

# **Computer Interface Option Owner's Manual**

**Firmware Version 3.5**

(October 14, 1988)

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# Chapter 1

## Bulletin Board System (BBS)

### Serial Port Access

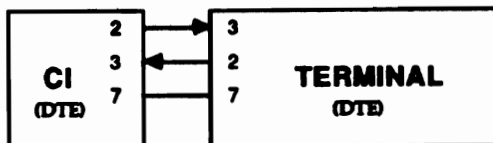
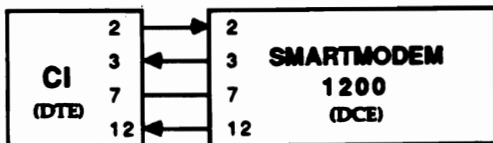
Two RS-232C serial ports are accessible at the Computer connector on the rear of the controller. A terminal or computer running a terminal emulation program (communication program) can connect directly to the DB-25 connector, or may connect indirectly through a modem or packet TNC.

For *local access*, either port may connect *directly to a terminal* by connection of transmit data, receive data, and signal ground. Note that both the controller and the terminal are Data Terminal Equipment (DTEs), so that transmit and receive data pins must be reversed between the controller and the terminal.

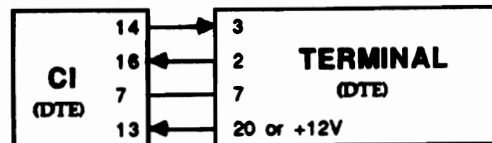
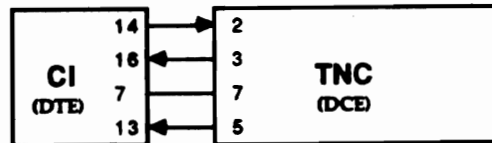
For *remote access*, Port 1 is intended to connect to a Smartmodem 1200 or software/hardware compatible, and provides automatic baud rate selection based on the High Speed Indicator from the modem. Port 2 is intended to connect to a packet TNC, and provides hardware flow control to prevent overflowing the TNC input character buffer. Other remote access configurations are possible, such as use of higher speed modems, but are the responsibility of the user to design and implement. See Table I for the Computer connector pinout.

	RS-232 Standard		CI Conn. / Port 1	SM1200	CI Conn. / Port 2	TNC
Pin	Ckt	Description	Description	CI ↔ SM	Description	CI ↔ TNC
1	AA	Protective Ground	Protective Ground	←→	Protective Ground	←→
2	BA	Transmitted Data	Transmitted Data	→		
3	BB	Received Data	Received Data	←		
6	CC	Data Set Ready - not used				
7	AB	Signal Ground	Signal Ground	←→	Signal Ground	←→
12	SCF/CI	High Speed Indicator	High Speed Indicator	←		
13	SCB	Sec. Clear to Send			Clear to Send	←
14	SBA	Sec. Transmitted Data			Transmitted Data	→
16	SBB	Sec. Received Data			Received Data	←
19	SCA	Sec. Request to Send - not used				
20	CD	Data Terminal Ready - not used				
25		Unassigned - Serial Port 3 Output				

#### PORT 1



#### PORT 2



**Baud Rate**

Port 1 may be set to 300 or 1200 baud based on the level applied to the High Speed Indicator signal (pin 12) of the RS-232 connector. It is controlled automatically by 1200 baud intelligent modems such as the Smartmodem 1200. (If a High Speed Indicator signal is not available, an RS-232 low signal or an open circuit selects 300 baud, and an RS-232 high signal selects 1200 baud. A high level signal is typically available at the connector of a terminal, such as at pin 20 - Data Terminal Ready. Consult your terminal or computer manual for details if you'd like to strap the port to 1200 baud.)

The baud rate of port 2 is DIP switch selectable between 300 and 9600 baud as shown in Table II. Be sure to leave only one switch ON.

Baud Rate	SW1	SW2	SW3	SW4	SW5	SW6
300	OFF	OFF	OFF	OFF	OFF	ON
600	OFF	OFF	OFF	OFF	ON	OFF
1200	OFF	OFF	OFF	ON	OFF	OFF
2400	OFF	OFF	ON	OFF	OFF	OFF
4800	OFF	ON	OFF	OFF	OFF	OFF
9600	ON	OFF	OFF	OFF	OFF	OFF

**Terminal / Communications Program Setup**

Characters sent and received by the controller are asynchronous, 8 data bits, 1 stop bit, and no parity. The controller does not echo characters, so select *half duplex*. Configure your terminal or comm program so that typing a carriage return causes the cursor to be line fed to a new line.

**Flow Control**

Both ports support software flow control by recognizing <control>S to suspend character transmission and <control>Q to resume. For example, if you're downloading a long file, such as the entire command log, you may freeze the transmission to look at the information on the screen by typing <control>S and resume transmission of the file by typing <control>Q.

Character <control>P will terminate the downloading of a file.

In addition, hardware flow control is supported on Port 2 to prevent buffer overflow in a packet TNC when sending long files. The controller will hold back from sending characters when the CTS signal supplied from the TNC is low, and will resume when the signal is high. Note that port 2's CTS signal must be connected to the TNC or terminal, or *must be strapped high* for the port to function.

**Menu**

The serial ports provide a text menu from which the user may enter commands. See Appendix 1 for a tour of the screen displays, including the text of the Help file, which provides information about the operation of each of the commands, and views of the menus and downloadable files. Type "Return" to see the menu.

### Connection to a Modem (Port 1)

For telephone line data connection between the controller and your terminal or computer, an auto-answer modem such as a Hayes Smartmodem 1200 or software/hardware compatible is recommended at the repeater controller location. An intelligent or manual modem may be used at the terminal or computer location. Note that some modems which are represented as "Hayes compatible" may only be compatible to varying degrees. We've had good results with the Packard Bell PB1200PLUS. Before hooking the controller to a modem, try using the modem with your home terminal or computer and communications program. *Ensure that the modem is working properly before taking it to the repeater site. Offshore clones of Hayes' modems seem to have a relatively high "out of the box failure" rate.*

See Table I for hookup to a Smartmodem 1200. Set the modem DIP switches as follows:

1	DOWN	Forces DTR TRUE; enables modem to execute commands.
2	DOWN	(don't care in this application)
3	UP	No result codes sent from modem to CI.
4	DOWN	Modem does not echo characters.
5	DOWN	Modem will not auto-answer. Overridden by modem command sent by controller to auto-answer after 5 rings. AA light should be on after controller reset.
6	UP	Must be up to use Carrier Detect output as signal to Phone Line Busy
7	UP	Setting used for connection to RJ 11 modular telephone jack.
8	DOWN	Enables modem command recognition.

You may call the modem at either 300 or 1200 baud and the Smartmodem and Computer Interface will automatically adjust to the proper baud rate.

### Sharing a Telephone Line

The auto-answer modem may share a telephone line with the controller. With both the controller and the modem on the line, answering priority should go to the controller. In other words, normally, the controller should answer first.

Set the controller's phone answer delay timer to 10-15 seconds. Unless otherwise specified, the controller sends the modem command "AT S0=5" on reset to set the modem to answer after the fifth ring (=30 seconds). This may be modified using the controller's T command (see Appendix I).

To access the modem, call the controller or enter on another command channel the Don't Answer Next Time Control Op level command. Then immediately call back and the controller will allow the modem to answer the phone.

When the modem is in use sharing the controller's patch telephone line, it is desirable to inhibit telephone patches by indicating to the repeater user that the line is busy. Since the modem is independent of the controller, the controller has no way of knowing when the modem is actually using the telephone line. For best results, a signal should be taken from the modem to indicate to the controller's Phone Line Busy input when the phone is in use by the modem.

## Computer Interface Option

A modem in use signal can be derived in one of two ways. In both cases, the controller's Shared Phone Line mode should be selected with the \*5405 Programming command.

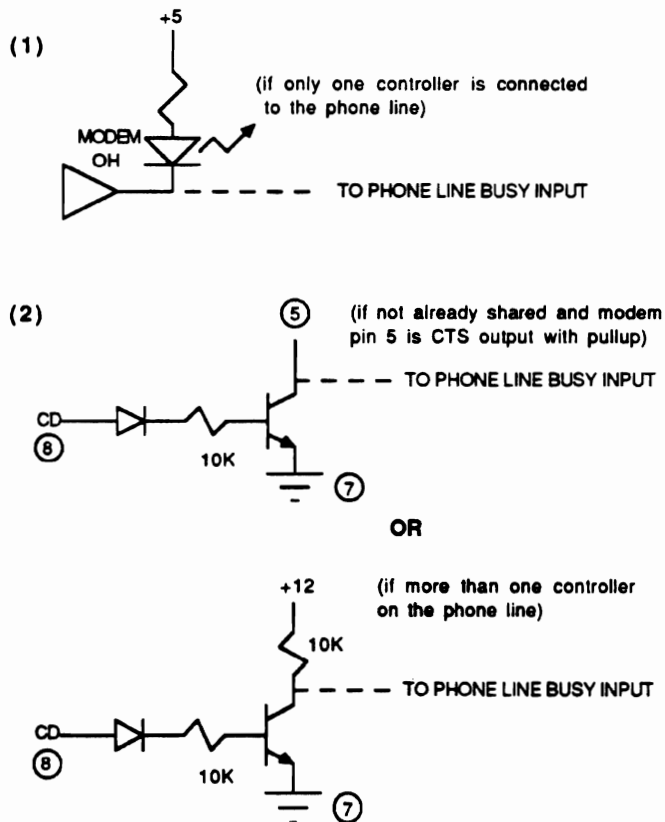
(1) *Get a signal from inside the modem - probably no added parts.*

Most modems have an Offhook (OH) LED indicator, with its anode pulled up to five volts through a resistor, and the cathode driven by a high current driver to ground to light the LED. This low true signal (at cathode of LED) can be taken to an unused pin of the DB-25 connector, typically such as pin 25, and taken directly to the Phone Line Busy input of the controller (Analog Connector pin 24). When the modem is offhook, the logic low signal to the controller causes a "Busy" response to anyone attempting to make a patch.

If more than one controller is already sharing a phone line with the new modem, then method 2 is recommended.

(2) *No need to get inside the modem but must add a transistor.*

If the modem does not have an Offhook LED, you aren't sure of the modem circuitry, or you don't want to get inside the modem, the Carrier Detect output of the modem may be used to indicate to the controller that the shared phone line is in use. This high true RS-232 signal must be inverted as shown below to change the logic sense and also provide the logic levels acceptable to the controller. Pin 5, the Clear to Send output of the modem, may be used as a convenient pullup resistor, depending on your modem.



### **Connection to a Packet TNC (Port 2)**

Port 2 may be connected to a packet radio terminal node controller. The signals to be connected include transmit and receive data, and, depending on your application and your TNC, the flow control signal to prevent the controller from overflowing the TNC's incoming character buffer. See Table I for hookup. (Check the operation of your TNC to verify that pin 5 provides a CTS signal which goes low to indicate buffer full.)

### **Control Timers**

For security, certain commands and downloadable files may not be accessed via the serial ports unless control is enabled through that port. The protected commands include Command entry, Text message entry, Print a programmable message, Edit a programmable message, Autodial number examine and load, and Front Panel display. The protected downloadable files include COMMAND.LOG, CALL.TXT, AUTODIAL.TXT and E2PROM.HEX.

For each port, a control enable and disable Control Op level command is available. See the Command Code Summary for the codes. The enable/disable status for each port is stored in the controller macro sets. In addition, each port has a programmable timer which begins to run when control is enabled for that port. The timer is refreshed each time a protected command is entered or a protected file is downloaded. If the timer is allowed to expire, control is disabled for that port and must be reenabled via another port.

To keep control permanently enabled on a serial port, program the timer value to zero to effectively disable the timer, and enable control. Otherwise, a value of approximately three to five minutes might be appropriate.





**Chapter 2****Auxiliary Touch-Tone Decoders**

Two auxiliary Touch-Tone decoders are provided on the Computer Interface Board. The audio inputs to the decoders appear at solder pads on the CI board and may be taken to the spare phono jacks on the rear panel of the controller. The audio level may range between .5 and 5 volts peak-to-peak. The decoder outputs are read by the controller's CPU through computer input ports implemented on the board.

Commands may be entered independently and simultaneously through the shared decoder on the main controller board and the two auxiliary decoders on the Computer Interface Board. Each auxiliary decoder may be assigned to replace a channel of the shared decoder with Programming commands. The decoders may be assigned to the telephone, the links or remote bases, and the control receiver.

Each command is acted on independently at the command evaluation point – when the command channel COS goes inactive, or after # if assigned to the phone. Command responses are directed to the system transmitters or the telephone.

**Programming Commands**

\*5411x            Assign Auxiliary Decoder #1  
\*5412x            Assign Auxiliary Decoder #2

Channel	0 = phone	3 = Link / RB 3
	1 = Link / RB 1	4 = Link / RB 4 / Control Receiver
	2 = Link / RB 2	5 = Not used

**Example**

Auxiliary Decoder #1 may be assigned to replace the telephone channel of the shared decoder and wired to the telephone audio available on the Telephone Interface Board. The telephone is then "uncoupled" from the shared decoder, and the audio from the phone is always being monitored for commands by the new Touch-Tone decoder.

Wire the decoder input pad labeled DTMF1 on the CI board to the telephone interface board U5 pin 7. No ground wire is necessary.

With the controller unlocked, enter Programming command \*54110.

Now when the phone rings and is answered by the controller, the shared decoder will not switch to the phone, and commands (terminated with #) will be accepted through the Auxiliary Decoder #1. Commands will be evaluated after the #.

### **Example**

Auxiliary Decoder #2 may be assigned to replace link 3 channel of the shared decoder and may be wired to link 3 receiver audio. Link 3 is then "uncoupled" from the shared decoder, and the audio from the link is always being monitored for commands by the new Touch-Tone decoder.

