



McMartin

TN-66B

TN-77B

TN-88B

INSTRUCTION MANUAL

TN66CB

TN77CB

MODEL TN66CB WITH MT-10 FILTER

SERIAL 1641848 117V 55W

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SCHEMATICS	

GENERAL DESCRIPTION

The McMartin Multiplex receiver is designed for continuous duty reception of commercial FM-SCA multiplex programming.

It utilizes a super-hetrodyne principle of circuitry which was originated and first introduced to this type of service by McMartin Industries, Inc. (Suggested reading: "Multiplex Reception, Heterodyning vs. Selective Filtering" in March, 1960 issue of Broadcast Engineering.)

The main channel is crystal controlled to receive any FM frequency between 88 and 108mc. The sub-channel (SCA-multiplex) is variably tuned (by simple adjustment) for convenient reception of any sub-carrier frequency between 25 and 75kc.

Three basic models are available:

- 1) Tuner (TN-66CB)
- 2) Tuner with 5 watt amplifier (TN-77CB)
- 3) Tuner with 15 watt amplifier (TN-88B)

The basic circuit, first utilized in April, 1960, has remained unchanged. Although minor refinements are being continually incorporated in your McMARTIN receiver as component reliability improves, the fundamental proven circuit has not and will not be modified.

The unique McMARTIN Model MT-10 stereo Filter is incorporated as standard equipment on all McMARTIN receivers. This filter is particularly advantageous for FM stations transmitting FM-stereo as well as SCA-multiplex.

The McMARTIN Model SP-50 or SP-55 Selective Programmer is an optional accessory which can be installed on the chassis of any current TN-66CB or TN-88B receiver. The Selective Programmer provides the broadcaster with additional capability to transmit and receive selective tones (simultaneous with program material on a single sub-channel) to activate the receiver (such as turning it ON and OFF), as used extensively in storecasting services.

Also optionally available is a McMARTIN Model MT-8 Plug-in Transformer which provides a balanced program output at 0 dbm (independent of the internal amplifier and paging circuit of the receiver). This feature enables one receiver to supply programming to two or more locations independently.

SPECIAL FEATURES

- * Tubes operate at less than 50% of their rated plate voltage for increased tube life.
- * Filaments operate at 6.0 volts rather than 6.3 volts for extended tube life. Receiver operation is noticeably cool.
- * The super-sensitive RF circuit offers sensitivity of 1.0 microvolts for 30db quieting on the main channel. The sub-channel has 3 microvolts for 25db of quieting.
- * An adjustable, automatic muting circuit is keyed by loss of either main or sub-carrier.
- * Improved AGC insures selectivity and IF bandpass under varying conditions, including cross-modulation.
- * Two limiters are in the main channel. One has a diode clipper to minimize impulse-type transients such as ignition noise.
- * Wide-band discriminators in the main and sub-channel provide maximum linearity and minimum distortion and cross talk.
- * All test points are easily accessible on the top of the chassis.
- * Seven tuned circuits in the sub-channel provide extreme selectivity to eliminate sub-to-sub cross talk.
- * RF shielding meets FCC requirements.
- * Separate bass and treble controls are provided on the TN-77CB and TN-88B units. Each control contains "boost and cut" and does not affect the microphone circuit.
- * The microphone input (on the TN-77CB and TN-88B units) contains a "press-to-talk" program muting circuit.
- * Audio amplifiers on both the TN-77CB and TN88B are of conservative, full rated push-pull circuitry with 8 ohm and 70.0 volt line outputs.
- * There is a front panel switch for "MN" (main) or "MX" (sub-channel). This switch simplifies servicing and enables a customer to switch to the main channel for special announcements such as historical events or local distress notices. A cover nut is supplied with all units, and can replace the knob if it is desired that the customer be prevented from usage of the switch.

