DATE 9/3/53 SH. 1 OF 14		TMC	SPECIFICATION	NO.	S-221
COMPILED BY A.J.J.	TITLE:	PRODUCTION	TESTING OF MODEL PMO		ЈОВ 285
APPROVED A.J.	7.				

COMPLETE INSTRUCTIONS FOR THE PRODUCTION TESTING OF THE MODEL PMO

DATE 9/3/53 SH. 2 OF 14		TMC	SPECIFICATION	NO. S-221
COMPILED BY	TITLE:	PRODUCTIO	n testing of model PMO	JOB 285
APPROVED A.J	. J.			

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DATE 9/3/53 SH. 3 OF 14		TMC	SPECIFICATION	NO.	
COMPILED BY A. J. J.	TITLE:	PRODUCTION	TESTING OF MODEL PMO		_{ЈОВ} 285
APPROVED A, J	. I. C				

1. (a). PURPOSE:

The Model PMO, Portable Master Oscillator, performs a double function. It may be employed wherever a high stability frequency source is necessary, as in the case of a transmitter exciter or as a substitute for a receiver high frequency oscillator. The unit also has a built-in feature enabling its utilization as a frequency meter whereby an external source of energy may be calibrated against the Model PMO.

(b). DESCRIPTION:

Primarily the Model PMO is a high stability, free running, oven controlled, direct reading oscillator which may be calibrated at 100 Kcs. intervals against a precisely set internal crystal standard. This means that the frequency will be correct at each 100 Kcs. interval and that some device must be employed to automatically alter the main tuning condenser calibration so that the frequencies between check points are accurately set according to a predetermined curve.

An adjustable cam combined with a small trimmer condenser serve this purpose.

Of course, provision must be made for a mixer-audio amplifier section so that the calibration beats can be obtained. In addition, a power amplifier and doubler provide the necessary power output and extend the frequency range.

DATE 9/3/53 SH. 4 OF 11		TMC	SPECIFICATION	NO.	S -221
COMPILED BY A.J.J.	TITLE:	PRODUCTION	TESTING OF MODEL PMO		JOB 285
APPROVED A. J.	J. 10				

2. TEST EQUIPMENT REQUIRED:

(a). 1 - Communications Receiver: TMC Model FFR with 1 each FFRD -5

and FFRD - 6 heads or

Hammarlund 600J

(b). 1 - V.T.V.M. (Audio Type): Daven 170 or

Heathkit AV2

(c). 1 - Audio Signal Generator: Hewlett Packard 200 or

Heathkit AG8

(d). 1 - V.T.V.M. (R.F.): Hewlett Packard 410B or

Heathkit V6 with R.F. probe

(e). 1 - Approximately 72 ohm non-inductive load rated at 10 watts.

3. TEST INSTRUCTIONS:

- (a). Proceed as outlined in Test Sequence and Procedure.

 (Part 4 to follow.)
- (b). Fill in blanks on Report Sheets, rejecting those units which do not meet the specifications stated herein.
- (c). Sign Report Sheets and submit them to your supervisor.

рат <u>е 9/3/53</u> sh. <u>5</u> of <u>14</u>		TMC	SPECIFICATION	NO.	S-221
COMPILED BY	TITLE:	PRODUCTION	TESTING OF MODEL PMO		ЈОВ 285
APPROVED A. J	.J. 1C				

4. TEST SEQUENCE AND PROCEDURE:

Part 1: Initial Calibration, Master Oscillator-

- (a). Set up and calibrate the 100 Kcs. oscillator as per the first part of Specification S-110 which relates to this subject alone.
- (b). Set up and calibrate the master oscillator cam as per the first part of Specification S-110 which relates to this subject alone.

Part 2: Mechanical Inspection-

- (a). Inspect the total unit for obvious electrical errors.
- (b). Inspect the total unit for obvious mechanical imperfections.
- (c). Carefully inspect the unit for loose screws on shaft couplings and other critical points. Most carefully inspect for loose screws at grounding points such as under tube sockets and at ground lugs.

Part 3: Power Supply and Mixer-Amplifier Section:

(a). After the master oscillator chassis has been inserted in the Model PMO unit in which it has been designated to operate, withdraw P301 and P302 from their sockets. This is to prevent damage to the now relatively inaccessible oscillator parts due to wiring errors within the other portions of the PMO.

