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MILITARY STANDARD

TEST EQUIPMENT FOR THE
STANDARD ELECTRONIC MODULES PROGRAM

TO ALL HOLDERS OF MIL-STD-1665:

1. THE FOLLOWING PAGES OF MIL-STD-1665 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
5	11 July 1979	5	20 January 1978
6	11 July 1979	6	20 January 1978

2. The following pages are to be added:

NEW PAGE	DATE
007-1 through 007-3	11 July 1979
J06-1 and J06-2	11 July 1979
Y06-1	11 July 1979

3. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

4. Holders of MIL-STD-1665 will verify that additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or canceled.

Custodians:
Navy - EC
Army - ER
Air Force - 11

Review activities:
Navy - AS, OS, SH
Army - AT, MI, AR
Air Force - 13, 17, 19, 85
DLA - ES

User activities:
Army - AR
Navy - MC
Air Force -

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5963-0002)

FSC 5963

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ITEM 007

OSCILLOSCOPE, HIGH FREQUENCY

TYPE OF EQUIPMENT	High frequency oscilloscope.
FUNCTION PERFORMED	Analog display of electrical signals.
SPECIFICATIONS	All specifications are for an ambient temperature of +15° to +35°C.
General information Cathode-ray tube	The cathode ray tube shall present a signal within the accurracy of the horizontal and vertical signal circuits over the full area of 10 cm horizontal by 8 cm vertical. A graticule either external or internal shall be supplied for measurements.
Positioning of trace	Provision for positioning the trace or spot and determining its location if off screen shall be incorporated.
Controls	CRT spot size, shape, intensity, graticule brightness, and power on/off.
Calibrator	1 kHz (nominal) square wave ranges from 2 mV, 20 mV, 0.2 V, 0.4 V into 50Ω and 4 mV, 40 mV, 0.4 V, 4 V, 40 V into an open circuit. Amplitude accuracy is ±1%.
Z AXIS INPUT	±15 V MAXIMUM POSITIVE signal decreases intensity.
Horizontal circuits Internal sweep	2 sweep circuits shall be provided.
Time base 1 (main sweep)	(a) 0.2 s/div to 10 ns/div. in a 1,2,5 sequence, (accuracy ±2% from 0.2 s/div. to 20 ns/div., ±3% at 10 ns/div.). (b) An uncalibrated variable is continuous between steps, and extends sweep rate to at least 0.5 s/div. The variable control is internally switchable between delaying and delayed sweeps. (c) Delay time multiplier range - 0 to 9.8 times the DLY TIME/Div. setting from 0.2 s/div. to 10 ns/div. (0 to 1.96 seconds).
Time base 2 (delayed sweep)	(a) 0.2 s/div. to 0.5 ns/div. in a 1,2,5 sequence, (accuracy ±2% from 0.2 s/div. to 20 ns/div., ±3% from 10 ns/div. to 5 ns/div., ±4% from 2 ns/div. to 1 ns/div., and ±5% at 0.5 ns/div. (b) An uncalibrated variable rate is continuous between steps, and extends sweep rate to at least 0.5 s/div.

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Triggers (Auto, Norm., Single) - - -	(a) Modes (1) AC (2) AC with low frequency reject. (3) AC with high frequency reject. (4) DC (b) Source/minimum sensitivity from 100 to 500 MHz for any coupling except ac hf Rej. (1) Internal/0.5 div. display amplitude (2) External/100 mV. (c) Polarity (1) Positive (2) Negative (d) Internal Jitter (MAIN and DELAYED) (1) 50 ps or less at 500 MHz (e) EXT ÷ 10 switch attenuates ext signal 10 times. (f) External Input (MAIN and DELAYED) (1) Selectable 50Ω or 1 MΩ inputs (1 MΩ is paralleled by approximately 20 pF). (2) MAXIMUM input is 250 V (dc + peak ac) for 1 MΩ input, and 1 W average for 50Ω input. (3) Range of trigger level ±3.5 V in EXT and EXT ÷ 10.
Horizontal modes (may be mutually exclusive) - - - - - - - - - - - -	(1)A: A horizontal unit only (2) ALT: Dual-sweep, alternates between horizontal units. (3) CHOP: Dual sweep, chopped between horizontal units. (4) B: B horizontal unit only.
Horizontal outputs - - - - - - - - -	(a) A or B time-base (+) Sawtooth (b) A, B or A Dly'd (+) Gate, rise time is 7 ns or less into 50Ω.
Vertical circuits Delay - - - - - - - - - - - - - - - - -	The vertical signal shall be delayed so that no part is lost due to sweep circuit start-up time.
Delay time difference between Channels - - - - - - - - - - - - - - - -	50 ps or less.
Accuracy - - - - - - - - - - - - - - - -	±2% with gain adjusted at 10 mV/div.
Rise time - - - - - - - - - - - - - - - -	1.8 ns maximum.
Frequency response - - - - - - - - - -	DC to 200 MHz.
Input voltage - - - - - - - - - - - - - -	DC coupled: 250 V (dc + peak ac); ac component 500 Vp-p maximum AC-coupled: 500 V (dc + peak ac); ac component 500 Vp-p max.
Sensitivity - - - - - - - - - - - - - - -	5 mV/Div. to 5 V/Div.; ten steps in 1,2,5 sequence.
Input impedance - - - - - - - - - - - - -	1 MΩ±2% shunted by 20 pF.
Number of inputs - - - - - - - - - - - -	Two (2) each having ac or dc couplings.

