DATE 29 December 1964 SHEET 1 OF 13	**TMC SPECIFICATION NO. S-892**	Ø
N.A.B. COMPILED / GAB CHECKED	TITLE:	
O.J.F. APPROVED / 9/15/65 SS		

LFCA
ALIGNMENT
PROCEDURE

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

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A. TEST EQUIPMENT REQUIRED:

1. Oscilloscope, Tektronic 541A or equivalent.
2. Frequency counter, Hewlett-Packard 5244L or equivalent.
3. Signal generator, Measurements Corp., Model 82 or equivalent.
4. 100 KC signal generator test jig TMC #6024.
5. AC VTVM, Ballantine 314 or equivalent.
6. DC VTVM, Hewlett-Packard 410B or equivalent.
7. BNC "T" connectors (3).
8. 600 ohm Dummy Load (2) (two 1200 ohm resistors 1/2 watt in parallel).
9. 4 ohm Dummy Load (three 12 ohm resistors 1/2 watt in parallel).
10. Daven attenuator, Model TG-950 or equivalent.

B. PRELIMINARY:

1. Inspect unit for obvious mechanical defects.
2. Card A-3722 must be inserted for following checks.
3. Check for AC shorts at J-113

Pin A to ground	INFINITY
Pin B to ground	0 ohm
Pin C to ground	INFINITY

at T-101

Pin 9 to ground	1000 ohm ± 10%
Pin 10 to ground	1000 ohm ± 10%

4. Apply AC power by connecting power cord to J-113. Turn power switch to ON. Red power light must come on. Turn power switch OFF.

C. 1. ALIGNMENT:

NOTE: Power must always be turned OFF when extracting or inserting cards on equipment under test.

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a. TEST SET UP:

Figure 1.