DATE 9/3/53 SH. 6 OF 14		TMC	SPECIFICATION	NO.	S-221
COMPILED BY	TITLE:	PRODUCTION	TESTING OF MODEL PMO		ЈОВ 285
APPROVED A. J	. J. 11C				

WARNING

UNDER NO CIRCUMSTANCES SHALL EITHER V301 OR V302 BE REMOVED
FROM ITS SOCKET WITHOUT FIRST WITHDRAWING P301 FROM ITS SOCKET.
THIS WILL SERVE TO PROTECT THE REGULATED FILAMENT CIRCUITRY.

(b). Connect the Model PMO to a monitored power line which has been set for 110 volts within plus or mimus 2 volts.

Turn the Main Power switch on.

Test A: Primary Power-

Remove the B Plus fuse (F103). The high voltage at Cl01 must disappear.

Remove the Main fuse (F102). The Main Power pilot lamp must go out.

Remove the Oven fuse (F101). Both Inner and Out r Oven lamps must go out.

Re-insert all fuses in their appropriate holders.

Test B: Wiring of J101-

- (a). At Pin 1 (with no jumper on E304) -- Must be shorted to ground in positions 1 and 2 of S103 and must be op n circuit to ground in position 3 of S103.
- (b). At Pin 2 -- 150 volts ± 5 volts DC all positions of S103.
- (c). At Pin 3 -- 150 volts +5 volts D.C. at position 2 and zero volts at positions 1 & 3 of \$103.
- (d). At Pin 4 -- Approximately 12-6 volts 60 cps.
- (e). At Pin 5 -- Short to ground.
- (f). At Pin 6 -- Open circuit r lative to ground.

DATE 9/3/53 SH. 7 OF 14	TMC SPEC	IFICATION NO.	S-221
COMPILED BY A.J.J.	TITLE: PRODUCTION TESTING	OF MODEL PMO	ЈОВ 285
APPROVED A, J	. J. Pag Issue A C		
	Mixer-Amplifier Gain-		
(a).	Connect an audio signal gener	rator set for 500 cps.	and
	volts output at pin 1	of V203. The output a	t
	J204 without phones being in	serted must be 20 v	olts
	within + 5 volts.		
(b).	The same output results must	be obtained with the s	ign a l
	generator set for vol	ts at pin 7 of V203.	
Test D	Beat Indicator-		
	While still connected to Pin	7 of V203 and driving	with
	volts, set generator	at its lowest frequency	·•
	T202 must then flash on and	off.	

Part 4. THE P.A. SECTION:

- (a). Plug in P301 and P302 and allow the master oscillator a few minutes to warm up.
- (b). Place a jumper across the terminals of E304.
- (c). By means of the slug in L301 and the trimmer C303, roughly align the low and high ends, respectively, of the master osc.
- (d). Set the master oscillator at approximately 2 Mcs.
- (e). Set the OUTPUT pot in the full clockwise position.
- (f). Set S103 in the Exciter position.
- (g). Place SlO2 in the On position.
- (h). Set S201 in the 2-4 Mcs. position.
- (i). Load J203 with approximately 70 ohms of non-inductive resistance.

DATE 9/3/53 SH. 8 OF 14		TMC	SPECIFICATION	NO.	S-221
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- (j). Set the C207 knob so that the pointer is horizontal to the right when C207 is fully closed. Then rotate the knob so that the pointer is on the 2 Mcs. mark.
- (k). Set C219 approximately in the center of its range.
- (1). Rotate the slug in L203 until maximum output is indicated at J203. The high end of the band may now be aligned. It is not necessary to change the master oscillator from its 2 Mcs. setting since, for the purposes of alignment, the use of harmonics is adequate.
- (m). Rotate C207 until it is set at 4 Mcs. Tune C219 for a maximum output reading. Repeat this process of tuning the slug at 2 Mcs. and C219 at 4 Mcs. several times until an alignment within + 200 Kcs. of the correct is obtained.

This process serves to properly determine the ratio of Cmax to Cmin which, in turn produces proper end alignment. Now only the lower end of the 4-8 Mcs. band need be set by means of the slug in L105-the upper end will then automatically be correct. Perform this operation and lock both slugs in place.

Test A: P.A. Alignment and Output-

Rotate the master oscillator through the band from two to four Mcs. and follow along with C207. At each 500 Kcs. interval, note the output across the load and the accuracy of the alignment of C207 on both bands.

(a). Alignment at each 500 Kcs. point must be within ±200 Kcs. to be acceptable.

