMPERATURE • PRESSURE • FLOW • pH • HUMIDITY • MOTION

Bulletin 9503-1
March 1993

IMPORTANT!
SET UP SECURE MENU FIRST
THEN SET UP SECONDARY MENU
THEN SET UP PRIMARY MENU
Do not enter Configuration Menu!



1600 Series
1/16 DIN Microprocessor Based Temperature/Process Control or Monitor

Available with Fuzzy Logic Software

UL LISTED CSA

LOVE® Controls Division

MOD-TRONIC
INSTRUMENTS LIMITED
1 Delta Park Blvd, #12 Brampton, ON L6T 5G1
Tel 905-457-6322 or 1-800-794-5883
Fax 905-457-4716 or 1-800-830-7122
sales@mod-tronic.com www.mod-tronic.com

TEMPERATURE • PRESSURE • FLOW • pH • HUMIDITY • MOTION

1600 Series 1/16 DIN Microprocessor Based Temperature/Process Control/Monitor Available with Fuzzy Logic Software

- Front panel may be washed down
- Dual four digit LED displays
- Selectable control modes
- Selectable tuning modes including Self-Tune®
- Selectable Thermocouple, RTD, current or voltage inputs
- Selectable indication of °F, °C, or engineering units
- Four security levels are password protected
- Front panel programmability
- Wide range power supply
- Available relay, logic, current or voltage outputs
- Additional standard features include:
  Loop break indication and protection
  Loop break time
  Peak and valley indication
  Auto/Manual
  Percent output indication
  Ramp and soak (ramp to set point and soak)
  Input correction
- Also available:
  Fuzzy Logic Software
  Dual set point models
  Alarm with selectable alarm modes
  Process (recorder) output or digital communications
- Engineered and made in U.S.A.

The Love 1600 Series provides economical control or monitoring for a wide variety of heating, cooling, heat/cool or other processes. Control of pressure, flow, humidity, motion, or pH can be obtained in conjunction with the proper transmitter.

Love's experience combined with the latest microprocessor and surface mount technology provide an unprecedented number of standard features in an economical 1/16 DIN package. All control functions are programmed from the front panel. Input types are DIP switch selectable. Multiple tuning modes in the control allow the operator to select from three standard tuning pre-sets, manual tune or Self-Tune®.

Non-volatile memory retains all process parameters when power is off without battery backup. Self diagnosis with indication of faults is standard. Optional alarm provides a full array of configurable alarm actions. Alarm start up inhibit feature is available to suspend the alarm function on power-up until the process value exceeds the alarm set point. A selectable power interrupt feature allows the alarm to reset upon power-up if the alarm condition no longer exists.

Additional standard features include: water proof and corrosion resistant front panel that may be washed down in sanitary applications, peak/valley indication, auto/manual output, percent output indication, ramp/soak, and selectable security levels.

Optional features include Fuzzy Logic Software, RS-485 communications, isolated 0 to 20mADC (monitor only) or non-isolated 0 to 10VDC signal for retransmission, four stage set point, and 24 or 12 Volt AC/DC control power input.

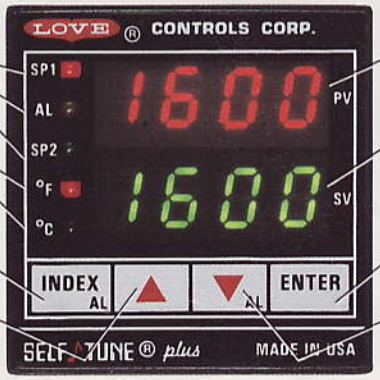
Front Panel Features

LEDs indicate status of set point and alarm outputs.

°C/°F descriptors. Both "off" for non-temperature inputs.

INDEX key advances menu for programming. Also used with the decrement key to reset an alarm programmed for manual reset.

Increment key raises value or turns "on" menu item chosen. Also used with ENTER key to display the secondary and secure menus.



Upper display continuously indicates process value or value of menu item selected.

Lower display continuously indicates set value or menu item selected. (Set point not illuminated in monitors.)

ENTER key enters new settings or commands into memory. Also used with the increment key to display other menus.

