

FUNCTIONAL DESCRIPTION.

The COR-2 module is designed for operation with Hamtronics FM Exciters and Receivers (and CWID board when used) to provide repeater operation. The unit may also be used with other makes of transmitters and receivers providing the required interface signals are available. The unit comprises three main circuits.

- 1.) A carrier operated electronic relay provides operating power to the exciter in the transmitter enclosure whenever the receiver squelch is open. When the squelch closes, the COR circuit holds the transmitter on for an extended time (tail) with no audio modulation. If the receiver is held on for more than the legal transmit period (e.g. 5 minutes), the COR circuit automatically shuts down the transmitter until the receiver is released.
- 2.) An audio mixer stage which mixes and buffers audio from the receiver and the CWID for application to the transmitters.
- 3.) A speaker amplifier which provides adjustable drive for a local speaker separate from the repeater audio; this avoids having to use "L" pads, etc. and compromising local audio for benefit of repeater. Refer to catalog for complete specifications for COR unit.

CONSTRUCTION GUIDELINES.

There is no special construction sequence; but following are some notes regarding various parts.

- a. Resistor bodies are designated as circles on the assembly diagram for those which are mounted vertically.
- b. Note the polarity of IC's, transistors, diodes, and electrolytic capacitors.
- c. Trim pots may be marked in plain values, such as 50K or 500K or may be in significant numbers and multipliers, such as "23" and some meaningless letter for 2K pots.
- d. Terminal pins for E1-E15 should be cut from the metal carrier strip, then snapped in place from top of board using care not to crush them. Firm pressure with a pair of fine nose pliers grasping one wall of the pin will cause it to snap and lock into hole.
- e. Use IC socket for U1 but not for U2, which must be soldered to board for heatsinking.
- f. Be careful not to interchange resistors which have similar appearing color bands, eg., 150K and 510K, 1 meg and 10 meg.

INSTALLATION.

The COR board can be mounted with standoffs in the four corners of the board. No special shielding is required. Connections are made to the terminal pins either by soldering hookup wires into hollow top of pin or wrapping around pin and soldering. Following are descriptions of required interface connections. When used with Hamtronics Exciter, Receiver, and CWID boards, required interface levels are assured. When used with other equipment, some care must be taken to be sure compatible interface connections are arranged. Referring to the Repeater System diagram, it can be seen that the Exciter/PA and the Receiver are mounted in rf tight boxes with feedthru capacitors used at control and audio signal entrances.

- a. **COS OUTPUT FROM RECEIVER.** This control signal at E7, taken from the squelch stage in the receiver must be about 3 to 10 Vdc when the squelch is open and near ground when squelch is closed.
- b. **AUDIO FROM RECEIVER.** The high level audio output from the IC in the receiver, which normally feeds the speaker, is connected to E6 on the COR board instead. The COR board applies it to the audio mixer stage for application to the Exciter. The receiver audio is also connected through a (user supplied) 100K SPKR VOL control to E14. A speaker amplifier on the COR

board amplifies the signal from the SPKR VOL control to provide an isolated signal for a local speaker on the repeater panel. The nominal audio level at E6 should be 1.5V P-P at full 5 kHz deviation on the receiver.

- c. **LOCAL SPEAKER** connected to E15 on COR board should be an 8 ohm speaker. Up to 2W of audio can be obtained from the COR speaker amplifier. Note that the speaker must return to ground.
- d. **B+** for COR board should be +13.6 Vdc connected to E3. Ground should be tied to E10. Current drain depends on speaker level and amount of current supplied to Exciter keyed B+ line, but should normally be about 600-700 mA.
- e. **KEYED B+** to Exciter at E1 is +13.4 Vdc (due to slight drop in Q2) at up to 600 MA. Because the PA is class C, it is unnecessary to switch the B+ to the PA.
- f. **REPEATER AUDIO** from E5 is connected to the microphone input of the Exciter. A 500 ohm dynamic microphone can also be connected to the same Exciter input. Resistor R30 prevents the microphone from being loaded down.
- g. **LOCAL KEY** input E12 may be grounded by the local microphone PTT switch to key the transmitter locally.
- h. Connections to CWID are as shown on the Repeater System diagram. **ID TRIP** is normally high and goes low when the Receiver squelch is open to trip the ID when the receiver squelch closes. The **ID KEY** signal is normally low and goes high to key the COR circuit while the CWID runs. The CWID audio output should be tied to E4, the input to the audio mixer on the COR board. The CWID level input at E4 normally is about 4V P-P.
- i. Outputs at E2, E8, and E11 are designed to drive front panel LED's to indicate repeater status. LED's are not supplied with this kit, but they are supplied in the hardware package if you bought a complete Hamtronics REP-100 Repeater Kit.

