INSTRUCTION MANUAL

MODIFICATION INSERT

Serial Number

FILE COPY

TYPE 1L20 MOD 139B

This insert has been written to supplement the Instruction Manual furnished with this modified instrument. The information given in this insert will supersede that given in the manual.

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TYPE 1L20

MOD 139B

Tektronix, Inc.

S.W. Millikan Way • P. O. Box 500 • Beaverton, Oregon • Phone MI 4-0161 • Cables: Tektronix

			INST TYPE MOD
			INST TTPE MOD
		# Dages	Dated
Section	ltem	# Payes	****
А	Correspondence	******	
В	Engineering notes and Spec Parts		DEIDO
С	Control Drawing		15-00
D	Cost and Price break-down		
Е	Build Procedure (includes Parts List and Calibration Procedure)		
F	Manual Insert	-4-	7-7-66

Change: Added New Nomenclature & Disp Bal Hole. Removed Mod 139B +10V DC Out Hole. For Larry W. By T.G. 9-15-67



#4131

120 mod 139B

11 Brunings 12-8-67

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1120 mod 1398 REMOVED COMMA "MAX INPUT" WEISS BY HAB 6-3-68 **TYPE 1L20** SPECTRUM ANALYZER 275 MHz TO 4200 MHz **PLUG-IN UNIT** IF 4 3000-4200 3 1950-3100 POS ATTEN dB 2 850-2000 275-900 1 **IF CENTER FREQ** 1 **RF CENTER FREQ** FINE 2 DISP CAL CAL 4 OFF 8 DISPERSION RANGE PHASE LOCK kHz/CM-- MHz/CM FINE DISP 1 MHz CAL MARKERS RF CENTER 16 BAL FREQ LOCK INT 1MHz - CHECK REF FREQ OUT DISPERSION COUPLED RESOLUTION (PULL TO VARY) .5 .2 20 20 50 10 100 (PUSH) OFF OR EXT REF FREQ IN MIXER PEAKING 200 2 5 1 500 5 2 VERTICAL 4435 DISPLAY 1 **RF INPUT** LOG 10 0 MAX INPUT POWER - 30dBm VIDEO LIN GAIN FILTER SQ LAW VIDEO то RECORDER INPUT SWEEP INPUT $\approx 50 \Omega$ SAWTOOTH SELECTOR SERIAL ON REAR PLATE TEKTRONIX, INC. PORTLAND, OREGON, U.S.A.

#4435 1220 mad 139B 11 Brun 6-7-68



DRAWING Custom Modification Engineering NTRO Engineering Div. TEKTRONIX, INC., P. O. BOX 500, BEAVERTON, OREGON

General. This control drawing defines the specifications of Tektronix Type 1L20 Mod 139B Spectrum Analyzer.

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CONTROL DRAW 70

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2. Requirements.

2.1 The operating frequency range shall be 275 MHz to 4200 MHz in four (4) ranges.

This drawing defines modifications to a standard Tektronix item. All specifications and tolerances not affected by these modifications are the same as for the standard item.

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Do not scale drawing

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PREPRODUCTION INSTRUMENT REQUIREMENTS

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Page 10F2

Topal 1

KI	LEVE	L #KIT D	ESCRIPT	ION 4	475-1100 MHZ_ KIT #	INST. MOD 139B
		REM	OVE	FA	OM 1120 PARTS LIS	57:
NEW ITEM	or 1-3	PART NUMBER	TOTAL QUANT	QTY PER	DESCRIPTION	CIRCUIT #
	1	119-0063-00	\$300,00	1	1220 OSCILLATO	210-475MH2 V40 2475-1100 MHZ V41
	1	162-0504-00)	5"	VARGLAS #20	ON OSC.
	1	162-0504-00		33/4	" VARGLAS #20	ON OSC.
	3	175-0310-00	1,90	1	CABLEASSY. 6"	W14
	3	175-0362-00	231	1	CABLE ASS'Y. 10"	WI
	3	175-0367-00	1.855 y	2	CABLE ASSY 2"	W19 \$ W34
	3	179-1047-00	- , 54	1	CABLE ASSY. BAND'S	2-4. W TO OSC.
	1	211-0544-00	利潤。	1	6-32 × 3/4 THS	SW WW R49
	1	211-0507-00		1	6-32 × 5/16 PHS	OSC, BRKT,
-0	1	312-0517-00		1	10-32 × 1 3/4 HEX HEL	D Sc. OSC. BRKT.
	1.	311-0008-00		2	4-40 × 14 PHS	MIXER B
	3	262-0761-00	.7.98	2	BAND SWITCH ASSY.	MT. 235 MHZ. FILTERY
H.	1	308-0394-00		1	RESISTOR, 225-25	WWWCH.MT. R49
	1	331-0166-00	1.15	1	DIAL TAPE 1120	
	3	333-0924-00	1,57	1	FRONT PANEL 11.	20
	3	366-0351-00		1	KNOB, CHARCOAL	BAND SW
	3	407-0228-00		1	BRACKET, OSCILL	ATOR
	3	610-0169-00	9.11	1	MIXER, 10-275 MHZ	(MIXER B)
	3	610-0171-00	10.90	1	FILTER, 235 MHZ	
	3	644-0014-00	57.05	1	PHASE LOCK ASSY. 1220	WOCOVER & HOWR.
_				1 (1965) 19		
				1.		

