TMC SPECIFICATION

NO. S-873

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TITLE:

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TEST PROCEDURE

for

PTE-3A

This specification outlines the testing and check out procedure for the PTE Spectrum Analyzer which consists of three major units (FSA, VOX, and TTG).

When testing is required for only unracked units that make up a PTE Spectrum Analyzer, i.e. FSA, VOX and TTG, these units will be inter-connected as an Analyzer system with an external voltage regulator for the FSA, and all checks and tests will be performed, except those for the "Manual Sweep" Steps 56 thru 58. Under "Remarks" on the "Test Data Sheet", the following notation will be inserted:

> "Unracked Spectrum Analyzer units, FSA, VOX, and TTG tested as a system without Manual Sweep.:

PRELIMINARY

A routine mechanical check and inspection of inter-connection cabling etc., must be made before proceeding with the checks and tests covered by Steps 1 thru 58. The tester is cautioned that the checks and tests outlined below must be accomplished in the order given, from Step 1 thru 58. If trouble is experienced at any step, it must be found and corrected before proceeding to the next step.

SET CONTROLS ON PANELS AS FOLLOWS

UNIT	PANEL DESIGNATION	SETTING
FSA	Sweep Width	Fully CW
"	IF Bandwidth	Fully CW
"	Video Filter, Hi/Off/Lo	Off
"	Sweep Rate	Fully CW
"	Input Attenuator	All switches up
"	5 KC Marker	Off
"	Illumination, Power Off	Off
"	Cal OSC Level	Off
"	IF Atten.	0 db
"	Sweep Width Selector	VAR
"	Amplitude Scale	LIN
"	Center Frequency	Center on Panel Mark

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SET CONTROLS ON PANELS AS FOLLOWS (CONT'D)

UNIT	PANEL DESIGNATION	SETTING
FSA	AFC	Off
"	Gain	Fully CCW
Control Panel	Manual Sweep	Auto
VOX	Beat	Switch down (off)
"	Meter	VMO
"	Power	Switch down (off)
"	HFO/IFO/BFO	All switches down (off)
"	Output	Fully CW
"	Band - MCS	2-4
"	XTAL	VMO
TTG	Audio Tone Selector	Off
"	RF Tone Selector	Off
"	Power	Off

The positions of all other controls are optional.

CONNECTIONS

Connect Power Cable, TMC #CA-575-1, to line voltage supply. Connect one of the two test cables, TMC #CA-480-1-18.00, to VFO INPUT jack of FSA and VFO OUT jack of Control Panel. Connect the other to SIGNAL INPUT jack of FSA, RF TONE OUT jack of Control Panel.

Proceed with the test and checkout of PTE-3 as outlined below - Steps 1 through 58.

STEP	OPERATION	FUNCTION	NORMAL INDICATIONS
1.	Place POWER switch of VOX in ON position.	Supplies power to VOX tube filaments and oven heater elements.	MAIN POWER indicator light ignites and remains lit. INNER OVEN and OUTER OVEN indicator lights ignite; cycling times: OUTER OVEN light goes on for about 5 seconds, and off for about 30 seconds; INNER OVEN goes on for about 90 seconds and off for about 90 seconds.
2.	Wait for INNER and OUTER OVEN lights to cycles as described in Step 1. while waiting, proceed with Steps 3 thru 45.	VOX oven temperature becomes stabilized, which in turn stabilizes master oscillator frequency components contained therein.	
3.	Turn ILLUMINATION knob clockwise.	Supplies all plate and filament power to FSA. Also turns on and controls brightness of illumination lights surrounding screen.	Indicator ligth ignites. Illumination lights around screen will brighten from CW turning of knob and dim from CCW turning. In about a minute, a straight baseline trace will appear on screen.
4.	Adjust BRILLIANCE knob until trace is just discernible. Allow at least 30 minutes warmup. Then adjust FOCUS knob for sharpest trace.	Focuses electron beam on screen.	Brightness of trace responds to movement of BRILLIANCE knob. Sharpness of trace responds to movement of FOCUS knob.
4a.	DELETED		
5.	Adjust V POS knob so that baseline trace coincides with bottom edge of grid marked on screen.	Calibrates vertical beam movement to grid.	Baseline trace responds vertically to V POS movement.

