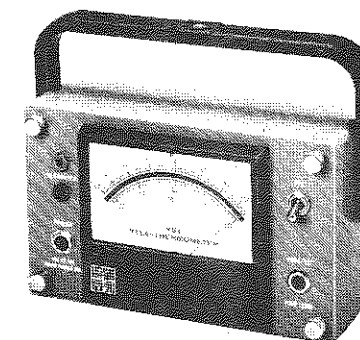




Scientific Division  
Yellow Springs Instrument Co., Inc.  
Yellow Springs, Ohio 45387

INSTRUCTIONS  
FOR  
YSI MODEL 43  
SINGLE CHANNEL  
TELE-THERMOMETER

FOR DIRECT READING WITH  
YSI SERIES 400 PROBES ONLY (see text)



GENERAL DESCRIPTION

The YSI Model 43 Tele-Thermometer is a precision temperature indicator produced in a number of ranges (see Range Chart), which comes to you tested and factory calibrated. With careful use and reasonable consideration of the meter movement and the temperature probes, years of trouble-free service may be expected.

## OPERATION

1. To ensure accuracy it is necessary to monitor meter and "red line" adjustments. Check these settings each time the instrument is used. With the instrument turned off, use a screwdriver to set the mechanical adjustment for the meter movement, located at the bottom center of the meter bezel, so that the pointer is aligned with the scale mark at the farthest right on the upper temperature scale. For maximum accuracy, all adjustments and readings should be made with the instrument in its normal operating position.

2. Turn switch to ON. Remove probe plug or interconnecting cable plug from the jack to the left of the meter. Turn the ADJ. TO RED LINE control so that the pointer is set at the red line. (If the pointer cannot be red-lined, replace the battery. See BATTERY REPLACEMENT below.) Replace probe plug or interconnecting cable plug. The instrument is now ready for use.

3. The output for the recorder is 0.000 volts at the highest temperature on the scale. At the lowest temperature on the scale it is 80 to 100 millivolts (50 to 70 millivolts in the TF and TI ranges). The recorder must have a minimum input resistance of 50,000 ohms.

4. When temperature measurement applications require probes of fast response time and very small physical size, YSI Series 500 probes can be used with this instrument. These probes are not interchangeable and must be used with a conversion chart to correct the temperature indication which the instrument displays. A conversion chart is furnished with each Series 500 probe. The chart is unique to that probe and is identified by serial number. The conversion chart should be inspected to assure that the temperature of interest, when appropriately corrected, falls within the display range of the instrument.

5. Measurement accuracy using Series 500 probes is conditioned by errors associated with thermistor self-heating. Thermistors used in these probes have very low thermal dissipation, and therefore the measurement current itself can produce a small but significant temperature offset. Measurement currents differ with instrument range. The error due to self-heating must be determined in the specific measurement circumstance.

## WARNING

All wire-lead patient-connected transducer assemblies are subject to reading error, local heating and possible damage from high-intensity sources of RF energy. Inadequately grounded electro-surgical equipment represents one such source in that capacitively-coupled currents may seek alternate paths to ground through probe cables and associated instruments. Patient burns may result.

In medical use, remove the probe from patient contact before activating the surgical unit or other RF source. If probes must be used simultaneously with electro-surgical apparatus, the instruments to which the probes are connected should be chosen to provide adequate isolation from electrical grounds at radio frequencies. Hazards can also be reduced by selecting a temperature monitoring point which is remote from the expected RF path to the ground return pad and by using pads having the largest practical contact area.

## PROBES

Should a probe fail completely, the meter pointer will move violently off-scale: to the right if the probe is shorted, to the left if it is open. Rarely, the base resistance of a probe may change sufficiently to cause the meter readings to be out of specification. If the accuracy of a probe is in question, it should be checked against a known temperature standard. Probe failures are normally irreparable since thermistors are potted and sealed in their assemblies. Replacement probes may be purchased through your YSI dealer.

## PROBE CARE

Some YSI probes are autoclavable and some are not. Refer to the YSI probe instruction sheets for further information and suggestions on cleaning and sterilization. 70% isopropanol or Dakin's solution are both effective for routine disinfection.

When not in use, probes and probe leads may be formed in loose loops for storage. Probe leads should never be wrapped around the instrument case, since permanent indentations might be impressed in the sheathing. Moreover, a lead which has been repeatedly wrapped tightly, pulled taut or stretched could develop stresses sufficient to cause mechanical failure.