Wire the decoder input labeled DTMF2 on the CI board to a spare phono jack on the rear panel. Using a phono Y connector, route link 3 receiver audio to the phono jack.

With the controller unlocked, enter Programming command \*54123.

Now when the link COS is active, the shared decoder will not switch to the link, and commands will be accepted through the Auxiliary Decoder #2. Commands will be evaluated when link 3 COS goes away (actually after the Delay to Segment 1 period for Courtesy Tone 11).

**Chapter 3****Vocabulary Expansion Option**

The VEO adds new words to the controller's vocabulary, bringing the total to over 530 words. Each word is accessible from the Touch-Tone activated message editor and from the terminal accessible message editing capability. The vocabulary codes for the complete word list are shown on the following pages. All words take up one slot in messages, except that \*2, \*3, \*4, \*5 and \*9 words *each take up two slots*. Remember this when figuring how long messages can be. The vocabulary listing may also be viewed from the serial ports by downloading the file WORDLIST.TXT.

## Computer Interface Option

(PAUSE)	34	CEILING	*158	ENTER	*995	HAM	*938
A	21	CENTER	*161	EQUAL	*893	HAMFEST	*946
A.M.	*110	CHANGE	*875	-ER(suffix)	*210	HAMVENTION	*947
ABORT	*992	CHARLIE	*623	ERROR	*211	HAVE	*253
ABOUT	*855	CHECK	*865	ESTIMATED	*212	HAZARDOUS	*254
ABOVE	*112	CIRCUIT	*720	EVACUATE	*213	HAZE	*255
ACKNOWLEDGE	*114	CLEAR	*163	EVACUATION	*214	HEAVY	*257
ACTION	*115	CLIMB	*165	EVENING†	*843	HELP	*258
ADJUST	*944	CLOCK	*945	EXIT	*761	HENRY	*260
ADVANCED	*916	CLOSED	*166	EXPECT	*215	HERTZ	*684
ADVISE	*116	CLUB	*926			HIGH	*763
AERIAL	*117	CODE	75	F	33	HOLD	*963
AFFIRMATIVE	*118	COME	*167	FAIL	*755	HOME	*615
AFTERNOON†	*842	COMPLETE	*721	FAILURE	*216	HOTEL	*642
AIR	*120	COMPUTER	*927	FARAD	*930	HOUR	*261
AIRPORT	*122	CONDITION	*168	FARENHEIT	*217	HOURS	*655
ALERT	40	CONGRATULATIONS		FAST	*925	HUNDRED	*640
ALL	*685		*170	FEBRUARY	*218		
ALOFT	*124	CONNECT	*940	FEET	15	I	43
ALPHA	*621	CONTACT	*171	FIF-(prefix)	50	ICE	*262
ALTERNATE	*125	CONTROL	*624	FIFTEEN†	*854	ICING	*263
ALTITUDE	*127	CONVERGING	*172	FIFTY†	*850	IDENTIFY	*264
AMATEUR	*917	COUNT	*173	FILED	*223	IGNITE	*266
AMPS	*831	COURSE	*174	FINAL	*224	IGNITION	*267
AND	74	CRANE	*950	FIRE	*634	IMMEDIATELY	*268
ANSWER	*128	CROSSWIND	*175	FIRST	*225	IN	*270
APRIL	*131	CURRENT	*177	FIVE	05	INBOUND	*271
AREA	*713	CYCLE	*951	FIVE†	*805	INCH	*964
ARRIVAL	*132			FLAPS	*227	INCREASE	*272
AS	*133	D	31	FLIGHT	*228	INCREASING TO	*274
AT	*742	DANGER	*712	FLOW	*960	INDIA	*643
AUGUST	*135	DAYS	*952	FOG	*230	INDICATED	*275
AUTO	*918	DAYTON	*928	FOR	*231	INFLIGHT	*276
AUTOMATIC	*741	DECEMBER	*181	FORTY†	*840	INFORMATION	*996
AUTOPILOT	*136	DECREASE	*182	FOUR	04	-ING(suffix)	*948
AUXILIARY	*137	DECREASING	*183	FOUR†	*804	INNER	*277
		DEGREES	*722	FOURTEEN†	*814	INSPECTOR	*785
		DELTA	*631	FOURTH	*234	INTRUDER	*764
		DEPARTURE	*185	FOXTROT	*633	IS	*733
B	22	DEVICE	*953	FREEDOM	*235	IS†	*823
BAND	*138	DIAL	*936	FREEZING	*236	IT	*281
BANK	*140	DINNER	*186	FREQUENCY	*610		
BASE	*141	DIRECTION	*752	FRIDAY	*237	J	51
BATTERY	*142	DISPLAY	*954	FROM	64	JANUARY	*282
BELOW	*143	DOOR	*955	FRONT	*238	JULIET	*651
BETWEEN	*660	DOWN	*654	FULL	*241	JULY	*283
BLOWING	*144	DOWNWIND	*188			JUNE	*284
BOARD	*145	DRIVE	*190				
BOOST	*146	DRIZZLE	*191	G	41		
BOZO	*147	DUST	*192	GALLONS	*991	K	52
BRAKE	*148			GATE	*845	KEY	*285
BRAVO	*622			GAUGE	*961	KILO	*652
BREAK	*743	E	32	GEAR	*244	KNOTS	*286
BROKEN	*151	EAST	*754	GET	*962		
BUTTON	*993	ECHO	*632	GLIDE	*245	L	53
BY	*152	-ED(suffix)	*193	GO	*895	LAND	*287
		EIGHT	08	GOLF	*641	LANDING	*288
C	23	EIGHT†	*808	GOOD†	*834	LATE	*956
CABIN	*153	EIGHTEEN†	*884	GREEN	*762	LAUNCH	*291
CALIBRATE	*735	ELECTRICIAN	*943	GROUND	*248	LEAN	*292
CALL	*751	ELEVATION	*196	GUSTING TO	*250	LEFT	*770
CALLING	*155	ELEVEN	11			LEG	*293
CALM	*156	ELEVEN†	*811	H	42	LESS THAN	*294
CANCEL	*664	EMERGENCY	*937	HAIL	*251	LEVEL	*295
CAUTION	*711	ENGINE	*198	HALF	*252	LIGHT	*934

## Computer Interface Option

LIMA	*653	OCLOCK†	*824	REPAIR	*745	TELEPHONE	*438
LINE	*942	OCTOBER	*346	REPEAT	*982	TEMPERATURE	*724
LINK	*998	OF	*694	REPEATER	80	TEN	10
LIST	*296	OFF	*614	RICH	*383	TEN†	*810
LOCK	*297	OH†	*800	RIG	*384	TERMINAL	*440
LONG	*298	OHIO	*348	RIGHT	*665	TEST	*792
LOOK	*957	OHMS	*933	ROAD	*385	-TH(suffix)	*441
LOW	*771	OIL	*350	ROGER	*386	THANK YOU	*978
LOWER	*310	ON	*613	ROMEO	*672	THAT	*442
LUNCH	*311	ONE	01	ROUTE	*388	THE	24
		ONE†	*801	RUNWAY	*390	THE(long e)	*443
M	61	OPEN	94			THE(short e)	*444
MACHINE	84	OPERATION	*352	S	73	THE†	*821
MAINTAIN	*312	OPERATOR	*630	-S(suffix)	*915	THIR-(prefix)	13 or 30
MANUAL	*965	OSCAR	*663	SAFE	*784	THIRD	*447
MARCH	*313	OTHER	*353	SAND	*391	THIRTEEN	*448
MARKER	*314	OUT	*740	SANTA CLARA	*392	THIRTEEN†	*813
MAY	*315	OUTER	*355	SATURDAY	*393	THIRTY†	*830
MAYDAY	*316	OVER	*773	SCATTERED	*394	THIS	*451
ME	*920	OVERCAST	*356	SECOND	*395	THIS IS	65
MEAN	*317			SECONDS	*635	THOUSAND	*644
MEASURE	*970	P	71	SECURITY	*396	THREE	03
MEETING	35	P.M.	*358	SELECT	*397	THREE†	*803
MEGA	*680	PAPA	*671	SEPTEMBER	*398	THUNDERSTORMS	*452
MESSAGES	*625	PARTIALLY	*361	SEQUENCE	*410	THURSDAY	*453
METER	*620	PASS	*774	SERVICE	*723	TIME	44
MICRO	*931	PASSED	*974	SET	*885	TIME†	*822
MIKE	*661	PATCH	*966	SEVEN	07	TIMER	*732
MILES	*322	PATH	*362	SEVEN†	*807	TO	*455
MILL	*971	PER	*364	SEVENTEEN†	*874	TODAY	*456
MILLI	*825	PERCENT	*675	SEVERE	*413	TOMORROW	55
MILLION	*323	PHONE	*914	SEXY	*414	TONIGHT	45
MINUS	*612	PICO	*932	SHORT	*415	TOOL	*985
MINUTES	*645	PLEASE	*967	SHOWERS	*416	TORNADO	*457
MIST	*324	PLUS	*611	SHUT	*765	TOUCHDOWN	*458
MOBILE	*958	POINT	*674	SIDE	*417	TOWER	*460
MODERATE	*326	POLICE	*968	SIERRA	*673	TRAFFIC	*461
MONDAY	*327	POSITION	*780	SIGHT	*418	TRANSMIT	*462
MONTH	*328	POWER	*714	SIX	06	TRIM	*463
MORE THAN	*330	PRACTICE	85	SIX†	*806	TUESDAY	*464
MORNING†	*841	PRESS	*781	SIXTEEN†	*864	TURBULANCE	*465
MOTOR	*972	PRESSURE	*935	SLEET	*423	TURN	*990
MOVE	*973	PRIVATE	*366	SLOPE	*424	TWELVE	12
MUCH	*332	PROBE	*975	SLOW	*983	TWELVE†	*812
		PROGRAMMING	*367	SMOKE	*795	TWENTY	20
N	62	PULL	*980	SNOW	*425	TWENTY†	*820
NEAR	*333	PUSH	*977	SOUTH	*790	TWO	02
NEGATIVE	*334			SPEED	*984	TWO†	*802
NET	25	Q	70	SPRAY	*427	-TY(suffix)	60
NEW	*335	QUEBEC	*670	SQUAWK	*428		
NEXT	*336			STALL	*431	U	82
NIGHT	*337	R	72	START	*730	UNDER	*775
NINE	09	RADIO	*976	STOP	*731	UNIFORM	*682
NINE†	*809	RAIN	*374	STORM	*433	UNIT	*715
NINETEEN†	*894	RAISE	*375	SUNDAY	*434	UNLIMITED	*467
NO	*342	RANGE	*981	SWITCH	*725	UNTIL	*468
NORTH	*772	RATE	*376	SYSTEM	*997	UP	*650
NOT	*695	READY	*783			USE(noun)	*470
NOVEMBER	*662	REAR	*377	T	81	USE(verb)	*471
NUMBER	*734	RECEIVE	*378	TANGO	*681		
		RED	*744	TANK	*435	V	83
O	63	RELEASE	*381	TARGET	*436	VALLEY	*986
OBSCURED	*344	REMARK	*382	TAXI	*437	VALVE	*941
OCLOCK	*345	REMOTE	*910	-TEEN(suffix)	14	VARIABLE	*473

## Computer Interface Option

VERIFY	*475	TWELVE	12	DECEMBER	*181
VICTOR	*683	THIRTEEN	*448	<u>COLORS</u>	
VISIBILITY	*476	THIR-(prefix)	13	GREEN	*762
VOLTS	*750	-TEEN(suffix)	14	RED	*744
		TWENTY	20	YELLOW	*794
W	91	FIF-(prefix)	50	<u>DIRECTIONS</u>	
WAIT	54	HUNDRED	*640	EAST	*754
WAKE	*477	THOUSAND	*644	NORTH	*772
WAKE UP	*478	MILLION	*323	SOUTH	*790
WARNING	*480	-TY(suffix)	60	WEST	*793
WATCH	*481	FIRST	*225	<u>NAMES</u>	
WATTS	*815	SECOND	*395	CHARLIE	*623
WAY	*482	THIRD	*447	DEE	31
WEATHER	95	FOURTH	*234	HENRY	*642
WEDNESDAY	*484			JAY	51
WELCOME	*913	<u>NUMBERS (FEMALE)</u>		JULIET	*651
WEST	*793	OH†	*800	KAYE	52
WHISKEY	*691	ONE†	*801	MIKE	*661
WILL	*912	TWO†	*802	OSCAR	*663
WIND	*487	THREE†	*803	PAPA	*671
WITH	*490	FOUR†	*804	ROMEO	*672
WRONG	*491	FIVE†	*805	VICTOR	*683
		SIX†	*806	<u>MACROS</u>	
X	92	SEVEN†	*807	MACRO 1	*861
X-RAY	*692	EIGHT†	*808	MACRO 2	*862
		NINE†	*809	MACRO 3	*863
Y	93	TEN†	*810	MACRO 4	*852
YANKEE	*693	ELEVEN†	*811	<u>RUN-TIME VARIABLES</u>	
YELLOW	*794	TWELVE†	*812	M/A/E	*844
YESTERDAY	*492	THIRTEEN†	*813	TIME	*872
YOU	*493	FOURTEEN†	*814	AM/PM	*832
YOUR	*987	FIFTEEN†	*854	DATE	*833
		SIXTEEN†	*864	MAIL PRESENT	*994
Z	90	SEVENTEEN†	*874	T. O. PERIOD	*5731
ZED	*988	EIGHTEEN†	*884	# MESSAGES	*5732
ZERO	00	NINETEEN†	*894	VRT	*57xx
ZONE	*494	TWENTY†	*820	<u>CHANGE TYPE</u>	
ZULU	*690	THIRTY†	*830	MORSE	*50
		FORTY†	*840	SPEECH	*51
		FIFTY†	*850	DTMF	*52(digits)
<u>SOUND EFFECTS</u>				PAGER	*53xx
CROWD	*892	<u>DAYS OF THE WEEK</u>		DVR	*55xyz
EXPLOSION	*891	DAYS	*952	EXT. DEVICE	*56x
LASER	*873	SUNDAY	*434		
PHASER	*882	MONDAY	*327		
TIC	*860	TUESDAY	*464		
TOC	*870	WEDNESDAY	*484		
TRAIN	*883	THURSDAY	*453		
WHISTLE	*881	FRIDAY	*237		
		SATURDAY	*393		
<u>NUMBERS (MALE)</u>		<u>MONTHS OF YEAR</u>			
NUMBER	*734	MONTH	*328		
ZERO	00	JANUARY	*282		
OH	63	FEBRUARY	*218		
ONE	01	MARCH	*313		
TWO	02	APRIL	*131		
THREE	03	MAY	*315		
FOUR	04	JUNE	*284		
FIVE	05	JULY	*283		
SIX	06	AUGUST	*135		
SEVEN	07	SEPTEMBER	*398		
EIGHT	08	OCTOBER	*346		
NINE	09	NOVEMBER	*662		
TEN	10				
ELEVEN	11				

## Chapter 4

# ICOM IC-900 Remote Base / Link Support

The ICOM IC-900 band units are supported as an alternative to BCD controllable radios as frequency synthesized remotes and links. Only the ICOM band units are needed - not the fiber optic controller - for a considerable cost savings. The FC-900 Interface from ACC provides the interface between the controller and the band units.