STEP	OPERATION	FUNCTION	NORMAL INDICATIONS
6.	Adjust H POS knob to approximately center baseline on grid of screen.	Approximately centers sweep on grid.	Baseline trace responds horizontally to H POS knob movement.
7.	Turn CAL OSC LEVEL knob fully clockwise. Turn GAIN knob clockwise slightly.	Connects a 500KC test signal to FSA input. Clockwise rotation of knob increases 500KC signal amplitude.	A small pip appears at or near center of screen and grows in height as knob is turned clockwise.
7a.	Set sweep width in VAR. position; remove top converter of FSA. Adj. LINE SIZE control (internal adj.) for proper baseline size(¼" on ea. side of graticule). Slowly turn sweep rate control CCW until optimum resolution is obtained. Re-adjust pip to full scale.	Achieves optimum resolution.	Pip base narrows to optimum resolution point and further sweep rate reduction has no indicated effect.
8.	Turn GAIN knob clockwise until pip reaches full scale deflection on screen (10 in LIN scale).	Further increases 500KC input.	Pip heightens with clockwise movement of the GAIN knob.
8a.	With sweep width control at 3.5kc position, AFC off, and center frequency control on center line, adjust CF pad control (internal adjustment) for pip centering on screen. Turn sweep width control to 500 cycle position and adjust rear screw on Z102 (internal adjustment) for pip centering on screen, (remove tool after each adjustment; very critical).		
9.	In VAR. Position, turn SWEEP WIDTH knob to completely counter-clockwise or until pip widens into an elevated line.	Decreases sweep width in KC thereby magnifying pip width.	Pip disappears. Trace may become elevated.
10.	Adjust CENTER FREQ knob for maximum height of trace. If trace is below 10 on LIN scale with CENTER FREQ on marker, adjust CF pad on chassis for maximum height.	Tunes V3 mixer in RF chain to 500KC, passing through a greater amount of the test signal.	Trace height is raised by adjustment of CENTER FREQ knob.

STEP	OPERATION	FUNCTION	NORMAL INDICATIONS
11.	Turn SWEEP WIDTH knob to fully clockwise position.	Increases sweep width, thereby decreasing pip width. Also, as a result of turning in Step 10, the 500KC has been brought to the center of the sweep.	Pip reappears and is at, or near, center of grid on screen.
12.	Adjust H POS knob until the pip coincides with the center frequency calibration on the screen.	Centers sweep on grid.	Adjustment of H POS knob brings pip to center calibration. About 1/4 inch of trace extends beyond grid markings on either side.
13.	Place 5KC MARKER switch in up (on) position. Turn GAIN knob clockwise to bring up 5 kc pips.	Activates built-in 5KC oscillator which hetrodynes with 500KC signal to produce sum and difference frequencies at 5KC intervals above and below 500KC.	At least fourteen 5KC marker pips appear across screen - 7 above and 7 below - 500KC pip in center.
14.	Turn SWEEP WIDTH knob in counter-clockwise direction. Then return knob to maximum clockwise position.	Counter-clockwise movement of SWEEP WIDTH knob decreases sweep width.	5KC pips move away from center as SWEEP WIDTH knob is turned counter-clockwise.
15.	Place 5KC MARKER switch in OFF position and adjust GAIN knob to bring pip back to full scale deflection.	Turns 5KC oscillator off.	5KC pip disappears.
16.	Turn SWEEP RATE knob to fully counter-clockwise position.	Changes sawtooth wave width from sweep generator, thereby changing sweep rate.	As SWEEP RATE knob is turned counter-clockwise, electron beam slows down in its motion across the screen. At its CCW extreme position, spot moves from right to left at the rate of 0.1 CPS (or once within a 10-second period). Pip amplitude increases.
17.	Turn SWEEP RATE knob to fully clockwise position.	Changes sweep rate back to 30 cps.	Trace reappears as a solid line. Pip amplitude returns to full scale deflection.