SPECIFICATIONS

Main Channel

Range	88 to 108 mc - crystal controlled
Sensitivity	1 micro volts/30db quieting
Selectivity	$\pm 250\text{kc}$ @ 3db points
Capture Ratio	3.5 : 1
Discriminator Bandwidth	900kc peak-to-peak
Frequency response (before de-emphasis)	30 to 100,000 cps $\pm 3\text{db}$
RF Input	72 ohms (BNC connector)

Sub-Channel

Range	25 to 75kc - tunable
Sensitivity	3 micro volts/25db quieting (15% SCA injection)
Selectivity	10kc @ 3db points
Cross Talk	Main to SCA -55db SCA to SCA - 55db Stereo to SCA- 55db
Frequency Response	30 to 8,000 cps $\pm 1\text{db}$
Distortion	1.5% @ $\pm 7.5\text{kc}$ deviation @ 400 cps

Amplifiers

Power Output	5 or 15 wats rms
Frequency Response	40 to 8,000 cps $\pm 1.0\text{db}$
Distortion	5.0% max @ 5 watts and 15 volts
Microphone	Hi Z: 9mc for 5 watts 6mv for 15 watts
Outputs	8 ohm, 70.7 v
Hum & Noise	-60db or better @ full output
Tone	Bass: $\pm 10\text{db}$ @ 50 cps Treble: $\pm 10\text{db}$ @ 5,000 cps

SPECIFICATIONS
(continued)

General

Front Panel Controls

Main/Sub-Channel Selector
Volume Control
Power ON-OFF

Top Chassis Controls

Adjustable Automatic Muting(Mute)
Amplifier Controls for TN-77CB & TN-88B:
Microphone Level, Bass, Treble

Outputs
(switched, either main
or sub)

Hi-Impedance: 8v @ 10K ohms
600 ohms(with MT-8): 0dbm, balanced or
unbalanced

Output Socket
(TN-66CB or TN-88B)

For SP-50 or SP-55 Selective Programmer
plug-in

Pilot Light

Neon Assembly

Power Supply

117 v AC, 50-60 cps. 1.6 a, 3AG Slo-Blo
Fused
TN-66CB 55 watts
TN-77CB 75 watts
TN-88CB 100 watts

Dimensions

TN-66CB, TN-77CB 14" X 10" X 6½"
TN-88B 18" X 14" X 6½"

Finish

Natural gray cover, cadmium plated
chassis

Shipping Weight

TN-66CB 18 lbs.
TN-77CB 19 lbs.
TN-88B 25 lbs.

TUBE COMPLEMENT

SYMBOL	TYPE	FUNCTION
<u>All Models</u>		
V1	6AB4	Local Oscillator
V2	12AT7	$\frac{1}{2}$ Local Oscillator and Doubler
V3	6DJ8	Cascode RF Amplifier
V4	6AB4	Hi Frequency Mixer
V5	6BH6	First 10.7mc IF Amplifier
V6	6BH6	Second 10.7mc IF Amplifier
V7	6BH6	First 10.7mc Limiter
V8	6BH6	Second 10.7mc Limiter
V9	6AL5	Main Channel Discriminator
V10	6AX8	Sub-Channel Oscillator and Mixer
V11	6BH6	First 455kc IF Amplifier
V12	6BH6	First 455kc Limiter
V13	6T8	Sub-Channel Detector and Mute Control
V14	12AT7	Audio Amplifier
<u>TN-77CB</u>		
V15	12AX7	Microphone Preamplifier
V16	6AX8	Voltage Amplifier and Phase Inverter
V17	6AS5	Push-Pull Output Amplifier
V18	6AS5	Push-Pull Output Amplifier
<u>TN-88B</u>		
V15	12AX7	Microphone Preamplifier
V16	6AX8	Voltage Amplifier and Phase Inverter
V17	6BQ5	Push-Pull output Amplifier
V18	6BQ5	Push-Pull Output Amplifier

DIODE COMPLEMENT

SYMBOL	TYPE	FUNCTION
<u>All Models</u>		
D1	1N51	10.7mc Clipper
D2	1N51	Second 455kc Limiter
<u>Power Supply, TN-66CB and TN-77CB</u>		
SR1	1N2095	Silicon Power Rectifier
<u>Power Supply, TN-88B</u>		
SR1	1N2095	Silicon Power Rectifier
SR2	1N2095	Silicon Power Rectifier
SR3	1N2095	Silicon Power Rectifier

UNPACKING

Remove receiver from carton and examine for signs of external physical damage. Remove the cover by loosening the four thumb screws at the sides. Examine tubes, crystals, etc., to see that they are properly seated in their sockets. If any damage is noticed, immediately notify the shipping agency and advise McMartin Industries, Inc. of such action.