ADJUSTMENTS.

- a. Adjust R3 for desired repeat tail time. Delay is adjustable up to about 10 to 15 seconds.
- b. Adjust R16 for desired "time out" period up to five minutes.
- c. Set up repeater audio level as follows. Set Exciter controls for normal microphone operation as stated in Exciter instruction manual. Then, adjust volume control on receiver for desired repeat modulation. It is normally not necessary to depend on the Exciter limiter for hard limiting because the filter in any good receiver will limit the maximum deviation level and thereby the maximum audio level applied to the Exciter. The correct nominal audio levels to use are 1.5V P-P at E6 input which results in about 30 mV P-P at E5. This under conditions of full audio modulation on received signal, i.e., 5 kHz deviation. It is especially important to check for 1.5V P-P max level if you will be using Autopatch or DTMF Decoder/Controller Modules to arrive at proper system levels.
- d. Adjust **LOCAL VOLUME** control to set speaker volume.
- e. CWID modulation level is adjusted with R25. Normally, the ID level is set lower than voice level, eg. 1 to 2 kHz deviation.

HOW THE CIRCUITS WORK.

The 3301 Quad Op-amp used is a Norton type for single supply operation. The voltage applied through various resistor values to the + and - inputs cause the output to go high or low, depending on which input has more current flowing. The amount of current depends on the voltage and resistance. In some cases, positive feedback resistors are used for Schmitt trigger action (snap action).

The receiver COS signal is applied to threshold detector U1-A. When the squelch opens, the COS signal exceeds the 3V

threshold, and U1-A goes high. The positive signal applied to U1-D causes the output to go high and turn on Q1 and Q2, which applies B+ to the Exciter. The ratio of R6 to R8 sets the turn on threshold of U1-D at 3V. When the receiver is open, 12V is applied to R8. When the squelch closes, C3 discharges slowly through R3-R4. When the voltage decays to 3V, the exciter is turned off. The quick-attack, slow-release action of CR1/C3/R3-R4 provides the repeater with a silent tail of adjustable length. When the squelch closes, as the output of U1-A goes low, an ID TRIP signal pulse is generated by C4-R14 for the CWID Module. This is a "polite" ID trip: it waits until you stop talking to ID.

U1-C provides a time-out timer to prevent the repeater from hanging up if the receiver stays open. The timer length is set by the charging of C6 through R16-R17. It is reset quickly through CR3 each time the receiver squelch closes. When the voltage of C6 reaches the 4V threshold, the output of U1-C snaps to +12V, which is applied through R5 to the - input of U1-D. Since the value of R5 is lower than R8, U1-C can positively override the keying of the exciter. A third input to U1-D from E12 via R7 has veto power over both of the other inputs. If the local keyline is grounded, U1-D turns on, regardless of other signals it receives. Likewise, when the CWID is running, a TTL high is applied from E13 via CR2 and R11 to hold U1-D on.

Speaker amplifier U2 receives audio from the SPKR VOL control to drive the local speaker. Voltage divider R22-R23 reduces the gain of U2 to a reasonable level, since it is driven from a high level input.

U1-B is biased as a class A amplifier. The two inputs via R26 and R27 mix the CWID audio in with the receiver audio to drive the microphone input of the Exciter. R30 works in conjunction with the 2K pot at the input of the Exciter to reduce the audio to the desired 30 mV P-P level and provide isolation from the local microphone (if used). If you are not using a Hamtronics Exciter, you may wish to change or remove R30 to obtain proper driving level for your exciter.