STEP	OPERATION	FUNCTION	NORMAL INDICATIONS
17a.	Slowly turn SWEEP RATE control CCW with optimum resolution is obtained.	Achieves optimum resolution.	Pip base narrows to optimum resolution point and further sweep rate reduction has no indicated effect.
18.	Adjust SWEEP WIDTH knob until the pip base covers approximately one-third of the screen.	Decreases sweep width from its maximum position.	Pip width is increased with decrease of sweep width. Pip height increases.
19.	Turn IF BANDWIDTH knob in counter-clockwise direction until ringing appears on trailing edge (left side) of 500KC pip. Adjust until first ringing notch beyond the apex of the pip dips into the baseline.	Decrease IF bandwidth to a point suitable for optimum resolution with a 30 cps sweep rate and the sweep width as set in Step 18.	When IF BANDWIDTH knob is turned counter-clockwise, pip base width decreases. At the same time, there may be a change in pip height.
20.	Turn AFC knob in a clockwise direction slightly.	Turns on AFC feedback circuit from V3 mixer to V4 reactance modulator. Changes maximum sweep width adjustment from 100KC to 2KC.	500KC pip distorts into an elevated line.
21.	Turn SWEEP WIDTH knob fully clockwise. Adjust SWEEP RATE knob until spot moves across screen at the rate of approximately 5 times per second. Adjust IF BANDWIDTH knob to obtain optimum resolution ringing.	Adjusts sweep width to 2 KC. Adjusts sweep rate and IF bandwidth for optimum resolution for 2KC sweep width.	Pip may now appear shifted off center.
22.	If 500KC pip has shifted off center, turn AFC knob to approximately center pip and use CENTER FREQ knob as a vernier adjustment to center pip exactly.	Retunes V4 circuit which became detuned by switching in AFC feedback.	As AFC knob is turned clockwise, the display may shift to the left, then to the right. Normally, with the AFC knob and CENTER FREQ knob manipulated as described in Operation column, the pip should center.

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STEP	OPERATION	FUNCTION	NORMAL INDICATIONS
23.	Adjust GAIN knob for full scale deflection of pip. Place AMPLITUDE SCALE switch in LOG position.	Switches in a feedback curcuit from V10 detector to V9 IF amplifier which has the effect of presenting pip amplitudes on the screen in a log relationship rather than linear.	Pip height reduces to "20DB" on LOG scale on screen.
24.	Set IF ATTEN switch in 20 DB position.	Inserts 20 db of attenuation in the IF amplifier input.	Pip height reduces to "40 DB" mark on LOG scale.
25.	Turn GAIN knob clockwise to bring pip back to full scale deflection.	Sets pip to full scale for comparisons to follow.	Another pip with ringing may appear at right edge of screen.
26.	Operate INPUT ATTENUATOR switches so as to insert attenuations up to 40 db in 5 db steps.	Inserts attenuations (which are additive) in the SIGNAL INPUT section. At final setting, signal is reduced by 40 db from its level in Step 25.	At each setting, the pip height coincides with the corresponding screen calibration withing $\pm$1 db.
27.	Set IF ATTEN switch in 0 DB position.	Switches out 20 db attenuation in IF amplifier input.	Pip height increases to 20 DB mark on screen.
28.	Continue to insert more attenuation with INPUT ATTENUATOR switches, until pip is brought down to 30 db calibration on screen.	At this point, pip has been reduced by 50 db from its level in Step 25 which would appear 20 db over full scale if INPUT ATTENUATOR switches were returned to up positions.	Pip reads 30 DB on screen with all INPUT ATTENUATOR switches down except 5 db switch and 10 db switch.
29.	Insert 5 db more attenuation by placing INPUT ATTENUATOR 5 DB switch down.	Inserts a total of 55 db attenuation in signal level as set in Step 25.	Pip is reduced to between 30 db and 35 db calibration on screen.
30.	Return all INPUT ATTENUATOR switches in the up (off) position. Place IF ATTEN switch in 20 db position.	Switches out the 55 db attenuation. Returns c ontrols to positions set in Step 25.	Pip returns to full scale deflections.
31.	Place VIDEO FILTER switch in HI position.	Filters out frequencies above 400 cps in V10 output.	Most noise indications on screen eliminated.

