TMC SPECIFICATION

NO. S 1158

REV: Ø A B

COMPILED: RRH | CHECKED: | APPD: 12/8/66 | SHEET 1 OF 15

TITLE:

Typed by mtp 12/5/66

HFS-2 FINAL SYSTEM ALIGNMENT PROCEDURE

I. REQUIRED TEST EQUIPMENT

A. Oscilloscope - TEK-541 or equivalent.

II. PROCEDURE

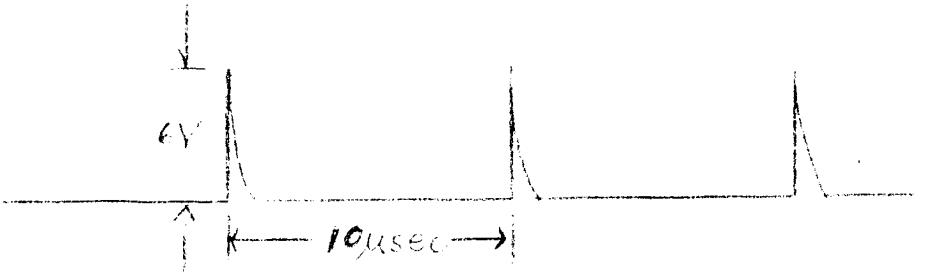
A. Set up the HFS-2 with either the HFR-2 or CHG-3. Turn the entire system on and allow to warm up for a period of 12 hours.

B. Divider Alignment

1. Connect the scope probe to TP-3401, a 1MHz signal with an amplitude of 2.8V PP should be present.

2. Connect the scope probe to TP-3042; a 500KHz distorted square wave with an approximate of 40V PP should be present.

3. Connect the scope probe to TP-3403 and adjust R3414 for a 100KHz pulse train. Set R3414 in middle of 100KHz range and lock.

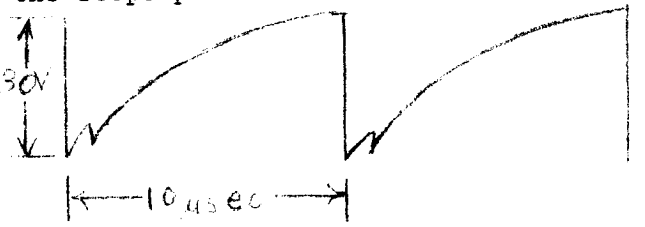


TP-3403

II. PROCEDURE - Cont'd

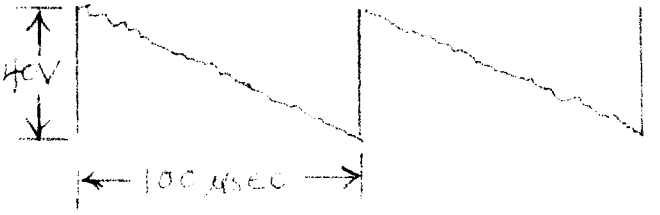
C. Divider Alignement:

4. Connect the scope probe to TP-3301 and observe the wave form.



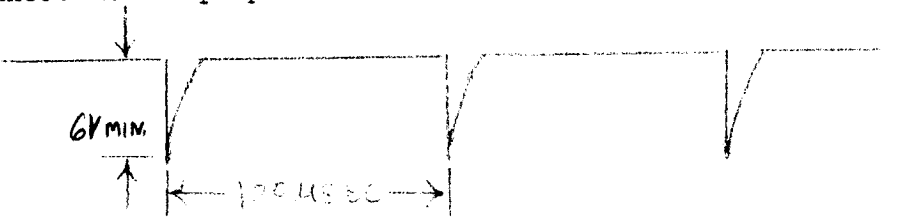
TP-3301

5. Connect the scope probe to TP-3302 and adjust R3303 for a 10 kHz sawtooth wave form. Set R3303 in middle of 10 kHz range and lock.



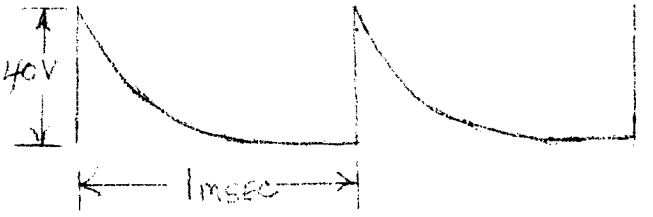
TP-3302

6. Connect the scope probe to TP-3201 and observe the wave form.



TP-3201

7. Connect the scope probe to TP-3202 and adjust R3203 for a 1 kHz pulse wave form. Set R3203 in middle of 1 kHz range and lock.