TYPICAL DC VOLTAGES (WITH 13.6 V SUPPLY):

CONDITION	E7	U1-2	U1-3	U1-4	U1-12	C3
Rcvr Open	6	0.6	0.045	12.4	0.6	12
Rcvr Closed	0	0	0.6	0.1	0	12 decaying

	U1-11	U1-10	Q1-B	Q1-C	Q2-B	Q2-C
Exciter On	0.03	12.6	0.9	0.3	13	0
Exciter Off	0.6	0.1	0.1	13	13	13.4

	C6	U1-8	U1-13	U1-9
Normal	0.4V	0.6	0.1	0.1
Timed Out	Charged to 4V	0.045	0.6	12.6

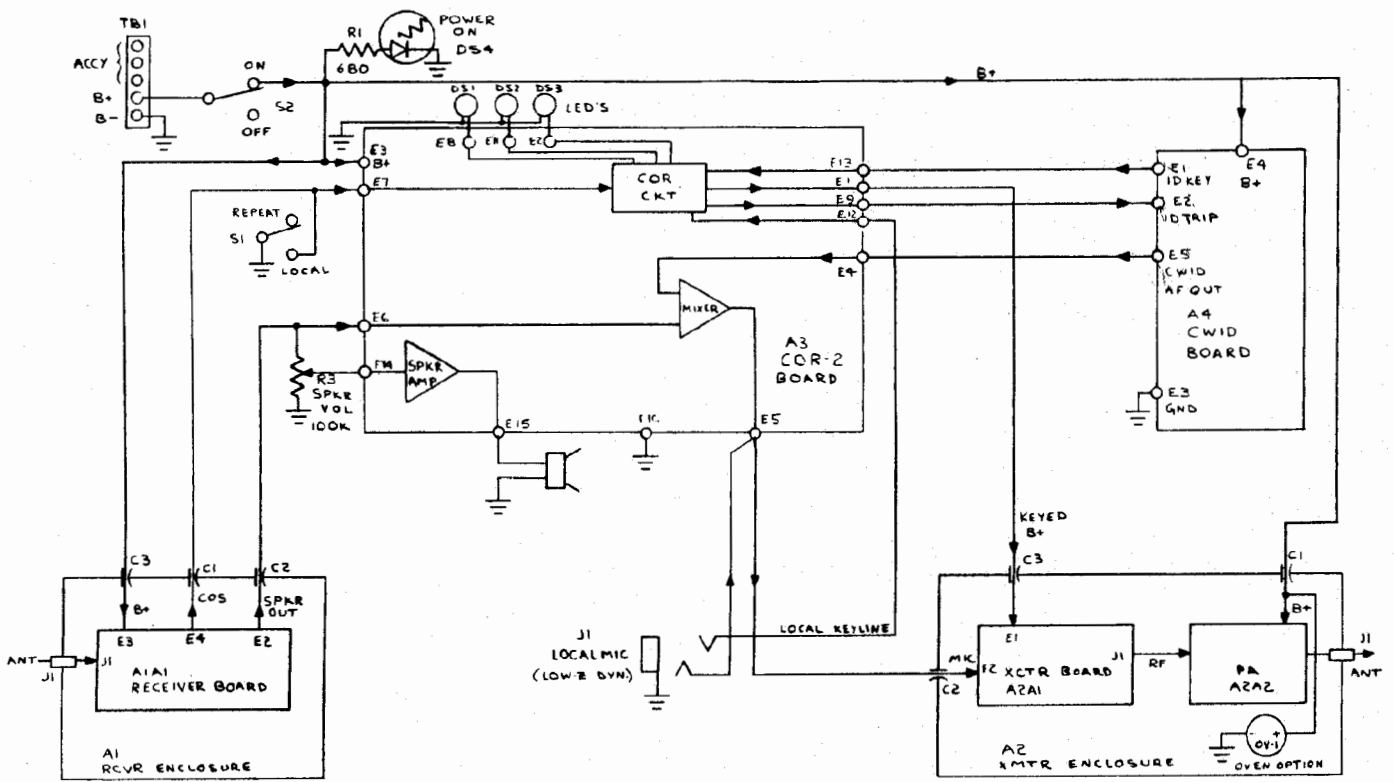
Quiescent	U1-1	U1-6	U1-5	U2-1	U2-6	U2-8
	0.6	0.6	7	7	0.03	6

