DATE November 27, 1962 SHEET 1 OF 12	TMC SPECIFICATION NO. S-696	B
JNS COMPILED / N.P. NP CHECKED	TITLE:	
APPROVED BP		

AX387, TEST PROCEDURE

(HFS) 100KC SELECTOR DECK

OGILVIE PRESS, INC., BROOKLYN 17, N. Y. STOCK NO. 439M

DATE November 27, 1962	TMC SPECIFICATION NO. S- 696	B
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APPROVED	(HFS) 100KC SELECTOR DECK	

I. FUNCTION AND DESCRIPTION:

The functions of the 100KC selector deck are to supply a 100KC signal to the 10KC selector deck, AX386, generate a reference signal of 3.25MC to 4.25MC, amplify an incoming signal to 3.25 to 4.25MC from the 1MC selector deck, AX388, compare this signal with the generated signal, and generate a D-C control voltage whose amplitude and polarity are determined by the deviation of the incoming signal from the generated reference signal. The D-C voltage will be negative if incoming frequency is lower than the reference signal and positive if it is higher. The amplitude of the DC is proportional to the phase deviation between the generated reference signal and the incoming signal.

The 100KC selector deck divides a 1MC signal down to a 100KC pulse signal. The 100KC pulse, besides going to the 10KC selector deck, AX386, is fed into a blocking oscillator to sharpen the rise time and increase its harmonic content. It is then fed into the crystal filters. The crystals select the 29th through the 38th harmonics of this pulse. The selected signal is then applied to a single stage high Q amplifier where the spurious signals are attenuated, and the wanted signal is amplified.

The 2.9 to 3.8MC signal is mixed with a 350 to 450KC signal supplied by the 10KC selector deck, AX386. The mixing is accomplished in a balanced modulator which feeds the signals into an amplifier with 100KC bandwidth tuned to amplify only the sum of the mixed frequencies. The summing amplifier feeds a signal which may vary from 3.25 to 4.25MC into the phase detector.

The incoming signal from the 1MC selector deck, AX388, is amplified

through a single-stage amplifier and fed into the phase detector. The phase detector will produce a DC control voltage which depends upon the phase difference between the incoming signal and the synthesized signal.

II. REQUIRED TEST EQUIPMENT:

A. Oscilloscope, Tektronix 515 A, or equivalent.

B. A-C VTVM, Hewlett-Packard 410 B, or equivalent.

C. Power Supply, Lambda Mo. 26, or equivalent.

D. Test Cable (Fig. A)

E. TMC model CSS-1 (1V RMS output of 1MC signal).

F. 56 ohm watt load mounted in PL204.

G. Burroughs mixie (B5031) with TMC cable CA668

H. Signal Generator, STD SIG GEN Model 82 - (2 req'd).

I. 47 ohm resistor matching pad, attached to PL204 with 3" length of RG 174U cable - (2 req'd).

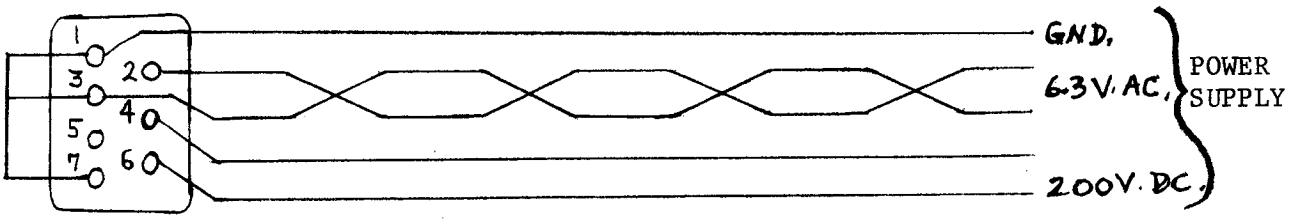
III. PRELIMINARY:

A. Inspect unit carefully. See if unit is clear of loose parts, short circuits etc.

* B. Measure resistance of B+ line to ground. Reading should be greater than 20K ohms. Red lead or positive side of ohm meter must be connected to ground.

C. Connect unit to power supply through test cable. Turn on A-C. Turn on B+ and set level to 200VDC. Allow 5 minutes for warmup before continuing tests.

Fig. A



To mate with J3409

IV. ALIGNMENT PROCEDURE:

A. Phantastron Divider -

1. Connect 1MC signal output from CSS to J3401.
2. Connect VTVM A-C probe to T.P. 3401 and check amplitude of incoming signal. Voltage should be approximately IV RMS.
3. Connect scope probe to TP3402. A 500KC signal should be observed at this point.
4. Remove scope probe from TP3402 and attach it to TP3403.
5. Adjust potentiometer R3411 for 100KC pulse at TP3403.
* 6. Set potentiometer in middle of 100KC range and lock.
* 7. Remove scope probe from TP3403 and attach it to J3403. 100KC pulse should be 35-42V peak-to-peak.

