

FC-1 Frequency Control Board Repeater / Remote Base Applications

The FC-1 Frequency Control Board may be used with the RC-850 and RC-85 Repeater Controllers, and the ITC-32 Intelligent Touch-Tone Control Board. It can provide the remote base interface for an ICOM IC-2A, IC-3A, or IC-4A transceiver, and/or recover expanded remote control output functions. The applications include:

RC-850 Repeater Controller

Control IC2/3/4A on Link 1 or Recover 32 Expanded UF Outputs
(two required to do both)

RC-85 Repeater Controller

Control IC2/3/4A on Link and Recover 8 Expanded UF Outputs
(one board does both)

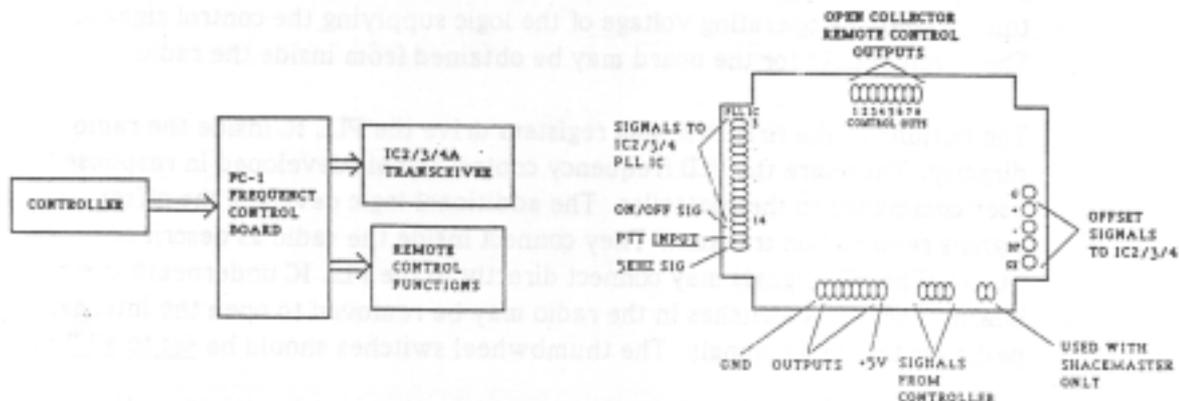
ITC-32 Intelligent Touch-Tone Control Board

Control IC2/3/4A on Link

The board is also designed to be compatible with ShackMaster, and a few of its circuits apply only to ShackMaster. Several of the outputs are labeled as they apply to the ShackMaster application of interfacing to the ICOM IC-751 HF transceiver remote frequency controller connector.

The FC-1 board may be mounted in any way convenient in your installation, but is designed to fit directly into a Unibox 130 standard enclosure, manufactured by Amerex, P.O. Box 2815, Riverside, CA 92516, (714) 686-1400. Unibox's are available from many electronic suppliers.

The following instructions apply to each of the repeater / remote base applications of the FC-1 frequency control board.



Control of IC2/3/4A Transceiver

The ICOM IC2/3/4A transceivers are low cost synthesized handheld rigs which are easily controllable with external BCD frequency and offset logic signals. For applications in high rf environments, it may be necessary to mount the transceiver in an rf tight enclosure, such as a Bud Econobox, for optimum performance. Signals entering and leaving the enclosure should go through feedthrough capacitors, as with any high performance repeater rf equipment. The FC-1 board may mount inside the enclosure with the transceiver, to minimize the number of I/O lines requiring feedthrough capacitors. Be careful about degrading the rise times of the clock and data signals from the controller - it may be necessary to reduce the pullup resistors (R1 and R2) to 4.7K or 2.2K to restore fast rise times when capacitance is hung on the signals. At low rf density sites or where optimum performance isn't required, no special packaging considerations may be necessary.

The FC-1 board receives the serially encoded frequency and offset information from the controller, performs the serial to parallel conversion and provides the logic to interface to the transceiver's offset circuitry.

