OPERATING INSTRUCTIONS FOR AMECO TRANSMITTER, Model TX-86

(CW)

GENERAL INFORMATION

The Ameco Transmitter, Model TX-86 is a versatile, compact phone and CW transmitter. Because of its compactness, the TX-86 can be used equally well in a mobile or fixed station installation. It can handle up to 90 watts input on CW and up to 90 watts peak input on phone on all bands. The TX-86 has many features which make it a high quality unit. Some of these features are: Audio gain control on the front panel, a true potentiometer drive control (there is no need to detune circuits to adjust drive), a push-to-talk microphone jack on the front panel, the 6146 runs straight through (no doubling) on all bands, a pi-net output circuit and TVI suppression.

The Transmitter consists of a 12BY7 crystal controlled oscillator, a 6BQ5 buffer and a 6146 final amplifier, modulated by a 12AX7 and a 6AQ5. The TX-86 uses the new, low distortion DUOGRID MODULATION. It is NOT clamp tube or controlled carrier modulation but a far superior system with quality that cannot be distinguished from push pull plate modulation, even with an oscilloscope. The TX-86 for 6 volts uses the tubes mentioned above. The TX-86 for 12 volts uses a 6883 which is the 12 volt version of the 6146 and a 12AQ5 which is the 12 volt version of the 6AQ5. The Transmitter is crystal controlled and is designed to use low cost crystals on all bands. It may also use an external VFO.

POWER REQUIREMENTS

For maximum power output, the TX-86 requires 6.3 volts at 3.36 amps (or 12.6 volts at 1.76 amps for the 12 volt system) for the filaments and 300 volts at 75 ma. plus 600 volts at 150 ma. for the plates and screens. The 600 volts is for the plate of the final amplifier and the 300 volts is for the screen of the final and the plates and screens of the other tubes. For fixed station use, where 115 volts AC is available, these power requirements can be met by using the Ameco Power Supply, Model PS-3. See Power Supplies Section below. Other power supplies delivering 500 and 250, 500 and 300, 400 and 300 or 400 and 250 are suitable without any changes. If only a 300 volt supply is available, the 6146 (or 6883) can be used if the power supply is rated at 150 ma. or more. With a 300 volt-100 ma. pack, the final should be changed to a 2E26 for 6V. or a 6893 for 12V. No internal changes are needed in the transmitter in any case.

As the current drawn by the exciter varies considerably with different bands and crystals, the use of a dropping resistor or voltage divider to obtain the 300 volts from a higher voltage supply is not recommended.

When two power supplies are used, it is necessary to have the high voltage (600 volts) power on whenever the low (300 volt) power is on. If only the 300 volt supply is turned on, the final tube will be destroyed in a very few minutes.

In order to bring power to the TX-86 a four-wire cable must be used. It should be terminated by a six pin Amphenol socket and cap (Cat. #78S6 Socket with a 3-13 Cap) to mate with the Amphenol plug on the back of the Transmitter. The plug connections are as follows:

Pin 1 - Chassis, filament and B-	Pin 3 - B+ 600	Pin 5 - Spare
Pin 2 - B+300 - do not exceed	Pin 4 - Spare	Pin 6 - Hot filament

In making the cable that connects the Power Supply (Model PS-3) to the transmitter, observe that pin 5 of the power supply plug provides 12.6 volts and pin 6 of the power supply plug provides 6.3 volts.

See page 4 for power supply information.