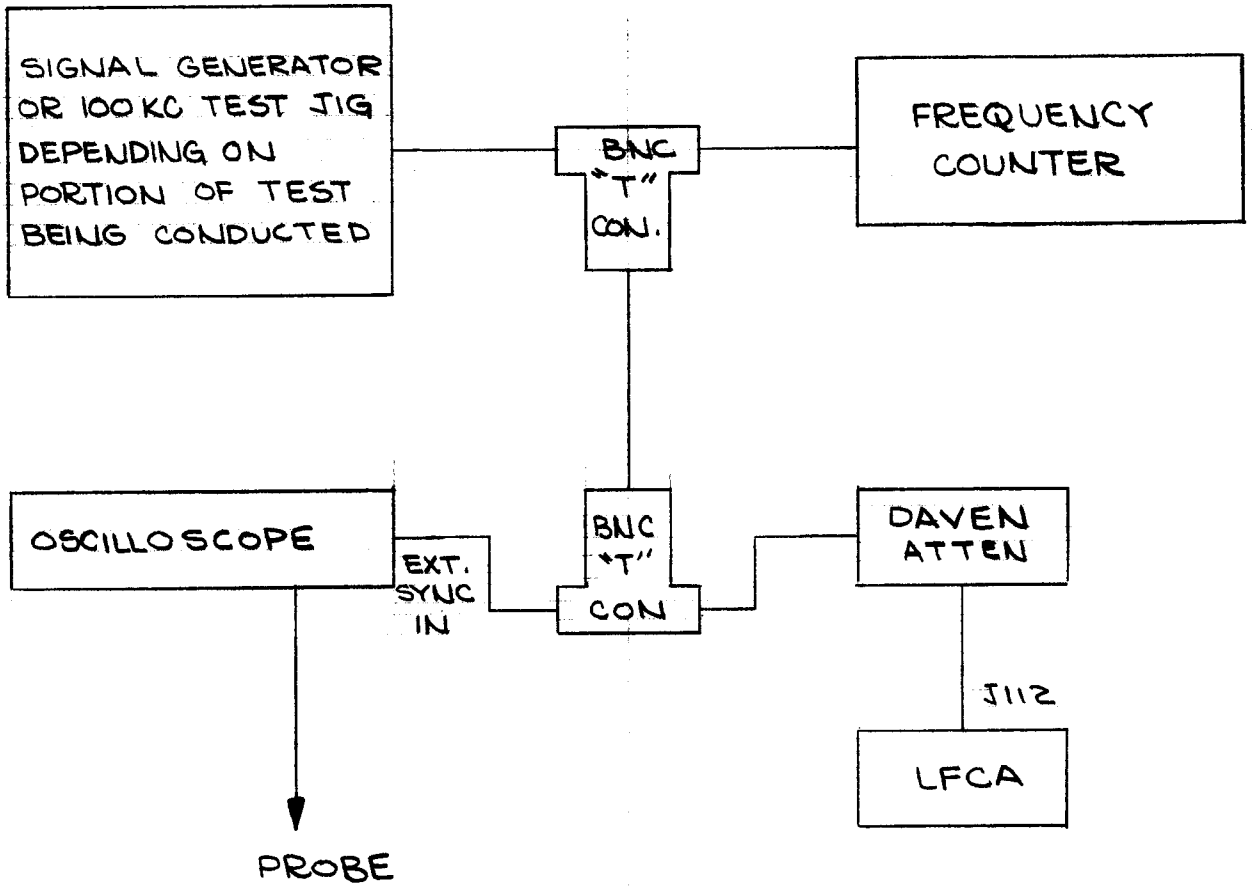

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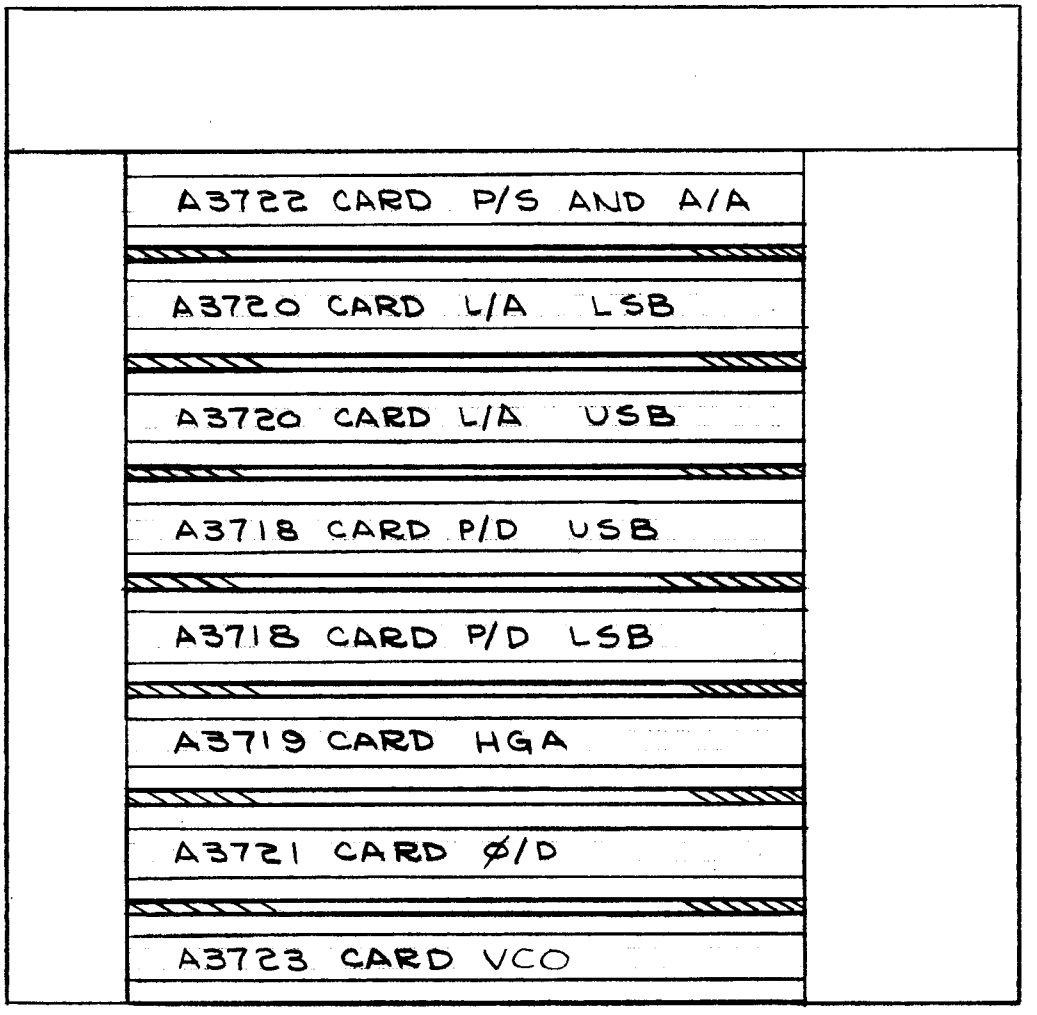
Figure 2.