The controller provides serial data and clock (or strobe) as follows:

<u>Controller</u>	<u>Data</u>	<u>Strobe</u>
RC-850	UF7	UF Strobe
RC-85	CX 1	CX 2
ITC-32	OUT 7	OUT 6

The FC-1 includes a transfer (XFER) logic input which transfers the outputs of the shift registers to a set of parallel registers (inside the 4094 IC's). The transfer logic input isn't used in this application and should be left open (pulled high, or active).

The synthesizer logic inside the IC2/3/4 transceivers operates from 5 volts, so this dictates the operating voltage of the logic supplying the control signals. The 5 volt supply for the board may be obtained from inside the radio.

The outputs of the first two shift registers drive the PLL IC inside the radio directly. These are the BCD frequency control signals developed in response to user commands to the controller. The additional logic develops the offset signals required on transmit. They connect inside the radio as described below. The BCD signals may connect directly to the PLL IC underneath the pc board. The offset switches in the radio may be removed to open the internal paths for the offset signals. The thumbwheel switches should be set to all 0's.

Note that the PTT signal (described below) must be connected to the controller output driving the radio PTT to activate the offset circuitry. Otherwise, the transmitter will be inhibited.

The active low open collector PTT signal from the controller should drive the radio through a resistor (around 2.2K) to the base of the switching transistor (IC2A-Q23, IC3A-Q23, IC4A-Q26). Driving the switching transistor directly rather than through the dc path from the PTT switch helps eliminate keying problems when applying audio.

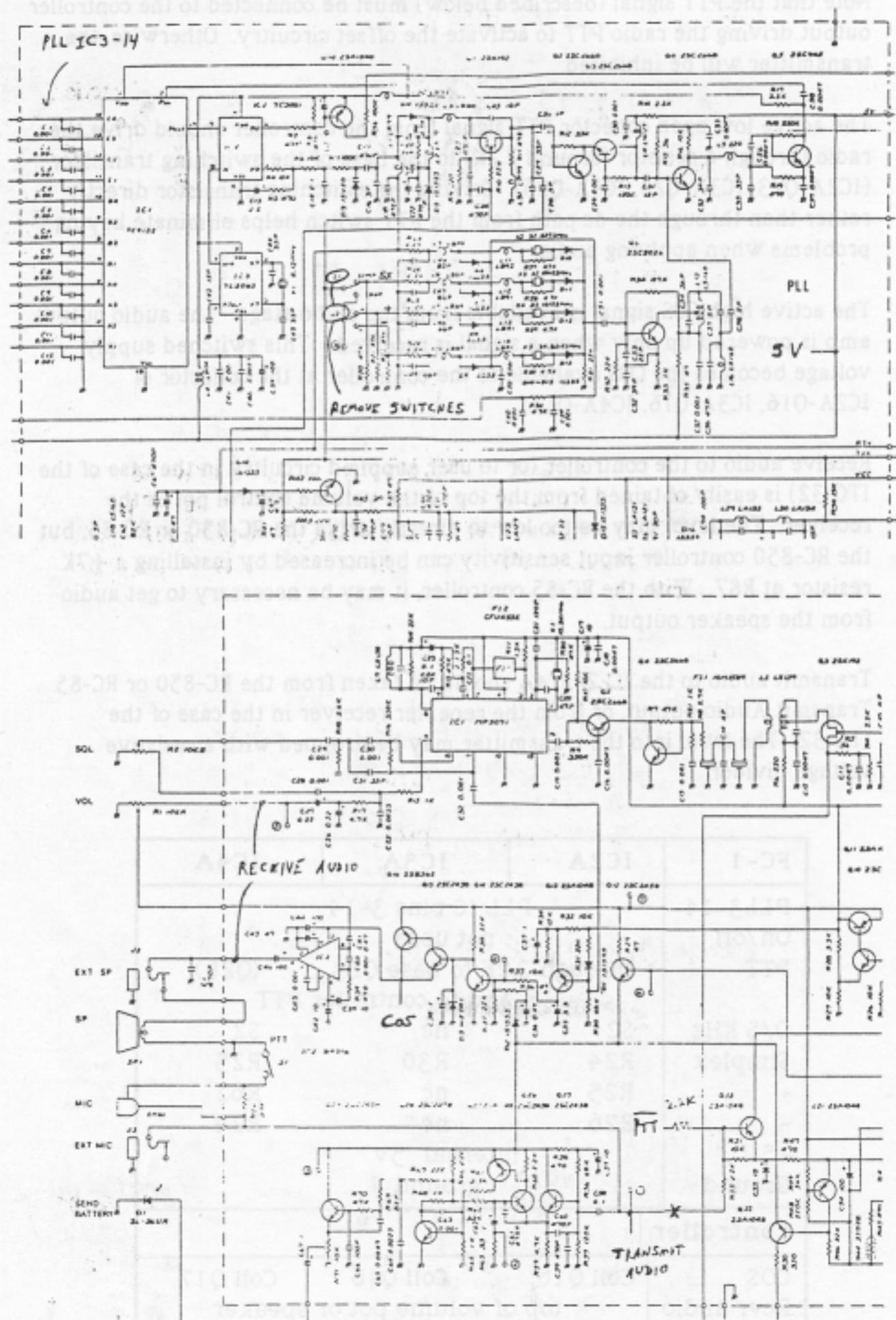
The active high COS signal is available from the audio stage - the audio output amp is powered up only when a signal is received. This switched supply voltage becomes the COS available to the controller at the collector of IC2A-Q16, IC3A-Q16, IC4A-Q17.