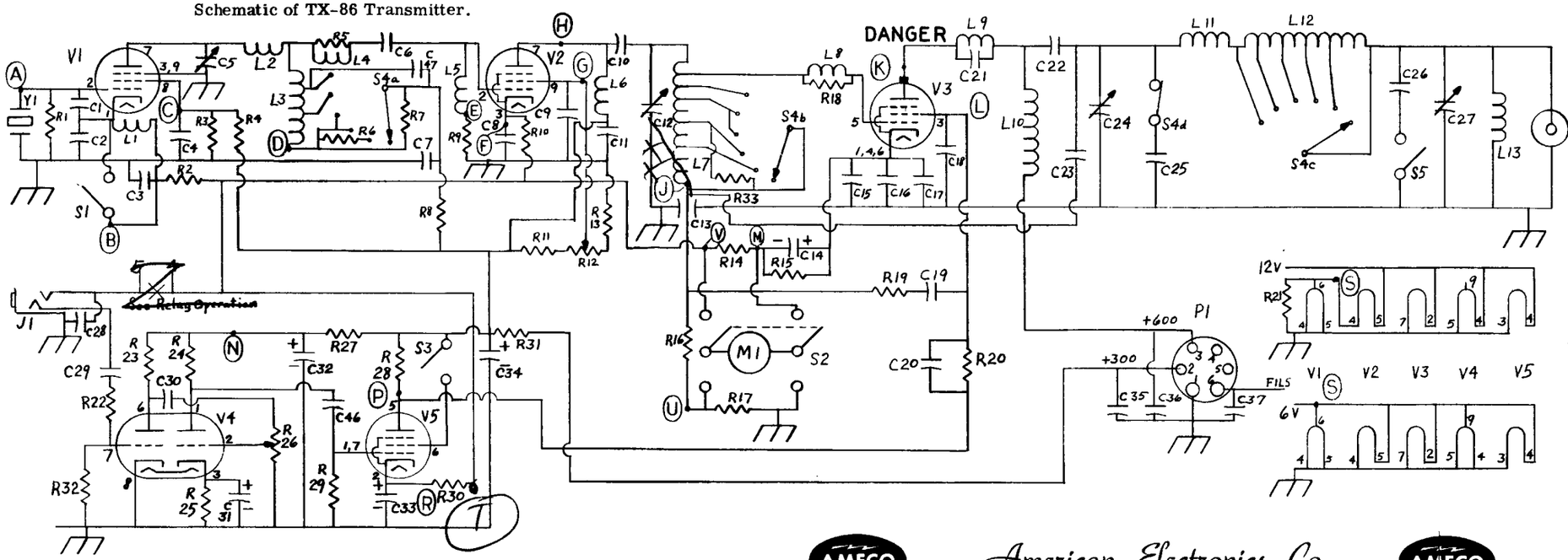
ANTENNA

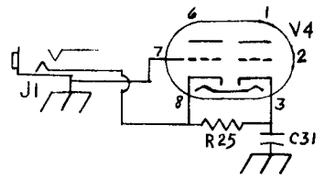
The Pi-Net output circuit can couple the Transmitter to antennas of 50 to 600 ohms impedance. The output terminal is a coaxial jack, SO-239 (Amphenol #83-1R). The mating cable plug required is the PL-259 (Amphenol #83-1SP). Antenna information, both theoretical and practical, is well covered by the ARRL Antenna Book and the ARRL Handbook. For the 80 to 15 meter bands, it is possible to use most random lengths of wire as an antenna. However, some lengths cannot be tuned on one band or another without the addition of an antenna tuner between the transmitter and the antenna. The performance will be much better where an antenna with a coaxial feed is used (beams, dipoles, halos, verticals, quads, etc.). Beams are frequently used on 15, 20 and 40 meters; a necessity on 6 and 10 meters. A halo or ground plain antenna is also commonly used on 6 and 10 meters.

CRYSTALS AND VFO

Band	Crystal	VFO
3.5 - 4 Mc.	3.500 - 4.000 Mc.	3.500 - 4.000 Mc.
7 - 7.3	7.000 - 7.300	7.000 - 7.300
14 - 14.35	7.000 - 7.175	7.000 - 7.175 or 14.000 - 14.350
21 - 21.45	7.000 - 7.150	7.000 - 7.150
28 - 29.7	7.000 - 7.425	7.000 - 7.425 or 14.000 - 14.212
50 - 54	8.333 - 9.000	8.333 - 9.000 or 12.500 - 13.500

Schematic of TX-86 Transmitter.





CARBON MICROPHONE CONNECTIONS

1. Remove 12AX7 from socket.
2. Cut wire from chassis to pin 8 and ground pin 7 with it.
3. Add a wire from pin 8 to J1 terminal with .001 condenser (microphone).
4. Put 12AX7 tube and shield back.