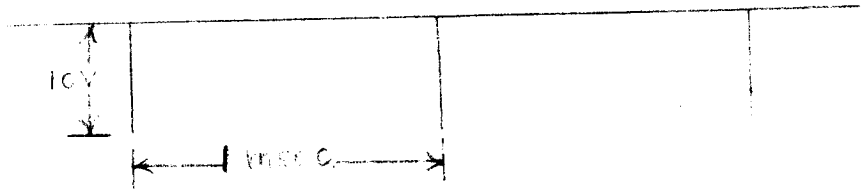


TP-3202

II. PROCEDURE - Cont'd

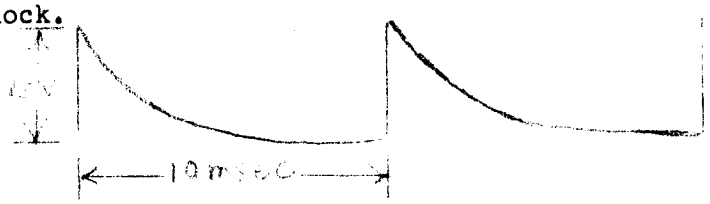
C. Divider Alignment:

8. Connect the scope probe to TP-3101 and observe the wave form.



TP-3101

9. Connect the scope probe to TP3102 and adjust R3103 for a 100 Hz pulse train. Set R3103 in middle of 100 Hz range and lock.



TP-3102

10. This completes the Divider Alignment.

D. 100 Hz Harmonic Selector Aligment:

1. Connect the scope probe to TP-3103.

2. Place 100 Hz selector switch in the "0" position.

3. Adjust C-3128 for maximum amplitude at TP-3103. (Approx. .7VPP sine wave)

4. Place the 100 Hz selector switch in the "1" position and adjust C3129 for maximum amplitude at TP-3103.

5. Repeat Steps 3 & 4 for positions "2" thru "9" adjusting C-3130 thru C-3137.

E. 1 kHz Harmonic Selector Alignment:

1. Connect the scope probe to TP-3203.

2. Place the 1 kHz selector switch in the "0" position.

3. Adjust C-3232 and C-3272 for maximum amplitude at TP-3203. (1.0V PP MIN.)

II. PROCEDURE - Cont'd

E. 1 kHz Harmonic Selector Alignment:

4. Place the 1 kHz selector switch in the "1" position and adjust C-3233 for maximum amplitude at TP-3203.

5. Repeat Steps 3 & 4 for positions "2" thru "9" adjusting C-3234 thru C-3241.

6. Set 100 Hz selector switch to position "5". Set 1 kHz selector switch to position "0".

7. Attach scope probe to TP-3204.

8. Adjust C-3273 for maximum output at TP-3204.

9. Set 100 Hz selector switch to position "0". Set 1 kHz selector switch to position "0".

10. Attach scope probe to TP-3205.

11. Adjust C-3274 for maximum output at TP-3205 (500 to 600 mv PP sine wave).

F. 10 kHz Harmonic Selector Alignment:

1. Connect the scope probe to TP-3303.

2. Place the 10 kHz selector switch in the "0" position.

3. Adjust C-3328 and C-3370 for maximum amplitude at TP-3303 (3.0V pp min)

4. Place the 10 kHz selector switch in the "1" position, and adjust C-3329 for maximum amplitude at TP-3303.

5. Repeat Step 4 for positions "2" thru "9" adjusting C-3330 thru C-3337.

6. Attach scope probe to TP-3304.

7. Set 100 Hz selector switch to position "5". Set 1 kHz selector switch to position "5" and set 10 kHz selector switch to position "0".

II. PROCEDURE - Cont'd

F. 10 kHz Harmonic Selector Alignment:

8. Adjust C-3371 for maximum amplitude at TP-3304.

9. Set 100 Hz selector to position "0". Set 1 kHz selector switch to position "0" and set 10 kHz selector switch to position "0".