## SERVICE

Normally, service on the Model 43 will be limited to occasional battery replacement. Battery life should be approximately 2000 hours. The battery should be inspected for leakage at regular intervals and replaced yearly. For all ranges except TIY, use Panasonic "Super-top Extra Duty" UM-1N or equivalent. For TIY use Mallory TR-135R.

## BATTERY REPLACEMENT

1. Loosen the four knurled thumbscrews on the front panel (do not remove them; they are designed to remain attached), and remove the meter-panel assembly from the case.
2. Steady the instrument to avoid jolting it while removing or installing a battery.
3. Observe polarity. The battery must be installed with the center or positive terminal in the direction indicated by the + sign on the printed circuit board.
4. Make certain that the battery is firmly seated and that good electrical contact is made.
5. DO NOT disturb the potentiometers inside the instrument. To do so will destroy the calibration accuracy.
6. Replace the meter-panel assembly. The thumbscrews should be drawn only finger-tight.
7. See note on schematic for battery types.

## CALIBRATION

With proper instrument care, recalibration will rarely be necessary. If it is definitely determined that recalibration is needed, it is preferable that the instrument be returned to the factory.

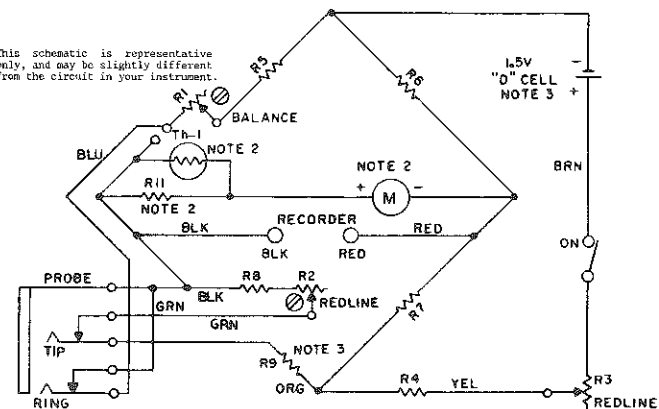
Recalibration in the field may be accomplished as follows:

1. With the instrument turned off, set the mechanical adjustment for the meter movement so that the pointer is aligned with the mark at the extreme right on the  $^{\circ}\text{F}$  scale.
2. Remove the instrument from its case by loosening the knurled screws at each corner of the front panel. Install a fresh battery and turn the switch to ON.
3. Rotate the ADJ. TO RED LINE control fully counterclockwise. *Do not force.*
4. Insert the probe into a constant temperature bath which is at a temperature corresponding to the high end of the range of the instrument. (*Note: only Series 400 probes may be used for calibration procedures.*) Allow one minute for the probe to stabilize at the bath temperature. Carefully adjust the internal control R1 so that the meter pointer is aligned with the scale mark corresponding to the bath temperature. (Controls R1 and R2 are indicated on the underside of the printed circuit board.)

A decade resistance box with 0.5% or better tolerance can be used instead of the probe and a constant temperature bath. Set decade box to HIGH resistance (see chart on reverse) and adjust R1 so that pointer is aligned with extreme right hand mark on  $^{\circ}\text{F}$  scale.

5. When calibrating with a probe, insert the probe into a constant temperature bath at the temperature corresponding to the Red Line mark on the meter face. Allow time for the probe to stabilize, then carefully turn ADJ. TO RED LINE control so that meter pointer is aligned with the red line on the meter.
- If the decade box is being used, set it to Red Line resistance (see chart) for the temperature range of your instrument and adjust until pointer is aligned with the red line on the meter face.
6. Repeat steps 4 and 5.
7. Remove probe plug or interconnecting plug and adjust the inside variable resistance R2 so that the meter again reads red line.
8. Verify calibration by using CHECK POINTS noted in the calibration table on the reverse side of this sheet.
9. Replace the instrument in its case.

This schematic is representative only, and may be slightly different from the circuit in your instrument.



- NOTE:
- All 1% resistors: metal film, 100 ppm/°C
  - |       | TF & TI Ranges             | All other ranges       |
|-------|----------------------------|------------------------|
| R-11  | 1.5K                       | 825 Ohms               |
| Th-1  | A-44040<br>100 Ohms @ 25°C | A-44042<br>1.2K @ 40°C |
| Meter | 25µA                       | 50µA                   |
  - |         | TIY Range                      | All other ranges             |
|---------|--------------------------------|------------------------------|
| R-9     | 18.2K                          | Zero                         |
| Battery | 6.75V Mercury TR-135R or Equal | 1.5V "D" Cell<br>Zinc Carbon |
  - In TIY range only, R3 is shunted across outside terminals by 301Ω

**WARRANTY**

All YSI products are warranted for one year against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. Damages from accidents, misuse, tampering or lack of prescribed maintenance are not covered. This warranty is limited to repair or replacement at no charge.