Connections to the FC-900 Interface consist of RB CLK, RB DATA, RB STB, link COS, receive and transmit audio. (PTT control is accommodated as part of the serial data sent to the band units by the controller.) The connection between the FC-900 interface and the IC-900 modules is the daisy-chained multiconductor cable supplied by ICOM.

One or two FC-900 Interfaces, each controlling up to six band units, are supported. One FC-900 Interface may attach to link ports 1 and 2, and a second interface to link ports 3 and 4 if desired.

On each port pair, any two band units may be on at the same time. For example, ports 1/2 could have 10M, 6M, 2M, 220, 440 and 1200 MHz transceivers for remotes, while ports 3/4 might have 430 MHz and 1200 MHz transceivers as synthesized links. Ports 1/2 could have the 10M and 2M remotes up, while 430 and 1200 MHz links are up on ports 3/4.

The link / remote base User commands are supplemented to allow for assignment of the desired band unit to the port.

(Remote Base prefix) 1x	Link / Remote Base 1 Band Unit Assignment
(Remote Base prefix) 4x	Link / Remote Base 2 Band Unit Assignment
(Remote Base prefix) 7x	Link / Remote Base 3 Band Unit Assignment
(Remote Base prefix) *x	Link / Remote Base 4 Band Unit Assignment

x = 0	1240-1249.995 MHz, simplex or $\pm 12$ MHz offset
1	10M (29-29.995 MHz), simplex or $\pm 100$ kHz offset
2	2M (144-147.995 MHz), simplex or $\pm 600$ kHz offset
3	220-224.995 MHz, simplex or $\pm 1.6$ MHz offset
4	440-449.995 MHz, simplex or $\pm 5$ MHz offset
5	430-439.995 MHz, simplex or $\pm 5$ MHz offset
6	6M (50-53.995 MHz), simplex or $\pm 1$ MHz offset
7	420-429.995 MHz, simplex or $\pm 5$ MHz offset
8	1280-1289.995 MHz, simplex or $\pm 12$ MHz offset
9	1290-1299.995 MHz, simplex or -20 MHz offset
*	Off

Additional installation and operation information is available with the FC-900 Interface documentation.





## Chapter 5

# Rotor Control Interface

The RC-850 Repeater Controller with V3.5 software may control an antenna rotor through the RCB-2 Rotor Control Board interfaced to a Hygain/Telex CD-45-II, HAM IV or T<sup>2</sup>X Rotor System control unit. The rotor control board mounts inside the rotor's control unit and simulates operation of the clockwise, counter clockwise, and brake switches in response to Touch-Tone commands sent to the controller. The control unit remains available for normal use locally when the RC-850 controller is not being used. The RC-850 controller software is set up for north center.

Commands available through the controller include rotate clockwise (right), rotate counter clockwise (left), stop, interrogate direction, rotate to a particular direction in degrees, and "budge" clockwise or counter clockwise. The controller always knows the direction of the rotor by measuring the potentiometer voltage from the control unit. An adjustable delay on the board keeps the brake released for several seconds to allow the rotor to coast to a stop.

Use of the Rotor Control Board requires giving up the controller's Power Amplifier remote control output, UF6 / Link 4 PTT output, and VRT analog channel 14, which become dedicated to support of the RCB-2. These signals become RCB-2 signals when an RCB command code prefix is defined using a Programming command (i.e., not an empty prefix). Note that the Link 4 PTT output is not needed for support of Link 4 when an FC-900 Interface to the ICOM IC-900 modules is used.

A command code prefix must be programmed for the RCB operation. Use Programming command \*5023(prefix) to define a command code prefix for the RCB commands. Be careful to avoid conflicts with existing command codes.

**Note:** The Rotor Control Board support is completely independent of the direction information set using the "(Remote Base prefix) 8 (0-360)" command, supplied as part of the serial data stream at RB DATA and RB STROBE. The RCB responds only to manual commands, and is not affected by direction information stored in link memories or macro sets.

### Installing the Rotor Control Board

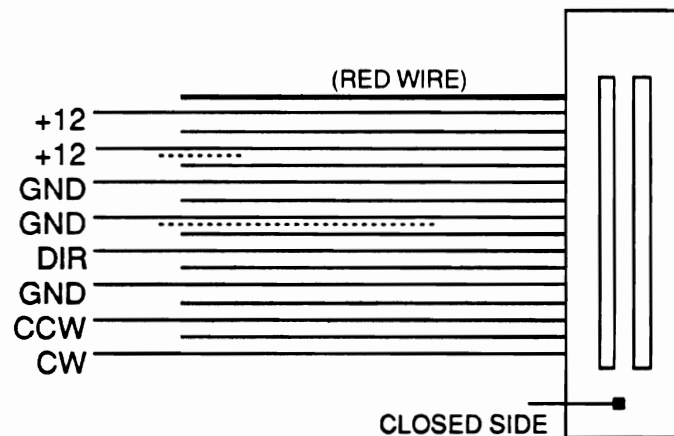
The RCB-2 board is designed to mount inside the bottom of the control unit. *Unplug the control unit from the ac line.* Remove the mounting hardware for the smaller of the two transformers and mount the rotor control board using the spacers and screws supplied with it. Position the board so that the card edge connector is oriented toward the back of the control unit. Wire the points from the RCB-2 to points inside the rotor control unit as follows:

## Computer Interface Option

"2"	CW and CCW switches common terminal, to rear panel terminal 2
"5"	CW switch terminal, to rear panel terminal 5
"6"	CCW switch terminal, to rear panel terminal 6
"3 or 7"	"15" on p.c. board, to rear panel terminal 3
"GND"	Ground lug on top at small transformer
"110V"	Brake release switch terminals (two wires)

Several signals must be connected from the RCB-2 to the controller. In addition, a +12 volt supply voltage must be obtained. These signals appear at the RCB-2 card edge connector which mates to the supplied ribbon cable. Prepare the ribbon cable as shown below. Note that every other lead carries a signal. The cable will be folded at a 90° angle near the connector and will be brought out the back of the control unit. Provide some means of insulation so that the ribbon wire is not pinched by the metal back. The connector should be plugged into the board with the cable exiting the connector away from the chassis, although plugging it in wrong will not cause any harm (it just won't work).

Prepare the end of the ribbon cable and make the connections to the RC-850 controller logic and analog connectors. Obtain +12 volts directly from your 12 volt supply. You may partially peel away the ribbon wire pair carrying the 12 volts and ground if they need to go in another direction.



"CW"	Digital I/O connector pin 10 (UF6)
"CCW"	Digital I/O connector pin 5 (PA)
"GND"	Analog connector pin 14
"DIR"	Analog connector pin 5 (channel 14)
"GND"	To 12 volt power supply ground
"+12V"	To 12 volt power supply, minimum 100 mA capacity

The RCB-2 Rotor Control Board will now allow you to control your antenna rotor through the RC-850 controller.

## Adjustments

Two pots on the RCB-2 board allow calibration of the rotor direction voltage and adjustment of the brake release time.

First calibrate the rotor control unit as described in the manual, independent of the RCB-2. Now turn the rotor using the control unit switches to exactly 90 degrees as indicated on the meter. Read back the direction through the controller by entering the Rotor Control Prefix. Adjust pot R101 on the rotor control board for a speech readback of 90 degrees. Turn the rotor using the controller commands "[Rotor Control Prefix] 1" (left) or "[Rotor Control Prefix] 3" (right). Stop with "[Rotor Control Prefix] 2". Notice that when stopping, the brake relay hangs in for a period of time (you should be able to hear the second relay drop out). Adjust pot R102 for the desired hang time - typically two or three seconds - which should depend on the size of the antenna array you're rotating.

## Commands

The RC-850 controller controls the rotor through several Touch-Tone commands. They include:

<b>Left (ccw)</b>	<b>[Rotor Control Prefix] 1</b>
<b>Right (cw)</b>	<b>[Rotor Control Prefix] 3</b>
<b>Stop</b>	<b>[Rotor Control Prefix] 2</b>
<b>Budge Left (ccw)</b>	<b>[Rotor Control Prefix] 4</b>
<b>Budge Right (cw)</b>	<b>[Rotor Control Prefix] 6</b>
<b>Go to direction</b>	<b>[Rotor Control Prefix] (degrees - 0-360)</b>
<b>Interrogate</b>	<b>[Rotor Control Prefix]</b>

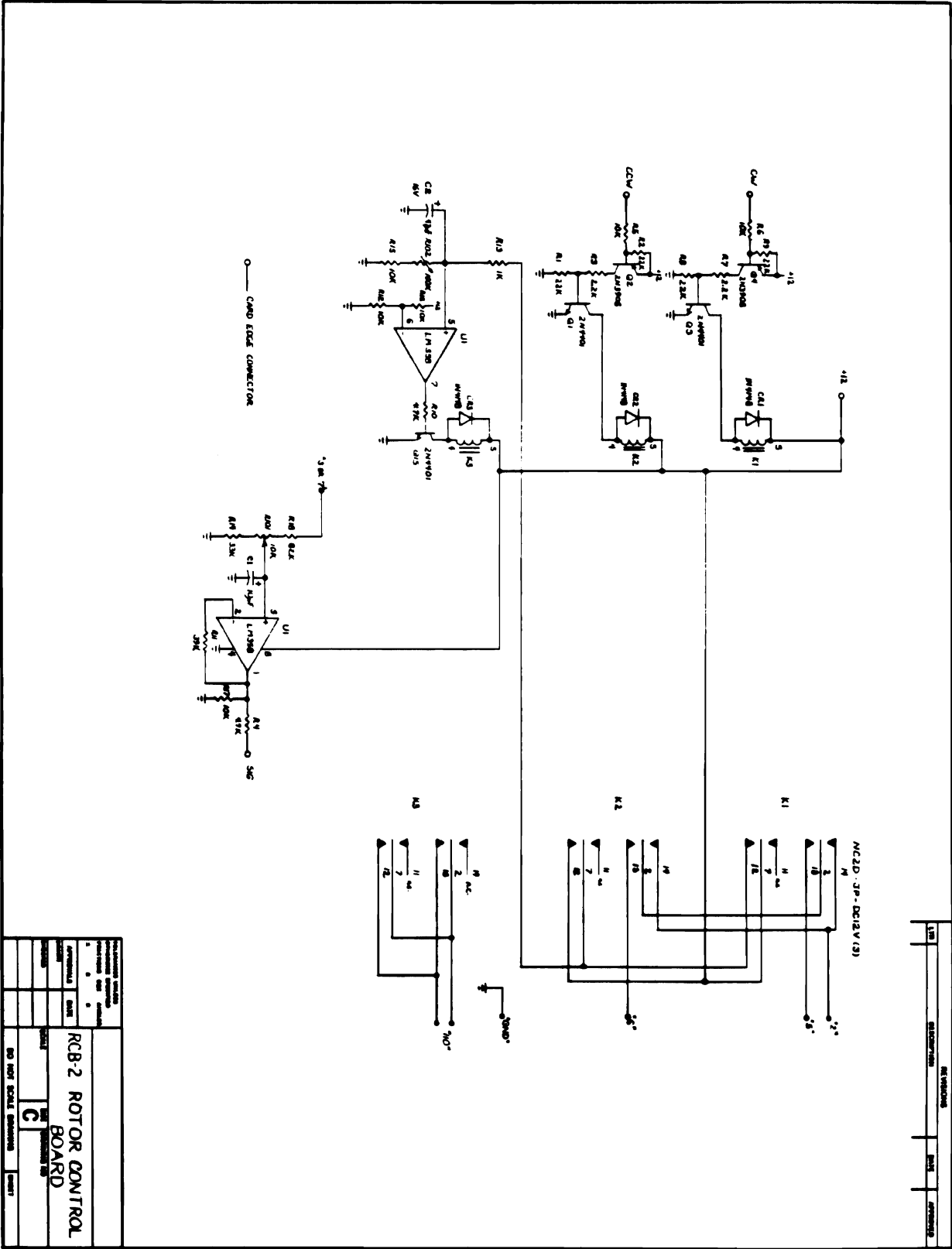
The Left and Right commands cause the rotor to turn continuously until stopped. The RC-850 stops the rotor automatically at approximately 195 degrees when turning left, and 165 degrees when turning right, to prevent excessive twisting when the rotor hits the stopper. The Stop command may be entered at any time.