10. Place the scope probe on TP-3305.

11. Adjust C-3372 for maximum output at TP-3305.

12. Place 100 Hz selector switch in position "5". Place 10 kHz selector switch in position "0". Vary 1 kHz selector switch from position "0" to position "9"; the output at TP-3305 should be constant within ±1 DB, (approx. 1.0 PP sine wave).

13. Repeat Step "12" with the 10 kHz selector in position "5" and position "9".

G. 100 kHz Harmonic Selector alignment:

1. Connect scope probe to TP-3404.

2. Set 100 kHz selector switch to the "0" position.

3. Adjust C-3454 and C-3463 for maximum level at TP-3404.

4. Repeat Step 3 for remaining positions 1 thru 9 adjusting C-3453 thru C-3448, C-3457 thru C-3455 (crystal trimmers) and C-3462 thru C-3458, C-3464 thru C-3467 (plate tuners).

5. Place 100 kHz selector switch in position "0".
" 10 kHz " " " " "5".
" 1 kHz " " " " "5".
" 100 Hz " " " " "5".

6. Connect scope probe to TP-3405.

7. Adjust C-3473 for maximum amplitude.

8. Set 100 kHz selector switch to "1" and adjust C3472 for maximum amplitude.

9. Go through positions 2 thru 9 adjusting in sequence capacitors C-3471 thru C-3468 and C-3474 thru C-3477 for maximum amplitude at TP-3405.

II. PROCEDURE - Cont'd

G. 100 kHz Harmonic Selector Alignment:

10. Attach scope probe to TP-3406.

11. Set 1 MHz selector in blank position.
" 100 kHz " " "0" "
" 10 kHz " " "0" "
" 1 kHz " " "0" "
" 100 Hz " " "0" "

12. Adjust C-3483 for maximum amplitude at TP-3406.

13. Run through the remaining switch positions of the 100 kHz selector switch adjusting C-3482 thru C-3478 and C-3484 thru C-3487.

14. Set the 100 Hz selector in position "5".
" " 1 kHz " " " "5".
" " 100 kHz " " " "0".
Vary the 10 kHs " from positions "0" thru "9", and note level at TP-3406. Repeat with 100 kHz selector in position "5" and position "9". The level at TP-3406 should be constant within ±2 DB.

15. Attach scope probe to TP-3408.

16. Set the 1 MHz selector switch at 10 mHz.

17. Disconnect the cable going to J-3404.

18. Place the CHG or HFR in Band 5 and move tuner to 10 MHz.

19. Vary the tuning head from 10 to 11 MHz and note level at TP-3408. It should not vary more than 3 db total. See addendum to this alighment procedure if this response is not correct.

20. Place scope probe on TP-3407.

21. Place 1 MHz selector in 2.0 MHz position.
Place 100 kHz selector in position "0".

22. Put CHG or HFR in Band 1, and set tuner at 2.05MHz

II. PROCEDURE - Cont'd

G. 100 kHz Harmonic Selector Alignment:

23. Adjust C-3493 for maximum amplitude at TP-3407.

24. Place 100 kHz selector in position "1" and move CHG or HFR tuner to 2.15 MHz.

25. Adjust C-3492 for maximum amplitude at TP-3407.

26. Repeat Steps 23 and 24 for remainder of 100 kHz selector positions adjusting in sequence capacitors C-3491 thru C-3488 and C-3494 thru C-3497. Each time, advance the tuner 100 kHz; e.g. 2.05, 2.15, 2.25, etc.

27. The level at TP-3407 must be at least **3VPP. If it is** not, replace V-3406.

28. Reconnect cable to J-3404.

H. Phase Detector Alignment:

1. Initially, set R-3442 to mid-range.

2. Set HFR or CHG on Band 1. Set HFS to 2.5 MHz. Move tuner to the vicinity of 2.5 MHz and look for a SYNC indication by observing the error phase detector meter on the CHG or HFR.

3. After observing SYNC, move the tuner to approximately 2.55 MHz or the point where it first falls out of SYNC. Adjust R-3442 for ZERO on error phase detector meter on the CHG or HFR.

4. Place system in SYNC again. Move dial back and forth noting hold-in range. The error phase detector meter should produce at least a full scale reading in either direction corresponding to hold-in, if the system is working properly. This full scale indication corresponds to approximately a ±5V swing out of the error phase detector.