Contents of carton:

- 1 McMARTIN multiplex receiver
- 1 Instruction Manual *
- 1 Cover Nut (for MN-MX switch)

*Instruction Manuals are usually supplied with the first five sets per customer unless additional copies are specifically requested.

INSTALLATION PROCEDURE

Pre-Check

Because of conditions during shipment - moisture, vibration, etc., it is advisable to bench-check alignment and operation for at least a few hours prior to final installation.

Receiver Location

Sufficient space should be allowed for proper circulation of air. Keyhole slots are provided in all bottom plates to facilitate mounting receiver on a wall. This is desirable in order to guarantee air circulation and also to prevent use of the receiver as a "shelf" for paper, books, etc. It will also eliminate the probability of your customer moving the receiver, and possible shorting or breaking connecting wires. The receiver should be located as near to the entrance of antenna lead-in as possible.

Antenna

A properly selected and installed antenna is one of the most important factors for satisfactory multiplex reception. Good directional characteristics are very important for reduction of "multipath" reception. Multipath is one of the most common causes of cross talk. Only the antenna installation can eliminate it. Multipath is most common in large metropolitan areas or in mountainous country. High gain antennas usually have the best directional patterns, and although signal strength may be

INSTALLATION PROCEDURE (Cont.)

Antenna (Cont.)

high at some location, it may still be necessary to use a high gain antenna in order to get proper directional characteristics for elimination of multipath. The antenna should be oriented for a combination of best signal and least multipath (cross talk). For all installations we recommend the use of an outside, cut-to-frequency, directional antenna - either 3 or 6 element Yagi. For proper location and orientation of the antenna, we recommend using the McMARTIN TX-200 Field Strength Meter.

Antenna Connection

The 72 ohm and 300 ohm inputs are clearly marked on the rear of the chassis. Tinned wires and spade lugs make a more durable connection. In all cases the 72 ohm input is strongly recommended. It eliminates ignition and other man-made noises and gives better impedance matching. When using 72 ohms, a coaxial cable is required. Be sure to connect the coaxial shield to the ground terminal. In an extremely strong signal area, an attenuation pad installed between the cable and connector may be desirable to prevent overloading the receiver's front end.

Microphone Connection

The mike cable requires an Amphenol type #91-PC3F plug to feed the input of the microphone circuit. Pin #1 is ground and pin #2 is high impedance. Pin #3 is for use only when it is desired to mute the program while paging. Simply short pin #3 to ground for muting. This can be done with the press-to-talk switch of many microphones, or you could use an external switch of any type.

Speaker and Output Connections

Unless only a few speakers are to be used, the 70.7 volt output is recommended.

8 Ohms: Connect the speakers in parrallel, series-parallel, etc., in such a manner that the total combined speaker impedance closely equals 8 ohms.

70.7 Volt: A 70.7 volt type transformer is required with every speaker. These transformers are usually of the "multiple-tap" type. Be sure that the total combined sum of the values of all taps used closely equals the rated output of the emplifier. For example: With a 5 watt amplifier, five transformers (and speakers) tapped at 1 watt; or three transformers tapped at 1 watt and four at $\frac{1}{2}$ watt, the

INSTALLATION PROCEDURE
(Continued)

Speaker and Output Connections (Cont.)

70.7 Volt: (Cont.) amplifier will be properly loaded. In the latter case, the four speakers tapped at $\frac{1}{2}$ watt will have less volume than the other three.

600 Ohm: All McMARTIN receivers include provisions for a 600 ohm balanced or unbalanced (your choice) output. Simply plug in a McMARTIN Model MT-8 Transformer. The output terminals are clearly marked at the rear of the chassis. By grounding the center terminal, the line is balanced. For unbalanced output, ground one of the end terminals. The output level is set at 0dbm. This level is recommended for feeding a telephone line or running a long trunk, such as around a shipping center. The 600 ohm output is fixed, and is completely independent of all volume, tone and paging circuits. This output may be used separately and concurrently with the Hi Impedance output.