The Budge Left and Budge Right commands apply power to the rotor for a half second to cause the rotor to turn slightly in either direction. After coasting, the RC-850 reads back the new rotor direction.

The Go command causes the rotor to turn to a particular direction specified in the command. Directions from 165 to 195 are ignored by this command since they are dangerously near the ends. When the desired direction is reached, the actual direction measured is spoken by the RC-850. There may be a small error because the rotor will coast for a short time after power is removed. The RC-850 intentionally "undershoots" by about eight degrees to allow for coasting. While rotating in response to the Go command, other Touch-Tone commands may not be sent to the RC-850.

The Interrogate command causes the RC-850 to read back the current rotor direction. In addition, it reads back "Right" or "Left" if the rotor is currently turning.

Schematic



(Rotor Control Board)



## Chapter 6

# V3.5 New Command Code Summary

## Programming Commands

### Timers

- \*4029(seconds) Serial Port 1 Control Timer
- \*4030(seconds) Serial Port 2 Control Timer

### Auxiliary Touch-Tone Decoder Command Channels

- \*5411x Assign Auxiliary Decoder #1
- \*5412x Assign Auxiliary Decoder #2

Channel	0 = phone	3 = Link / RB 3
	1 = Link / RB 1	4 = Link / RB 4 / Control Receiver
	2 = Link / RB 2	5 = Not used

### Rotor Control Board Command Prefix

- \*5023(prefix)

### Command Log Filter

- \*5420 Disable logging of all commands
- \*5421xx Enable logging of command xx

<u>xx</u>	<u>Command</u>
00	Unlock
01	Control Op (air)
14	Control Op (phone)
05	Primary Autopatch
16	Secondary Autopatch
17	Tertiary Autopatch
03	Primary Emergency Autodialer
18	Secondary Emergency Autodialer
04	User Loadable Autodial Bank 0
19	User Loadable Autodial Bank 1
29	User Loadable Autodial Bank 2
07	User Loadable Autodial Bank 0 L/E
20	User Loadable Autodial Bank 1 L/E
30	User Loadable Autodial Bank 2 L/E
13	Patch Utility P (rp answer, custom hu, duplex, cover, timer extend)
21	Patch Utility Q (redial, hookflash)
11	Reverse Patch Activate
22	Patch/Spare 1 Hangup, Lock
23	Rotor Control
02	User Function Remote Control
06	Link / Remote Base
15	Paging
12	Spare Audio 1 On
10	Demo Message / Bulletin Board

25 Mailbox  
 09 Voice Response Telemetry  
 08 Touch-Tone Access Up/Down  
 26 Touch-Tone Pad Test  
 27 User Mapped Control Op  
 28 Individual User Access Code

## Control Operator Commands

NA	254	444	724	984	+Don't Answer Next Time
S1E	271	461	741	001	Enable Control From Serial Port 1
S1D	272	462	742	002	Disable Control From Serial Port 1
S2E	273	463	743	003	Enable Control From Serial Port 2
S2D	274	464	744	004	Disable Control From Serial Port 2
CCL	275	465	745	005	†Clear Command Log

## User Commands

### Rotor Control (RCB-2 Board)

(Rotor Control prefix) 1	Rotate Left
(Rotor Control prefix) 2	Stop
(Rotor Control prefix) 3	Rotate Right
(Rotor Control prefix) 4	Bump Left
(Rotor Control prefix) 6	Bump Right
(Rotor Control prefix)	Direction Interrogate
(Rotor Control prefix) xxx	Go to Direction xxx

## Appendix I Screen Examples

Computer terminal screen displays are shown below in this font. Commands entered by the user **are in this font**. Each line entered by the user should be terminated by a carriage return. Commands may be entered in either upper or lower case after the prompt character >.

### Menu

There are two forms of the menu available at any time when entering carriage return - the short form and the long form. The short form just says "de [the repeater callsign]". The long form includes additional information, and displays the commands available.

Each form of the menu includes your repeater callsign which you program with the T command, described in detail later.

This is the short form of the menu:

```
de [the repeater callsign]
>
```

In other words, with the repeater callsign having been loaded with the T command, the short menu might look like this:

```
de WA6AXX 440 Repeater
>
```

Note that before a callsign is loaded using the T CALL <callsign> command, as will be the case when you first fire up the Computer Interface, the short menu will look like this:

```
de
>
```

Program your repeater's callsign into the controller by entering the following command. Control must be enabled from the serial port (Touch-Tone command [COP prefix]271 for serial port 1, assuming Control Op root set #1). The T command will take several seconds to execute, since the text callsign is being programmed into your controller's E<sup>2</sup>PROM.

```
>t call WA6AXX 440 Repeater
```

```
de WA6AXX 440 Repeater
>
```

The long form of the menu may be selected by entering the Short/Long Menu command, X. This is the long menu when control is not enabled from the serial port:



## Computer Interface Option

```
de WA6AXX 440 Repeater
>x
de WA6AXX 440 Repeater : Date 880830 Time 1356      1 active message(s)
Messages: L - List, S - Send, K - Kill
Files:    W - What, D - Download
Misc:     X - Short/Long menu, I - Information, H - Help

>
```

The date is given in yymmdd format, along with time in military format. The number of messages in the mailbox is indicated.

The List, Send and Kill commands relate to the electronic mailbox.

The What command causes the list of downloadable files to be displayed, and the Download command is used to download these files.

The Short/Long menu command toggles the menu form between the short and long form, as described above. The Information command causes a programmable text message to be displayed. The Help command displays on-line help messages about the various commands.

When control is enabled from the serial port (via the Enable Control From Serial Port command entered from a Touch-Tone channel), the long menu looks like this:

```
de      : Date 880830 Time 1347      1 active message(s)
Messages: L - List, S - Send, K - Kill
Files:   W - What, D - Download
Control: C - Command entry, T - Text message entry
         P - Print a programmable message
         E - Edit a programmable message
         A - Autodial number print/load/erase
         F - Front Panel display
Misc:    X - Short/Long menu, I - Information, H - Help

>
```

The additional "Control" commands are available only when control is enabled from the serial port.

The Command entry command allows any Touch-Tone command to be entered from the terminal, with a text response message displayed on the terminal screen. The Text message entry command allows defining certain text messages associated with the BBS, including the repeater callsign, VRT channel descriptions, and others. The Print command allows any programmable message in the controller (IDs, tail messages, etc.) to be printed as text on the terminal display. The Edit command allows these messages to be edited by typing the words themselves rather than vocabulary codes. The Autodial command allows programming autodial

## Computer Interface Option

numbers from the terminal. The Front Panel command presents a display of the controller's front panel on the screen.

Toggle between the short and long form of the menu at any time by entering **x**. When the long form of the menu is selected, the Control commands are listed only when control is enabled from the serial port. If a control command is entered when control is not enabled, a message is sent indicating that control is not enabled.

```
de WA6AXX 440 Repeater
>x
```

```
de WA6AXX 440 Repeater : Date 880830 Time 1353      0 active message(s)
Messages: L - List, S - Send, K - Kill
Files:    W - What, D - Download
Misc:     X - Short/Long menu, I - Information, H - Help
```

```
>f
```

Control not enabled from this port.

```
de WA6AXX 440 Repeater : Date 880830 Time 1353      0 active message(s)
Messages: L - List, S - Send, K - Kill
Files:    W - What, D - Download
Misc:     X - Short/Long menu, I - Information, H - Help
```

```
>x
```

```
de WA6AXX 440 Repeater
>
```

### Help

On-line help messages are available by typing **H**, or **H** and the letter representing the command that you'd like help with. **HH** gives help messages for all commands.

Below is the text of the Help file, printed here for your convenience. It may be displayed by typing **HH**, or by downloading the help file (**D HELP.TXT**).

```
>hh
```

```
(H)elp
```

Help on any command may be requested by entering 'Hx'.

```
Arguments [x] - [L]ist, [S]end, [K]ill, [W]hat, [D]ownload,
[C]ommand entry, [T]ext message entry,
[P]rint a programmable message, [E]dit a programmable message,
[A]utodial number print/load/erase,
[F]ront Panel display,
[X]Short/Long menu, [I]nformation, [H]elp All.
```

```
(L)ist
```

List mailbox messages in the repeater. These mailbox messages were entered either through the voice port or computer port.

```
(S)end
```

Send a mailbox message to the voice repeater.

## Computer Interface Option

Arguments - recipient callsign, sender callsign, message number.

Example: For WA6AXX to send mailbox message number 2 to WB6KHP ...

S WB6KHP WA6AXX 2.

The recipient and sender callsigns must be stored in the controller's non-volatile memory by the repeater owner to be recognized. To see the available messages to be sent [messages 0-9], download [D] MAILMSG.S.TXT.

(K)ill

Kill mailbox messages destined for a user.

Argument - callsign of the user.

Example: For WA6AXX to kill his mailbox messages ... K WA6AXX.

(W)hat

What repeater controller files are available for Download.

See Download.

(D)ownload a file FROM the repeater.

Argument - Name of file to download.

Example: To download the meter reading file ... D METER.RDG.

See What.

File downloading may be frozen by entering <cntl>S and resumed by entering <cntl>Q, and may be aborted by entering <cntl>P.

(C)ommand

Enter a Touch-Tone equivalent command from the keyboard.

Argument [x] - Touch-Tone digits. The command is acted on by the controller and the command response is sent to the terminal as text.

Example: Command User Function 1 high ... C 911

(T)ext message

Program a text message into the controller.

Arguments

[x] - The name of the text message, including:

MBM0-MBM9 - Text equivalent of mailbox messages

(MBM0-2 15 chars, MBM3-8 23 chars, MBM9 31 chars)

INFO1-INFO8 - Lines 1-8 of [I]nformation message (63 chars)

(all lines must be programmed and will be displayed)

VRT1-VRT16 - VRT channel description for METER.RDG (15 chars)

CALL - Repeater callsign for menus and headings (19 chars)

BATCH1-BATCH2 - Text sent by the controller on reset to initialize modem, etc. (15 chars)

[y] - The text string, which should be limited to the number of characters indicated above.

Example: To define VRT channel 15 as internal temperature ...

T VRT15 internal temp.

(P)rint

Print a remotely programmable controller message by entering 'Px'.

Argument [x] - message name. Download [D] MSGNAMES.TXT for the names of messages stored in the controller.

(E)dit

Edit a remotely programmable controller message by entering 'Ex'.

Argument [x] - message name. Download [D] MSGNAMES.TXT for the names of messages stored in the controller.

## Computer Interface Option

The controller responds with a \* prompt, rather than the normal > prompt. At the \*, type the words, letters and tokens which make up the programmable message. Download [D] WORDLIST.TXT for the words and tokens which are recognized by the controller. If the entire message does not fit on a line, terminate the line with % to tell the controller that the message continues on the next line.

Example: To program the Special ID ...

>E SPID

\*THISIS THE NUMBER 1 REPEATER IN THE AREA PAUSE W A 6 A X X %

\*ON 2 TWENTY 4 POINT 6 8 MEGA HERTZ <MORSE> 7 3

>

(A)utodial number print/load/erase

Print, load, or erase Autodial numbers.

Print - A [x] x=autodial slot 0-249

Load - A [x][y] x=autodial slot, y=telephone number

Erase - A E [x] x=autodial slot 0-249

Example: Load autodial slot 39 with 253-8085

>A E 39

Slot erased.

>A 39 2538085

>A 39

2538085

>

(F)ront Panel

Display the controller's front panel.

The display resembles the LED panel on the controller, and is enhanced with some additional information.

See the manual for an explanation of the abbreviations used.

(X) Short/Long Menus

Toggle between short and long form of the menu. The long form includes Control commands only when control is enabled from this port.

(I)nformation

Display "canned" informational message about the system loaded by the system operator.

## Mailbox

Electronic mailbox messages may be exchanged between the voice repeater channel and the serial ports. From the terminal, messages may be listed, sent, and killed using the L, S, and K commands. It isn't necessary to know the callsign slot numbers of the users, since entry and listings are based on callsigns - not slot numbers. The callsign slots must contain just the user callsign, without pager memories, sound effects, or other words.

The text of the message is displayed in the last column. The text is intended to be a parallel of the speech message stored in the canned mailbox messages 0-9. In order to allow the displayed text to be formatted and spelled properly, it is programmed independent of the speech message. Program the text equivalent of each mail speech message using the T

## Computer Interface Option

command. For example, if the mailbox message 3 is programmed as a synthesized speech message "c u tomorrow", program mailbox *text* message 3 as "See you tomorrow".

>1

Sorry, no messages.

de WA6AXX 440 Repeater

>s nu6p wa6axx 0

To	From	Date	Time	Message
NU6P	WA6AXX	TODAY	01:55pm	Pse call me.(0)

de WA6AXX 440 Repeater

>1

To	From	Date	Time	Message
NU6P	WA6AXX	TODAY	01:55pm	Pse call me.(0)

de WA6AXX 440 Repeater

>x

de WA6AXX 440 Repeater : Date 880830 Time 1356 1 active message(s)  
Messages: L - List, S - Send, K - Kill  
Files: W - What, D - Download  
Misc: X - Short/Long menu, I - Information, H - Help

### Downloading Files

Several files are available to be downloaded from the controller. The names of the files may be viewed with the What command.

de WA6AXX 440 Repeater

>w

ACTIVITY.RDG	AUTODIAL.TXT	CALLSIGN.TXT
COMMAND.LOG	E2PROM.HEX	HELP.TXT
MAILMSG.S.TXT	METER.RDG	MSGNAMES.TXT
MINMAX.RDG	WORDLIST.TXT	

de WA6AXX 440 Repeater

>

Descriptions of each downloadable file follow.