* B. Harmonic Selector Bank -

1. Insert crystals in their respective sockets.
2. Insert indicator cable assembly in J3408.
3. Remove scope probe from J3403 and connect to TP3404.
4. Set switch so that indicator reads "0".

5. Adjust C3454 (crystal trimmer) and C3463 (plate tuner) for maximum amplitude at TP3404.
6. Set switch so that indicator reads "1" and adjust C3453 (crystal trimmer) and C3462 (plate tuner) for maximum amplitude.
7. Repeat step 6 for remainder of positions through 9 adjusting in sequency C3452 through C3448, C3457 through C3455, (crystal trimmers), and C3461 through C3458, C3464 through C3467 (plate tuners).

C. Balanced Modulator and Sum Amplifiers -

1. Set selector switch on position "0" and attach scope probe to J3404. Adjust R3432 for minimum amplitude.
2. Remove scope probe from J3404 and attach Model 82 generator.
3. Set signal generator at frequency of 360KC and adjust the generator amplitude so that there is a .2VRMS input to J3404.
4. Attach scope probe to TP3405.
5. Adjust C3473 for maximum amplitude in this position.
6. Set selector switch so that indicator reads "1" and adjust C3472 for maximum amplitude.
7. Run through remaining positions through "9" and adjust in sequence capacitors C3471 through C3468 and C3474 through C3477 for maximum amplitude.
8. Remove scope probe from TP3405 and attach it to TP3406.
9. Set generator at 440KC and adjust output level to .2V RMS into J3404.
10. Repeat steps 5 and 6, adjusting C3483 instead of C3473.

* 11. Vary the generator frequency between 450KC and 350KC. The output should not vary more than 3db. The bandwidth between the 3db points should be 100KC ±10KC.

* 12. Run through remaining switch positions repeating steps 11 and 12 and adjusting in sequence capacitors C3482 through C3478 and C3484 through C3487.

D. 3.24 - 4.25MC Amplifier (incoming signal) -

1. Remove generator from J3404 and connect it to TP3408. Connect VTVM to J3407.

* 2. Set selector switch to blank position. Set signal generator to 3.4MC and tune T3406 for maximum output at J3407.

3. Remove generator and meter. Connect generator to J3407.

4. Set selector switch so that indicator reads "0".

5. Set generator to frequency of 4.2MC and adjust output to .1V RMS into J3407.

6. Attach VTVM probe to TP3407 and adjust C3493 for maximum amplitude.

* 7. Vary signal generator frequency ±50KC about the initial setting. The amplitude at TP3407 should not vary more than 3db. The bandwidth between 3db points should be 100KC ±10KC.

8. Set selector switch so that indicator reads "1".

9. Decrease frequency of signal generator by .1MC and readjust output into J3407 to .1V RMS if necessary.

10. Adjust C3492 for maximum amplitude at TP3407.

* 11. Repeat Step 7.

12. Repeat Steps 9, 10 and 11 for remainder of switch positions through 9 adjusting in sequence capacitors C3491 through C3496 and C3494 through C3497.

E. Quadrature Phase Detector -

1. Leave signal generator on J3407 and attach other signal generator to J3404.
2. Attach meter to J3405 and set on 3-volt D-C scale.
3. Switch scope to D-C and attach probe to J3406.
4. Set selector switch so that indicator reads "0".
5. Set J3404 generator at a frequency of 400KC and output level of .2V RMS.
6. Set J3407 generator at a frequency of 4.2MC and output level of .1V RMS.

* 7. Note audio frequency on scope and adjust frequency of J3404 generator to obtain lowest possible frequency. It is very difficult to obtain a complete null. As scope presentation frequency falls below 100CPS, note peak-to-peak amplitude. Peak-to-peak amplitude should be approximately 4 volts. Note D-C level of audio frequency as it approaches a zero beat. Level should be approximately +2V.

8. Vary J3407 generator between 3.25 and 4.25MC and note change in reading of meter attached to J3405. Reading should be zero with maximum variation of +.3to-.5V throughout the rang . Return setting of J3407 generator to initial setting.

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9. Increase both generators in frequency by 50KC and maintain initial drive levels. Repeat Step 7.
10. Decrease frequency of both generators by 100KC (this gives frequencies of 50KC below initial settings) and repeat Step 7.
11. Go through the remaining switch positions and in each position return the J3404 generator to the 400KC frequency setting. In each position, decrease the frequency of the J3407 generator by a step of .1MC (4.1MC for position "1". 4.0MC for position 2; 3.9MC for position 3; 3.8MC for position 4 etc.). Repeat Steps 7, 8, 9 and 10 for each switch position.

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The D-C voltages in the Voltage Chart are for reference only. These voltages should be within ±10% - no signal applied.