Decrement key lowers value or turns "off" menu item chosen. Also used with INDEX key to reset an alarm programmed for manual reset.

Available Options

Fuzzy Logic Software
(Option 942)

- Software enhancements provide better response time and reduce overshoot.
- For use in processes with unpredictable inputs such as extruders, very fast processes such as pressure systems, when response time or reduction of overshoot is critical, or when enhanced performance is preferred.

Isolated 0 to 20mA DC
(Option 937 - Monitors only)

- Retransmission output is optically isolated and scalable for use in monitoring or retransmitting the input. Available for the monitors only.

Non-isolated 0 to 10VDC
(Option 936*)

- Signal is linearized 0 to 10VDC (scaleable) at 5mA for retransmitting the input.

Other Options

Option 992* RS-485 communication link.

Option 948* Four stage set point. Up to four set points may be selected through two sets of external contacts.

Option 9502 24 Volt AC/DC control power input.

Option 9503 12 Volt AC/DC control power input.

*Due to terminal requirements, only one of these options may be selected.

Functions / Outputs / Inputs

Control Functions

Time Proportioning and Proportional Control Modes - Self-tune®, Manual PID, P, PI, or PD with anti-reset windup, or Selectable Pre-set Tune for fast, normal or slow response systems,

Proportional Band (P): 6 to 5000 °F or equivalent °C for temperature inputs. 6 to 9990 counts for current or voltage inputs.

Integral Time (I): 0.1 to 99.9 minutes or off.

Derivative Time (D): 0.01 to 99.99 minutes or off.

Cycle Rate: 2 to 80 seconds.

Approach Rate: Off to 99.99 minutes

- On-Off Control Mode

  Adjustable On/Off Differential 1° to full scale in 1° steps, 1 count to full scale in 1 count steps (current or voltage inputs)
- Digital Input Filter adjustable for noisy or jittery processes.

Control Outputs

- Solid state relay 3.5 A up to 240 VAC or 5 VDC output up to 25 mA selectable. Two set point SSR units have a combined total rating of 3.5 A. Solid state relay outputs are recommended for longer life.
- Relay 3 A up to 250 VAC
- 5 VDC output up to 25 mA
- Proportional current, non-isolated 0 to 20 mA into 600 ohms maximum. Zero and span programmable to 4 to 20 mA, 2 to 12 mA, etc.
- Proportional voltage, non-isolated 0 to 10 VDC into 500 ohms minimum (10 mA). Zero and span programmable to 0 to 1 VDC, 1 to 5 VDC , 4 to 7 VDC, etc.
- Dual outputs for Heat/Cool applications are available with most combinations of above.

Control/Monitor Inputs

- Type J, K, E, T, R, S, N, L, B, C thermocouple with 1° resolution
- Type J, K, E, T, N, L thermocouple with 0.1° resolution
- RTD (DIN or NIST) with 1° resolution
- RTD (DIN or NIST) with 0.1° resolution
- DC Voltage 0 to 5 VDC across 5000 ohms
- DC Voltage 1 to 5 VDC across 5000 ohms
- DC Current 0 to 20 mA through 249 ohms
- DC Current 4 to 20 mA through 249 ohms

Alarms

Two alarms operate the same 3.0 A resistive 250 VAC Form A contact relay (SPST). Alarms are field programmable for absolute (non-tracking) or deviation (tracking). Alarms can be set anywhere within the scaling of the control. Selectable inhibit and power interrupt features are included. Alarms can be reset automatically or manually.

Specifications

Selectable Inputs: Thermocouple, RTD, current or voltage.

Input Impedance:

- Thermocouple = 3 megohms minimum.
- RTD current = 200 µA maximum.
- Current = 249 ohms.
- Voltage = 5000 ohms.

Sensor Break or Short Protection: De-energizes control outputs to protect system.

Loop Break Protection: Error message is initiated upon shorted sensor or open heater circuit. Break time is adjustable from OFF to 99 minutes.

Loop Break Alarm: If equipped with an Alarm relay, the Alarm relay may be programmed to operate upon a loop break.

Set Point Range: Selectable.

Displays: Two 4 digit, 7 segment 0.3" high LED's. PV red; SV green.