Top View LFCA Card Positions



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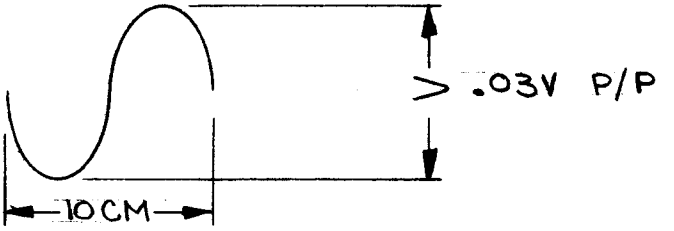
b. Insert card extender into A-3719 slot. Plug A-3719 card into extender.

c. Using Test Set up as shown in Figure 1 with 100 KC test jig as signal source, adjust frequency of test jig for 100 KC at 1 volt at output of test jig. Be sure test is loaded. (Either the counter or daven attenuator is connected).

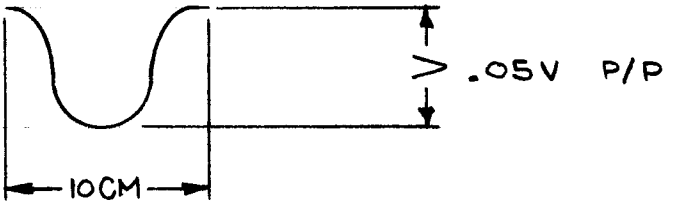
d. Use 80 db of attenuation on daven attenuator. Set scope controls as follows:

Trigger Selector	to + AC
Preset	to ON
Time Base	to 1 μsec/CM (Calibrated)

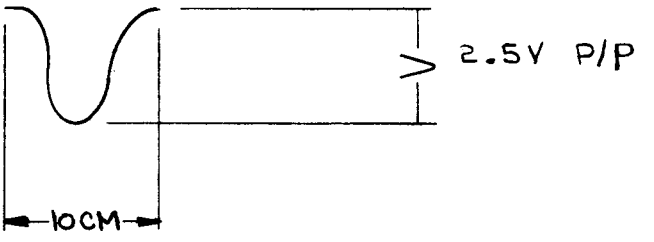
e. Turn LFCA to ON; monitor TP-5 on A-3719 card with scope. Waveshape as shown below should appear.



f. Monitor TP-6 on A-3719 card. Adjust T-1 for waveshape as shown below:



g. Monitor TP-7 on A-3719 card. Adjust T-2 for waveshape as shown below:



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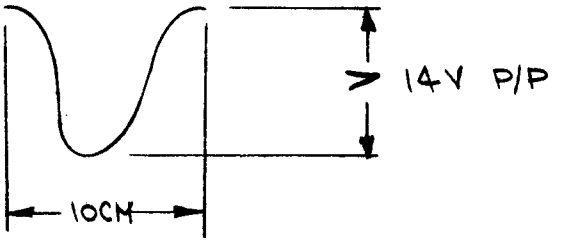
h. Monitor TP-8 on A-3719 card. Adjust T-3 & T-4 for waveshape as shown below:



i. There is some interaction between stages, therefore it will be necessary to go back and retouch transformers, T-1, T-2, T-3 and T-4 for proper phase relationship between stages.

j. Test point voltages for A-3719 card are as follows:

TP-1	-11.8 V. DC ± 5%		
TP-2	0 GND		
TP-3	+10.9 V. DC ± 5%		
TP-4	0		
TP-5	-10.8 V. DC ± 5%		> 15 MV AC
TP-6	-10.8 V. DC ± 5%		>10 MV AC
TP-7	-10.8 V. DC ± 5%		> 1100 MV AC
TP-8	-9.4 V. DC ± 5%		>5000 MV AC
TP-9		when used	>1 MV AC

k. Remove A-3719 card and extender. Replace A-3719 card.

2. ALIGNMENT:

a. Remove A-3721 card insert card extender into A-3721 slot, insert A-3721 card into extender. Remove crystal from A-3723 card.

b. Monitor TP-7 on A-3721 card with AC VTVM. Using lowest scale, adjust R-13 for minimum reading.

c. Monitor TP-8 on A-3721 card with AC VTVM. Using lowest scale, adjust R-14 for minimum reading.

d. Replace crystal in A-3723 card.

e. Ensure that VCO crystal is oscillating at the same frequency as the carrier crystal . This is accomplished by monitoring TP-7 on A-3723 card with scope and counting the frequency at the vertical output of the scope with the frequency counter. Adjust C-15 on A-3723 card to obtain same frequency as the carrier crystal. If frequency cannot be obtained use R-13 on A-3723 card to further tune.