D-C VOLTAGE CHART

TUBE	TYPE	1	2	3	4	5	6	7	8	9
V3201	12AJ7	130	80	80	-	-	170	65	80	0
V3402	6AS6	15	15	-	-	170	75	5	-	-
V3203	12AT7	170	0	3	-	-	175	0	0	-
V3404	6AH6	0	1.5	-	-	145	115	1.5	-	-
V3405	6AH6	0	1	-	-		110	1	-	-
V3406	6AH6	0	1.25	-	-	160	125	1.25	—	-

- INDICATES NO MEASUREMENT TAKEN

The voltages shown below are with signal applied and for reference only.

TP3401 3.5V peak-to-peak
TP3402 30V peak-to-peak
TP3403 5V peak-to-peak
TP3404 **3-6V peak-to-peak**
TP3405 .15V peak-to-peak
TP3406 **2.8-5V peak-to-peak**
TP3407 **3-6V peak-to-peak**
TP3408 .9V peak-to-peak

J3401 and J3402 1V RMS input
J3403 12-15V peak-to-peak
J3404 .2V input
J3405 +2VDC *
J3406 4V peak-to-peak Δ
+1.8VDC ‡
J3407 .1V RMS input

* Obtained only when frequency out of J3406 is 10 cps or less.
Δ Obtained only when frequency is 100 cps or less.
‡ Obtained only when frequency approaches zero.

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REAR OF DECK

PISTON CAPACITORS [Switch position is in circle]

C-3461 (2) C-3464 (6) C-3467 (9)

C-3459 (4) C-3462 (1) C-3465 (7)

C-3458 (5) C-3460 (3) C-3465 (0) C-3466 (8)

2.9mc-3.8mc Plate Tuning Capacitors

O TP-3404

O TP-3405

C-3468 (5) C-3471 (2) C-3474 (6) C-3477 (9)

C-3469 (4) C-3472 (1) C-3475 (7)

C-3470 (3) C-3473 (0) C-3476 (8)

Summing Amplifier 3.25mc-4.25mc Grid Tuning Capacitors

O TP-3406

C-3478 (5) C-3481 (2) C-3484 (6) C-3487 (9)

C-3479 (4) C-3482 (1) C-3485 (7)

C-3480 (3) C-3483 (0) C-3486 (8)

Summing Amplifier 3.25mc-4.25mc Plate Tuning Capacitors

O TP-3407

C-3490 (3) C-3493 (0) C-3496 (8) C-3497 (9)

C-3489 (4) C-3491 (2) C-3495 (7)

C-3488 (5) C-3492 (1) C-3494 (6)

Incoming Signal 3.25mc-4.25mc Plate Tuning Capacitors

(O) J3407

J3408

FRONT: SELECTOR SWITCH

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THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y.

AX-387 TEST DATA SHEET #1

MFG. NO._____

1. Resistance B+ to ground_____ohms. (Positive lead of ohm-meter must be attached to ground.)

2. 100KC divider. Division frequency_____check OK.

   J3403 Output voltage _____volts peak-to-peak.

3. Harmonic generator output. Voltage at TP3404.

   Maximum Amplitude_____Volts P to P, Switch Pos._____

   Minimum Amplitude_____Volts P to P, Switch Pos._____

4. Summing Amplifier TP3406.

POSITION	FREQUENCY	100KC ±10KC BANDWIDTH OK	TP3406 PEAK-TO-PEAK VOLTAGE
0	4.1501-4.25MC	_____	_____
1	4.0501-4.15MC	_____	_____
2	3.9501-4.05MC	_____	_____
3	3.8501-3.95MC	_____	_____
4	3.7501-3.85MC	_____	_____
5	3.6501-3.75MC	_____	_____
6	3.5501-3.65MC	_____	_____
7	3.4501-3.55MC	_____	_____
8	3.3501-3.45MC	_____	_____
9	3.2501-3.35MC	_____	_____

5. 3.25-4.25MC amplifier (incoming signal)

   a) T3406 tune at 3.4 MC_____check OK.

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AX-387 TEST DATA SHEET #2

b) POSITION	FREQUENCY	100KC±10KC BANDWIDTH OK	TP3407 PEAK-TO-PEAK VOLTAGE
0	4.15-4.25MC	_____	_____
1	4.05-4.15MC	_____	_____
2	3.95-4.05MC	_____	_____
3	3.85-3.95MC	_____	_____
4.	3.74-3.85MC	_____	_____
5	3.65-3.75MC	_____	_____
6	3.55-3.65MC	_____	_____
7	3.45-3.55MC	_____	_____
8	3.35-3.45MC	_____	_____
9	3.25-3.35MC	_____	_____

6. Quadrature Phase Detector.

Audio Signal J3406 (2V peak-to-peak min.) OK all switch position _____ check OK.

DC Output

Reference level shift of no more than +.3 to -.5V.DC on all switch positions _____ check OK. check OK.

DATE: _____

TESTER: _____

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REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S696
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
4/23/64	A	------	11283	Revised Shts.3,4,6,7 per EMN	
10/13/64	B	4	12631	Revised sht.4 per EMN	