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ĸĩ	Leve	L #KIT D	ESCRIPT	ION	475-1100 MH2 KIT #	1120 INST. MOD 139 B
NEW ITEM	or 1-3	PART NUMBER	TOTAL QUANT	QTY PER	DESCRIPTION	CIRCUIT #
¥	/	119-0083-00	300100	1	OSCILLATOR 142	0 MOD 139B V41
	1	308-0395-00		/	RESISTOR, 300-2 101	V.W.W. CH.MT R49
*	1	331-0172-00		1	DIAL TAPE 1120	MOD 139B (4 ROWS
7	3	333-*****-00		1	FRONT PANEL IL	20 MOD 1398 UNSTALL MOD SLOT & SERT
9	3	644-0015-00	32.28	./	PHASE LOCK ASSY. 1130	> N/O COVERS & HOWR.
	1	211-0553-00		/	SEREW 6-32 × 1/2 RHS	R49
		NON-CONT.		1	MOD SLOT	MOD 139B
			- North			



TYPE 1L20 MOD 139B

This manual insert describes the special features of the Type 1L20, MOD 139B Spectrum Analyzer which has been designed for use with RF signals in the frequency range of 275 MHz to 4200 MHz. Band 1 (RF CENTER FREQ of 10-275 MHz) has been removed. The Band 2-5 characteristics and instructions given throughout the manual apply to Bands 1-4 of this modified instrument, but any reference to Band 1 should be disregarded.

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FRONT PANEL

The RF CENTER FREQ control has been changed to 275 MHz to 4200 MHz, and the Band numbers, 1 through 5, have been changed to 1 through 4.

The RF INPUT connector for Band 1 (10-275 MHz) and the Band Selector switch have been removed.

CHARACTERISTICS

The Input Frequency Range (p.1-1) has been changed to a performance requirement of 275 MHz to 4200 MHz.

OPERATING INSTRUCTIONS

First Time Operation (p.2-1) - In step 6, connect a signal in the frequency range between 275 MHz and 4200 MHz to the RF INPUT connector. If a steady, drift-free signal is not available, connect a cable between the RF INPUT connector and the 1 MHz CAL MARKERS OUT connector.

Front Panel Adjustments (p.2-3) - In step 1-b, apply an external signal (275-4200 MHz) to the RF INPUT connector.

Applied Signal Precautions (p.2-3) - Signals applied to the RF INPUT connector should be connected through a 50-ohm coaxial cable, using a Type N connector.

MIXER PEAKING Control Operation (p.2-5) - The front-panel MIXER PEAKING control has been provided to improve the over-all sensitivity of the Spectrum Analyzer on Bands 1-4.

As a very rough guide, the MIXER PEAKING control will be set near the counterclockwise end of its rotation for Band 1, near the middle of its range for Bands 2 and 3, and near either end for Band 4.

CIRCUIT DESCRIPTION

Local Oscillator Circuit (p.3-1) - The RF Tuner section of the Type 1L20, MOD 139B contains a tuned circuit triode Local Oscillator which is tuned by the RF CENTER FREQ control. The Analyzer operates on the fundamental frequency of 475 MHz to 1100 MHz and the second, third, and fourth harmonics for Bands 1, 2, 3, and 4 respectively.

Diode Mixer Circuits (p.3-3) - Diode mixers are used to combine the RF input signal with the output from the Local Oscillator to produce a difference signal centered around 200 MHz.

The mixer for Bands 1-4 uses a peaking circuit to optimize the mixer action. Efficient mixer operation depends on the diode being properly biased, and is a function of the Local Oscillator drive, the desired harmonic conversion, and the series resistance of the diode loop. Since Bands 2, 3, and 4 use higher harmonics of the 475-1100 MHz oscillator, MIXER PEAKING control R66 has been added to the mixer. R66 controls the amount of bias and harmonic content of the rectified signal; therefore it is able to peak up the sensitivity of the mixer at the various harmonic frequencies being used.