Receive audio to the controller (or to user supplied circuitry in the case of the ITC-32) is easily obtained from the top of the volume control pot in the receiver. The level may be too low to directly drive the RC-850 or RC-85, but the RC-850 controller input sensitivity can be increased by installing a 4.7K resistor at R87. With the RC-85 controller, it may be necessary to get audio from the speaker output.

Transmit audio to the IC-2/3/4A should be taken from the RC-850 or RC-85 Transmit Audio output, or from the repeater receiver in the case of the ITC-32. The level into the transmitter may be dropped with a resistive voltage divider.

FC-1	IC2A	IC3A	IC4A
PLL3-14	PLL IC pins 3-14		
On/off	not used		
PTT	through 2.2K to base Q23		(Q26)
	and to controller PTT		
0/5 KHz	S2	nc	S2
Simplex	R24	R30	R25
+	R25	nc	R62
-	R26	nc	R24
+5V	internal "5V"		
Ground	ground		
Controller			
COS	Coll Q16	Coll Q16	Coll Q17
Rcvr audio	top of volume pot or speaker		
Tx audio	external mic input		

IC-2A/AT/E SCHEMATIC DIAGRAM



IC-2A schematic - see appropriate schematic for your transceiver

RC-850 Controller Expanded UF Outputs

The FC-1 Frequency Control Board can recover the 32 expanded User Function remote control logic outputs from the RC-850 controller. The "expanded mode" configuration command should be executed on the '850 to inform it of the presence of the FC-1 board. The signals from the '850 to the FC-1 are as follows:

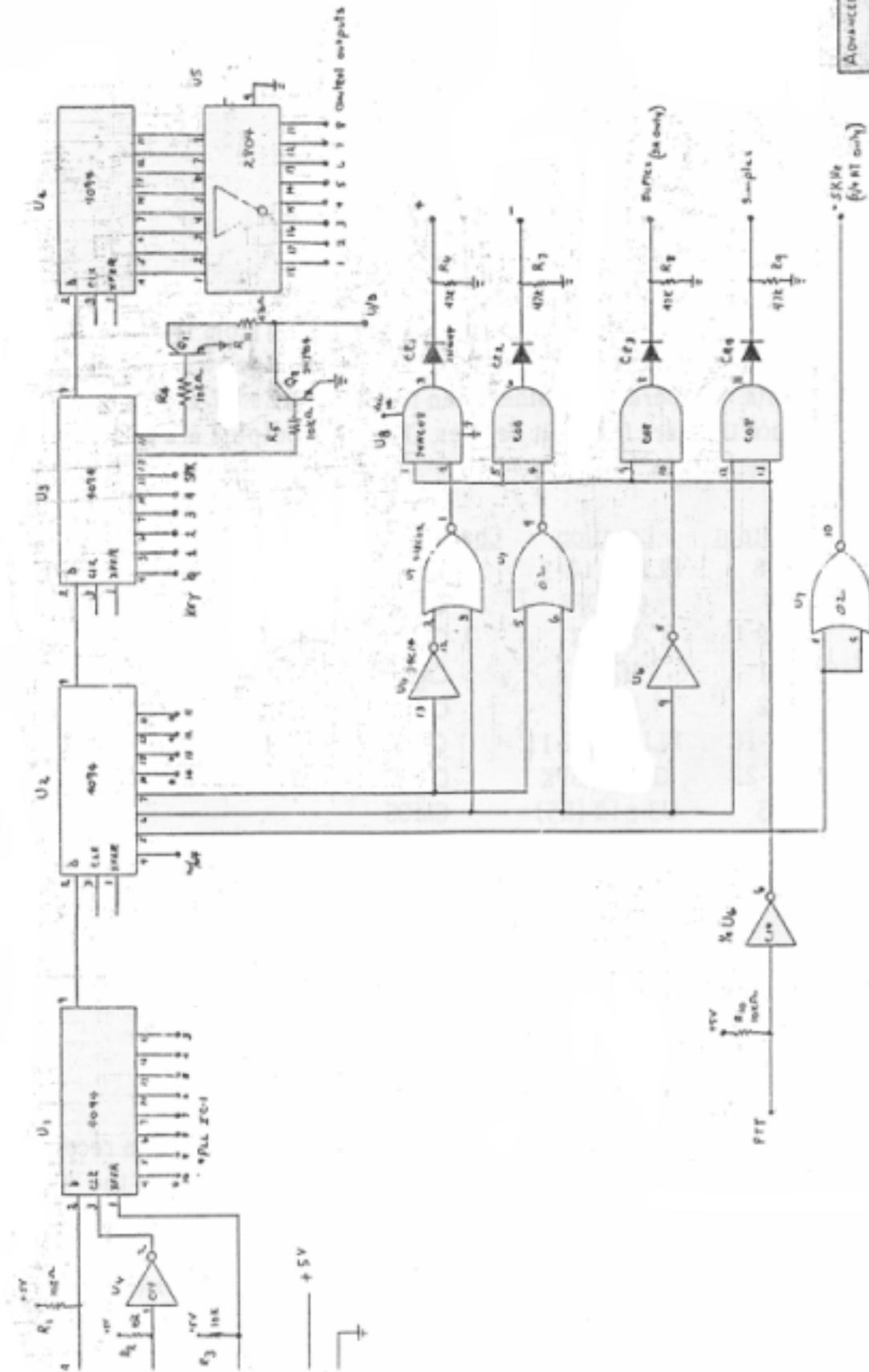
<u>RC-850 Controller</u>	<u>FC-1 Board</u>
UF1	DATA
UF2	CLK
UF3	XFER
GNDD	GND

The board may be operated at any supply voltage ranging from five to thirteen volts. The operating voltage determines the voltage swing of the recovered outputs. If operated at other than five volts, IC's U7 and U8 must be removed, since they are five volt devices. The logic outputs are available at the following terminals:

<u>UF Output</u>	<u>Location</u>	<u>Characteristic</u>
1-8	PLL IC 10-3	CMOS
9	ON/OFF	CMOS
10	U7 p8	CMOS
11	U7 p6	CMOS
12	U7 p5	CMOS
13-16	PLL IC 14-11	CMOS
17-22	KEY0-4,SPK	CMOS
23	U3 p12 (R5)	CMOS
24	U3 p11 (R4)	CMOS
25-32	CONTROL OUTS 1-8	Open Collector

RC-85 Expanded UF Output

In addition to controlling the IC/3/4A transceiver, the FC-1 board can recover the eight expanded User Function remote control outputs supplied by the RC-85 Repeater Controller. To recover the outputs, the third shift register is bypassed by removing U3 and shorting U3 pin 2 to pin 9. The eight UF outputs are available as open collector signals at CONTROL OUTS 8-1 (UF1 = CONTROL OUT 8, UF2 = CONTROL OUT 7, etc).



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