**RETURN INSTRUCTIONS**

Contact the dealer from whom you bought the instrument.  
 If recalibration only is required, contact Service Department  
 Yellow Springs Instrument Co., Inc.  
 Yellow Springs, Ohio 45387  
 Telephone: (513) 767-7241 Telex: 20-5437

Report the date of purchase, serial number, model-range designation and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charge for repair or replacement.  
 When shipping any instrument, be sure it is properly packaged for complete protection.

RANGE	TEMP. RANGE °C	TEMP. RANGE °F	RESISTOR 1% K = 1000 Ω										CHECK POINTS				CALIB PTS		REMARKS		
			POT R-1	POT R-2	POT R-3	R-4	R-5	R-6	R-7	R-8	NOTE 3	NOTE 4	RED LINE CALIB.	RES.	TEMP. RES.	RES.	TEMP. RES.	TEMP. RES.		HIGH	
TA	20 to 42	68 to 108	100	100	1K	806	1.05K	806	806	2.37K	0	1K	74°F	2424	68°F	2814	88°F	1731	108°F	1098	
TB	0 to 40	32 to 104	100	200	2K	3.01K	1.15K	2K	2K	5.62K	0	1K	5°C	5720	0°C	7355	20°C	2814	40°C	1200	
TC	15 to 100	59 to 212	20	100	1K	1.21K	143	221	221	1.43K	0	100	35°C	1471	15°C	3539	57°C	625.2	100°C	153.2	
TD	0 to 50	32 to 122	100	200	2K	3.01K	768	1.21K	1.21K	5.62K	0	68Q	5°C	5720	0°C	7355	25°C	2253	50°C	811.7	
TE	-23 to +40	-10 to 105	200	500	4K	6.19K	1.07K	4.53K	4.53K	7.15K	0	1K	0°C	7355	-10°F	26590	10°C	4483	105°F	1174	
TF	35 to 46	95 to 115	500	500	1K	232	2.61K	750	249	1.21K	0	820	37°C	1355	95°F	1471	105°F	1174	115°F	942.5	25 µa taut band meter (40477)
TG	25 to 45	77 to 113	100	200	400	499	953	499	499	1.96K	0	820	27°C	2065	25°C	2253	35°C	1471	45°C	984.2	
TH	-4 to 37	25 to 100	100	500	2K	4.02K	1.27K	2K	2K	7.15K	0	1K	0°C	7355	-4°C	9046	65°F	3055	100°F	1313	
TI	30 to 41	86 to 106	500	500	400	232	3.24K	750	249	1.50K	0	1K	89°F	1691.2	86°F	1815.0	96°F	1438.0	106°F	1148.0	25 µa taut band meter (40477)
TJ	10 to 40	50 to 104	100	200	2K	1.5K	1.15K	1.21K	1.21K	3.83K	0	1K	55°F	3928	10°C	4483	25°C	2253	40°C	1200	
TK	27 to 43	80 to 110	100	200	400	301	1K	499	499	1.74K	0	820	30°C	1815	80°F	2095	35°C	1471	110°F	1051	
TP	35 to 60	95 to 140	100	100	1K	499	499	499	499	1.50K	0	390	37°C	1355	35°C	1471	47°C	910.6	60°C	560.7	
TQ	70 to 100	158 to 212	50	50	400	402	124	221	221	301	0	100	75°C	3335	70°C	394.9	85°C	241.3	100°C	153.2	
TS	0 to 66	32 to 152	50	500	2K	3.01K	422	750	750	5.490K	0	390	5°C	5720	0°C	7355	35°C	1599	66°C	453.3	
TW	24 to 146	70 to 300	20	50	1K	806	33.2	110	110	536	0	33	60°C	560.7	70°F	2677	185°F	241.3	300°F	43.34	
TZ	-17 to +48	0 to 120	100	500	4K	6.19K	806	2.49K	2.49K	7.15K	0	68Q	0°C	7356	0°F	19240	60°F	3449	120°F	846.8	
TIY	-40 to -13	-40 to +10	5K	5K	2K	200	30.1K	8.06K	8.06K	49.9K	18.2K	10K	-34°C	31270	-40°F	75790	-15°F	31410	10°F	14080	TR135 (6.75V) mercury battery
TIY	88 to 150	190 to 302	20	20	400	200	33.2	49.9	49.9	147	0	33	100°C	153.2	190°F	221.2	240°F	99.14	150°C	42.26	R3 shunted by 301 Ω across outside terminals