II. PROCEDURE - Cont'd

H. Phase Detector Alignment:

5. Remove bottom cover from HFS.

6. Locate variable resistor, R3460, on PC board A4454, which is located underneath 3400 deck to the front.

7. Set HFS at 2.5 mHz. Set CHG or HFR at 2.9 MHz.

8. Adjust variable resistor, R3460, on PC board until SYNC light comes on.

9. Move HFR or CHG to SYNC at 2.5 MHz.

10. Manually turn tuner until system falls out of SYNC as indicated by error phase detector meter.

11. Adjust R3460 until SYNC light goes off.

12. Check SYNC light operation at 2.0 thru 2.9 mHz in 100 kHz steps. Also check at 2.999 MHz. The light should remain on for at least ±1/2 scale deflection on the error phase detector meter.

I. Outputs on Rear Panel:

1. 1MHz internal standard. 2.8vpp minimum across 47ohm load on J3019.

2. 2MHz signal. 2.8vpp minimum across 27ohm load on J3012.

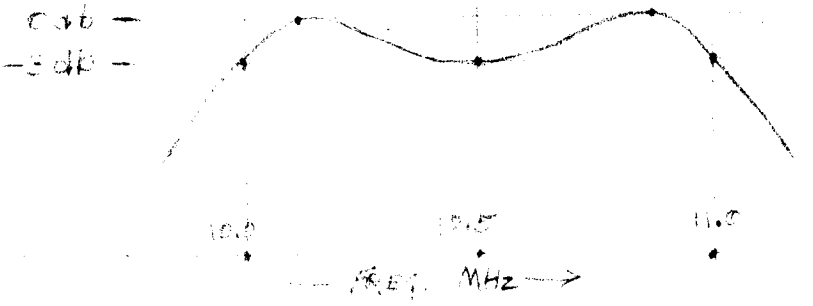
3. 250Kc signal. 3.5vpp minimum across 56ohm load on J3016.

III. ADDENDUM TO ALIGNMENT PROCEDURE

If the amplitude vs. frequency response is not correct at TP-3408, the following procedure should be used to properly align T-3504 and T-3506. Proper alignment of this circuit is absolutely necessary to obtain proper operation from the error and SYNC phase detectors.

1. Place the scope probe on TP-3408.
2. Place 1 MHz selector in the 10 MHz position.
3. Put HFR or CHG in Band 5 and set tuner to 10.15 MHz.
4. Peak T-3504 and 5-3406 at this frequency.
5. Move tuner to 10.8 MHz and check level at TP-3408.
6. Move tuner back and forth between 10.15 and 10.8 MHz adjusting T-3504 and 5-3406 until both frequencies have as close to the same amplitude as possible. The level should be 2.0V PP.

The response should look as follows:



0 DB level should be approximately 2.0V PP.

(HFS) 100KC SELECTOR DECK

REAR OF DECK

PISTON CAPACITORS (Switch Position is in circle)

C-3461 (2) C-3464 (5) C-3467 (9)

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

C-3458 (5) C-3460 (3) C-3465 (0) C-3466 (6)

2.9mc - 3.8 mc

Plate Tuning

Capacitors

○ TP-3404

○ 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

3.25 mc - 4.25 mc

Grid Tuning Capacitors

○ 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

3.25 mc - 4.25 mc

Plate Tuning Capacitors

○ TP-3407

C-3490 (3) C-3493 (0) C-3496 (6) C-3497 (9)

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

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

Incoming Signal

3.25 mc - 4.25 mc

Plate Tuning Capacitors

○ J3407

J3408

FRONT: SELECTOR SWITCH

THE TECHNICAL MATERIEL CORPORATION

FINAL SYSTEM TEST

MFG. NO.:_____ SERIAL NO.:_____

II. C1 TP-3401 Voltage_____V PP

C2 TP-3402 Voltage_____V PP

C3 TP-3403 100 kHz Pulse Train _____OK

C4 TP-3301 Wave Form ....._____OK

C5 TP-3302 10 kHz Wave Form...._____OK

C6 TP-3201 Wave Form....._____OK

C7 TP-3202 1 kHz Wave Form....._____OK

C8 TP-3101 Wave Form....._____OK

C9 TP-3102 100 Hz Pulse Train.._____OK

D3 TP-3103, C3128 Adjustment...._____OK

D4 TP-3103, C3129 Adjustment...._____OK

D5 TP3103, Capacitor Alignment:

100 Hz Position	Capacitor	Freq. (KC)	OK
2	C3130	3.8	
3	C3131	3.7	
4	C3132	3.6	
5	C3133	3.3	
6	C3134	3.4	
7	C3135	3.3	
8	C3136	3.2	
9	C3137	3.1	

E3 TP-3203, C3232 and C3272 Adjustment
(1 kHz selector in "0" position)_____OK

Cont'd.....