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(b). Output must be above 3 watts throughout the 2-4 Mcs. band and above 2 watts throughout the 4-8 Mcs. band to be acceptable.

Test B: P.A. Spurious -

With R218, set for full output, remove P302 from J202 and the load from J203. Rotate C207 slowly from on extreme to the other on both bands. Reject any unit which shows even a minute output under these conditions since this indicates self-oscillation.

Test C: Output Control -

Replace P302 and the load in J203. Rotate R218. To be acceptable, the power output on either band and at any arbitrary frequency must drop continuously from maximum to an unreadable value.

Test D: Plate Switch -

Turning plate switch (SlO2) to the off position must remove all B plus voltage from V2O1 and V2O2.

Test E: Function Switch -

Portions of the function switch have already been tested.

For the remaining section:

- (a). Positions 1 and 2 B plus must appear at R214 zero volts must appear at S102
- (b). Position 3 B plus must appear at SlO2 zero volts must appear at R2ll;

TMC SPECIFICATION NO. S-221

THE: PRODUCTION TESTING OF MODEL PMO

A.J.J.

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Test F: Tuning Indicator -

When the power amplifier is tuned at full output, the tuning indicator must light brightly and then extinguish when C207 is brought out of resonance.

Part 5. THE MASTER OSCILLATOR SECTION:

WARNING

AFTER THE OVEN HAS COME UP TO TEMPERATURE, NEVER PERMIT THE MODEL PMO TO COOL DOWN IN ANY POSITION OTHER THAN RIGHT SIDE UP. THIS IS TO PREVENT MERCURY SEPARATION IN THE THERMOSTAT.

After having concluded Part 3, leave the unit on until the inner oven commences to cycle. Depending upon ambient temperature conditions, as much as three or four hours may be required to reach this point.

Test A: Inner Oven Cycling -

Observe the inner oven cycling by means of I301. The on time should be very roughly one minute and the off time, very roughly two minutes. Do not pass a unit which varies radically from these figures. (By more than -50, +100%).

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TMC SPECIFICATION NO. S-221

COMPILED BY
A.J.J.

TITLE: PRODUCTION TESTING OF MODEL PMD

APPROVED A.J.J.

Test B: Outer Oven Cycling
Outer oven cycling should be roughly two to four

seconds on and thirty to one hundred and twenty

seconds off.

Couple lightly from the input to V201 to a communications receiver tuned to WWV at either 2.5 Mcs. or 5 Mcs. (Be sure BFO is off). Tune the master oscillator dial to the region of 2.5 Mcs. and set the Function switch in th CAL position. Carefully zero beat the master oscillator against WWV to within a fraction of one cycle. Now, by means of C311 and the beat indicator (I202), zero beat the 100 Kcs. crystal against the master oscillator to within a fraction of a cycle. The unit can be passed only after this operation has been concluded.

Test D: Master Oscillator Calibration -

Re-calibrate the master oscillator at both the upper and lower ends and then, without again touching either end adjustment control, record the amount of error in the master oscillator dial against the 100 Kcs. standard at every 100 Kcs. point between 2 and 4 Mcs. A form has been provided for this purpose. No unit may be passed where this error exceeds 200 Cps.

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APPROVED A, J	· J.	ICI			

Test E: Master Oscillator Keying -

Tune the master oscillator and power amplifier to about 3 Mcs. and pick the signal up on a communications receiver. Insert key at J301 after jumper has been neatly placed across E304. Key the unit at about a five Cps. rate (about fifteen words per minute) and listen on the receiver to see that the keying sounds clean and follows the key.

When all of the preceding tests have been successfully passed, the unit must be placed in its final form with cover plates, etc., and prepared for shipment. One copy of each report sheet shall be enclosed with each Model PMO.