**ACTIVITY.RDG** - The readings of VRT channels 25-32.

>d activity.rdg

REPEATER ACTIVITY READINGS - 880830 1350  
Chnl Total Description

(25)	298	repeater receiver keyups (clear ch. 57)
(26)	108	minutes of repeater activity (clear ch. 58)
(27)	3	phone patches (clear ch. 59)
(28)	4	mailbox accesses (clear ch. 60)
(29)	29	command entries (clear ch. 61)
(31)	0	seconds of timed out period (clear ch. 63)
(32)	0	message(s) in the mailbox (clear ch. 64)

## Computer Interface Option

**AUTODIAL.TXT** - The Emergency and User Loadable autodial numbers. Empty autodial slots are not listed.

```
>d autodial.txt
EMERGENCY
(00) 0
(01) 5551212
(04) 411
(06) 611
(07) 8005551212
(08) 7678900
(09) 911
USER BANK 0
(20) 5552020
(40) 7273330
(41) 2538085
(42) 3582999
(43) 5551213
(44) 9761234
USER BANK 1
(01) 5551234
(02) 5552345
USER BANK 2
(01) 5553456
(02) 5554567
```

**CALLSIGN.TXT** - The callsigns stored in the controller for use with the reverse patch and mailbox. Empty callsign slots are not listed.

```
>d callsign.txt
(00) <speech> W A 6 A X X
(01) <speech> W B 6 K H P
(02) <speech> N U 6 P
(03) <speech> N 6 Q Y U
(38) <speech> TRAIN SMOKE TEST EXPLOSION EXPLOSION EXPLOSION
(39) <speech> N 6 H W L
(99) <speech> N 6 P P Y
```

```
de WA6AXX 440 Repeater
>
```

**COMMAND .LOG** - The contents of the command log. The controller stores information about the commands entered from all ports. Only desired commands are logged, as specified by the Command Log Filter programming commands. The selective logging reduces the size of the file to be downloaded by only storing commands of interest. For example, it may be desirable to log Control Op commands, patches, and link activity but nothing else. Lock and unlock commands may be logged, but programming commands entered during an unlocked period cannot be logged.

Each entry of the command log contains the name of the command, the time entered (military time), the command channel it was entered through, and the digits following the command prefix.

## Computer Interface Option

The command names are abbreviated (i.e. COPA = Control Op over the air, HU = hang up or lock, PAP = primary autopatch, etc.). The command channels include RX (repeater receiver), L1-L4 (link channels), PH (phone), LM (local mic), S1-2 (serial ports 1 or 2), and A1-2 (auxiliary DTMF decoders 1 or 2). The arguments are the digits following the command prefix. For example, following a COP prefix, the argument would be the root code. Following an autopatch prefix, the argument would be the phone number. Following an emergency autodial, the argument would be the autodial location.

```
>d command.log
REPEATER COMMAND LOG - 880830 1352
Cmd Time Ch Arguments
-----
***DATE000000***
***DATE880829***
UL 1527 A1
HU 1529 A1
HU 1529 A1
COPA 1732 A1 254
COPA 1732 A1 271
HU 1732 A1
COPA 1925 S1 187
COPA 1925 S1 120
COPA 1931 S1 054
COPA 1933 S1 130
***DATE880830***
COPA 1331 A1 254
HU 1331 A1
COPA 1335 RX 271
COPA 1337 S1 031
COPA 1345 A1 254
COPA 1345 A1 271
HU 1345 A1

de WA6AXX 440 Repeater
>
```

**E2PROM** .HEX - The contents of the E<sup>2</sup>PROM in Intel hex format. This file is intended to be used with an IBM PC compatible program to be available from ACC which will allow printout of complete Programming Sheets based on the contents of this file.

**HELP** .TXT - The entire Help file. See the Help section earlier in this manual for a complete listing.

**MAILMSG** .TXT - The mailbox text messages, programmed with the T command, paralleling the stored speech mailbox messages 0 - 9.

## Computer Interface Option

```
>d mailmsgs.txt
Call me.(0)
Call me tonite.(1)
Call me at home.(2)
Call me at ... (3)
Cancel our meeting.(4)
See you at the meeting.(5)
(6)
(7)
(8)
The meeting tomorrow is at 9 pm.(9)

de WA6AXX 440 Repeater
>
```

**METER** .RDG - The current values of VRT channels 1-16. Text messages providing a description of each channel may be defined using the T command. Only those VRT channels which are assigned a meter type are displayed.

```
>d meter.rdg
ANALOG METER READINGS - 880830 1351
Ch Reading Description
-----
(1) S9+
(3) 15.6 Volts
(4) North
(5) 31 Watts
(6) 7 Watts
(7) 1.9 Watts
(8) 3.1 Watts
(9) 7.6 Watts
(10) 100
(11) 15.9 Amps
(12) 15.9 Amps
(15) 115 degrees int. temp.
(16) 13.5 Volts int. volt.

de WA6AXX 440 Repeater
>
```



## Computer Interface Option

**MSGNAMES.TXT** - The names of the remotely programmable messages available to be printed using the Print a programmable message command. This is a "memory jogger" file, and specifies the exact name of the messages.

```
>d msgnames.txt
*** REMOTELY PROGRAMMABLE CONTROLLER MESSAGE NAMES ***
/IDs/ qst iid1...iid3,fid,aid,pid1,pid2,pida...pide,spid,ttid,pgid,phid
/TAIL MESSAGES/ tm1,tm2,tm3,tm40...tm49
/TIMEOUTS/ repeater time out,repeater time out cancel,time out alert
/COVER TONES (TT AND PATCH)/ ttct,pct
/EMERGENCY AUTODIAL/ ade0...ade9
/PATCH UP, PHONE ANSWER AND HANGUP/ ap up,adu up,phan,hang
/ANTIDIAL, RP CALL FOR/ anti,rpc4 /PHONE NUMBER MACROS/ ma mb mc
/PATCH DIALING PREFIXES (PRIM.,SEC.,TERT.)/ ppre,spre,tpre
/AREA CODES/ area code l,area code j,area code pl...area code p3
/UF OUTPUTS/ uf1 high...uf8 high,uf1 low...uf8 low,ufb1,ufb2
/COURTESY TONES/ ct1 ... ct13
/LINK/RB NAMES/ ll...l4
/LINK/RB FREQ. PREFIXES/ remote lp,remote 2p
/LINK 1 AND 2 MEMORY NAMES/ llnl ... lln7,l2nl ... l2n7
/LEADING 1 OVERRIDE/ ld over
/MAILBOX MESSAGES/ mbm0...mbm9 /MAIL PRESENT MESSAGE/ mail
/BULLETIN BOARD MESSAGES/ bl...b5 /DEMO TAG/ demo
/PAGER PROMPT/ ppro /ALARM/ all...al4
/GENERIC COP RESPONSE/ copr /MESSAGE MACROS/ m1...m4
/TOUCH-TONE PAD TEST RESPONSES/ pad
/SCHEDULER CHANGEOVER, EVENT MESSAGES/ changeover,e1...e5

de WA6AXX 440 Repeater
>
```

**MINMAX .RDG** - The stored min and max readings of VRT channels1-16.

```
>d minmax.rdg
ANALOG METER MIN/MAX READINGS - 880830 1351
Ch Max Reading Date/Time Min Reading Date/Time
-----
(1) S9+ 0000 880101 S9+ 0400 880823
(3) 15.9 Volts 0000 880101 7.4 Volts 0002 880101
(4) North 0000 880101 South 0002 880101
(5) 31 Watts 0000 880101 5 Watts 0002 880101
(6) 7 Watts 0000 880101 0 Watts 0002 880101
(7) 1.9 Watts 0000 880101 0.9 Watts 0730 880824
(8) 3.9 Watts 0000 880101 2.0 Watts 0400 880823
(9) 7.9 Watts 0000 880101 4.3 Watts 0730 880824
(10) 100 0000 880101 97 0730 880829
(11) 15.9 Amps 0000 880101 12.7 Amps 0830 880829
(12) 15.9 Amps 0000 880101 13.2 Amps 0730 880824
(15) 118 degrees 1421 880825 66 degrees 0436 880824
(16) 13.7 Volts 0040 880101 12.7 Volts 1749 880823
```

## Computer Interface Option

**WORDLIST.TXT** - The list of synthesized speech vocabulary words available to be used with the Edit programmable messages command.

>d wordlist.txt

\*RTVS\* (TIME) (DATE) (AM/PM) (M/A/E) (MAILPRESENT)  
\*MACROS\* MACRO1 MACRO2 MACRO3 MACRO4  
\*TYPES\* <SPEECH> <MORSE> <DVR> <VRT> <PAGER> <EXT>  
\*MALE NUMBERS\* 0 OH 1 2 3 4 5 6 7 8 9 10 11 12 13 20 THIR-  
-TEEN FIF- -TY HUNDRED THOUSAND MILLION FIRST SECOND THIRD FOURTH  
\*FEMALE NUMBERS\* 0/F OH/F 1/F 2/F 3/F 4/F 5/F 6/F 7/F 8/F 9/F  
10/F 11/F 12/F 13/F 14/F 15/F 16/F 17/F 18/F 19/F 20/F 30/F  
40/F 50/F  
\*A\* A.M. A.M./F ABORT ABOUT ABOVE ACKNOWLEDGE ACTION ADJUST ADVANCED  
ADVISE AERIAL AFFIRMATIVE AFTERNOON/F AIR AIRPORT ALERT ALL ALOFT  
ALPHA ALTERNATE ALTIMETER ALTITUDE AMATEUR AMPS AND ANSWER APRIL  
ARE AREA ARRIVAL AS AT AUGUST AUTO AUTOMATIC AUTOPILOT AUXILIARY  
\*B\* BAND BANK BASE BATTERY BE BEE BELOW BETWEEN BLOWING BOARD BOOST  
BOZO BRAKE BRAVO BREAK BROKEN BUTTON BY  
\*C\* CABIN CALIBRATE CALL CALLING CALM CANCEL CAUTION CEILING CENTER  
CHANGE CHARLIE CHECK CIRCUIT CLEAR CLIMB CLOCK CLOSED CLUB CODE COME  
COMPLETE COMPUTER CONDITION CONGRATULATIONS CONNECT CONTACT CONTROL  
CONVERGING COUNT COURSE CRANE CROSSWIND CROWD CURRENT CYCLE  
\*D\* DANGER DAYS DAYTON DAZE DECEMBER DECREASE DECREASING DEGREES DELTA  
DEPARTURE DEVICE DIAL DINNER DIRECTION DISPLAY DOOR DOWN DOWNWIND DRIVE  
DRIZZLE DUST  
\*E\* EAST ECHO -ED EIGHT EIGHT/F EIGHTEEN/F ELECTRICIAN ELEVATION ELEVEN  
ELEVEN/F EMERGENCY ENGINE ENTER EQUAL -ER ERROR ESTIMATED EVACUATE  
EVACUATION EVENING/F EXIT EXPECT EXPLOSION EYE  
\*F\* FAIL FAILURE FARAD FARENHEIT FAST FEBRUARY FEET FIFTEEN/F FIFTY/F  
FILED FINAL FIRE FIRST FIVE FIVE/F FLAPS FLIGHT FLOW FOG FOR FORTY/F  
FOUR FOUR/F FOURTEEN/F FOURTH FOXTROT FREEDOM FREEZING FREQUENCY FRIDAY  
FROM FRONT FULL  
\*G\* GALLONS GATE GAUGE GEAR GEE GET GLIDE GO GOLF GOOD/F GREEN GROUND  
GUSTINGTO  
\*H\* HAIL HALF HAM HAMFEST HAMVENTION HAVE HAZARDOUS HAZE HEAVY HELP HENRY  
HERTZ HIGH HOLD HOME HOTEL HOUR HOURS HUNDRED  
\*I\* ICE ICING IDENTIFY IGNITE IGNITION IMMEDIATELY IN INBOUND INCH  
INCREASE INCREASINGTO INDIA INDICATED INFLIGHT INFORMATION -ING INNER  
INSPECTOR INTRUDER IS IS/F IT  
\*J\* JANUARY JULIET JULY JUNE  
\*K\* KEY KILO KNOTS  
\*L\* LAND LANDING LASER LATE LAUNCH LEAN LEFT LEG LESSTHAN LEVEL LIGHT  
LIMA LINE LINK LIST LOCK LONG LOOK LOW LOWER LUNCH  
\*M\* MACHINE MAINTAIN MANUAL MARCH MARKER MAY MAYDAY ME MEAN MEASURE MEETING  
MEGA MESSAGES METER MICRO MIKE MILES MILL MILLI MILLION MINUS MINUTES MIST  
MOBILE MODERATE MONDAY MONTH MORETHAN MORNING/F MOTOR MOVE MUCH  
\*N\* NEAR NEGATIVE NET NEW NEXT NIGHT NINE NINE/F NINETEEN/F NO NORTH NOT  
NOVEMBER NUMBER  
\*O\* OBSCURED OCLOCK OCLOCK/F OCTOBER OF OFF OH OH/F OHIO OHMS OIL ON ONE  
ONE/F OPEN OPERATION OPERATOR OSCAR OTHER OUT OUTER OVER OVERCAST  
\*P\* P.M. P.M./F PAPA PARTIALLY PASS PASSED PATCH PATH PAUSE PER PERCENT  
PHASER PHONE PICO PLEASE PLUS POINT POLICE POSITION POWER PRACTICE PRESS  
PRESSURE PRIVATE PROBE PROGRAMMING PULL PUSH  
\*Q\* QUEBEC  
\*R\* RADIO RAIN RAISE RANGE RATE READY REAR RECEIVE RED RELEASE REMARK