Control Action: Reverse (usually heating), Direct (usually cooling) selectable for single or dual set point models.

Ramp/Soak: One ramp time and soak time each adjustable from 0 to 100 hours. End procedure can be set for HOLD or OFF.

Accuracy: ±0.25% of span ± 1 degree or count.

Resolution: 1 degree, 0.1 degree, or 1 count.

Line voltage Stability: ± 0.05% over supply voltage range.

Temperature Stability: 4 µV/°C (2.3 µV/°F) typical, 8µV/°C (4.5µV/°F) maximum.

Common Mode Rejection: 140 DB minimum at 60 Hz.

Normal Mode Rejection: 65 DB typical, 60 DB at 60 Hz.

Isolation: Relay and SSR outputs are isolated. Current, voltage, and logic outputs must not share common grounds with the input.

Power Consumption: 5 VA maximum.

Supply Voltage: 100 to 240 VAC, nom., +10% - 15%, 50 to 400 Hz. single phase; 132 to 240 VDC, nom., + 10% - 20%. This applies to the instrument power only. Consult the factory for relay and SSR output operation at DC and power line frequencies other than 50/60 Hz.

Operating Temperature Range: -10 °C to 55 °C (14 °F to 131 °F).

Storage Temperature Range: -40 °C to 80 °C (-40 °F to 176 °F).

Humidity Range: 0 to 90% up to 40 °C non-condensing. 10 to 50% at 55 °C non-condensing.

Memory Backup: Non-volatile memory. No batteries required.

Control Output Ratings:

1. SSR: 3.5 A @ 25 °C typical. Derates to 1.25 A @ 55 °C. Minimum 40 VAC and 100 mA required.
2. Relay, Form A contact (SPST):
   a. 3 A @ 250 VAC resistive.
   b. 1.5 A @ 250 VAC inductive.
   c. Pilot Duty Rating: 250 VA, 2A @ 125 VAC or 1 A @ 250 VAC.
3. Current (non-isolated): 0 to 20 mA, 600 ohms maximum.
4. Voltage (non-isolated): 0 to 10 VDC, 500 ohms minimum.
5. Switched voltage (non-isolated): 5 VDC @ 25mA.

Panel Cutout: 45mm x 45mm (1.775" x 1.775").

Depth Behind Mounting Surface: 117 mm (4.6").

Weight: 227 g (8 oz.).

Warranty: 5 years.

Agency Approvals: UL E83725; CSA LR 40125.

Front Panel Ratings: Meets UL 2, 3R, 3S, and 12 for non-hazardous, indoor locations (equal to NEMA ratings).

Standard Input Ranges

Thermocouple Types

Input Type		TYPE J or L Iron-Constantan	TYPE K Chromel-Alumel	TYPE E Chromel-Constantan	TYPE T Copper-Constantan	TYPE R PT13% RH-PT	TYPE S PT10% RH-PT	TYPE B PT6% RH-PT30% RH	TYPE C W5%RE-W26% RE	TYPE N Ni Cro Sil-Ni Sil
Temperature Range & Unit of Measure	1°F	-100 to 1600	-200 to 2500	-100 to 1800	-350 to 750	0 to 3200	0 to 3200	75 to 3308	0 to 4208	-100 to 2372
	1°C	-73 to 871	-129 to 1371	-73 to 982	-212 to 398	-17 to 1760	-17 to 1760	24 to 1820	-17 to 2320	-73 to 1300
	0.1°F	-100.0 to 990.0	-190.0 to 990.0	-100.0 to 990.0	-190.0 to 750.0	-	-	-	-	-100.0 to 990.0
	0.1°C	-73.0 to 871.0	-129.0 to 990.0	-73.0 to 982.0	-190.0 to 398.0	-	-	-	-	-73.0 to 990.0

RTD Types

Input Type		100 Ohm Platinum .00385 DIN Curve Love Cal. 106	100 Ohm Platinum .00392 NIST Curve Love Cal. 104	120 Ohm Nickel .006725 NIST Curve Love Cal. 105
Temperature Range & Unit of Measure	1°F	-328 to 1607	-328 to 1607	-112 to 608
	1°C	-200 to 875	-200 to 875	-80 to 320
	0.1°F	-190.0 to 990.0	-190.0 to 990.0	-112.0 to 608.0
	0.1°C	-190.0 to 875.0	-190.0 to 875.0	-80.0 to 320.0

Current and Voltage Types

Input Type	DC Current	DC Voltage
Standard Ranges	0 to 20 mA	0 to 5 V
	4 to 20 mA	1 to 5V
Unit of Measure	Current and voltage ranges are fully field scaleable to engineering units with up to 3 decimal places.	