DATE 9/3/53 SH. 13 OF 14		TMC	SPECIFICATION	NO.	
COMPILED BY	TITLE:	PRODUCTIO	ON TESTING OF MODEL PMO		JOB285
APPROVED A. J	. J.	(C)			

SAMPLE

TEST REPORT SHEET #1

MODEL RMO		
For each item check the accept or reject colu		
	ACCEPT	REJECT
Part 2: Mechanical Inspection	•	
Part 3: Pwr. Supply and Mixer-Amp. Section		
Test A: Primary Power		
Test B: Wiring of J101		
Test C: Mixer-Amplifier Gain		
Test D: Beat Indicator	***************************************	
Part 4: The Power Amplifier Section		
Test A: P.A. Alignment and Output		
Test B: P.A. Spurious		
Test C: Output Control		
Test D: Plate Switch		
Test E: Function Switch		
Test F: Tuning Indicator		
Part 5: The Master Oscillator Section		
	magang e (papaganaha) — na	Basis nia de la Michales las condicións d
Test A: Inner Oven Cycling		-
Test B: Outer Oven Cycling		
Test C: 100 Kcs. Osc. Calibration		
Test D: Master Oscillator Calibration		43 -
Test E: Master Oscillator Keying		
Serial Number	ACCEPTED	Tested by
Date	REJECTED	

TMC SPECIFICATION NO. S - 221							
A.J.J. TITLE: PRODUCTION TESTING OF MODEL PMO JOS 285 PROVED	H. 14 OF 14	ТМ	C SPECII	FICATION	NO.	S-	221
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VOX SERIAL NO							
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		11	11	Chg. "Test E" to "Test D".	70	
4-5-61		12		Chg. "Test F" to "Test E".	for	
4-5-61	В	13	4589	Deleted "Test A- Mercury Thermostat"	OP	
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TMC SPECIFICATION NO. S-221

COMPILED BY
A.J.J. TITLE: PRODUCTION TESTING OF MODEL PMO

APPROVED A J J.

COMPLETE INSTRUCTIONS FOR THE PRODUCTION TESTING OF THE MODEL PMO

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DATE 9/3/53 SH. 2 OF 14 COMPILED BY

TMC SPECIFICATION NO. S-221

TITLE:

PRODUCTION TESTING OF MODEL PMO

JOB 285

APPROVED

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SH. 3 OF 14 COMPILED BY

TMC

SPECIFICATION NO. S-221

PRODUCTION TESTING OF MODEL PMO

ЈОВ 285

APPROVED A. J. J.

1. (a). PURPOSE:

TITLE:

The Model PMO, Portable Master Oscillator, performs a double function. It may be employed wherever a high stability frequency source is necessary, as in the case of a transmitter exciter or as a substitute for a receiver high frequency oscillator. The unit also has a built-in feature enabling its utilization as a frequency meter whereby an external source of energy may be calibrated against the Model PMO.

(b). DESCRIPTION:

Primarily the Model PMO is a high stability, free running, oven controlled, direct reading oscillator which may be calibrated at 100 Kcs. intervals against a precisely set internal crystal standard. This means that the frequency will be correct at each 100 Kcs. interval and that some device must be employed to automatically alter the main tuning condenser calibration so that the frequencies between check points are accurately set according to a predetermined curve. An adjustable cam combined with a small trimmer condenser serve this purpose.

Of course, provision must be made for a mixer-audio amplifier section so that the calibration beats can be obtained. In addition, a power amplifier and doubler provide the necessary power output and extend the frequency range.

APPROVED A. J. J.

2. TEST EQUIPMENT REQUIRED:

(a). 1 - Communications Receiver: TMC Model FFR with 1 each FFRD -5

and FFRD - 6 heads or

Hammarlund 600J

(b). 1 - V.T.V.M. (Audio Type):

Daven 170 or

Heathkit AV2

(c). 1 - Audio Signal Generator:

Hewlett Packard 200 or

Heathkit AG8

(d). 1 - V.T.V.M. (R.F.):

Hewlett Packard 410B or

Heathkit V6 with R.F. probe

(e). 1 - Approximately 72 ohm
non-inductive load*rated
at 10 watts.

3. TEST INSTRUCTIONS:

- (a). Proceed as outlined in Test Sequence and Procedure.
 (Part 4 to follow.)
- (b). Fill in blanks on Report Sheets, rejecting those units which do not meet the specifications stated herein.
- (c). Sign Report Sheets and submit them to your supervisor.

TMC

SPECIFICATION NO. S-221

JOB 285

PRODUCTION TESTING OF MODEL PMO

APPROVED A J. J

4. TEST SEQUENCE AND PROCEDURE:

TITLE:

Part 1: Initial Calibration, Master Oscillator-

- (a). Set up and calibrate the 100 Kcs. oscillator as per the first part of Specification S-110 which relates to this subject alone.
- (b). Set up and calibrate the master oscillator cam as per the first part of Specification S-110 which relates to this subject alone.