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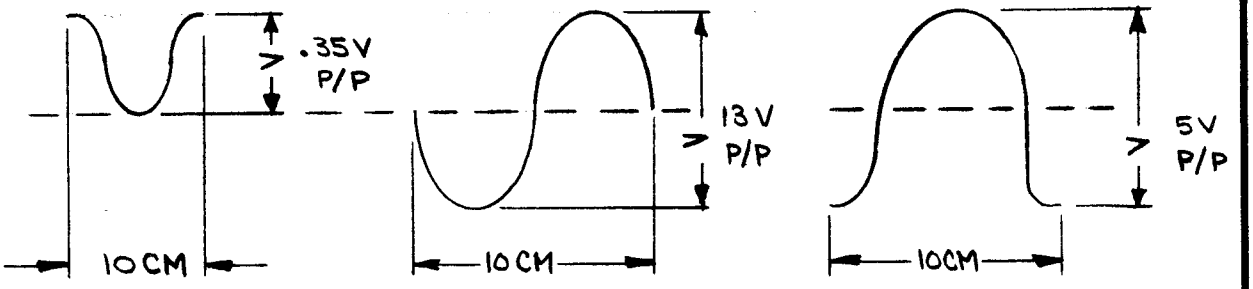
f. Monitor TP-8 on A-3721 card with DC VTVM. Adjust T-2 for 0 volts. Sync indicator light must be lit for this step, if not procede to step 6.h.

g. Monitor TP-7 on A-3721 card with DC VTVM adjust T-1 for maximum positive voltage.

h. Monitor the test point voltages and waveforms for levels and phase correlation as shown below. Controls for oscilloscope are the same as for the A-3719 card. Adjust trigger level to obtain waveshape as shown for TP-4 below and procede to observe waveforms at TP-5 and TP-6, without touching scope controls except vertical sensitivity. The waveforms shown give an indication that the tranformer primary's and secondary's are connected properly. If steps 6.f. and 6.g. were skipped return to step 6.f.

i. Test point voltages and waveforms for A-3721 card are as follows:

TP-1	-12.1 V. DC ± 5%	
TP-2	0	
TP-3	+11.2 V. DC ± 5%	
TP-4	0	> 1 V. AC
TP-5	-11.4 V. DC ± 5%	> 5 V. AC
TP-6	-11.4 V. DC ± 5%	> 2 V. AC
TP-7	0 to 4 V. DC	
TP-8	-2 to +2 V. DC	



3. ALIGNMENT:

a. Replace A-3721 card extend A -3723 card.

b. Put TP-5 at ground with clip lead.

c. Monitor TP-6 with DC VTVM, adjust R-13 for approximately -10.8 V. DC

d. Monitor TP-10 with scope. Adjust R-18 for waveform as shown below:

e. Monitor TP-7 with scope and peak by adjusting T-1.

f. Counting the frequency at TP-7, adjust C-15 for the same frequency as the carrier crystal. If frequency cannot be obtained, use R-13 to further adjust.

g. Test point voltages for A-3723 card are as follows:

TP-1	-11.4 V. DC ± 5%	
TP-2	0	
TP-3	+10.5 V. DC ± 5%	
TP-4	> +3.5 V. DC	
TP-5	-2 V. to +2 V. DC	
TP-6		
TP-7	-10.8 V. DC ± 5%	> 7 V. AC
TP-8	-2 to +2 V. DC	
TP-9	-12.5 V. RELAY ON +9.2 V. RELAY OFF	
TP-10	+.5 V. DC ± 5%	> .4 V. AC

4. ALIGNMENT:

a. Replace A-3723 card extend A-3718 card (LSB).

b. Connect 600 ohm Dummy Loads USB and LSB terminals on E-101 on back of unit. Connect 4 ohm Dummy Load across speaker terminals on E-101 on back of unit.

c. Remove IF INPUT.

d. Monitor TP-8 on A-3718 card with scope. Adjust T-2 for maximum output.

e. Center R-11 monitor TP-7 with AC VTVM. Adjust R-11 for minimum reading.

f. Adjust signal generator for 99 KC @ 1 volt at output. See test set up. Use 60 db of attenuation on attenuator.

g. Connect output of attenuator to J-112 (IF INPUT).

h. Monitor TP-6 with scope. Adjust T-1 for maximu

h. Monitor TP-6 with scope. Adjust T-1 for maximum output.

i. Test point voltages for A-3718 card are as follows:

TP-1	-12.5 V. DC ± 5%
TP-2	0
TP-3	+10.8 V. DC ± 5%
TP-4	
TP-5	≯ .008 V. AC
TP-6	≯ .04 V. AC
TP-7	≯ .01 V. AC
TP-8	≯ 15 V. p/p

5. ALIGNMENT:

a. Replace A-3718 card LSB, extend A-3718 card USB.

b. Same procedure of alignment is used as A-3718 LSB except that a frequency of 101 KC is used.