FINAL SYSTEM TEST - Cont'd

II. E4,5

1 kHz Position	Capacitor	Freq.	OK
1	C3233	35	
2	C3234	34	
3	C3235	33	
4	C3236	32	
5	C3237	31	
6	C3238	30	
7	C3239	29	
8	C3240	28	
9	C3241	27	

E8 TP-3204, C3273 Adjustment.... _____ OK

E11 TP-3205, C3274 Adjustment.... _____ OK

F3 TP-3303, C3328 and C3370 Adjustment
(1 kHz selector in "0" position) _____ OK

F4,5 TP-3303:

10 kHz Position	Capacitor	Freq. (KC)	OK
1	C3329	400	
2	C3330	390	
3	C3331	380	
4	C3332	370	
5	C3333	360	
6	C3334	350	
7	C3335	340	
8	C3336	330	
9	C3337	320	

F9 TP-3304, C3371 Adjustment.... _____ OK

F11 TP-3305, C3372 Adjustment.... _____ OK

F12 TP-3305 Output ±1 DB
(10 kHz selector in "0" position) _____ OK

F13 TP-3305 Output ±1 DB
(10 kHz selector in "5" position) _____ OK
TP-3305 Output ±1 DB
(10 kHz in "9" position)..... _____ OK

Cont'd.....

FINAL SYSTEM TEST - Cont'd

II. G3 TP-3404, C3454 and C3463 Adjustment_____OK

G4 TP-3404

100 kHz Position	Capacitors	Freq. (MC)	OK
1	C3453, C3462	3.7	
2	C3452, C3461	3.6	
3	C3451, C3460	3.5	
4	C3450, C3459	3.4	
5	C3449, C3458	3.3	
6	C3448, C3464	3.2	
7	C3457, C3465	3.1	
8	C3456, C3466	3.0	
9	C3455, C3467	2.9	

G7 TP-3405, C3473 Adjustment....._____OK

G8,9 TP-3405

100 kHz Position	Capacitor	Freq. (MC)	OK
1	C3472	4.06	
2	C3471	3.96	
3	C3470	3.86	
4	C3469	3.76	
5	C3468	3.66	
6	C3474	3.56	
7	C3475	3.46	
8	C3476	3.36	
9	C3477	3.26	

G12 TP-3406, C3483 Adjustment....._____OK

G13 TP-3406

100 kHz Position	Capacitor	Freq.	OK
1	C3482	4.14	
2	C3481	4.04	
3	C3480	3.94	
4	C3479	3.84	
5	C3478	3.74	
6	C3484	3.64	
7	C3485	3.54	
8	C3486	3.44	
9	C3487	3.34	

Cont'd.....

FINAL SYSTEM TEST - Cont'd

II. G14 TP-3406 Output ±2 DB....._____OK

G19 TP-3408 Output ±3 DB....._____OK

G23 TP-3407, C3493 Adjustment....._____OK

G25, 26, 27 TP-3407

100 kHz Position	Capacitor	Tuner Freq. (MC)	Synth. Freq. (MC)	OK
1	C3492	2.15	4.1	
2	C3491	2.25	4.0	
3	C3490	2.35	3.9	
4	C3489	2.45	3.8	
5	C3488	2.55	3.6	
6	C3494	2.65	3.6	
7	C3495	2.75	3.5	
8	C3496	2.85	3.4	
9	C3497	2.95	3.3	

H2 SYNC Operation....._____OK

H3 R3442 Adjustment....._____OK

H4 Meter Reading....._____OK

H8,11 R3460 Adjustment....._____OK

H12 SYNC Light Operation....._____OK

I. 1. 1MHz output J3019_____OK

2. 2MHz output J3012_____OK

3. 250Kc output J3016_____OK

DATE:_____

TESTER:_____

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S 1158
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
12/9/66	ø			ORIGINAL RELEASE FOR PRODUCTION	
10/22/68	A		19088	REVISED PER EMN	
7/14/69	B	4,8	19507	REVISED PER EMN	

TMC FORM MLR-1 2-65—AINS.