Hi Impedance: On the TN-66CB, use a low capacity shielded cable to feed a high level, high impedance input of an external amplifier. This output is also provided on TN-77CB and TN-88B models. It has the same program content as the 600 ohm output, but is high impedance. On the TN-66CB, the output level is adjustable by the volume control on the front of the chassis. On TN-77CB and TN-88B models, the level is fixed at full output.

FINAL ADJUSTMENTS

Check to see that the crystal frequency is correct for your station.
(f minus 10.7mc) * 2 = Fx. f = RF carrier frequency. Fx = crystal frequency.

After completing all input and output connections, remove the top cover and plug in AC cord into any 117 volt AC receptacle. Turn the power switch to ON and allow several minutes warm up. Adjust the volume control for the desired level. On TN-77CB and TN-88B models, adjust the tone controls for proper balance between the program material and room acoustics. If a microphone is connected for paging, adjust the microphone volume for proper level compared to the program.

FINAL ADJUSTMENTS (Continued)

Each MCMARTIN receiver has been carefully and individually aligned at the factory to specific frequencies. Complete realignment in the field is not recommended as normal practice. However, due to conditions encountered during shipment, final alignment or "touch up" is desirable.

The recommended final alignment procedure which is the most accurate and dependable involves the use of your broadcasted FM and SCA-multiplex program as the signal source. Rarely, if ever, will you find test equipment (RF generator) that can fully duplicate a transmitted, multiplexed signal.

Do not remove the bottom plate. Allow the receiver to warm up a few minutes. Turn the adjustable squelch control (mute) fully clockwise.

Main Channel

- 1) Place the MN-MX switch in the MN position.
- 2) Attach VTVM (approximately -15volts DC scale) to test point "A" and chassis. Adjust RF OSC. for maximum, then detune slightly on the slope side of the peak (counterclockwise when adjusting from the top of the chassis) for stable oscillator operation. Reading should be between -5 volts and -8 volts.
- 3) Attach VTVM (approximately -15 volts DC scale) to test point "B". Adjust RF OSC. for maximum in the sequence shown:
 - a) DBLR (doubler)
 - b) RF
 - c) ANT (antenna)

Repeat the above adjustments for further improvements. The RF antenna coil must be peaked to insure exact matching to the specific antenna installation. (Each installation will vary.) The reading obtained on test point "B" is entirely dependent on the amount of signal applied to the antenna terminals. It may vary from -2volts to -15 volts. Average strong signals will be about -12 volts. Complete limiting action takes place at -.5 volts. Generally as low as -.5 will provide a usable sub-channel signal depending on local conditions.

FINAL ADJUSTMENTS
(Continued)

Main Channel (Cont.)

- 4) Attach VTVM (zero center, lowest scale) to test point "C". CAUTION: THIS ADJUSTMENT IS VERY SENSITIVE. Adjust only the top slug of L₄ (discriminator) for zero voltage. The correct setting is with negative voltage on one side of zero and positive voltage on the other.
- 5) Listen for quality of the main channel reception. This portion of the alignment is now completed.

Sub-Channel

- 1) Place the MN-MX switch in the MX position.
- 2) Attach VTVM (approximately -50 volts DC scale) to test point "D". Carefully adjust SUB CHANNEL FREQ for maximum. (Sub-channel must be on the air). The reading obtained here is entirely dependent on the amount of sub-carrier injection at the transmitter. (Injection of 15% will give a reading of approximately -55 volts. 10% sub-channel injection will give approximately -45 volts on test point "D"). Converting from one sub-channel to an alternate sub-channel is not recommended in the field. This should be a factory alignment.
- 3) Attach VTVM (zero center, lowest scale) to test point "E". CAUTION: THIS ADJUSTMENT IS VERY SENSITIVE. Adjust only the top slug of L₇ (discriminator) for zero voltage. The correct setting is with negative voltage on one side of zero and positive voltage on the other.
- 4) Listen for quality of sub-channel reception. Final alignment has now been completed.

With the function switch in the MX position, and with the sub-carrier off the air, turn the mutet control counterclockwise until the set mutes, then advance control amother $\frac{1}{4}$ turn counterclockwise beyond this threshold.

Replace the knob of the MN-MX switch with the "cover-nut" supplied if you do not wish customer access to the control. Replace the cover and mount the receiver securely. Also secure all connecting wires in a manner that will prevent any mechanical strein at the screw terminals. Your receiver should be performing satisfactorily at this point.