Ordering Code

Model 16 [ ][ ][ ] – [ ] – [ ]

Hardware

Option Numbers See Page 2

Alarm
0 = No
1 = Yes

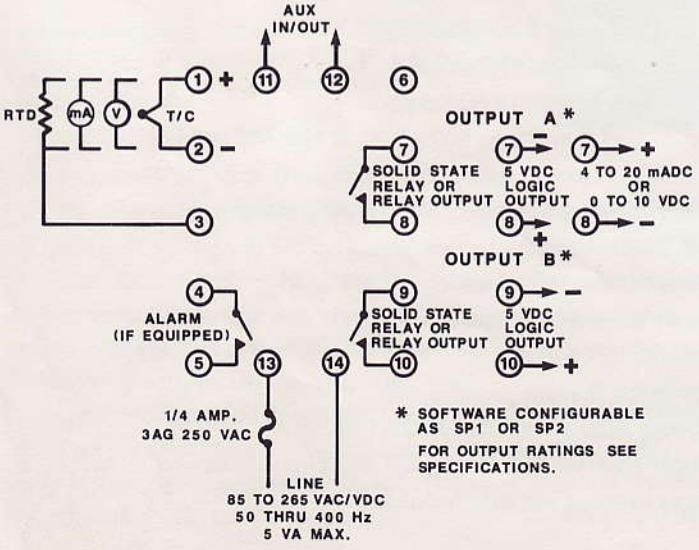
Output A (2)
0 = None
1 = SSR/5 VDC(1)
2 = 5 VDC/SSR(1)
3 = Relay/5 VDC(1)
4 = 5 VDC/Relay(1)
5 = Current
6 = Voltage

Output B (2)
0 = None
1 = SSR/5 VDC
2 = 5 VDC/SSR
3 = Relay/5 VDC
4 = 5 VDC/Relay

NOTES

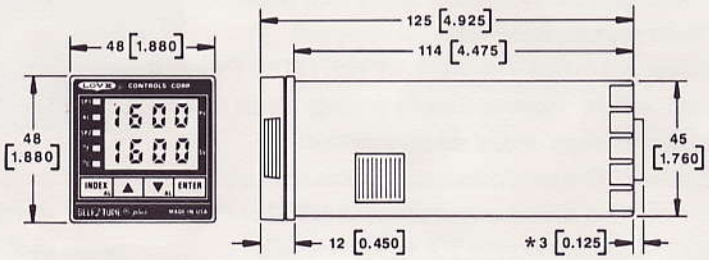
(1) For dual set point models, if ordering a relay for Output A, you must order a relay for Output B. If ordering an SSR for Output A, you must order an SSR for Output B. If ordering current or voltage for Output A, any Output B can be ordered.
(2) When selecting OUTPUT A or B, the hardware will be factory set to the item shown to the left of the "/" mark. Example: for SSR/5 VDC, the SSR hardware will be factory setup, but can be changed to 5 VDC output in the field. Conversely, when ordering 5 VDC/SSR the hardware will be factory set to 5 VDC output, but can be changed to the SSR output in the field.
(3) When ordering a control to operate contactor or solenoid loads greater than 100 mA, it is suggested that the SSR output be selected rather than the RELAY. If the RELAY output is selected, then also order part number 541-0014, R/C Snubber.

External Wiring



Dimensions

(All dimensions in MM with inches in parenthesis):



PANEL CUTOUT FOR ALL MODELS 45 MM X 45 MM [1.775" X 1.775"]
ALLOW FOR 13 MM (0.5") CLEARANCE AT THE REAR OF INSTRUMENT.
* PRESENT FOR ALL OUTPUTS OTHER THAN RELAY.

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