## Computer Interface Option

REMOTE REPAIR REPEAT REPEATER RICH RIG RIGHT ROAD RODE ROGER ROMEO  
ROUTE RUNWAY  
\*S\* -S SAFE SAND SANTA CLARA SATURDAY SCATTERED SECOND SECONDS SECURITY  
SEE SELECT SEPTEMBER SEQUENCE SERVICE SET SEVEN SEVEN/F SEVENTEEN/F  
SEVERE SEXY SHORT SHOWERS SHUT SIDE SIERRA SIGHT SIX SIX/F SIXTEEN/F  
SLEET SLOPE SLOW SMOKE SNOW SOUTH SPEED SPRAY SQUAWK STALL START STOP  
STORM SUNDAY SWITCH SYSTEM  
\*T\* TANGO TANK TARGET TAXI -TEEN TELEPHONE TEMPERATURE TEN TEN/F  
TERMINAL TEST -TH THANKYOU THAT THE THE (LONGE) THE (SHORTE) THE/F THIR-  
THIRD THIRTEEN THIRTEEN/F THIRTY/F THIS THISIS THOUSAND THREE THREE/F  
THUNDERSTORMS THURSDAY TIC TIME TIME/F TIMER TO TOC TODAY TOMORROW  
TONIGHT TOO TOOL TORNADO TOUCHDOWN TOWER TRAFFIC TRAIN TRANSMIT TRIM  
TRUE TUESDAY TURBULANCE TURN TWELVE TWELVE/F TWENTY TWENTY/F TWO TWO/F  
\*U\* UNDER UNIFORM UNIT UNLIMITED UNTIL UP USE (NOUN) USE (VERB)  
\*V\* VALLEY VALVE VARIABLE VERIFY VICTOR VISIBILITY VOLT  
\*W\* WAIT WAKE WAKEUP WARNING WATCH WATTS WAY WEATHER WEDNESDAY WELCOME  
WEST WHISKEY WHISTLE WHY WILL WIND WITH WON WRITE WRONG  
\*X\* X-RAY  
\*Y\* YANKEE YELLOW YESTERDAY YOU YOUR  
\*Z\* ZED ZERO ZONE ZULU  
\*CUSTOM\* CUSTOM1 CUSTOM2 CUSTOM3 CUSTOM4  
\*MORSE PUNCTUATION\* SPACE - / : ? ; , AR AS SK

de WA6AXX 440 Repeater  
>

### Information

The repeater owner may create an 8 line message providing information about the repeater system, or serving any other purpose desired. Entering the I command causes this message to be displayed. All 8 lines of the message must be programmed with the T command. Blank lines must be programmed as well, with at least 2 spaces.

de WA6AXX 440 Repeater  
>i

Welcome to the WA6AXX 440 Repeater, with its voice channel on 440.025 MHz (output). The repeater is co-located with WB6KHP Repeater on 224.14 MHz in the east foothills of San Jose.

Both repeaters are open, with autopatch facilities available. Contact Dave, WB6KHP for codes.

Enjoy using the repeaters. 73

This message would be programmed as follows, with control enabled from the serial port.

>t info1 Welcome to the WA6AXX 440 Repeater, with its voice channel on

de WA6AXX 440 Repeater

>t info2 440.025 MHz (output). The repeater is co-located with WB6KHP

de WA6AXX 440 Repeater

>t info3 Repeater on 224.14 MHz in the east foothills of San Jose.

## Computer Interface Option

```
de WA6AXX 440 Repeater
>t info4 [at least 2 spaces]

de WA6AXX 440 Repeater
>
    etc.
```

### Command Entry

Any Touch-Tone command may be entered through the terminal using the C command followed by the Touch-Tone equivalent, when control is enabled from the port. The controller responds with a text equivalent of the speech response message. Remember to enter the C, then the entire Touch-Tone command. User level and Control Operator commands may be entered.

```
de WA6AXX 440 Repeater
>c 73
Command executing ...
<speech> 2 METER -S OFF
de WA6AXX 440 Repeater
>c 815
Command executing ...
<speech> 1 HUNDRED FIF- -TEEN DEGREES
de WA6AXX 440 Repeater
>c 123031
Command executing ...
<speech> REPEATER E
de WA6AXX 440 Repeater
```

The controller may also be unlocked and Programming commands may be entered. Remember to precede all Touch-Tone commands with the C command, and to lock the controller with "C #" when you're done.

### Text Message Entry

Several terminal screen text messages may be programmed by the repeater owner. These include the repeater callsign, VRT channel descriptions, mailbox messages, the information message, and text messages directed to a modem for initialization. Each message is allowed up to a maximum number of characters, specified in the Help file. Programming the information message using the T command was illustrated earlier in this manual. Several other examples are shown below.

```
>t vrt15 int. temp.

de WA6AXX 440 Repeater
>t batch1 AT S0=3

de WA6AXX 440 Repeater
>t call WA6AXX Repeater

de WA6AXX Repeater
```

### Print A Programmable Message

Any of the controller's programmable messages (IDs, tail messages, etc.) may be viewed using the P command. The list of message names may be viewed to jog your memory by downloading the MSGNAMES.TXT file (D MSGNAMES.TXT). Stored user callsigns can be viewed by entering P CALL [00-99]. For example, to view callsign 15, enter P CALL 15.

Female speech words are appended with /F. Run time variables are enclosed in parentheses (). Messages can consist of combinations of <speech>, <morse>, <pager> (pager memories), <dtmf> (Touch-Tone sequences), <dvr> (DVR tracks), and <ext> (external devices).

```
de WA6AXX 440 Repeater
>p aid
<morse> W A 6 A X X / R
```

```
de WA6AXX 440 Repeater
>p pid1
<speech> PAUSE THISIS W A 6 A X X REPEATER
```

```
>p spid
<speech> GOOD/F (M/A/E) PAUSE THISIS <speech> W A 6 A
X X REPEATER PAUSE <morse> S C V
```

```
de WA6AXX 440 Repeater
>
```

### Edit a Programmable Message

Any of the controller's programmable messages (IDs, tail messages, etc.) may be edited using the E command. The controller then prompts with an asterisk (\*) rather than the greater-than (>) symbol. Type the words and letters which make up the message directly. A message is assumed to begin as speech unless another type is specified. If the entire message cannot fit on one line, type a percent (%) following the last word on the line. *Include a space between the last word on the line and the %.* The controller will then again prompt with \*, allowing you to continue entering the message. When you terminate a line without the %, the message is converted to tokens and is written into the controller's non-volatile memory. This process will take several seconds. The message will then be printed as it was loaded into memory (identical to using the P command).

The list of message names may be viewed to jog your memory by downloading the MSGNAMES.TXT file (D MSGNAMES.TXT). The list of synthesized speech words, Morse code punctuation, change type tokens, etc. may be viewed by downloading the WORDLIST.TXT file. Stored user callsigns can be edited by entering E CALL [00-99]. For example, to edit callsign 15, enter E CALL 15.

## Computer Interface Option

Female speech words are appended with /F. Run time variables are enclosed in parentheses (). Messages can consist of combinations of <speech>, <morse>, <pager> (pager memories), <dvr> (DVR tracks), and <ext> (external devices). DTMF sequences cannot be included in messages using the E command.

```
de WA6AXX 440 Repeater
>e fid
*<morse> d e space w a 6 a x x / r
<morse> D E SPACE W A 6 A X X / R
```

```
de WA6AXX 440 Repeater
>e spid
*thisis the number 1 two twenty repeater n the santaclara 8
*valley pause w a 6 a x x pause 2 twenty 4 point 68 mega hertz
<speech> THISIS THE NUMBER 1 2 20 REPEATER N THE SANTACLARA
VALLEY PAUSE W A 6 A X X PAUSE 2 20 4 POINT 6 8 MEGA HERTZ
```

```
de WA6AXX 440 Repeater
>e uf4 low
*low power
<speech> LOW POWER
```

```
de WA6AXX 440 Repeater
>e call 01
*k 8 j w
<speech> K 8 J W
```

```
de WA6AXX 440 Repeater
>
```

### Autodial Number Print/Load/Erase

Autodial numbers stored in the controller may be viewed, loaded and erased using the A command. The A followed by a number 0-249 will cause the controller to display the telephone number stored in that slot, or a message "Slot is empty". A, E and the slot number will cause the slot to be erased. A, the slot number, and a telephone number will cause the telephone number to be loaded into the slot, unless there is already a number present, in which case the message "Slot not empty" will be present. A new number may only be entered into an empty slot. Erase the slot before writing a new number.

```
de WA6AXX Repeater
>a 40
2538085
```

```
de WA6AXX Repeater
>a e 40
```

```
de WA6AXX Repeater
>a 40 9870229
```

## Computer Interface Option

```
de WA6AXX Repeater
>a 40
9870229
```

```
de WA6AXX Repeater
>
```

### Front Panel Display

An enhanced replica of the controller's LED front panel may be displayed on the terminal screen by typing F. Control must be enabled from the serial port to view the front panel.

```
de WA6AXX 440 Repeater
>f
```

```
*** WA6AXX 440 Repeater 'FRONT PANEL' DISPLAY ***
 STATUS          CONTROL          AUDIO          I/O
 E ENABLE        INPUTS          XMTR          OUTPUTS
 A ACCESS MODE   COS            - RCVR        UF1
 D TT ACCESS     COS/LINK1     - LINK1       - UF2
 IDENT          - COS/LINK2   LINK2         UF3
 KERCH          COS/LINK3     LINK3/SP1     UF4
 E PRIM AP      COS/LINK4     LINK4/CR      UF5
 E SEC AP       COS/CR        SPEECH/LM     UF6
 E TERT AP      PL            PHONE         UF7
 E PRIM EAD     USER PL      TONE          UF8
 E SEC EAD      PHONE RING    PHONE
 L UAD BANK0    OUTPUTS      RCVR          INPUTS
 L UAD BANK1    PTT          SPEECH        UT1
 L UAD BANK2    PTT/LINK1    TONE          UT2
 R LINK1        PTT/LINK2
 E LINK2        PTT/LINK3    L2 DTMF CHANNEL AL1
 E LINK3        PTT/LINK4    0N MACRO SET  AL2
 E LINK4        - PWR AMP     6.520S L1 FREQ - PHBZ
 L LOCK         PHONE OFFHK  0.000- L2 FREQ
```

```
de WA6AXX 440 Repeater
>
```

Under the Status column, the following abbreviations apply:

ENABLE E = Enabled

T = Timed out

D = Disabled

ACCESS MODE A-K

TT ACCESS E = Enabled but down

U = Enabled and up

D = Disabled

IDENT R = ID required

A = Anxious ID waiting

P = Pending ID waiting

KERCH K = has been Kerchunked in the last few seconds

## Computer Interface Option

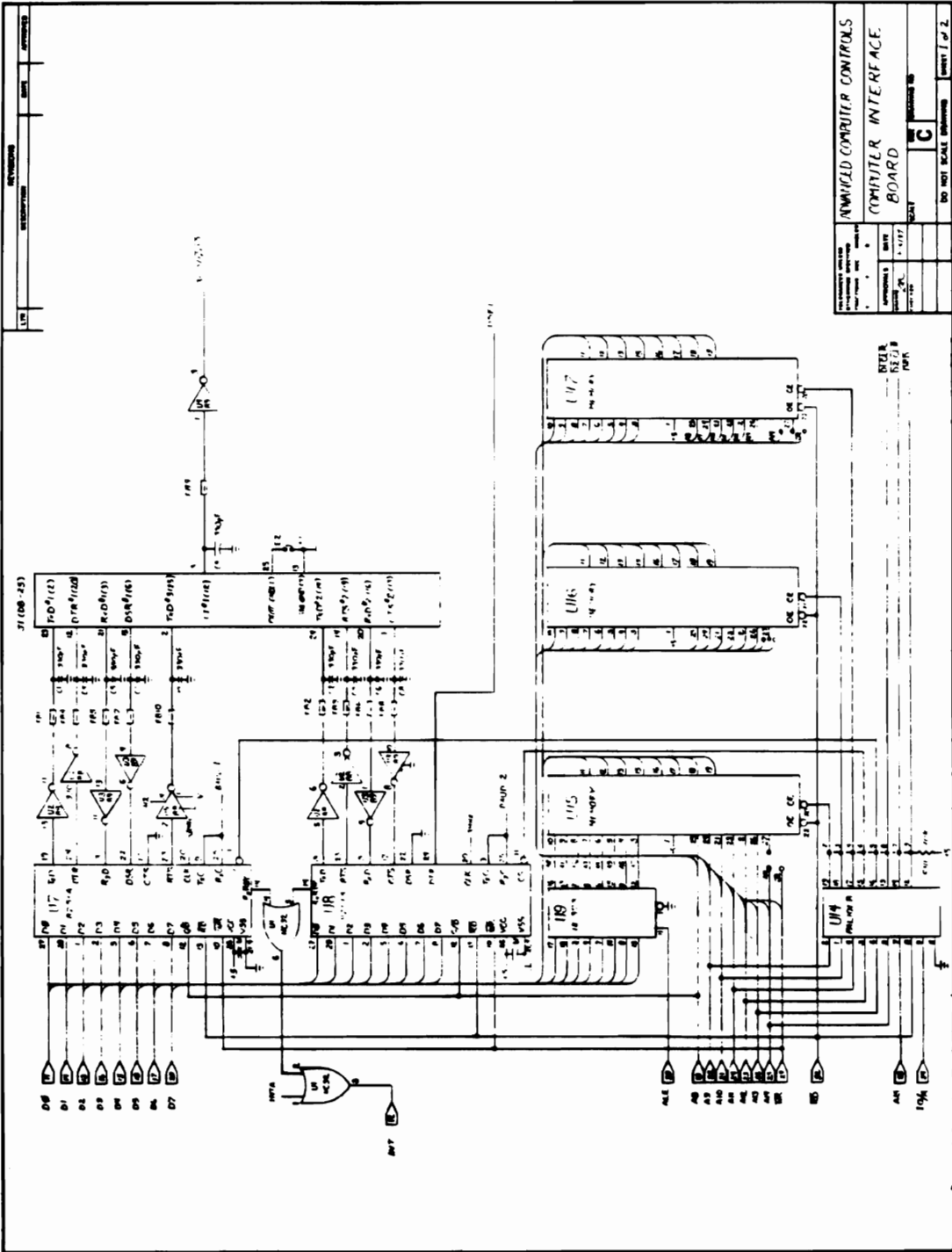
APs	U = In use L = Enabled and long distance enabled E = Enabled but long distance disabled D = Disabled
EADs	U = In use E = Enabled D = Disabled
UADs	U = In use L = Enabled and locked E = Enabled and unlocked, available for load/erase D = Disabled
LINKs	E = Enabled but off R = On in Receive only T = On in Receive/Transmit D = Disabled
LOCK	U = Unlocked L = Locked

Under the other columns, a “-” indicates that the input or output is active, resembling the LED front panel display. The shared DTMF decoder channel is indicated (RX, L1-L4, PH, LM). The currently selected macro set 0-9, and scheduler on/off status is indicated. For example, “ON” indicates macro set 0, with the scheduler turned on. The currently selected link frequencies are also indicated.