STEP	OPERATION	FUNCTION	NORMAL INDICATION
32.	Place VIDEO FILTER switch in LO position. Decrease sweep rate with SWEEP RATE knob to bring spot movement down to 1 cps or less.	Filters out frequencies above 40 cps in V10 output. Sweep rate is decreased for more effective results from 40 cps BW filter.	A more effective elimination of noise is observed. Pip height is reaised as sweep rate is decreased.
33.	**Place VIDEO FILTER switch in OFF position. Set AFC knob in OFF position. Set SWEEP WIDTH and IF BANDWIDTH knobs in their fully clockwise positions. Place AMPLITUDE SCALE switch in LIN position. Adjust GAIN knob to bring pip back to full scale deflection. Increase sweep rate fully clockwise. Adjust CENTER FREQ. knob to bring pip back to center calibration.**	Switches out both 400 cps and 40 cps filters in V10 output. Switches out AFC and retunes sweep width, IF bandwidth, and sweep rate to maximum settings. Returns amplitude representations to linear. Adjusts gain for reference point. Retunes V4 circuit which became detuned by turning off AFC.	Pip appears at full scale deflection with solid state trace.
33a.	Slowly turn SWEEP RATE control CCW until optimum resolution is obtained.	Achieves optimum resolution.	Pip base narrows to optimum resolution point and further sweep rate reduction has no indicated effect.
34.	Set SWEEP WIDTH SELECTOR knob in 14 KC position.	Sets sweep width at 14KC and sweep rate at 1 cps. Sets IF bandwidth for optimal resolution. AFC remains off and 400 cps video filter is in.	Pip appears at or near center screen. Amplitude may vary slightly. Beam takes about 1 second to cross screen. In Steps 34 - 38, SWEEP WIDTH, IF BANDWIDTH, VIDEO FILTER, SWEEP RATE controls are all inoperative.
35.	Set SWEEP WIDTH SELECTOR knob in 7KC position.	Sets sweep width at 7KC and sweep rate at 1 cps. Sets IF Bandwidth for optimal resolution. AFC remains off and 400 cps video filter is in.	Same as Step 34. Pip position and amplitude remain essentiall unchanged from Step 34.
36.	Set SWEEP WIDTH SELECTOR knob in 3.5 position.	Sets sweep width at 3.5KC and sweep rate at 1 cps. Sets IF bandwidth for optimal resolution. AFC remains off and 400 cps filter is in.	Same as Step 35. Pip position and amplitude remain essentially unchanged from Step 35.

STEP	OPERATION	FUNCTION	NORMAL INDICATION
37.	Set SWEEP WIDTH SELECTOR knob in 500 cycle position.	Sets sweep width at 500 cps, and sweep rate at 0.1 cps. Set IF bandwidth for optimal resolution. AFC is tuned on and 400 cps video filter is replaced by 40 cps video filter.	Pip position may shift noticeably from that of Step 36. Amplitude is essentially unchanged from Step 36. Beam takes about 10 seconds to cross screen.
38.	Re-center pip by using AFC knob as a course, adjustment and CENTER FREQ knob (26) as a vernier adjustment.	Retunes V4 circuit which became detuned when AFC feedback became switched in.	Pip is re-centered.
39.	Set SWEEP WIDTH SELECTOR knob in 150 cps position.	Sets sweep width at 150 cps and sweep rate at 0.1 cps. Sets IF bandwidth for optimal resolution. AFC remains on and 40 cps video filter remains in.	Same as Step 38. Pip position and amplitude remain essentially unchanged from Step 38.
40.	Place CENTER FREQ knob on panel marker. Turn AFC knob to OFF position. Set SWEEP WIDTH SELECTOR knob to VAR position. Turn SWEEP WIDTH knob fully counter-clockwise. Adjust CENTER FREQ knob to obtain maximum height of trace. Set SWEEP WIDTH knob fully clockwise.	Retunes V4 circuit which became de-tuned when AFC feedback became switched out.	Pip appears at or near center of screen.
41.	Place POWER knob of TTG in ON position. Wait 2 seconds for TTG to warm up.	Supplies voltages to TTG plate and filament circuits.	MAIN POWER lamp lights.
42.	Set RF TONE SELECTOR knob in TWO TONE position.	Generates 1,999KC and 2001KC test signals to TTG unit.	
43.	Using patchcords supplied with PTE, connect VFO OUT jack of Control Panel to VFO INPUT jack of FSA and RF TONE OUT jack of Control Panel to SIGNAL INPUT jack of FSA.	Connects VOX output to FSA VFO input and TTG RF output to FSA	