Low Pass Filters (p.3-3) - The output from the mixer is passed through a 265 MHz low-pass filter to attenuate any frequencies above 265 MHz. This attenuation, along with that supplied by the following 150-250 MHz Bandpass Filter, suppresses signals in the image frequency band of the 200 MHz IF amplifier (300 MHz to 400 MHz).

PERFORMANCE CHECK

2. Set Front Panel IF CENTER FREQ CAL Adjustment (p.5-2) - In step b, apply the signal to the RF INPUT connector.

5. Phase Lock Check and RF CENTER FREQ Dial Calibration Check (p.5-2) - Delete step b. In step c, apply -70 dBm signals from the UHF Signal Generator to the RF INPUT connector. In step e, since bands 2, 3, and 4 use harmonics of the Band 1 Local Oscillator output, it follows that if the accuracy of Band 1 is within specifications, then Bands 2, 3, and 4 will also be within the specifications.

6. Sensitivity and Frequency Range Checks (p.5-3) - In step b, apply a -30 dBm 275 MHz signal from the UHF Signal Generator to the RF INPUT connector. In step g, check the sensitivity over the rest of the frequency range of the Analyzer as directed in Table 5-1. (Perform the Bands 2, 3, 4, and 5 checks for Bands 1, 2, 3, and 4 respectively.)

8. IF Attenuator Accuracy Check (p.5-4) - Instepb, apply the signal to the RF INPUT connector.

10. Display Flatness Check (p.5-5) - In step a, preset the RF CENTER FREQ to 350 MHz. Delete steps b through g.

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TYPE 1L20, MOD 139B

17. Incidental Frequency Modulation Check (p.5-7) - In step c, apply the signal to the RF INPUT connector.

CALIBRATION

Calibration Record and Index (p.6-1) - In step 13, delete the Band 1 check and perform the Band 2, 3, 4, and 5 checks for Band 1, 2, 3, and 4 respectively. In step 15, check display for less than ± 1.5 dB flatness from 300 MHz to 400 MHz.

8. Check RF CENTER FREQ Calibration and Phase Lock Display (p.6-12) - Delete step c. In stepf, since Bands 2, 3, and 4 use harmonics of the frequencies checked in d and e above, it follows that if the dial calibration of Band 1 is within specifications, Bands 2, 3, and 4 will also be within specifications.

10. Adjust Wide-Band Amplifier Circuit (p.6-14) - Delete steps a and n.

11. Check Lowpass and Bandpass Filters (p.6-14) - Delete steps c and d.

12. Adjust RF Mixers (p.6-15) - Delete step c.

13. Check Sensitivity and RF Frequency Range (p.6-16) - In step c, apply a -30 dBm 275 MHz signal from the UHF Signal Generator to the RF INPUT connector. In step h, check the sensitivity over the rest of the frequency range of the Analyzer as directed in Table 6-2. (Perform the Band 2, 3, 4, and 5 checks for Band 1, 2, 3, and 4 respectively.)

15. Check Display Flatness (p.6-17) - In step b, preset the RF CENTER FREQ to 350 MHz. Delete steps c through h.

Dial Tracking Procedure (p.6-22) - Replace with the following: 1. Install the dial tape on the sprocket assembly. Adjust the position of the tape for about the same amount of travel beyond the printing at each end.

2. Connect the power to the oscillator (see Fig. 6-28). Set the varactor bias to +7.0 volts.

3. Tune the oscillator to exactly 835 MHz. The dial tape should read 635 ± 8 on Band 1. If the tape does not read within this range, then the coupling between the oscillator and the gears must be reset as follows:

a. The sprocket drive will probably prevent exact positioning of the dial tape; if this is the case, loosen the set screws locking the gear to the oscillator shaft (see Fig. 6-28) and disengage the tape drive to reset the tape.

b. Set the tape to read exactly 635.

c. While holding the front shaft at 635 on the dial tape, tune the Band 1-4 oscillator to 835 MHz.d. Tighten the set screws.

7. Check the dial tape tracking on Band 1 at several points, including each end of the band. The oscillator frequency must always be within $\pm 1\%$ of the dial frequency ± 200 MHz.

Band 1 Local Oscillator Calibration Procedure (p.6-22) - Delete

Bands 2-5 Local Oscillator Calibration Procedure (p.6-23) - Delete steps 3 through 7. In step 8, connect the power to the Bands 1-4 oscillator (see Fig. 6-28). In step 10, use the frequency meter to tune the oscillator to 470 MHz (around 270 on Band 1 of the dial tape). Note whether the tape reads above or below 270.