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Output - - - - - - - - - - - - - - - - -	Derived from vertical signal as selected by (a) trigger source switch.
Vertical modes - - - - - - - - - - - - -	(1) LEFT, Left vertical channel only. (2) ALT.: Dual-sweep, alternates between vert. units. (3) ADD: Added algebraically (4) CHOP: Dual sweep, chopped between vert. units. (5) RIGHT, right vertical channel only

EQUIPMENT MEETING ALL SPECIFICATIONS

Manufacturer - - - - - - - - - - - - -	Tektronix Any one of the following models: (a) 7904 (b) R7903 Used in conjunction with the following probe and plug in units: (1) 7B92A - Horizontal time base (2) 7A26 - Vertical amplifier (3) P6106-10X, 1 meter probe.
Exceptions - - - - - - - - - - - - - -	None

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ITEM J06

GENERATOR, PULSE

TYPE OF EQUIPMENT	Pulse generator.
FUNCTION PERFORMED	A versatile pulse generator with very fast variable transition times and repetition rate up to 50 MHz, compatible with MOS and other general purpose circuitry.
SPECIFICATIONS	
Pulse repetition rate	
Single pulse	5 Hz to 50 MHz (jitter < 0.1% of period +50 ps)
Double pulse	5 Hz to 25 MHz
Pulse characteristics	
Pulse amplitude	Pulse high and low levels independently adjustable over a ±20 V range from a 50Ω low reactance source. Maximum pulse amplitude into a 50Ω load is ≥10 V peak to peak; minimum is ≤0.5 V peak to peak. Maximum pulse amplitude into an open circuit is ≥20 V peak to peak; minimum is ≤1.0 V peak to peak. The preset level controls are adjustable over the same ranges.
Aberrations	≤5%, +50 mV into a 50Ω load for pulse levels between ±5 V. May increase to ≤10%, +50 mV for pulse levels outside this range.
Transition times	Independently adjustable leading and trailing transition times from ≤5 ns typical (≤7 ns at some offset and amplitude levels) to ≥50 ms, measured from the 10% point to the 90% point, in six decade steps plus variable. Variable controls with 100:1 range (50:1 on 5 ns) provide overlap on all ranges. Transition times longer than 50 ms are obtainable in the custom range position.
Transition linearity	Deviation from straight line ≤5% between the 10% and 90% point for transition times greater than 10 ns.
Pulse width	Adjustable from ≤10 ns to 20 ms.
Pulse delay	Variable from 10 ns to 10 ms.
Pulse delay (paired pulse mode)	Variable from ≤10 ns to ≥100 ms.
Jitter (all modes)	≤0.1% +50 ps.
Input data	
Trigger/gate input	Sensitivity: 80 mV peak to peak to ≥10 MHz; 250 mV peak to peak to 50 MHz at 50Ω input impedance.
Input impedance	Internally selected, 50Ω or 1 MΩ paralleled by ≈ 20 pF.

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Maximum input	*±5 V peak into 50Ω, ±20 V peak into 1 MΩ.*
Minimum input Pulse width	10 ns.
Trigger level	
Polarity	Front panel selectable, + or - slope.
Range	±3 V.
Trigger output data	
Trigger output amplitude	≥+2 V from 50Ω.
Trigger source impedance	50Ω.
Trigger duty cycle (internal trig.)	≈ 50%.
Trigger duty cycle (external trig.)	*Determined by duty cycle of triggering signal.*
Pulse delay modes	Undelayed, delayed, and paired. Paired pulse mode limited to 25 MHz. Minimum pulse separation governed by duration duty factor specification.
Fixed pulse delays	
Trigger out to pulse out	≈ 23 ns.
Gate input to trigger out	≈ 25 ns.
EQUIPMENT MEETING ALL SPECIFICATIONS	
Manufacturer	Tektronix Model PG508. When used in conjunction with all Tektronix TM500 *series power modules except the TM501.*
EQUIPMENT MEETING SPECIFICATIONS WITH EXCEPTION NOTED.	(Later)

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ITEM Y06

PROBE, OSCILLOSCOPE VOLTAGE

TYPE OF EQUIPMENT - - - - - - - - - - - -	General purpose 10X voltage probe
FUNCTION PERFORMED - - - - - - - - - - -	To enable voltage monitoring with minimum circuit loading and signal distortion.
SPECIFICATIONS	
Input impedance - - - - - - - - - - - -	10 MΩ in shunt with an adjustable capacitor.
Input capacitance - - - - - - - - - - -	(1 meter probe) - 10.5 pF (2 meter probe) - 13.0 pF (3 meter probe) - 15.5 pF
Attenuation - - - - - - - - - - - - - -	10X ±3% (oscilloscope input = 1 MΩ±2%)
*Bandwidth - - - - - - - - - - - - - - -	(Oscilloscope bandwidth 255 MHz) when used with: (a) 1 and 2 meter probes; at least 250 MHz (b) 3 meter probe; at least 150 MHz.
Maximum input voltage - - - - - - - - -	500 V (dc + peak ac) to 1.7 MHz derated to 65 V at 200 MHz.
EQUIPMENT MEETING ALL SPECIFICATIONS	
Manufacturer - - - - - - - - - - -	Tektronix (1) P6106

* All three probes are usable on oscilloscopes with bandwiths up to 350 MHz. When the 1 meter probe is used with oscilloscopes having bandwidths of at least 325 MHz the system bandwidth will typically be 300 MHz.