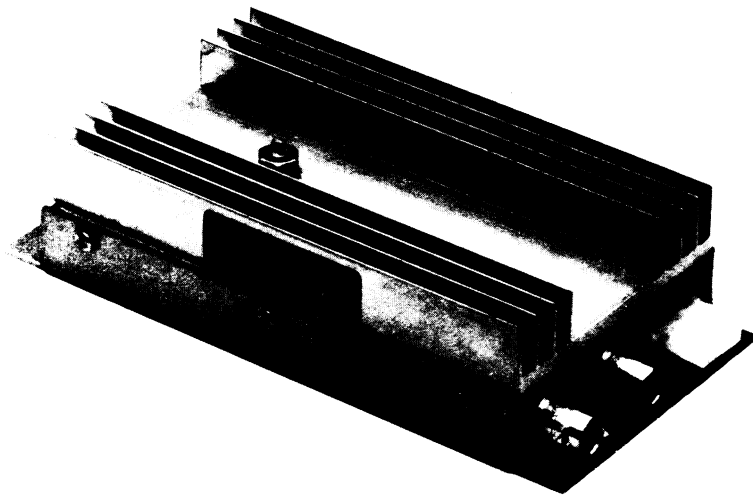

MODEL CS-10



OWNER'S MANUAL

INDEX

Introduction	1
Specifications	2
Installation	3
Precautions & Safety Information	4
Theory of Operation	5
Alignment & Disassembly Instructions	6
Parts List	7
Pictorial Diagram	8
Schematic Diagram	9
Warranty	Back Cover



INTRODUCTION

The CS-10 is an ultralinear AM broadband power amplifier intended to be used as an accessory to the TR-720 Handheld Airband Transceiver. It covers the entire 118-136Mhz aircraft band and boosts the TR-720 from 1 watt carrier output to 10 watt carrier output (30 watts P.E.P.). It is connected in series between the TR-720 and an outside quarter wave antenna mounted on an aircraft or ground vehicle. This puts the TR-720 on par with even the most sophisticated panel mounted transceivers allowing 150 mile plus range. The CS-10 is fully FCC Type Accepted for use with the TR-720. Power is supplied to the CS-10 through a fused cigarette lighter plug and 5 foot supplied cable which can be plugged into any vehicle equipped with such a socket supplying 12vdc. If power is removed from the CS-10, it reverts the TR-720 to "straight through" operation with no extra amplification. This still allows the TR-720 to transmit and receive for backup use during a power failure. The CS-10 comes with a 3 year warranty when returned to the factory for repair.

SPECIFICATIONS

Model	CS-10
Frequency range	118-136Mhz
RF connections	2ea BNC jacks
Size	5.9" x 3.0" x 1.4"
Weight	12 ounces
Power gain	10db (1 watt in = 10 watts out) 30 watts PEP output
Voltage	12-14vdc (negative ground only)
Power consumption	2.2A
Polarity protection	Reverse polarity protection built-in
Fuse	Fused in cigar lighter plug for 3A
FCC ID#	CFX6IV CS-10
Mounting	Four mounting holes in case bottom
Impedance	50 ohms in and out
Supplied with	Five foot power cord and 5 foot coax with BNC plugs attached
Price	\$199.95 AON

INSTALLATION

The CS-10 is designed for non-permanent installation in planes, autos, base stations, etc. If permanent installation is contemplated in an airplane, helicopter, or other airworthy vehicle, make sure all work is done in accordance with AC 43.13-2A and any other relevant regulations and signed off by a proper A&P Mechanic or Avionics Technician. Only three connections need be made to the CS-10:

1. Plug the supplied red/black power cable into the CS-10 "Power" socket. Plug the other end into the cigarette lighter socket in your vehicle. This must be a source of 12-14vdc, negative ground only. **If the CS-10 is permanently wired to a 12 volt source without the cigarette lighter plug, make sure a 3A fuse or circuitbreaker is installed in series with the red power wire.**
2. Using the 5 foot coax lead supplied, plug one end into the BNC antenna jack on the top of the TR-720. The BNC plug is connected by gently pushing it onto the jack and twisting it clockwise until it locks. It may be removed by gently pushing it in and twisting it counterclockwise until it unlocks. It can then be pulled away from the radio. Plug the other end of the cable into the BNC jack on the CS-10 marked "TR-720" "IN."
3. Connect the coax coming from your antenna to the BNC jack on the CS-10 marked "OUT" "ANT."

