

Rockwell
CSD Dallas

Calibration Instruction (CI)
For

MFG\MODEL: BIRD 6156DESCRIPTION: RF WATTMETERMANUAL REFERENCE NUMBER: 6100 SERIES INSTRUCTION DATE: 1967
BOOK

[] SEE MULTIPLE MANUAL CROSS-REFERENCE ATTACHMENT

UUT ENVIRONMENTAL RANGE

	Temperature	Humidity
CALIBRATION:	<u>23°C ± 3°C</u>	<u>40% to 60%</u>
OPERATION:	<u>NOT SPECIFIED</u>	<u>NOT SPECIFIED</u>

A CI contains the detail necessary for an experienced Calibration Technician to evaluate the performance/verification/calibration status of M&TE. The M&TE being evaluated will be referred to as, UUT (Unit Under Test). Standards used to evaluate UUT will be referred to as TI (Test Instrument).

Prepared by: D. R. Montgomery

Date 07-17-98

Approved by: *[Signature]*Date 8/11/98REVISION CONTROL

REV	DESCRIPTION	DATE	INITIAL

INTRODUCTION AND DESCRIPTIONSTANDARDS AND EQUIPMENT REQUIREMENTS

Standards are selected based on a minimum TI to UUT ratio of 4:1. The UUT specification may be published manufacture's specification, user defined specifications, or specifications defined with consideration given to the minimum accuracy ratio.

TI's selected in this section are suggested TI's and may be substituted provided the stability and accuracy ratio is adequate.

For accuracy ratios of less than 4:1 for which UUT specifications cannot be adjusted methods described in QAM-307B par. 2.6 will be used.

Data will be recorded for all data found to be out of tolerance.

Temperature compensation factor will be applied when calibrating outside the UUT/TI operating temperature range.

STANDARDS (TI)

PARAMETER	MFG	MODEL	RPT #	RATIO
SWR		85021A	85021A-05280	
	H.P.	8756A	WITH ABOVE	>4:1
		8350B	WITH ABOVE	>4:1
RF POWER	H.P.	438A	438A-90	
		8481A	8481-05207	
		8484A		>4:1
DC mA	FLUKE	5700A		>10:1

SUPPORT EQUIPMENT

MFG	MODEL	DESCRIPTION	LOCATION
NARDA	768-30	20 WATT 30 dBm ATTENUATOR	LAB
AMPLIFIER RESEARCH	30L	30 WATT POWER AMP NOTE: SPEC. TO 250 MHZ - MONITORED TO 1 GHZ	LAB
H.P.	8640B	RF SOURCE	LAB

CALIBRATION SPECIFICATIONS*

*This sheet may be changed as needed to accommodate parameters of UUT.

TEST #	PARAMETER/RANGE		NOMINAL	LIMITS		
				LOW	ACTUAL	HI
A1.1	INPUT RESISTANCE	NOMINAL	50 Ω	$\approx \pm 5\%$		NOT OPEN
A1.2	SWR	>1.1:1	26.38 dB	>26.38 dB		N/A
A1.3	BLACK SCALE	30 μ A	MOVEMENT	F.S. $\pm 2\%$		N/A
A1.4	RED SCALE	60 μ A	DIVIDER	F.S. $\pm 2\%$		N/A

A1.REF	POWER METER 5 WATTS WITH 30 dB ATTENUATOR			REFERENCE		
A1.5	FULL SCALE	50 MHZ	REFERENCE	REF. ± 0.2 dBm		N/A
A1.6	FULL SCALE	20 MHZ	REFERENCE	REF. ± 0.2 dBm		N/A
A1.7	FULL SCALE	100 MHZ	REFERENCE	REF. ± 0.2 dBm		N/A
A1.8	FULL SCALE	400 MHZ	REFERENCE	REF. ± 0.2 dBm		N/A
A1.9	FULL SCALE	600 MHZ	REFERENCE	REF. ± 0.4 dBm		N/A
A1.10	FULL SCALE	800 MHZ	REFERENCE	REF. ± 0.4 dBm		N/A
A1.11	FULL SCALE	1.0 GHZ	REFERENCE	REF. ± 0.4 dBm		N/A
A1.12	RED SCALE	50 MHZ	5 W BLACK SCALE	5w $\pm .25$ w		N/A
A1.13	BLACK SCALE X10	50 MHZ	15 W RED SCALE X1	5W ± 2.5 W		N/A

CALIBRATION PROCESS

PRELIMINARY INSTRUCTIONS

When Applicable:

1. Visually inspect the TI for signs of physical and electrical damage to include cords, knobs, and handles. Take necessary corrective actions.
2. Clean all air passages, filters, cases, and front panels.
3. Adjust analog meter mechanical zero adjustments.
4. Allow sufficient time for warm-up of TI and Standards.
5. Note the calibrating temperature and apply tolerance compensation for all parameters calibrated outside the TI and UUT operating range.