STEP	OPERATION	FUNCTION	NORMAL INDICATION
44.	Place SWEEP WIDTH SELECTOR knob in 14KC position. Place CENTER FREQ knob on panel mark and then adjust H POS knob to bring 500KC pip to center screen calibration. Turn CAL OSC LEVEL knob to OFF position.	Sets sweep width at 14KC and sweep rate at 1 cps. Sets IF bandwidth for optimal resolution. AFC is off and 400 cps video filter is in. Turns off 500KC oscillator.	Beam speeds up to 1 cps. Pip remains around full scale deflection mark and is centered by adjustment to H POS knob. Pip disappears when CAL OSC LEVEL knob is placed in OFF position.
45.	Set GAIN knob fully clockwise (maximum) and set AMPLITUDE SCALE switch in LOG position. Set IF ATTEN switch in 0 db position.	Sets equipment for presentation of signals with a 60 db relationship (with only lower 40 db portion displayed).	No change from Step 44.
46.	IF INNER and OUTER OVEN lamps are cycling as described in Step 1. Set BEAT switch to ON position.	Turns on 100KC calibrating signal in VOX.	ZERO BEAT lamp lights.
47.	Turn MASTER OSCILLATOR FREQUENCY knob to bring a reading of 2.5 MC (000 cps on counters. Vary CALIBRATE knob until ZERO BEAT light flashes at the rate of about once or twice per second.	Sets VOX output frequency at 2500KC within an error of one or two cycles.	Adjustment of CALIBRATE knob causes ZERO BEAT lamp to flash.
48.	Set BEAT switch to down position (off).	Turns of 100KC calibrating signal.	ZERO BEAT lamp goes out.
49.	Set HFO switch in ON position.	Turns on RF amplifier plate voltage in VOX.	
50.	Set METER knob in HFO position.	Connects meter to sample output from RF amplifier.	
51.	Watch VOX meter. Turn OUTPUT knob clockwise to bring a reading of approximately ".1" on meter dial.	Turns up VOX output level to approximately 0.1ma to get good reading for next step. 1,999KC, 2,001KC combine with 2500KC to produce 499KC and 501KC signals on screen.	Two test tone pips now appear on screen about 1KC above and below center calibration.

STEP	OPERATION	FUNCTION	NORMAL INDICATION
52.	Set TUNING knob of VOX in 2.5 area to bring highest reading on VOX meter.	Tunes VOX RF amplifier.	Pips may shift and become more defined.
53.	Adjust OUTPUT knob to bring a reading of ".1" on VOX meter dial.	Sets VOX output at approximate level for FSA mixer ratio.	
54.	Set IF ATTEN switch in 20 db position. Then adjust INPUT ATTENUATOR switches to reduce pips down to 0 db calibration on screen, using GAIN knob for variations less than smallest INPUT ATTENUATOR switch position. Then set IF ATTEN switch in 0 db position.	Sets display to show lower 40 db portion of 65 db presentation with 2 test tones representing 0 db.	Odd-order distortion pips appear on screen.
55.	Check all odd-order distortion pips.	Checking to see if all odd-order distortion producs fall below 60 db down from two test tones.	Maximum level of odd-order distortion pips do not exceed 40 db mark on screen, (60 db below two test tone pips).
56.	Set IF ATTEN switch in 20 db position. Set MANUAL SWEEP switch in up (manual) position.	Disconnects sweep generator from horizontal deflection plates and connects in MANUAL SWEEP control of plate voltage.	Horizontal movement of beam stops. Beam becomes stationary spot on screen. CAUTION: DO NOT LEAVE BEAM STATIONARY FOR MORE THAN 60 SECONDS.
57.	Crank MANUAL SWEEP knob clockwise, then counter-clockwise.	Changes voltage of horizontal deflection plates.	Clockwise movement of MANUAL SWEEP knob causes spot on screen to move from left to right. Counter-clockwise movement causes spot to move from right to left. The same distortion products should be observed as in Step 55. A slight adjustment of the GAIN knob may be necessary to bring distortion pips to the same level as in Step 55.
58.	Return MANUAL SWEEP switch to AUTO position.	reconnects sweep generator to horizontal deflection plates.	Horizontal motion of beam resumes automaticall.

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

TEST DATA SHEET

PTE-3A SPECTRUM ANALYZER
(FSA-TTG-VOX)

STEPS	CHECKS	TESTER (INITIAL)
1-6	FUNCTIONAL CONTROL CHECKS	_____
7-19	500KC CALIBRATE OSCILLATOR & 500KC MARKER CHECKS	_____ _____
20-22	AFC CHECKS	_____
23-30	ATTENUATOR CHECKS	_____
31-33	VIDEO FILTER CHECKS	_____
33-40	SWEEP WIDTH SELECTOR CHECKS	_____
41-45	SYSTEM INHERENT ODD-ORDER DISTORTION - REGM'T AT LEAST - 60DB	_____ DB (reading)
56-58	MANUAL SWEEP CHECKS	_____

TESTED BY _____ SERIAL NO. _____

APPROVED BY _____ MFG. NO. _____

DATE _____

REMARKS: _____

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