TYPICAL AC VOLTAGES (FULL 5 KHZ DEVIATION):

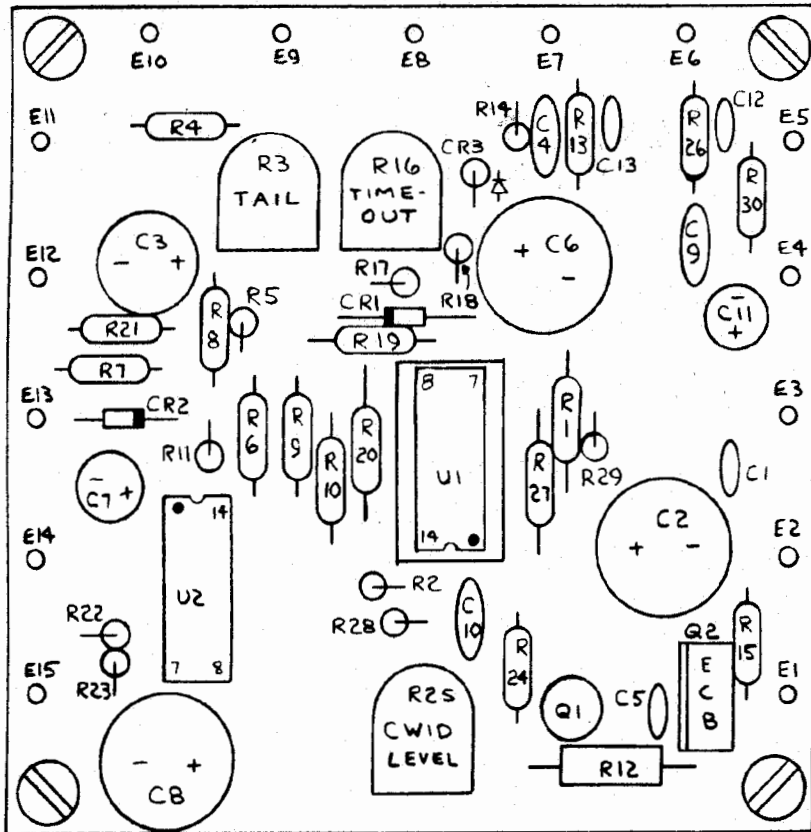
E4 CWID:	4V P-P
E6 Rcvr AF:	1.5V P-P
E5 Mixer Out:	30 mV P-P
U1-5	0.8V P-P
U2-6	Up to 0.4V P-P
U2-8	Up to 8V P-P