UUT minimum warm-up time N/A

TEST #	CALIBRATION PROCESS
	SPECIFICATIONS
	Frequency Range.....30 to 500 Mhz or 30 to 1000 Mhz with special calibration.
	VSWR..... 1.1:1 dc to 1000 Mhz (>-26 dB).
	Input Impedance 50 Ω nominal.
	Accuracy $\pm 5\%$ of full scale (30 - 500 MHz) $\pm 10\%$ of full scale (500 - 1000 MHz)
Setup	Turn the Amplifier Research model 30L amplifier to ON and Standby.
	INPUT RESISTANCE
	Connect the DMM to the UUT Type N input with a 4 wire ohms connection.
A1.1	Verify that the UUT input resistance is approximately 50 Ω . This is primarily a check to verify that the UUT resistance has not been blown, the normal range of resistance is from 47.5 to 52.5 Ω .
	SWR
	Connect the H.P. 85021A Directional Bridge to the H.P. 8756A Network analyzer Channel A input. Connect the H.P. 8350B Sweep Oscillator output to the Directional Bridge RF input.
	Set the Sweep Oscillator START frequency to .1 Mhz and the STOP frequency to 1.0 GHz. Set the output level to 0.0 dBm.
	Perform the 8756A CAL SHORT procedure using the SHORT/OPEN termination included with the Directional Bridge.
	Connect the Directional Bridge TEST input to the UUT Type N input c connector and verify that the Network Analyzer CURSOR MAX reading is more than 26.38 dB down from the CAL REF.

	METER MOVEMENT / DIVIDER ACCURACY
	Disconnect the coaxial leads from the meter movement (leave the terminal strip connected) and connect the DC μA calibrator output to the Meter Movement / Terminal Strip connectors.
	With the UUT scale switch in the BLACK SCALE position, apply 30 μA DC to the UUT meter input terminals.
A1.3	Verify that the meter needle deflects to full scale $\pm 2\%$.
	Switch the UUT scale switch to the RED SCALE position. Increase the calibrator output to 60 μA .
A1.4	Verify that the meter needle deflects to full scale $\pm 2\%$.
	RF ACCURACY
	Disconnect the calibrator and reconnect the UUT coaxial leads to the meter movement.
	Zero and calibrate the 438A power meter with an H.P. 8481A sensor on channel 1 and an H.P. 8484A sensor on Channel 2.
	Connect the Narda model 768-30 20 watt 30 dB attenuator to the 438A POWER REF. Connect the channel 2 sensor to the attenuator. Note the power meter reading and subtract it from 36.99 dBm (5 watts through 50 Ω). Note the difference reading on the test data sheet as A1.REF
	Disconnect the sensor from the attenuator and the attenuator from the power meter POWER REF connector. Connect the Attenuator to the power meter channel 1 input.
	Set the 8640B output to 50 Mhz at -40 dBm.
	Connect the 8640B output to the Amplifier Research amplifier input.
	On the UUT, verify that the crystal diode is in the left (X1) position.
	Connect the Amplifier output to the UUT input.
	Slowly adjust the 8640B output level and the amplifier GAIN to obtain a full scale (5 watt) reading on the UUT. NOTE: DO NOT EXCEED +10 dB INPUT TO THE AMPLIFIER.
	Disconnect the RF input cable from the UUT and connect it to the input of the Narda attenuator.
A1.5	Verify that the power meter reading is within the limits (± 2 dBm 30 to 500 Mhz [5%], ± 4 dBm 500 Mhz to 1 GHz [10%]) listed.
A1.6	Repeat for each listed frequency and limit listed in tests A1.6

thru	through A1.11.
A1.11	
	Reset the 8640B to 50 Mhz and adjust the 8640B output and Amplifier gain for a full scale (5 Watt) reading on the UUT.
A1.12	Set the UUT scale switch to the RED SCALE position and verify that the UUT reads 5 Watts ± 0.25 Watts on the RED SCALE.
	Adjust the pot connected to the UUT meter movement terminal strip for a reading of exactly 5 Watts on the UUT RED SCALE. (Normalize reading)
	Adjust the 8640B output and Amplifier gain for a 15 Watt reading on the UUT RED SCALE (full scale).
	Set the Amplifier output to STANDBY.
	On the UUT, move the Crystal Diode from the X1 (left hand) connector to the X10 (right hand) connector and set the UUT scale switch to BLACK SCALE.
	Set the Amplifier output to OPERATE.
A1.13	Verify that the UUT meter reading is 15 Watts ± 2.5 Watts.