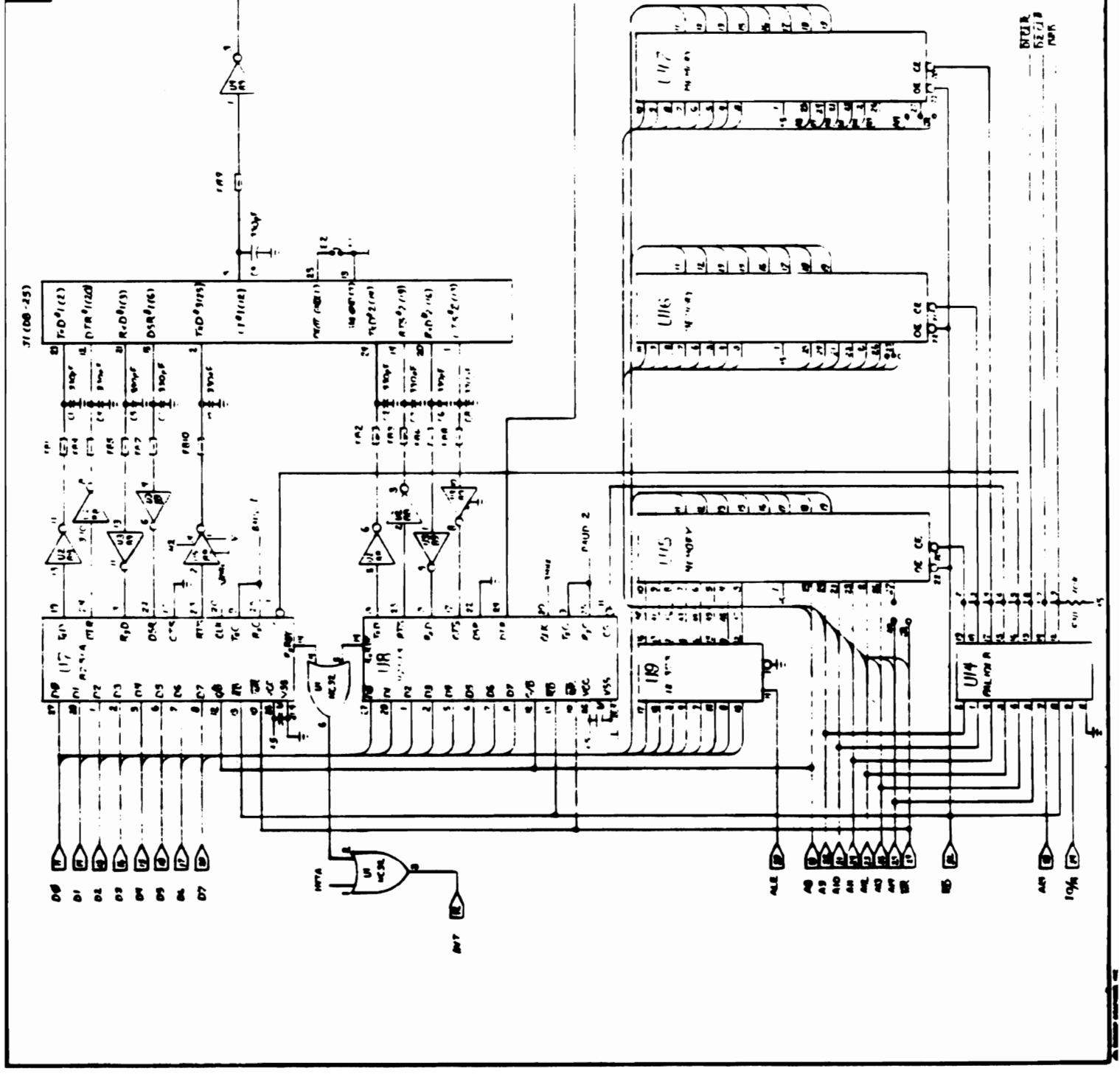


## Computer Interface Option

# Appendix II Schematic







DESIGNED BY: [ ]	DATE: [ ]
CHECKED BY: [ ]	DATE: [ ]
APPROVED BY: [ ]	DATE: [ ]
SCALE: [ ]	REV: [ ]
<b>C</b>	
DO NOT SCALE DRAWING	

ADVANCED COMPUTER CONTROLS  
 COMPUTER INTERFACE BOARD  
 SHEET 1 OF 2



## **Computer Interface Board Installation** 10/26/88

Please read the following instructions through completely before beginning installation of the Computer Interface Board.

1. Turn power off to controller.
2. Install RP-2 rear panel if necessary. See separate RP-2 instructions.
3. Unplug the DB-25 connector and cable assembly (J1) from the Computer Interface Board. Attach the DB-25 connector to the rear panel cutout labeled COMPUTER using the two small screws and nuts. (You may attach the connector to the RP-2 before installing the rear panel if required in step 2 - this will make DB-25 installation slightly easier.)
4. Remove EPROMs at locations U7 and U8 on the main controller board and U6 and U8 on the Voice Response Telemetry board.
5. Remove the MX-2 piggyback board on the main controller board at the BUS connector.
6. Install the CI board on the existing four mounting posts between the main controller board and the telephone interface board. If the posts are not present, mount the enclosed posts in the pre-drilled holes.
7. Plug the 34 pin cable connector into the BUS connector on the main controller board. Plug the short cable from the DB-25 cable attached to the COMPUTER cutout on the rear panel to the J1 connector on the Computer Interface Board.
8. Plug the supplied U8 EPROM into the U8 location on the main controller board.
9. Solder the wire coming from pin 3 of U1 to the bottom pad of R2 (closest to the edge) on the main controller board.
10. Double check each of the above steps.
11. Restore power to the controller. It should sign on with the 3.5 revision announcement.
12. Have a beer. You have successfully completed the installation of the Computer Interface Board. Now read Chapter 1, "Bulletin Board System (BBS) Serial Port Access" for connection instructions to a MODEM and/or packet TNC.

## Computer Interface Board

The Computer Interface Board option for the RC-850 Repeater Controller supplies a variety of resources for hardware expansion of the controller, including

- Four serial I/O ports
- Socket for 300/1200 baud FSK MODEM chip - AMD 7910
- Secondary Touch-Tone decoder with 8-input multiplexer
- Two 4x4 audio cross-point switches
- Additional general purpose logic I/O
- EPROM socket for firmware expansion to total of 96K bytes

The Computer Interface Board mounts inside the RC-850 controller cabinet, between the Telephone Interface Board and the main controller board. It connects to the main controller board with a 34 pin ribbon cable (supplied). It forms part of the planned long-term upgrade path for the controller.

### Serial Ports

Two serial I/O ports are implemented with Zilog's Z8530 Serial Communications Controller (SCC). These ports are buffered for RS-232 level interfaces. The SCC supports both asynchronous and synchronous (HDLC) formats. Version 3 firmware supports asynchronous communication with terminals, and computers running terminal emulation software or other applications software which can make use of the serial interface to the controller. Baud rates of 300 to 9600 baud are supported.

Two additional RS-232 serial ports are implemented in software, for dedicated interface to peripheral equipment as determined by the controller's firmware.

### MODEM Chip

A socket is provided for use with the AMD 7910 FSK MODEM "World-Chip". The single chip MODEM implements Bell 103 and Bell 202 functions. [The Bell 103 standard is commonly used in 300 baud home computer MODEMs and amateur RTTY. The Bell 202 FSK standard is not compatible with popular 1200 baud PSK (Bell 212A) MODEMS, but is the 1200 baud packet radio standard.]

The MODEM chip is connected to serial port #1, and its input and output are connected to the cross-point switch audio matrix.

As an alternative to the internal MODEM chip, an external MODEM connected to one of the serial ports may be used for remote computer communication with the controller.

## **Secondary Touch-Tone Decoder**

A second hardware Touch-Tone decoder is provided which supplements the existing shared decoder on the main controller board. The additional decoder implements a fully independent command decoder with Version 3 firmware. An 8-input analog multiplexer selects one of eight audio signals which may be applied to the decoder, based on internal mapping using the toolbox. (See the Version 3 Operation Manual – "Logical I/O and the Toolbox".)

The decoder may be dedicated to high priority command sources such as a link or remote base receiver, without the need to share it with other command channels.

## **Cross-point Switch Matrix**

Two 4x4 cross-point switch audio matrices are supplied, which may alternately be wired as one 8x4 matrix. Control of the matrices is performed using logical I/O mapping with the toolbox. The audio matrix can assist in developing complex linking systems and perform other audio switching.

## **General Purpose I/O**

Four logic outputs, and three logic inputs may be assigned functions using the logical I/O mapping capabilities of the toolbox.

## **EPROM Socket**

A socket is provided for firmware expansion to a total of 96K bytes (32K on main controller board, 64K on Computer Interface board). The socket accommodates EPROMs up to the Intel 27513, which is a paged 64K byte memory. A portion of Version 3.5 (and higher) firmware resides in this socket.

## **Pricing**

Assembled and tested board with cable (does not include 7910 MODEM chip)	\$295
Rear panel upgrade	\$25



# **RC-850 Repeater Controller Computer Interface Board Hardware Specification**

The Computer Interface Board which mounts inside the '850 controller cabinet supplies expansion resources, including:

- **Two RS-232C serial I/O ports**

Two serial I/O ports are implemented with CMOS 82C51 USARTs. These ports are buffered for RS-232C levels using CMOS line drivers and receivers. Version 3.5 and later firmware support communication with terminals and computers running terminal emulation software. The user interface resembles a packet BBS, making operation intuitive to anyone with packet experience, and easy for anyone else to learn.

The serial ports are brought out at the new DB-25 connector accessible from the rear of the controller. Typical applications of the two serial ports would include connection to a telephone MODEM and to a packet TNC for remote access to the BBS.

- **Two auxiliary Touch-Tone receivers**

Two additional Touch-Tone receivers are provided (Mitel MT8870s) which supplement the existing shared Touch-Tone receiver on the main controller board. The additional receivers implement fully independent command decoders with Version 3.5 and later firmware. The receivers may connect to any audio source desired. A typical application might be connection of one decoder to the telephone audio to allow simultaneous command entry from the phone and the repeater receiver. The second decoder might be dedicated to the control receiver or a link.

The decoder inputs are accessible at solder pads on the board, and may be brought to spare phono jacks on the rear panel (RP-2).

- **Three EPROM sockets for extensive firmware expansion**

Version 3.5 firmware and up reside in these expansion sockets. Three sockets accommodate 27128, 27256, or the paged family of 27513 and larger EPROMs. Future firmware expansion of the previous 48K bytes (V3.42) to beyond 384K bytes is feasible with this feature. V3.5 software occupies 144K bytes of EPROM.

Version 3.5 software is included as standard with the Computer Interface Board to owners currently running Version 3.41 or 3.42. (Owners of Version 1 or 2 software must purchase the V3 family upgrade.)

Two software **options** which utilize the features of the new hardware include:

- **Vocabulary Expansion Option**

A major expansion of the synthesized speech vocabulary is available in EPROM which may reside on the Computer Interface Board. Over 500 words become accessible from the message editor, including new words from ACC's custom library, plus semi-custom and standard speech vocabulary. See the new vocabulary list on the back of this sheet. The Vocabulary Expansion Option *requires* the Computer Interface Board hardware.