SHOULD YOU EXPERIENCE TROUBLE.....

At this very moment, there are over 16,000 McMARTIN receivers providing excellent service in this country and abroad in conjunction with many different makes of transmitting equipment and under all types of conditions. If you experience difficulty initially, it could be because of component failure in the receiver... or because of any one of the numerous conditions in the following paragraphs.

Test Equipment

Normally, only a VTVM is needed for complete alignment. For further trouble shooting, the following additional equipment will be helpful:

- 1) McMARTIN Model TX-100 Multiplex Alignment Generator
or
RF generator (FM type), Range: 400kc to 110kc
- 2) Audio generator, 20cps to 100kc range
- 3) Oscilloscope

Rf and audio generators would rarely be required, but could be helpful. The cost of this type equipment is unusually very high compared to its merit for use in the field.

The McMARTIN Model TX-100 is an inexpensive crystal-controlled generator with 10.7 mc, 455kc and 472kc outputs.

McMARTIN's complete facilities and experienced engineering staff are available to you, should any serious difficulties develop in the field.

Distortion (Sub-Channel)

McMARTIN receivers are designed to work with a sub-carrier deviation of + 5kc because of the incorporation of the McMARTIN Model MT-10 Stereo Filter. This deviation is adequate for good frequency response and good signal-to-noise ratio. It will also reduce possible sub-go-sub or stereo-to-sub cross talk.

If you deviate considerably more than this, it may introduce high frequency distortion.

Cross Talk (Main to Sub)

Cross talk is intermodulation between the main and sub-channel(s). It can occur only in places where the main channel is present, such as: Main channel exciter, transmitting antenna system, receiver antenna, and main channel portion of the receiver. Cross talk is not developed in the sub-channel portion of receiver.

SHOULD YOU EXPERIENCE TROUBLE (Cont.)

Cross Talk (Main to Sub) (Cont.)

To assure accurate calibration and adjustment of your transmitter at all times, we recommend using the MCMARTIN Model TBM-4000 combination FM-SCA Multiplex Modulation Monitor. It will simultaneously monitor main and sub-channel modulation plus sub-carrier frequency. Also, it reads percent of sub-carrier injection and cross talk directly. All specifications meet or surpass present FCC requirements for Type Approval on FM.

Many operators also utilize the MCMARTIN Model TBM-1000 and Model TBM-2000 for accurate, "off-the-air", metered and aural monitoring. These units are particularly useful for remote monitoring.

At the transmitter check:

- 1) Main channel percent of modulation. This is a common source of cross talk. Do not over-modulate.
- 2) Tuning of the main channel exciter, drivers and finals. The circuits must be broad-band and linear. Phase error causes cross talk.
- 3) VSWR of the antenna must be low.
- 4) Sub-channel deviation and injection must be correct. We normally recommend 15% injection for monaural main channel and one sub. If two subs are used, we recommend 12% on the higher sub, and 18% on the lower.

At the receiver check:

- 1) Rotate the antenna for best rejection of multipath signals. This is a common cause of crosstalk. A fluctuating signal is an indication of multipath.
- 2) Recheck oscillator and discriminator adjustments.
- 3) Only after checking all the above factors, listen for cross talk with the sub-channel modulation removed, and very carefully adjust the top and bottom slugs of L1, L2 and L3 for minimum cross talk. Generally, the bottom slug of L1 will have the most

SHOULD YOU EXPERIENCE TROUBLE ... (Cont.)

Cross Talk (Main to Sub) (Cont.)

At the receiver check: (Cont.)

affect--if any. THESE ADJUSTMENTS ARE CRITICAL. Do not tune more than 1/8th turn in either direction from the original setting. Generally, minimum cross talk will occur when the IF's are peaked to 10.7mc. Regardless, all MCMARTIN receivers are sweep-aligned at the factory for minimum cross talk and maximum performance.

Cross Talk (Sub-to-Sub)

This is caused by over-deviation of one or both sub-channels.

