MODEL 630 - AUTO NULLING
THERMAL TRANSIENT TEST SET

SPECIFICATIONS

BRIDGEWIRE RESISTANCE RANGE: 0.10 to 3.50 ohms,
to 10.00 ohms with reduced capability (see graph).

TEST CURRENT: Current is normally set to 60% of no-fire current and can range from 10 to 2000 ma. Minimum and full scale values are set by downloading from a host computer via the GPIB port or locally from the keyboard.

CURRENT RESOLUTION: One part in 4095 of full scale value.

CURRENT ACCURACY: 2% plus 1 milliamp

GAIN: Nominal 100 (may be set to other values and read via the GPIB port or local VGA monitor.

NULL: Precise to +/-5 millivolts at output at nominal gain, 50-microvolts at the EED (see graph)

OUTPUT NOISE: Less than 5 millivolts p-p at output at nominal gain, 50-microvolts at the EED (see graph).

BALANCE CURRENT: Minimum 10 milliamp, maximum 200 milliamp. Normally balance current is set to 10% of test current. Value is set by downloading from a host computer via the GPIB port or locally from the keyboard.

CURRENT PULSE DURATION: 10 to 99 milliseconds. Value is set by downloading from a host computer via the GPIB port or locally from the keyboard.

TEST START TRIGGER: Command input from user to start test. TTL level pulse, 15 millisec minimum, via a BNC connector or a software trigger via the keyboard or GPIB port.

SYNC OUT (SWEEP START TRIGGER): TTL output, nominal
5 millisec, via a BNC connector to trigger oscilloscope sweep prior to start of EED characteristic pulse.

INPUT POWER: 105 - 125V, 50-60Hz, 10 Amps (max).

TEMPERATURE: Operating: 15°C to +35°C
Storage : -40°C to +70°C

COOLING: Fan

DIMENSIONS: 19.00"W x 12.25"H x 22.70"D.

WEIGHT: 40 lbs (approx) net.
100 lbs (approx) shipping

ACCESSORIES: AC Power Cord, Coaxial cable assemblies, Reference bridgewire RB-101, GPIB cable; Installation and Operation Manuals

PHYSICAL DESCRIPTION

The Model 630 Auto Nulling Thermal Transient Test Set consists of a standard 19-inch rack mounted cabinet 22.70 inches deep by 12.25 inches high. The cabinet is light blue with dark blue trim. Front and back panels are ivory with black engraved lettering.

The test set can run as a stand-alone unit or under control of a host computer. Communication is achieved via a GBIP port on the back panel.

The front panel contains the power switch, a digital display. Power and other cable connections are on the back panel.

The test set is shipped with AC power cord; coaxial cable assemblies; EED Cable; GPIB Cable; Reference Bridgewire RB101; and Installation and Operating Manuals.

The Model 630 is capable of providing 2000 milliampere constant current pulses to an EED of 0.1 to 3.5 ohms. EEDs in the range of 3.5 to 10.0 ohms require reduced maximum current levels and have increased noise and null specifications (see graph).

FUNCTIONAL DESCRIPTION

Test Section

The Model 630 Auto Nulling Thermal Transient Test Set is a digitally controlled measurement system designed to produce a high level analog output waveform representing the change in resistance of a bridgewire device as it heats during a DC current pulse.

When a Command Trigger pulse is received, the processor establishes a coarse null using null current pulses; then a fine null, using a few short test current pulses. Resistance of the EED is then displayed on the front panel and made available to a connected computer via the serial port or the GPIB port.

The I/O section passes control signals from the processor to the rest of the test set. These signals set op amp gains, control the nulling sequence, and set the current levels produced by the CCPS section.

In the constant current power supply (CCPS) section analog voltages to the DAC set up the null and test current levels sent to the EED. Relays in this section provide Safe-and-Arm and Current-Disable functions.

The measurement section receives voltage from the sense leads across the Electro-Explosive Device (EED) and produce a digital word at null that is proportional to the cold resistance of the EED. The measurement section also sends the characteristic output waveform of the EED to the output BNC connector on the back panel of the test set. The output analog characteristic waveform represents the change in resistance of the EED as a result of heating during the test current pulse.

The measurement circuits within the Model 630 monitor the voltage across the EED during this entire sequence and produce the EED characteristic waveform in less than one-half second. The waveform may be viewed on an oscilloscope or be digitized and sent to a host computer for analysis.

Safe-And-Arm and Current Disable relays protect the EED during setup and test parameter changes.

Test parameters are passed to the Model 630 via the GPIB port.

Data Capture Section

The data capture section of the Model 630 test set consists of a digital-to-analog conversion circuit board, a DOS based single-board CPU, a GPIB interface board, a TTL I/O board, and a suite of software.

The system captures the waveform digitally; measures initial slope, thermal time constant, and final pulse amplitude. Using these values and the cold resistance from the measurement section of the test set, the system solves the Rosenthal equations to calculate heat loss coefficient (thermal conductance), heat capacitance, and temperature rise of the bridgewire. Provision is made to serialize each EED tested. Means and Standard deviation are calculated for the test population. The characteristic waveform can be displayed on a CRT.

Data Log files can be opened to store the waveform and all of the above values. The waveform and the stored data can be printed out or displayed at a later time.

Pass/Fail analysis can be based on any combination of the measured or calculated values. High and low limits can be set as a percentage or as an absolute value. Waveshape matching is also available. The user can define high and low limit waveforms and display them on the monitor. If the characteristic waveform goes outside the limit lines, a "fail" indication is sent.