- **PC Software for Printing Programming Sheets**

Software on floppy diskette for the IBM PC and compatibles provides high level menu-driven display and printout of the programmed contents of your controller. Information programmed in the controller may be viewed on the screen and may be printed for thorough documentation of your repeater. (Available Winter '88)

# Vocabulary Expansion Option Word List

(PAUSE)	DEGREES	HELP	MOVE	-S(suffix)	-TY(suffix)	THREE†
A	DELTA	HENRY	MUCH	SAFE	U	FOUR†
A.M.	DEPARTURE	HERTZ		SAND	UNDER	FIVE†
ABORT	DEVICE	HIGH	N	SANTA CLARA	UNIFORM	SIX†
ABOUT	DIAL	HOLD	NEAR	SATURDAY	UNIT	SEVEN†
ABOVE	DINNER	HOME	NEGATIVE	SCATTERED	UNLIMITED	EIGHT†
ACKNOWLEDGE	DIRECTION	HOTEL	NET	SECOND	UNTIL	NINE†
ACTION	DISPLAY	HOUR	NEW	SECONDS	UP	TEN†
ADJUST	DOOR	HOURS	NEXT	SECURITY	USE(noun)	ELEVEN†
ADVANCED	DOWN	HUNDRED	NIGHT	SELECT	USE(verb)	TWELVE†
ADVISE	DOWNWIND		NINE	SEPTEMBER		THIRTEEN†
AERIAL	DRIVE		NINE†	SEQUENCE		FOURTEEN†
AFFIRMATIVE	DRIZZLE	I	NINETEEN	SERVICE	V	FIFTEEN†
AFTERNOON†	DUST	ICE	NO	SET	VALLEY	SIXTEEN†
AIR		ICING	NO	SEVEN	VALVE	SEVENTEEN†
AIRPORT	E	IDENTIFY	NORTH	SEVENT	VARIABLE	EIGHTEEN†
ALERT	EAST	IGNITE	NOT	SEVENTEEN†	VERIFY	NINETEEN†
ALL	ECHO	IGNITION	NOVEMBER	SEVERE	VICTOR	TWENTY†
ALLOFT	-ED(suffix)	IMMEDIATELY	NUMBER	SEXY	VISIBILITY	THIRTY†
ALPHA	EIGHT	IN		SHORT	VOLTS	FORTY†
ALTERNATE	EIGHT†	INBOUND	O	SHOWERS		FIFTY†
ALTITUDE	EIGHTEEN†	INCH	OBSCURED	SHUT	W	<u>DAYS OF THE WEEK</u>
AMATEUR	ELECTRICIAN	INCREASE	OCLOCK	SHUT	WAIT	DAYS
AMPS	ELEVATION	INDICATED	OCLOCK†	SIERRA	WAKE	SUNDAY
AND	ELEVEN	INDICATED	OCTOBER	SIERRA	WAKEUP	MONDAY
ANSWER	EMERGENCY	INFLIGHT	OF	SIX	WARNING	TUESDAY
APRIL	ENGINE	INFORMATION	OFF	SIX†	WATTS	WEDNESDAY
AREA	ENTER	-ING(suffix)	OH†	SIXTEEN†	WAY	THURSDAY
ARRIVAL	EQUAL	INNER	OHIO	SLEET	WEATHER	FRIDAY
AS	-ER(suffix)	INSPECTOR	OHMS	SLOPE	WEDNESDAY	SATURDAY
AT	ERROR	INTRUDER	OL	SLOW	WELCOME	
AUGUST	ESTIMATED	IS	ON	SMOKE	WEST	<u>MONTHS OF YEAR</u>
AUTO	EVACUATE	IS†	ONE	SNOW	WHISKEY	MONTH
AUTOMATIC	EVACUATION	IT	ONE†	SOUTH	WILL	JANUARY
AUTOPILOT	EVENING†	J	OPEN	SPEED	WIND	FEBRUARY
AUXILIARY	EXIT	JANUARY	OPERATION	SPRAY	WITH	MARCH
	EXPECT	JULIET	OPERATOR	SQUAWK	WRONG	APRIL
B		JULY	OSCAR	STALL		MAY
BAND	F	JUNE	OTHER	START	X	JUNE
BANK	FAIL		OUT	STOP	X-RAY	JULY
BASE	FAILURE	K	OUTER	STORM		AUGUST
BATTERY	FARAD	KEY	OVER	SUNDAY	Y	SEPTEMBER
BELOW	FARENHEIT	KLO	OVERCAST	SWITCH	YANKEE	OCTOBER
BETWEEN	FAST	KNOTS		SYSTEM	YELLOW	NOVEMBER
BLOWING	FEBRUARY	L	P		YESTERDAY	DECEMBER
BOARD	FEET	LAND	P.M.	T	YOU	<u>COLORS</u>
BOOST	FIF(prefix)	LANDING	PAPA	TANGO	Z	GREEN
BOZO	FIFTEEN†	LATE	PARTIALLY	TANK	ZED	RED
BRAKE	FIFTY†	LAUNCH	PASS	TARGET	ZERO	YELLOW
BRAVO	FILED	LEAN	PASSED	TAXI	ZONE	<u>DIRECTIONS</u>
BREAK	FINAL	LEFT	PATCH	-TEEN(suffix)	ZULU	EAST
BROKEN	FIRE	LEG	PATH	TELEPHONE		NORTH
BUTTON	FIRST	LESS THAN	PERCENT	TEMPERATURE		SOUTH
BY	FIVE	LIGHT	PHONE	TEN	<u>SOUND EFFECTS</u>	WEST
	FIVE†	LIGHT	PICO	TERMINAL	CROWD	<u>NAMES</u>
C	FLAPS	LIMA	PLEASE	TEST	EXPLOSION	CHARLIE
CABIN	FLIGHT	LINE	PLUS	-TH(suffix)	LASER	DEE
CALIBRATE	FLOW	LINK	POINT	THANKYOU	PHASER	HENRY
CALL	FOG	LIST	POLICE	THAT	TOC	JAY
CALLING	FOR	LOCK	POSITION	THE	TRAIN	JULIET
CALM	FORTY†	LONG	POWER	THE(longe)	WHISTLE	KAYE
CANCEL	FOUR	LOOK	PRACTICE	THE(shorte)		MIKE
CAUTION	FOUR†	LOWER	PRESS	THE†	<u>NUMBERS(MALE)</u>	OSCAR
CEILING	FOURTEEN†	LUNCH	PRESSURE	THIR-	NUMBER	PAPA
CENTER	FOURTH	M	PRIVATE	THIRTY†	ZERO	ROME
CHANGE	FOXTROT	MACHINE	PROBE	THIS	OH	ROSCAR
CHARLIE	FREEDOM	MAINTAIN	PROGRAMMING	THISIS	ONE	VICTOR
CHECK	FREZZING	MANUAL	PULL	THOUSAND	TWO	<u>MACROS</u>
CIRCUIT	FREQUENCY	MARCH	PUSH	THREE	THREE	MACRO1
CLEAR	FRIDAY	MARKER		THREE†	FOUR	MACRO2
CLIMB	FROM	MAY	Q	THUNDERSTORMS	FIVE	MACRO3
CLOCK	FRONT	MAYDAY	QUEBEC	THURSDAY	SIX	MACRO4
CLOSED	FULL	ME		TIME	SEVEN	
CLUB		MEAN	R	TIME†	EIGHT	<u>RUN-TIME VARIABLES</u>
CODE	G	MEASURE	RADIO	TIMER	NINE	M/A/E
COME	GALLONS	MEETING	RAIN	TO	TEN	TIME
COMPLETE	GATE	MEGA	RAISE	TODAY	ELEVEN	A/M/P/M
COMPUTER	GEAR	MESSAGES	RANGE	TOMORROW	TWELVE	DATE
CONDITION	GET	METER	RATE	TONIGHT	THIRTEEN	MAIL PRESENT
CONGRATULATIONS	GLIDE	MICRO	READY	TOOL	THIR-(prefix)	T.O.PERIOD
CONNECT	GO	MILES	REAR	TORNADO	-TEEN(suffix)	#MESSAGES
CONTACT	GOLF	MILL	RECEIVE	TOUCHDOWN	FIF-(prefix)	VRT
CONTROL	GOOD†	MILLI	RED	TOWER	HUNDRED	<u>CHANGETYPE</u>
CONVERGING	GROUND	MILLION	RELEASE	TRAFFIC	THOUSAND	MORSE
COUNT	GAUGE	MINUS	REMARK	TRANSMIT	MILLION	SPEECH
COURSE	GUSTING TO	MINUTES	REMOTE	TRIM	-TY(suffix)	DTMF
CRANE		MIST	REPAIR	TUESDAY	FIRST	PAGER
CROSSWIND		MOBILE	REPEAT	TURBULANCE	SECOND	DVR
CURRENT	H	MODERATE	REPEATER	TURN	THIRD	EXT.DEVICE
CYCLE	HAIL	MONDAY	RICH	TWELVE	FOURTH	
	HALF	MONTH	RIG	TWELVE†		<u>NUMBERS(FEMALE)</u>
D	HAM	MORNING†	RIGHT	TWENTY	OH†	ONE†
DANGER	HAMFEST	MOTOR	ROAD	TWENTY†	ONE†	TWO†
DAYS	HAMVENTION		ROGER	TWO		
DAYTON	HAVE		ROMEO			
DECEMBER	HAZARDOUS		ROUTE			
DECREASE	HAZE		RUNWAY			
DECREASING	HEAVY					

# RC-850 Repeater Controller

## V3.5 Software Specification

### • Bulletin Board System (BBS) Style Serial Port Access

#### **Remote Repeater Control**

All User, Control Op, and Programming commands may be entered through the serial ports with text command responses sent back to the port. The commands may be originated manually or automatically under remote computer control.

#### **Message Editing**

Programmable messages stored in the controller may be viewed directly as text, and may be reprogrammed by typing the letters, words, and other tokens directly (i.e., "meeting tomorrow"). It isn't necessary to refer to vocabulary codes.

#### **Downloading of Repeater Information**

Various information may be downloaded from the controller manually or automatically under remote computer control. It may be presented for visual display on the screen, or may be used as input to user written data processing programs to analyze repeater and site activity and characteristics.

**Front Panel Display** - An enhanced version of the LED front panel display may be viewed on the remote terminal or computer screen. The Front Panel Display option is not necessary to employ this feature.

**Command Log** - A listing of commands tagged with time and date may be downloaded. The particular commands to be logged may be specified with programming commands (i.e., log patches, linking, Control Op commands, unlocks, etc. but do not log Touch-Tone pad test, demo message playback, etc.)

**Metering Information** - A display of the 16 VRT channel current meter readings may be requested. The measurements are tagged with a user defined description (i.e., heat sink temp.). In addition, the stored highs and lows for each channel along with the time/date tag for each reading are available.

**Activity Information** - VRT channels 25-32 may be viewed, which provide ongoing running totals on aspects of repeater activity.

**E<sup>2</sup>PROM Contents** - The contents of the E<sup>2</sup>PROM may be downloaded to be processed by a separate program which runs on IBM PCs and compatibles to print Programming Sheets, which document how the controller has been programmed.

#### **Voice - Packet Mailbox**

Electronic messages may be exchanged between the voice repeater and the serial ports. Messages may be sent, listed and killed from the repeater or the serial ports. Mail may be sent by typing the source and destination callsigns and the mailbox message number. The list of mail currently in the controller may be displayed, including the source and destination callsign, message, and the time and day of entry.

#### **On-Line Help**

Extensive on-line help is available for each command to get the user going quickly. In addition, lists of the names of the controller's programmable messages and the words in the speech synthesizer's vocabulary can be viewed to assist in programming messages without having to refer to a manual.

#### **Informational Text Message**

A programmable text message may be viewed by users to provide information about the repeater system.

#### **Security**

Access to remote repeater control, message editing and downloading of E<sup>2</sup>PROM contents through the serial ports must be enabled by a Touch-Tone Control Operator level command. Each port has a programmable access timeout. Typically, access to these functions would be enabled by entering the Control Op command on a Touch-Tone command channel, such as through the Control Receiver. If this security is not needed, access may be kept enabled by setting the access timer value to 0.

## • Auxiliary Touch-Tone Decoders (2)

### Independent dedicated command channels

Commands may be entered independently and simultaneously through the shared decoder on the main controller board and the two auxiliary decoders on the Computer Interface Board. Each auxiliary decoder may be assigned to replace channels of the shared decoder with Programming commands.

Commands from each channel are acted on at their command evaluation point - when the command channel COS goes inactive, or after # if assigned to the phone. Command responses are directed to the repeater and link transmitters or the telephone.

### Applications:

Connect to links/remotes for 100% coverage for incoming commands

Connect to Control Receiver so a transmission on the control channel doesn't steal the decoder from other channels

Connect to telephone audio so a call to the repeater doesn't steal the decoder from other channels (i.e., Touch-Tones will still mute over the air when someone is on the phone)

## • ICOM IC-900 Remote Base / Link Support

The ICOM IC-900 band units are supported as an alternative to BCD controllable radios for frequency synthesized remotes and links. Only the ICOM band units are needed - not the fiber optic controller - for a considerable cost savings. The FC-900 interface from ACC provides the interface between the controller and the band units.

Connections to the FC-900 interface consist of RB CLK, RB DATA, RB STB, link COS, receive and transmit audio. The connection between the FC-900 interface and the IC-900 modules is simply the daisy-chained multiconductor cable supplied by ICOM. The FC-900 interface mounts on top of the stacked band units.

One or two FC-900 interfaces, each controlling up to six band units are supported. One interface may attach to link ports 1 and 2 and a second to ports 3 and 4 if desired. The FC-900 interface includes a remotely programmable CTCSS (PL) encoder.

Any two band units may be on at any time on each port pair. For example, ports 1/2 could have 10M, 6M, 2M, 220 and 440 MHz transceivers used as remotes, while ports 3/4 might have 220 MHz and 1200 MHz transceivers as synthesized links. Ports 1/2 could have the 10M and 2M remotes up, while 220 and 1200 MHz links are up on ports 3/4. (FC-900 available Fall '88)

## • Rotor Control Board

The RCB-2 Rotor Control Board allows the RC-850 controller to control a Hygain/Telex CD-45-II, Ham IV or T<sup>2</sup>X Rotor System control unit. The rotor control board mounts inside the control unit and simulates operation of the clockwise, counterclockwise and brake switches in response to Touch-Tone commands sent to the controller.

Commands available to users include rotate clockwise, rotate counter clockwise, stop, interrogate direction, rotate to a particular direction in degrees, and "budge" clockwise or counter clockwise. The controller always knows the direction of the rotor by measuring the potentiometer voltage from the control unit. An adjustable delay on the board keeps the brake released for several seconds to allow the rotor to coast to a stop.

## • Vocabulary Expansion Option - Over 500 Synthesized Speech Words

Amateur radio words

Weather words

Public service words

Alternative inflections of key words

Days of the week

Female words

Months of the year

Sound effects

## • Improvements to Version 3.42

Various aspects of V3.42 software have been improved based on suggestions from customers.

Prices and specifications subject to change without notice. 7/88