DO NOT interchange "IN" and "OUT" connections as the CS-10 relay will chatter and it may be damaged.

DO NOT transmit without an antenna connected to the "OUT" BNC jack.

PRECAUTIONS and SAFETY INFORMATION

- Never transmit without an antenna connected. This may damage the radio.
- Do not operate your radio while taking on additional fuel, or while parked in gasoline service stations.
- Do not operate your radio when anyone is touching the antenna, or when anyone is standing within two to three feet of your antenna, to avoid the possibility of radio frequency burns or related physical injury.
- Do not hold (depress) the P.T.T. bar when not actually desiring to transmit.
- Do not allow children to play with any type of radio equipment containing a transmitter.
- Do not operate the TR-720 near unshielded electrical blasting caps or in an explosive atmosphere.
- There are no user serviceable parts inside the CS-10. If you suspect a problem with the CS-10, first call the factory. If your CS-10 is still not operating properly, return it to the factory at the following address:
COMMUNICATIONS SPECIALISTS
426 W. Taft Avenue
Orange, California 92665-4296
(800) 854-0547 • (714) 998-3021
- A repair time of 72 hours is guaranteed for units in or out of warranty, or return the unit to your local Avionics Dealer.
- All work on the transmitter section must be done by or under the direct supervision of a person holding at least a General Radiotelephone License issued by the Federal Communications Commission (F.C.C.).

IMPORTANT: U.S. law prohibits the operation of unlicensed radio transmitters within the territories under U.S. control. Illegal operation is punishable by fine or imprisonment or both.

See the TR-720 Operating manual under "Licensing Information" for Station and Operator Licenses required and FCC Field Offices.

THE CS-10 IS TYPE ACCEPTED FOR USE ONLY WITH THE TR-720. USE WITH OTHER TRANSCEIVERS WILL VOID F.C.C. TYPE ACCEPTANCE.

THEORY of OPERATION

The 1 watt transmitted signal from the TR-720 is connected to the INPUT BNC jack through a normally closed set of contacts on relay RL1 to the OUTPUT BNC jack. If no power is applied to the CS-10, the relay RL1 cannot energize and therefore the TR-720 transmits "straight through." This same condition works in reverse during receive. The relay is not energized so the received signal is connected from the OUTPUT BNC jack to the INPUT BNC jack and then to the TR-720.

If more than 1/4 watt is present at the INPUT BNC jack, C18 couples a small amount of RF to diodes D1 and D2, a full wave rectifier. Capacitor C3 filters the DC at low frequencies while C2 filters it at high frequencies. Resistors R1 and R2 set the bias on transistor Q2 which switches its Collector to ground when DC is applied to its Base. The Collector of Q2 energizes relay RL1 which has D3 across it to eliminate any switching spikes which might destroy Q2. When the Collector of Q2 goes to ground, PNP transistor Q1 is turned on through current limiting resistor R3. Transistor Q1 switches the 12v battery to voltage divider R4 and R5 which make up the bias network for amplifier Q3. Diode D4 sets the bias of Q3 at approximately .6vdc and capacitors C4 and C5 and choke RFC1 decouple any RF from the bias line.

Diode D5, if reverse biased by the wrong input voltage polarity, draws enough current to blow the 3A fuse in the cigarette lighter plug. The fuse also protects the 5 foot power cable if it inadvertently gets nicked and shorted to ground. If the cigarette lighter plug is cut off, be sure to use an inline fuseholder with a 3A fuse or a 3A circuit breaker for protection of the cable and amplifier. Capacitors C1, C6, and C7 bypass any RF on the supply line to ground.

When transistor Q2 is energized by an input signal, the relay RL1 pulls in and applies the input signal to the input tuned circuit through C8. The input tank circuit is comprised of L1, a foil tuned line on the PCB, C9 with C10 in parallel for tuning and C11. With transistor Q1 supplying bias voltage and a 1 watt input signal on the Base of Q3, the amplifier transistor Q3 raises the input signal 10db to 10 watts (30 watts P.E.P.).

Transformer T1 and capacitor C12 make up the broadband output tank circuit which couples the amplified signal through C13 to the low pass filter circuit. The low pass filter eliminates any spurious or harmonic radiation above 136Mhz. It is made up of capacitors C14, C15, C16, C17 and coils L2, L3, and L4. When relay RL1 is energized, the signal from the low pass filter is connected to the OUTPUT BNC jack which is connected to the antenna.