Hum & Noise

The transmitter or studio equipment is sometimes at fault. check by listening to several different receivers. Ignition or spark type noise usually stems from the receiving antenna installation. Mounting the antenna away from the noise source (ie. highway) will help. Locate and correct noise producing devices such as motors and cash registers. Occasionally this type of noise is fed into the receiver via AC power lines. Use line filters for correction. Poor grounding and shielding of microphone system can pick up noise. A common cause of hum is cathode-filament leakage in receiver audio tubes. If any of the test point voltages indicated in the alignment procedure are very low, check for defective tubes. Under certain conditions a strong RF signal may be picked up and detected by the amplifying system directly.

General

The voltage chart in the back of this manual will assist you when trouble-shooting ordinary service problems.

Automatic Muting

The adjustable threshold should be established just below the point where noise caused by weak signal would become objectionable. This circuit is fast acting and positive. It will not create a "popping noise", nor is it affected adversely by the time constant used at the transmitter when muting between musical selections. Advancing an additional $\frac{1}{4}$ turn allows for tube ageing and signal variance.

WARRANTY

MCMARTIN Broadcast and Audio Products are warranted to be free from defects in workmanship -- FOREVER.

At our discretion, we will exchange or repair any defective unit or components, at any time, without charge. Material and components are guaranteed for a minimum period of nineth days from the date of original purchase. Transportation charges must be prepaid on equipment returned for warranty service.

This warranty does not extend to any of our products which have been subjected to misuse, neglect, accidents, incorrect wiring not out own, improper installation, or to use in violation of the instructions furnished by us; nor to units that have been altered outside out factory.