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TX-86 PARTS LIST

Tubes

	12V	6V
V1 -	12BY7	12BY7
V2 -	6BQ5	6BQ5
V3 -	6883	6146
V4 -	12AX7	12AX7
V5 -	12AQ5	6AQ5

Inductances

L 1 - 2.5 mh RF choke
L 2 - 6 turns #16
L 3 - Special-Osc. plate coil
L 4 - 5 turns #22 Parasitic suppressor
L 5 - 1. mh RF choke
L 6 - 2.5 mh RF choke
L 7 - Special - Final grid coil
L 8 - 5 turns #22 Parasitic suppressor
L 9 - 3 turns #14 Parasitic suppressor
L10 - Special RF choke
L11 - 4-1/2 turns #14. 6 meter PI-net coil
L12 - Special 10 thru 80 meter PI-net coil
L13 - 2.5 mh RF choke

Connectors

J1 - Microphone and Key jack #JK33
J2 - SO-239 Coaxial jack
P1 - Amphenol 86CP6

Capacitors

C 1 - 22 mmfd. disc ceramic NPO
C 2 - 100 mmfd tubular ceramic N750
C 3 - .001 mfd. disc ceramic
C 4 - .001 mfd. disc ceramic
C 5 - 100 mmfd. variable (OSC PLATE)
C 6 - 100 mmfd. tubular ceramic
C 7 - .001 mfd. disc ceramic
C 8 - .001 mfd. disc ceramic
C 9 - .001 mfd. disc ceramic
C10 - 100 mmfd. tubular ceramic
C11 - .001 mfd. disc ceramic
C12 - 80 mmfd. variable (FINAL GRID)
C13 - 470 mmfd. ceramic feed-thru
C14 - 10 mfd. electrolytic 50V
C15 - .001 mfd. disc ceramic
C16 - .001 mfd. disc ceramic
C17 - .001 mfd. disc ceramic
C18 - .002 mfd. disc ceramic 1.5 KV
C19 - 0.1 mfd. tubular paper 600V
C20 - .22 mfd. tubular paper 200V
C21 - 7 mmfd. disc ceramic NPO
C22 - .002 mfd. disc ceramic 1.5KV
C23 - 2 mmfd. tubular
C24 - 140 mmfd. variable (PLATE)
C25 - 82 mmfd. disc ceramic 2.0KV
C26 - 680 mmfd. mica
C27 - Dual-525 mmfd. variable (LOAD)
C28 - .005 mfd. disc ceramic
C29 - .001 mfd. disc ceramic
C30 - .005 mfd. disc ceramic
C31 - 5.mfd. electrolytic 6V.
C32 - 8.mfd. electrolytic 450V.
C33 - 10.mfd. electrolytic 150V.
C34 - 8. mfd. electrolytic 450V.
C35 - .005 mfd. disc ceramic
C36 - .002 mfd. disc ceramic 1.5KV
C37 - .005 mfd. disc ceramic
C28, 39 - .001 mfd. disc ceramic from meter to chassis.
C40 thru 45 - .001 mfd. disc ceramic from filaments to chassis. C38 thru 45 not drawn to make drawing easier to read.
C46 - .005mfd. disc ceramic
C47 - 22mmfd. disc ceramic NPO

Resistors

in ohms. K=X1,000 M=X1,000,000

R 1 - 100K 1/2 watt
R 2 - 100 1/2 watt
R 3 - 15K 1 watt
R 4 - 39K 2 watt
R 5 - 47 1/2 watt
R 6 - 27 1/2 watt
R 7 - 1000 2 watt
R 8 - 100 1/2 watt
R 9 - 22K 1 watt
R10 - 100 1/2 watt
R11 - 3.9K 1 watt
R12 - 25K 4 watt Potentiometer (DRIVE)
R13 - 2.2K 1/2 watt
R14 - Meter shunt - special
R15 - 200 10 watts, wire wound
R16 - 5.6K 1 watt
R17 - Meter shunt - special
R18 - 47 1/2 watt
R19 - 3.9K 1 watt
R20 - 8.2K 2 watt
R21 - 39 2 watt
R22 - 10K 1/2 watt
R23 - 470K 1/2 watt
R24 - 470K 1/2 watt
R25 - 2.2K 1/2 watt
R26 - 500K potentiometer (AF GAIN)
R27 - 47K 1/2 watt
R28 - 4K 10 watt wire wound
R29 - 470K 1/2 watt
R30 - 330 1 watt
R31 - 47 1 watt
R32 - 5.6M 1/2 watt
R33 - 2.2K 1/2 watt

Switches

S1 - SPST Slide Switch Open on CRYSTAL, closed on VFO
S2 - DPDT Slide Switch Meter Selector
S3 - SPST on R26. Open on CW, closed on PHONE
S4 - Band selector switch, 3 sections. S4d is closed on 80M only. Switch is shown in 80M position.
S5 - SPST Slide Switch. Adds 680mmfd. to LOAD capacitor when needed on 80 and 40M only.