ALIGNMENT & DISASSEMBLY INSTRUCTIONS

PLEASE NOTE THAT TUNING, DISASSEMBLY, OR REPAIRING THE CS-10 MAY VOID THE 3 YEAR WARRANTY. The information below is for reference only and is not meant to encourage or authorize field service by anyone.

ALIGNMENT PROCEDURE

Align by applying 1 watt carrier signal at 125Mhz. Put wattmeter in series with driver and tune C-10 for best (min.) VSWR while observing output. Tune for maximum out with C-12. If C-10 is detuned too much, the relay will chatter.

Check distortion at 118Mhz, 125Mhz, 135.9Mhz. No distortion or flat topping of sinewave is allowed. Make sure power is flat at 118Mhz, 125Mhz, 135.9Mhz or that only a small dropoff in power occurs at each end of the band. The 3 low pass filter coils (L2, L3, L4) may have to be opened up or squeezed together slightly to achieve these results. L3 has the greatest effect.

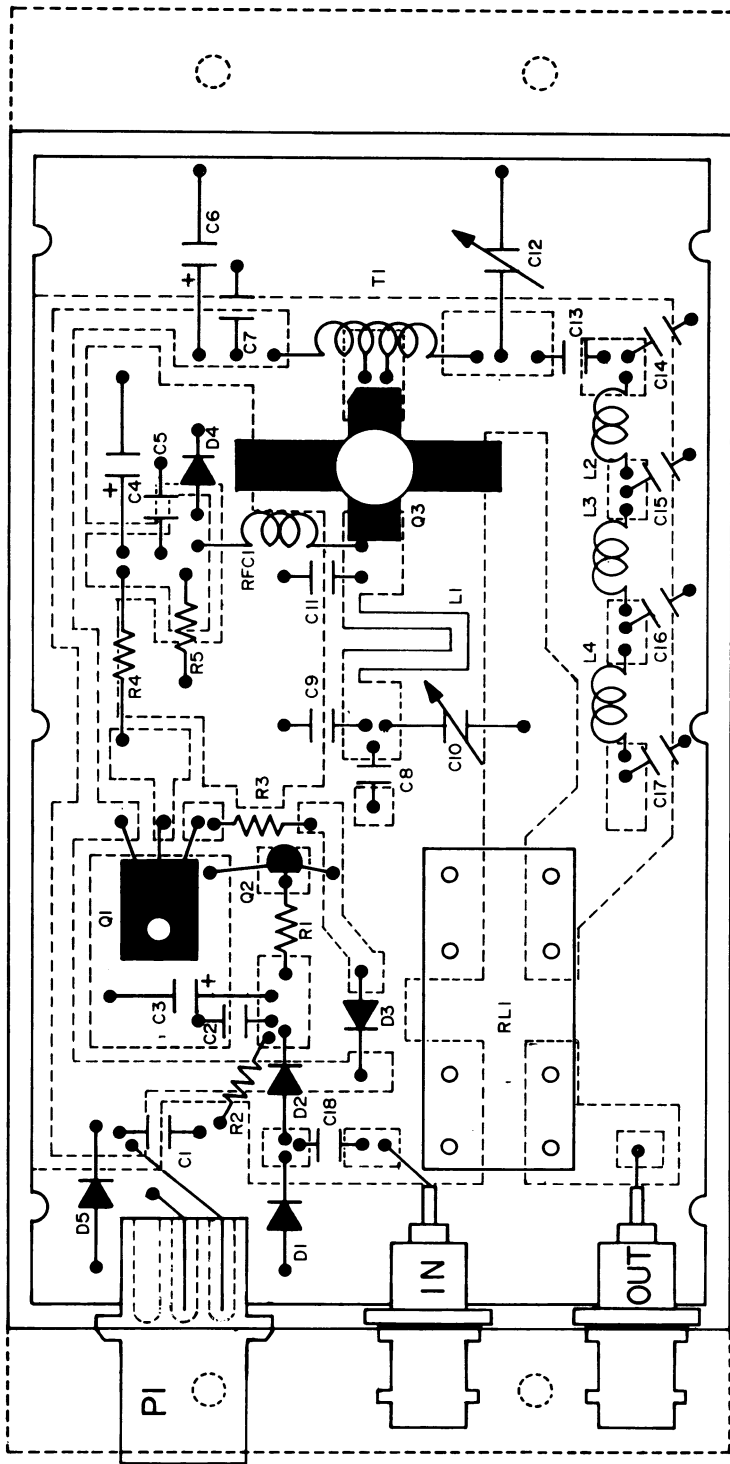
With 1 watt carrier, DC current should be 2.2A at 12.6v. During receive (standby) current drain should be less than 2 microamps.