Part 2: Mechanical Inspection-

- (a). Inspect the total unit for obvious electrical errors.
- (b). Inspect the total unit for obvious mechanical imperfections.
- (c). Carefully inspect the unit for loose screws on shaft couplings and other critical points. Most carefully inspect for loose screws at grounding points such as under tube sockets and at ground lugs.

Part 3: Power Supply and Mixer-Amplifier Section:

(a). After the master oscillator chassis has been inserted in the Model PMO unit in which it has been designated to operate, withdraw P301 and P302 from their sockets. This is to prevent damage to the now relatively inaccessible oscillator parts due to wiring errors within the other portions of the PMO.

SH. 6 OF THE COMPILED BY

TMC

SPECIFICATION NO. S-221

A.J.J.

PRODUCTION TESTING OF MODEL PMO

JOB 285

APPROVED A. J. J

WARNING

UNDER NO CIRCUMSTANCES SHALL EITHER V301 OR V302 BE REMOVED
FROM ITS SOCKET WITHOUT FIRST WITHDRAWING P301 FROM ITS SOCKET.
THIS WILL SERVE TO PROTECT THE REGULATED FILAMENT CIRCUITRY.

(b). Connect the Model PMO to a monitored power line which has been set for 110 volts within plus or minus 2 volts.

Turn the Main Power switch on.

Test A: Primary Power-

Remove the B Plus fuse (F103). The high voltage at C101 must disappear.

Remove the Main fuse (F102). The Main Power pilot lamp must go out.

Remove the Oven fuse (F101). Both Inner and Outer Oven lamps must go out.

Re-insert all fuses in their appropriate holders.

Test B: Wiring of JlOl-

- (a). At Pin 1 (with no jumper on E304) -- Must be shorted to ground in positions 1 and 2 of S103 and must be open circuit to ground in position 3 of S103.
- (b). At Pin 2 -- Approximately 12.6 volts, 60 cps.
- (c). At Pin 3 -- 150 volts +5 volts D.C.
- (d). At Pin 4 -- 150 volts +5 volts D.C. in position 2 of S103 and zero volts in positions 1 and 3 of S103.
- (e). At Pin 5 -- Short to ground.
- (f). At Pin 6 -- Open circuit relative to ground.

DATE 9/3/53 SH. 7 OF 14		TMC	SPECIFICATION N	O. S-221
A.J.J.	TITLE:	PRODUCTION	TESTING OF MODEL PMO	ЈОВ 285
APPROVED A	ī. J.	Page Issue	A	

Test C: Mixer-Amplifier Gain-

- (b). The same output results must be obtained with the signal generator set for ______ volts at pin 7 of V2O3.

Part 4. THE P.A. SECTION:

- (a). Plug in P301 and P302 and allow the master oscillator a few minutes to warm up.
- (b). Place a jumper across the terminals of E304.
- (c). By means of the slug in L301 and the trimmer C303, roughly align the low and high ends, respectively, of the master osc.
- (d). Set the master oscillator at approximately 2 Mcs.
- (e). Set the OUTPUT pot in the full clockwise position.
- (f). Set S103 in the Exciter position.
- (g). Place SlO2 in the On position.
- (h). Set S201 in the 2-4 Mcs. position.
- (i). Load J203 with approximately 70 ohms of non-inductive resistance.

- (j). Set the C207 knob so that the pointer is horizontal to the right when C207 is fully closed. Then rotate the knob so that the pointer is on the 2 Mcs. mark.
- (k). Set C219 approximately in the center of its range.
- (1). Rotate the slug in L203 until maximum output is indicated at J203. The high end of the band may now be aligned. It is not necessary to change the master oscillator from its 2 Mcs. setting since, for the purposes of alignment, the use of harmonics is adequate.
- (m). Rotate C207 until it is set at 4 Mcs. Tune C219 for a maximum output reading. Repeat this process of tuning the slug at 2 Mcs. and C219 at 4 Mcs. several times until an alignment within + 200 Kcs. of the correct is obtained.

This process serves to properly determine the ratio of Cmax to Cmin which, in turn produces proper end alignment. Now only the lower end of the 4-8 Mcs. band need be set by means of the slug in 1105-the upper end will then automatically be correct. Perform this operation and lock both slugs in place.

Rotate the master oscillator through the band from two to four Mcs. and follow along with C207. At each 500 Kcs. interval, note the output across the load and the accuracy of the alignment of C207 on both bands.