TYPICAL TUBE SOCKET VOLTAGE CHART

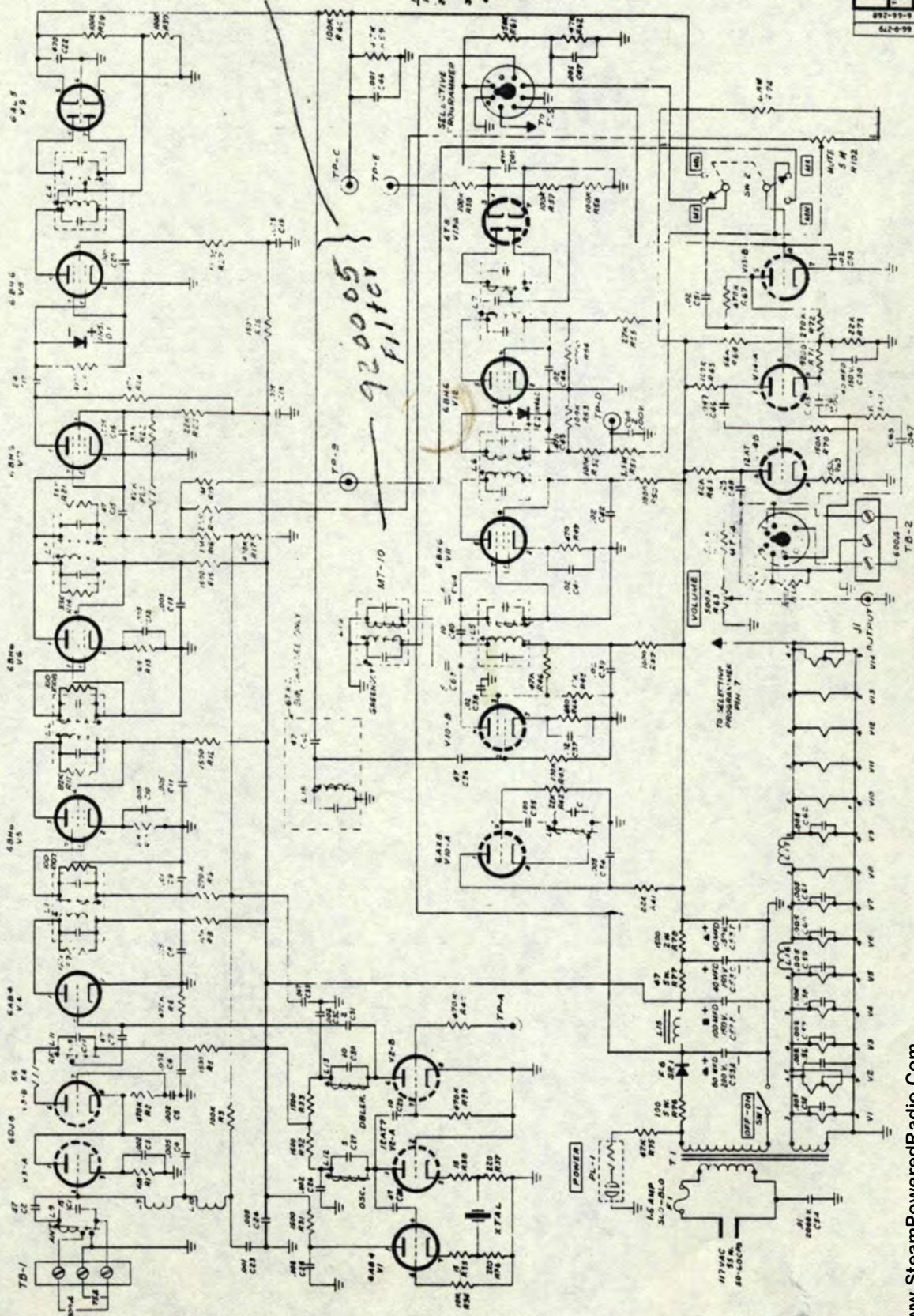
Tube Type	Tube Symbol	Pin Number								
		1	2	3	4	5	6	7	8	9
6AB4	V-1	150	NC	*	*	NC	-.64	1.3		
12AT7	V-2	150	0	1.33	*	*	160	-4	0	*
6DJ8	V-3	@120	-.04	.86	*	*	145	@80	@120	0
6AB4	V-4	120	NC	*	*	NC	-3.5	0		
6BH6	V-5	-.06	.68	*	*	150	150	0		
6BH6	V-6	-.02	.66	*	*	145	145	0		
6BH6	V-7	@-16 #-.4	0	*	*	@25 #5.8	135	0		
6BH6	V-8	-.08	0	*	*	118	118	0		
6AL5	V-9	0	@-10 #-.5	*	*	0	0	@-15 #.54		
6AX8	V-10	50	-.04	18	*	*	118	.68	0	-4.4
6BH6	V-11	0	1.7	*	*	116	116	0		
6BH6	V-12	@-42 #-2.6	0	*	*	@22 #2.5	0			
6T8	V-13	-2.9	-2.9	@+1 #.72	*	*	0	0	@-7 #-.58	@35 #9
12AT7	V-14	@95 #117	@33 #9	@38 #33	*	*	110	0	2.2	*
12AX7	V-15	60	-.4	0	*	*	72	-.56	0	*
TN-77CB 6AX8	V-16	20	-.52	12	*	*	40	0	.36	-.05
TN-88B 6AX8	V-16	43	-.68	24	*	*	78	.1	1	0
TN-77CB 6AS5	V-17	7.4	0	*	*	NC	119	146		
TN-77CB 6AS5	V-18	7.4	0	*	*	NC	119	146		
TN-88B 6BQ5	V-17	NC	0	9.4	*	*	NC	300	NC	300
TN-88B 6BQ5	V-18	NC	0	9.4	*	*	NC	300	NC	300