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6. ALIGNMENT:

a. Using same setup as for A-3718 card, adjust signal generator for 99 kc @ 1 volt RMS at output of signal generator. Use 60 db of attenuation on attenuator.

b. Replace A3718 card extend A-3720 card (LSB).

c. Turn meter switch (S-103) to LSB position.

d. Monitor 600 ohm LSB dummy load with A-C VTVM.

e. Turn LSB Gain Control (R-105) until a level of 78 volts RMS is obtained on A-C VTVM.

f. Adjust R-11 on A-3720 card to obtain a reading of 0 VU on line level meter (M-102).

g. Remove A-C VTVM from across LSB dummy load and connect across 4 ohm speaker dummy load. Use 10 volt scale.

h. Set R-2 and R-13 on A-3720 card to about mid-range.

i. Set Monitor Gain Control (R-106) to about mid-range (halfway between OFF and LSB.

j. While observing A-C VTVM, adjust R-13 for a 1.75 volt RMS indication.

k. While observing Line Level Meter (M-102), adjust R-12 for a 0 VU indication.

l. Repeat above two (2) steps (j & k) alternately until a 0 VU indication on Line Level Meter (M-102) and a 1.75 volt RMS indication on A-C VTVM is obtained simultaneously. Front panel gain controls may be used to aid in obtaining above readings.

7. ALIGNMENT:

a. Replace A-3720 card LSB; extend A-3720 card USB.

b. Same procedure of alignment is used as for A-3720 LSB, except a frequency of 101 kc is used.

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8. ALIGNMENT FOR SYSTEM OPERATION:

a. Following cards must be inserted, A-3722, A-3719, A-3721 and A-3723.

b. Remove 100 KC crystal from A-3723 card.

c. With card A-3719 extended, connect a -90 dbv signal to J-112 (use test set up as per Figure 1) at approximately 100 KC.

d. Monitor test point 6 with scope. Adjust signal source for maximum indication on scope and observe frequency on counter. This is center frequency of system and is called "carrier crystal frequency".

e. Adjust T-1 and T-2 for maximum signal. Adjustment should be very slight so as not to upset phase relationship.

f. Monitor TP-7 with scope and adjust T-3 for maximum signal. Adjustment should be very slight.

g. Monitor TP-8 with scope and adjust T-4 for maximum signal. Adjustment should be very slight.

h. Replace card A-3719 and extend card A-3721. (Crystal is still removed from A-3723 card).

i. Monitor TP-7 on A-3721 card with AC VTVM. Adjust R-13 for minimum indication.

j. Monitor TP-8 on A-3721 card with AC VTVM. Adjust R-14 for minimum indication.

k. Recheck signal source to ensure that it is still running at the "carrier crystal frequency".

l. Replace card A-3721 extend card A-3723. Replace 100 KC crystal in A-3723 card.

m. System should lock; if it does, observe sync. level meter, and adjust R-13 until sync. level meter reads 0 (center scale).

n. If system does not lock, perform alignment for A-3723 card again.

o. With system in lock monitor J-111 with DC VTVM.

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p. Vary signal source ± 5 cps. around the "carrier crystal frequency" system must remain in lock.

q. Disconnect signal input, system should go out of lock, reconnect signal input, system should return to lock.

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TEST DATA SHEET

B. 1.	MECHANICAL		OK
C. 6. 1.	AUDIO LEVELS LSB		
	LINE AMPLIFIER LSB > 0 DBM	600 ohm	VOLTS
	MONITOR AMPLIFIER LSB > .5 WATT	4 ohm	VOLTS
C. 7. b.	AUDIO LEVEL USB		
	LINE AMPLIFIER USB > 0 DBM	600 ohm	VOLTS
	MONITOR AMPLIFIER USB > .5 WATT	4 ohm	VOLTS
C. 8. d.	CARRIER CRYSTAL FREQUENCY		
	100 KC ± 5 CPS		CPS
C. 8. o.	DC ERROR VOLTAGE AT J-111 SYSTEM LOCKED		
	"CCF" + 5 CPS > + 1.5 VOLTS DC		VOLTS DC
	"CCF" - 5 CPS > - 1.5 VOLTS DC		VOLTS DC

CCF = CARRIER CRYSTAL FREQUENCY

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REVISION SHEET	THE TECHNICAL MATERIEL CORP. MAMARONECK NEW YORK	S892 LIST NO. Ø

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9/15/65		1 of 13		O=ORIGINAL RELEASE FOR PRODUCTION.	