DISASSEMBLY INSTRUCTIONS

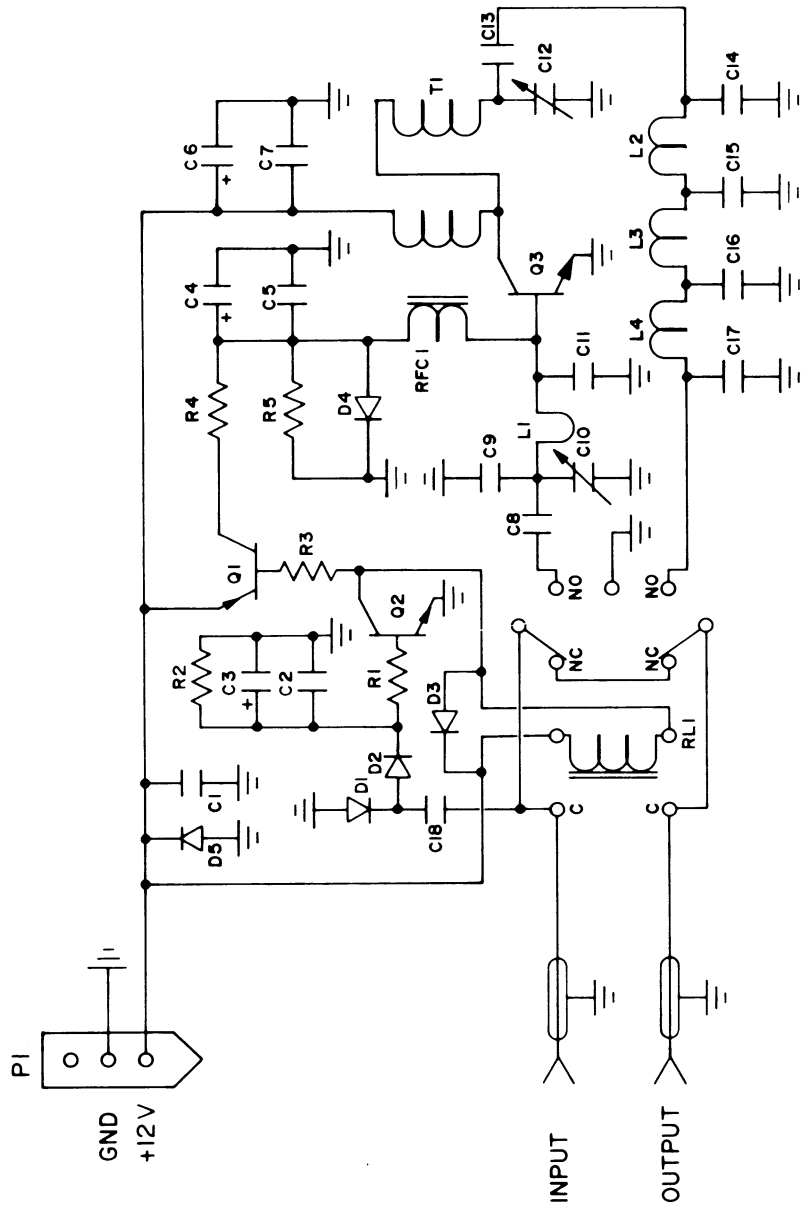
1. Remove 6 screws and take off bottom cover.
 2. Unsolder red and black leads going to power receptacle P1. Remove P1 by squeezing ears in and pushing it inside the box. Be careful not to break D1, D2, or C1.
 3. Unsolder both short bare wires from the INPUT and OUTPUT BNC jacks and lift them out of the way.
 4. Remove 8-32 nut and lockwasher holding down Q3 stud to heatsink.
 5. Remove 4 screws holding down PCB to case top and heatsink.
 6. To reassemble, put spacers between PCB and case top with 4 screws (do not tighten). Use heatsink compound on Q3 stud before reassembly. Tighten 8-32 nut on Q3 stud so lockwasher barely compresses or stud will break off. Tighten 4 screws and reverse disassembly instructions to reassemble. Realign CS-10 per above.
 7. If relay RL1 is replaced, make sure leads are cut off flush with board or they could short out on case bottom.
 8. If Q1 is replaced, the metal pad side is installed so it faces **away** from the PCB.
 9. If Q3 (MRF240) is replaced, the Collector is the diagonal sliced lead. Unsolder T1, RFC1, D4, and C11. Remove bad transistor. Mount PCB down tight with 4 screws with the spacers underneath with Q3 hole centered over Q3 stud hole in heatsink. Put heatsink compound on Q3 stud and set transistor in place. Tighten 8-32 nut so it just compresses lockwasher. Solder in Q3 mounting fins to PCB foils and reconnect and solder T1, RFC1, D4, and C11. Amplifier must be realigned per the instructions above after Q3 replacement.
-