M1 - Meter 5 ma. movement, 10 and 200ma. scales.
Y1 - Crystal

MALFUNCTIONS AND PROBABLE CAUSES

In the event that your kit or wired transmitter does not operate properly, check your symptoms with the table below. Also check with the resistance and voltage charts above.

SYMPTOM	PROBABLE CAUSE
1) Transmitter will not operate when AC power is applied.	1-1. Defective 5 amp. fuse in PS-3. 1-2. Poor or incorrect contact in power plug or cable. 1-3. Defective switch in PS-3.
2) Fuse in Power Supply blows when AC power is applied.	2-1. Pin 3 of power plug at either end shorted to ground. 2-2. Pin 2 of power plug shorted to ground. 2-3. Shorted tube or tubes. 2-4. Shorted power cable.
3) Lack of Final Grid Current.	3-1. Defective 12BY7, 6BQ5 or 6883/6146. 3-2. Open meter. 3-3. Key contacts not closed. 3-4. Key line open. 3-5. Grid coil open. 3-6. Small rf chokes or coupling condenser in Oscillator or Buffer stage open. 3-7. R-17 open. 3-8. C-13 shorted.
4) Lack of Bias Voltage at Xtal Socket.	4-1. Defective crystal. 4-2. R-1 open. 4-3. Crystal socket not grounded. 4-4. Crystal socket shorted. 4-5. L-1 open.
5) Insufficient Drive or drooping drive.	5-1. Filament miswired on 12BY7 or 6BQ5. 5-2. Faulty 12BY7 or 6BQ5.
6) Final will not dip.	6-1. Check for malfunction 5 above. 6-2. Defective 6883/6146. 6-3. Incorrectly loaded pi-network. 6-4. Improper OSC-PLATE tuning and/or GRID tuning. 6-5. LOAD capacitor shorted. 6-6. LOAD open. 6-7. Knobs improperly installed, giving false readings. 6-8. Switch S-5 set incorrectly.
7) No reading on Plate Current meter.	7-1. Meter open. 7-2. R-15 open. 7-3. Open cable or connection to pin 3 of power plug. 7-4. Defective power supply - No high B+.
8) Antenna will not load properly.	8-1. Defective antenna system. 8-2. LOAD capacitor shorted (C-27). 8-3. C-25 or Switch S-4A shorted to ground. 8-4. Antenna dimensions improper. 8-5. Improper or open ground system.
9) No drop in Plate current when switching from CW to AM position	9-1. Defective 6AQ5-12AQ5. 9-2. Open or miswired filament on 6AQ5-12AQ5. 9-3. R-20 open. 9-4. S-3 (AF GAIN) open. 9-5. R-30 open.
10) No modulation.	10-1. See 9 above. 10-2. Open filament or miswired filament on 12AX7 or 6AQ5/12AQ5. 10-3. Open microphone cable. 10-4. Defective microphone. 10-5. Improper microphone (carbon microphone in set wired for Xtal microphone, or vice versa). 10-6. Improperly wired microphone plug. 10-7. C-29 open. 10-8. R-22 open. 10-9. AF GAIN control open or incorrectly set. 10-10. R-27 open. 10-11. R-29 open. 10-12. R-25 open. 10-13. Pin 8 of 12AX7 (V4) ungrounded.
11) Hum in modulation.	11-1. Unshielded microphone cable. 11-2. Open cable ground. 11-3. Tube shield left off V4.
12) Distortion, squeal or overmodulation.	12-1. A.F. Gain Control set too high. 12-2. Defective 12AX7A. 12-3. See 10 above. 12-4. Feedback from receiver. See section on Antenna Relay.
13) Unit smokes.	13-1. Disconnect transmitter from power supply and recheck resistance chart.
14) Arcing of Final Plate tuning or Antenna Load capacitors.	14-1. Insufficient loading. 14-2. Defective antenna system. 14-3. Bent plates on variable capacitors. 14-4. Open solder joint on Antenna Jack.