ELECTRICAL PARTS LIST

Capacitors

C10	Delete
C14	Delete
C16	Delete
C17	Delete
C23	Delete
C24	Delete
C26	Delete
C27	Delete
C29	Delete
C30	Delete
C32	Delete
C34	Delete
C846	Delete
C851	Delete
C852	Delete
C854	Delete
Diadaa	
Diodes	
D14	Delete
D16	Delete
D851	Delete
D852	Delete
Connector	s
Connector	2
J1	Delete
J10	Delete
J14	Delete
J18	Delete

Delete Delete

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J20

J34

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J71	Delete
J73	Delete
J75	Delete
J850	Delete

Inductors

L10	Delete
L21	Delete
L23	Delete
L24	Delete
L26	Delete
L27	Delete
L29	Delete
L30	Delete

Resistors

R10 R14 R16 R17 R18 R49 R846 R850 R851 R851	Delete Delete Delete Delete Change Delete Delete Delete	308-0395-00	300Ω	10W	ww	
K032	Delete					
Switches	6.1	있는 것 그 관람을				
SW40 SW70	Delete Delete					
Transform	ners	1961년 44				
T14 T851 T852	Delete Delete Delete					
Electron 7	Tubes					
V40	Delete					
Cable Ass	emblies					
W1 W14 W19 W34 W40	Delete Delete Delete Delete Delete					
W70	Delete					

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TYPE 1L20, MOD 139B

Oscillator Change 119-0083-00 Oscillator (includes V41)

MECHANICAL PARTS LIST

Fig. and		Tektronix	1	
Index No.		Part No.	Qty.	Description
1-1	Change	030-0469-02	1	PANEL, front
1-18	Delete	366-0351-00	1	KNOB, charcoal - RF INPUTS
1-19	Delete	262-0761-00	1	SWITCH, wired - RF INPUTS
1-23	Change	119-0083-00	1	OSCILLATOR
1-38	Delete	407-0228-00	1	BRACKET, mounting
1-39	Delete	212-0516-00	1	SCREW, 10-32 x 2 inches, HHS
1-40	Change	331-0172-00	1	TAPE, dial, 4 rows
1-41	Delete	175-0310-00	1	ASSEMBLY, cable
1-42	Delete	175-0310-00	1	ASSEMBLY, cable
1-53	Delete	175-0367-00	1	ASSEMBLY, cable
1-55	Delete	175-0358-00	1	ASSEMBLY, cable
1-63	Delete	175-0362-00	1	ASSEMBLY, cable
2-	Delete	610-0169-00	1	ASSEMBLY, 10-275 MHz MIXER 'B'
2-27	Delete	386-1037-00	1	PLATE
2-28	Delete	211-0106-00	4	SCREW, 4-40 x 5/8 inch, FHS
2-29	Delete	380-0097-00	1	HOUSING
2-30	Delete	131-0373-00	4	CONNECTOR, stand-off
2-31	Delete	210-0001-00	1	LOCKWASHER, internal, #2
2-32	Delete	210-0405-00	1	NUT, hex., 4-40 x 3/16 inch
2-33	Delete	131-0372-00	3	CONNECTOR, coaxial, w/hardware
2-34	Delete	441-0671-00	1	CHASSIS
2-35	Delete	210-0599-00	4	. NUT, sleeve
2-36	Delete	211-0008-00	2	SCREW, 4-40 x 1/4 inch, PHS
2-37	Delete	175-0367-00	1	ASSEMBLY, cable
2-38	Delete	175-0362-00	1	ASSEMBLY, cable
2-39	Delete	175-0310-00	1	ASSEMBLY, cable
4-	Change	644-0015-00	1	ASSEMBLY, PHASE LOCK
4-	Delete	610-0171-00	1	ASSEMBLY, LOW PASS FILTER, 235 MHz
4-29	Delete	441-0669-02	1	CHASSIS
4-30	Delete	337-0806-00	2	SHIELD, 'U' shape
4-31	Delete	131-0372-00	2	CONNECTOR, coaxial w/hardware
4-32	Delete	337-0805-00	1	SHIELD
4-33	Delete	213-0138-00	4	SCREW, sheet metal
4-34	Delete	213-0138-00	2	SCREW, sheet metal
4-35	Delete	175-0367-00	1	ASSEMBLY, cable
4-36	Delete	175-0367-00	1	ASSEMBLY cable







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