(a). Alignment at each 500 Kcs. point must be within +200 Kcs. to be acceptable.

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(b). Output must be above 3 watts throughout the 2-4 Mcs. band and above 2 watts throughout the 4-8 Mcs. band to be acceptable.

Test B: P.A. Spurious -

With R218, set for full output, remove P302 from J202 and the load from J203. Rotate C207 slowly from one extreme to the other on both bands. Reject any unit which shows even a minute output under these conditions since this indicates self-oscillation.

Test C: Output Control -

Replace P302 and the load in J203. Rotate R218. To be acceptable, the power output on either band and at any arbitrary frequency must drop continuously from maximum to an unreadable value.

Test D: Plate Switch -

Turning plate switch (SlO2) to the off position must remove all B plus voltage from V2Ol and V2O2.

Test E: Function Switch -

Portions of the function switch have already been tested.

For the remaining section:

- (a). Positions 1 and 2 B plus must appear at R214 zero volts must appear at S102
- (b). Position 3 B plus must appear at SlO2 zero volts must appear at R2U;

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Test F: Tuning Indicator -

When the power amplifier is tuned at full output, the tuning indicator must light brightly and then extinguish when C207 is brought out of resonance.

Part 5. THE MASTER OSCILLATOR SECTION:

WARNING

AFTER THE OVEN HAS COME UP TO TEMPERATURE, NEVER PERMIT THE MODEL PMO TO COOL DOWN IN ANY POSITION OTHER THAN RIGHT SIDE UP. THIS IS TO PREVENT MERCURY SEPARATION IN THE THERMOSTAT.

After having concluded Part 3, leave the unit on until the inner oven commences to cycle. Depending upon ambient temperature conditions, as much as three or four, hours may be required to reach this point.

Test A: Inner Oven Cycling -

Observe the inner oven cycling by means of I301. The on time should be very roughly one minute and the off time, very roughly two minutes. Do not pass a unit which varies radically from these figures. (By more than -50, +100%).

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A.J.J.

TITLE:

Outer Oven Cycling -Test B Outer oven cycling should be roughly two to four seconds on and thirty to one hundred and twenty seconds off.

Test C: 100 Kcs. Oscillator Calibration -Couple lightly from the input to V201 to a communications receiver tuned to WWV at either 2.5 Mcs. or 5 Mcs. (Be sure BFO is off). Tune the master oscillator dial to the region of 2.5 Mcs. and set the Function switch in the CAL position. Carefully zero beat the master oscillator against WWV to within a fraction of one cycle. Now, by means of C311 and the beat indicator (I202), zero beat the 100 Kcs. crystal against the master oscillator to within a fraction of a cycle. The unit can be passed only after this operation has been concluded.

Test D: Master Oscillator Calibration -Re-calibrate the master oscillator at both the upper and lower ends and then, without again touching either end adjustment control, record the amount of error in the master oscillator dial against the 100 Kcs. standard at every 100 Kcs. point between 2 and 4 Mcs. A form has been provided for this purpose. No unit may be passed where this error exceeds 200 Cps.

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Test E: Master Oscillator Keying -

Tune the master oscillator and power amplifier to about 3 Mcs. and pick the signal up on a communications receiver. Insert key at J301 after jumper has been neatly placed across E304. Key the unit at about a five Cps. rate (about fifteen words per minute) and listen on the receiver to see that the keying sounds clean and follows the key.

When all of the preceding tests have been successfully passed, the unit must be placed in its final form with cover plates, etc., and prepared for shipment. One copy of each report sheet shall be enclosed with each Model PMO.

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SAMPLE

TEST REPORT SHEET #1

MODEL PMO

For	each	item	check	the	accept	or	reject	column,	as	the	case	may	be.
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Part 2:	Mechanical Inspection			
Part 3:	Pwr. Supply and Mixer-Amp. Section			
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Test B:	Wiring of J101			
Test C:	Mixer-Amplifier Gain		Market and the second second	
Test D:	Beat Indicator			_
Part 4:	The Power Amplifier Section			
Test A:	P.A. Alignment and Output			
Test B:	P.A. Spurious			
Test C:	Output Control			
Test D:	Plate Switch			
Test E:	Function Switch		-	
Test F:	Tuning Indicator		-	
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Test B:	Outer Oven Cycling		-	
Test C:	100 Kcs. Osc. Calibration			
Test D:	Master Oscillator Calibration			
Test E:	Master Oscillator Keying			
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