Note: * Filament 6.0 VAC
 NC No Connection
 # No Signal
 @ Average Signal

All readings with VTVM, chassis negative
 Allow +15% tolerance

for 19 KHz

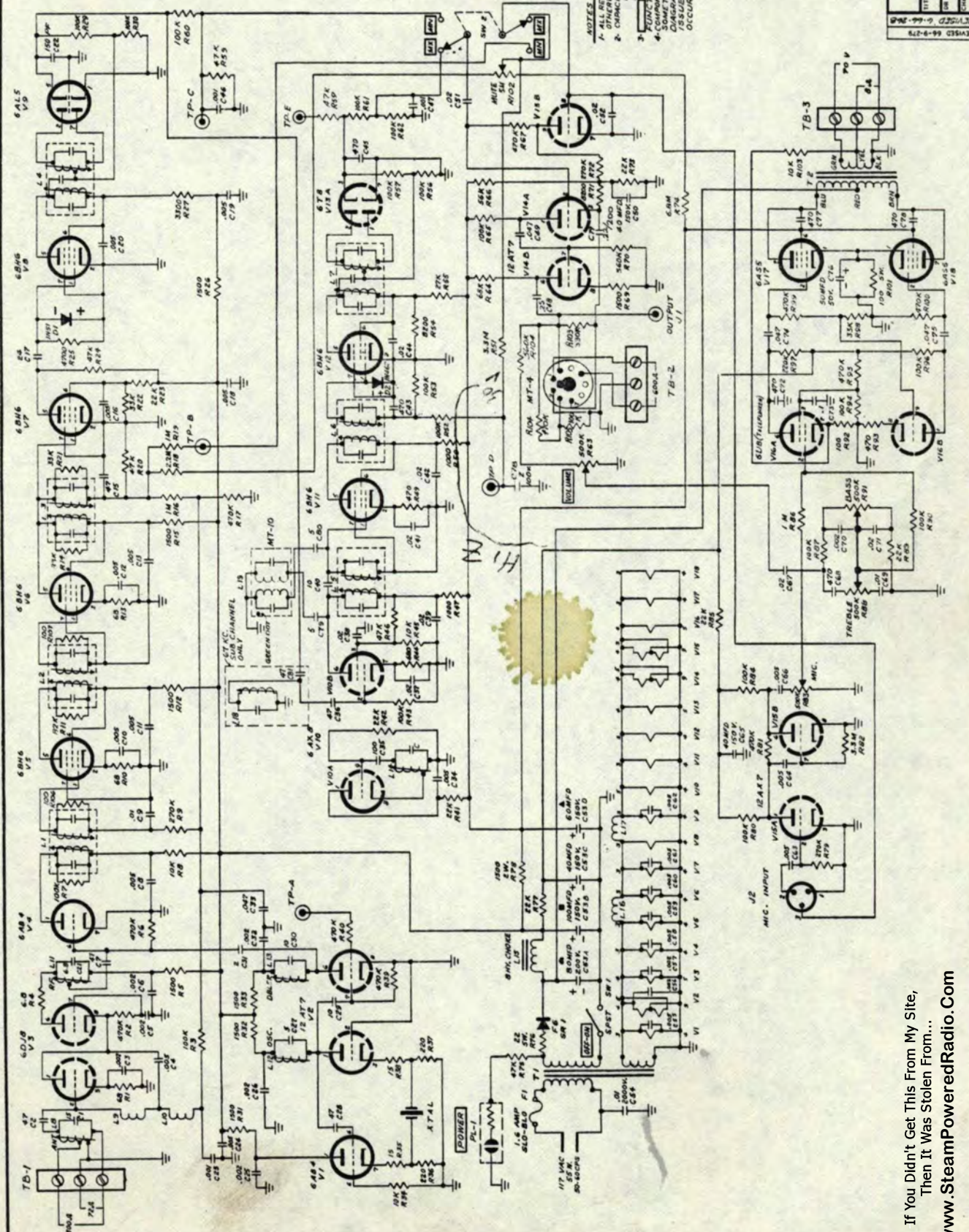
NOTES:
 1- ALL COMPONENTS ARE 1/2 WATT UNLESS OTHERWISE SPEC.
 2- CAPACITORS IN μ F.
 3- ALL RESISTORS IN OHMS UNLESS OTHERWISE SPEC.
 4- COMPONENT VALUES IN LINE MAY VARY SLIGHTLY AS DIFFERENT MANUFACTURERS ARE USED.
 5- ALL RESISTORS MUST BE PRECISELY TOLERANCE.



92005
 filter

01067
 MCMARTIN INDUSTRIES, INC.
 CHICAGO, ILLINOIS
 TITLE SCHEMATIC TN-66
 REVISED 6-6-58
 DESIGNED BY J. J. ...
 DRAWN BY ...
 CHECKED BY ...
 SCALE ...

- NOTES:
 1- ALL RESISTORS ARE 1/2 W. UNLESS OTHERWISE SPEC.
 2- COMPONENTS IN FRONT PANEL INDICATED BY A SQUARE.
 3- COMPONENTS IN UNIT MAY BE DIFFERENT FROM SCHEMATIC DIAGRAM. SEE SCHEMATICS MADE ISSUED WHEN MAJOR CHANGES OCCUR.



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