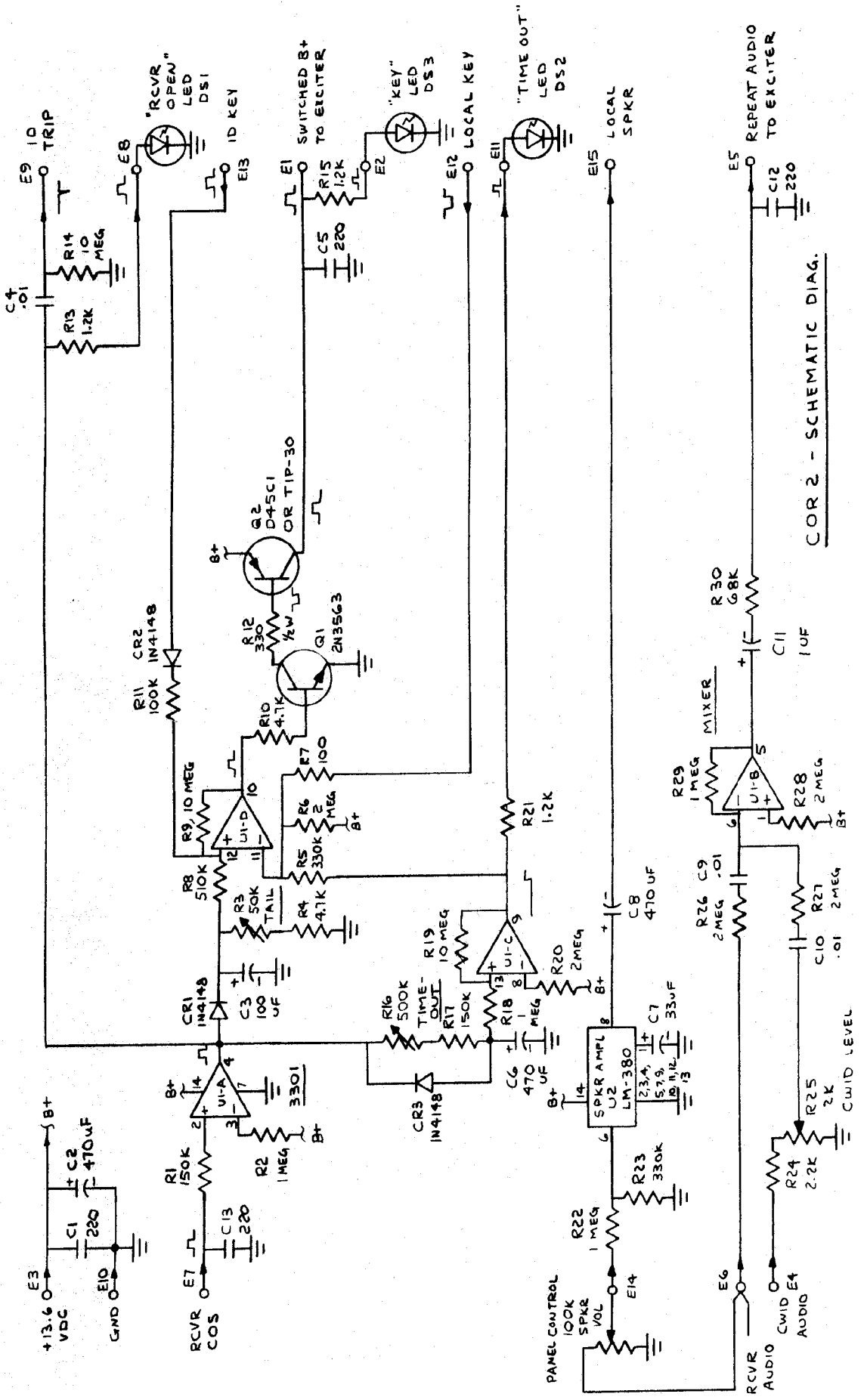
COR 2 MODULE - PARTS LIST

Ref Desig	Value (Marking)	Ref Desig	Value (Marking)
C1	220 pF (221)	R8	510K
C2	470 uF electrolytic	R9	10 meg
C3	100 uF electrolytic	R10	4.7K
C4	.01 uF (103)	R11	100K
C5	220 pF (221)	R12	330 ohms, 1/2 W
C6	470 uF electrolytic	R13	1.2K
C7	33 uF electrolytic	R14	10 meg
C8	470 uF electrolytic	R15	1.2K
C9-C10	.01 uF (103)	R16	500K pot
C11	1 uF electrolytic	R17	150K
C12-C13	220 pF (221)	R18	1 meg
CR1-CR3	1N4148	R19	10 meg
E1-E15	Terminal Pins	R20	2 meg
Q1	2N3563	R21	1.2K
Q2	D45C1 or TIP-30	R22	1 meg
R1	150K	R23	330K
R2	1 meg	R24	2.2K
R3	50K pot	R25	2K pot (23d or 23e)
R4	4.7K	R26-R28	2 meg
R5	330K	R29	1 meg
R6	2 meg	R30	68K
R7	100 ohms	U1	3301
		U2	LM-380



REP-100 REPEATER OVERALL SCHEMATIC





COR 2 - SCHEMATIC DIAG.