PARTS LIST

Part No.	Desig.	Description	Quantity	Price
03-1011		4-40 x 3/16 PH SCREW S/S	6 each	.05 each
03-1012		4-40 x 5/16 PH SCREW S/S	4 each	.05 each
03-1013		8-32 NUT. STAINLESS STEEL	1 each	.10 each
04-1001		8-32 SPLIT LOCKWASHER S/S	1 each	.05 each
06-1004	R5	10 OHM .25W 5% CF RESISTOR	1 each	.10 each
06-1034	R2	10K .25W 5% CF RESISTOR	1 each	.10 each
06-1212	R4	120 OHM 2W 5% CF RESISTOR	1 each	.50 each
06-4714	R1	470 OHM .25W 5% CF RESISTOR	1 each	.10 each
06-4724	R3	4700 OHM .25W 5% CF RESISTOR	1 each	.10 each
09-0201		PLUG (CABLE END)	1 each	.48 each
09-0202		PLUG PIN (CABLE END)	2 each	.15 each
09-0203	P1	RECEPTACLE (MOUNTED ON CS-10)	1 each	.54 each
09-0204		RECEPTACLE PIN (MOUNTED ON CS-10)	2 each	.15 each
09-7486		BNC JACK	2 each	1.95 each
15-1010		POWER AMPLIFIER BOX (BOTTOM)	1 each	4.50 each
20-0002	C18	2 PF-300V DIPPED MICA CAP.	1 each	.51 each
20-0015	C14, 17	15 PF-300V DIPPED MICA CAP.	2 each	.41 each
20-0034	C15, 16	33 PF-300V DIPPED MICA CAP.	2 each	.84 each
20-0301	C1, 2, 5, 7, 8, 13	300 PF-100V DIPPED MICA CAP.	6 each	.51 each
20-2000	C11	200 PF-350V MICA CAP. (METALIZED)	1 each	.81 each
20-4040	C10, 12	4-60 PF MICA TRIMMER CAP.	2 each	2.46 each
20-6800	C9	68 PF 350V MICA CAP. (METALIZED)	1 each	.81 each
23-1025	C3, 4	10UF 25V AXIAL ELECT. CAP.	2 each	.24 each
23-4725	C6	47UF 25V AXIAL ELECT. CAP.	1 each	.27 each
25-1007	L3, 4	COIL (LOOSE)	2 each	.90 each
25-1008	L2	COIL (TIGHT)	1 each	.90 each
25-1009	T1	TRANSFORMER	1 each	1.50 each
25-1010	RFC1	CHOKE	1 each	1.02 each
30-7066		DUAL #18 WIRE	5 feet	.32/foot
43-1007		STANDOFF FOR POWER AMPLIFIER	2 each	.75 each
43-5086		HEATSINK FOR PWR AMP.	1 each	4.65 each
48-0240	Q3	MRF240 SILICON NPN RF TRANS.	1 each	37.11 each
48-0504	D5	MR504 SILICON DIODE	1 each	.75 each
48-3904	Q2	2N3904 SILICON NPN TRANSISTOR	1 each	.36 each
48-4004	D3	IN4004 DIODE	1 each	.20 each
48-4007	D4	IN4007 SILICON DIODE	1 each	.21 each
48-4148	D1, 2	IN4148 DIODE	2 each	.15 each
48-5194	Q1	2N5194 SILICON PNP TRANSISTOR	1 each	1.77 each
54-1016		LABEL FOR PWR AMP. (FRONT)	1 each	.16 each
54-1017		LABEL FOR PWR AMP. (SIDE)	1 each	.21 each
65-1002		3 AMP 3AG GLASS FUSE	1 each	.26 each
65-1005		CAR BATTERY PLUG	1 each	4.40 each
80-1002	RL1	RELAY	1 each	7.26 each



PICTORIAL DIAGRAM



SCHEMATIC DIAGRAM