WJ-861X RECEIVER

APPENDIX D

WJ-861X IEEE-488 REMOTE INTERFACE OPTION

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WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

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IEEE-488 REMOTE INTERFACE OPTION

D.1 GENERAL DESCRIPTION

The IEEE-488 Remote Interface provides talk and listen capabilities between the receiver and external equipment, such as calculators, minicomputers or other IEEE-488 device, utilizing sixteen interconnection lines. These lines consist of eight bi-directional data bus lines, three data byte transfer lines and five management lines. Data or address information is transferred between devices, utilizing the data bus lines. The data byte transfer lines indicate: the availability and validity of the information on the data bus lines; if the devices are ready to accept data; and if the data has been accepted. The interface management lines: specify whether the data bus lines are carrying data or address information; request service; clear the interface; and indicate the end of a transfer sequence. Refer to **Figure D-1.** The capabilities of the IEEE-488 Interface include:

- SH1 Source handshake fully implemented
- AH1 Acceptor handshake fully implemented
- T6 Basic talker with serial poll
- L4 Basic listener with serial poll
- SR1 Service request fully implemented
- DC1 Device clear implemented
- RL0 No remote local capability
- PP0 No parallel polling capability
- C0 No controller capabilities implemented
- DT0 No device trigger capability

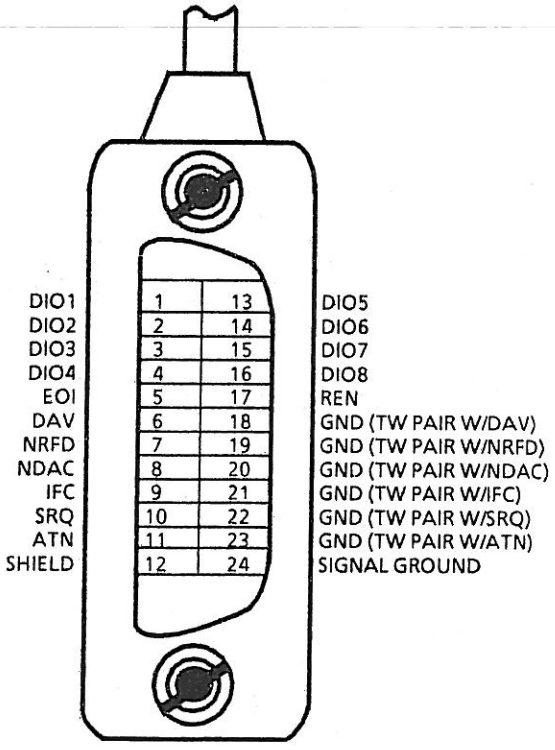

Figure D-1. Configuration of IEEE-488 Data Bus

Essentially, this means that the receiver can talk or listen when commanded by the controller. It can also issue a service request to notify the controller when it needs service. To be compatible, the controller should have the following capabilities:

C1, C2, C4, C27 System controller - single controller system.
AH1, SH1, T3, L1

Up to fourteen 488 equipped receivers can interface with a single controller, with the controller having the ability to address each receiver individually. A six position DIP switch located on each 488 card is used to set the address of the receiver. Switch positions #1 through #5 allow address settings from 0 (00000) to 30 (11110). 31 (11111) is not a valid address and should not be used. An open switch indicates a logic "1" state and a closed switch indicates a logic "0" state. Switch position #6 should be set to the logic "0"' (closed) position. The address set by the DIP switch is a default position. The address of the receiver may also be set via the front panel. By pressing upper case remote key (488 ADDR), the current address is displayed. The tuning wheel then allows this address to be changed. The last entry changed, either the DIP switch or the front panel, is the actual address that is used. Changing the address with the DIP switch requires the receiver power to be turned off and back on again before the new address is read by the Microprocessor.

D.2 INTERFACE OPERATION

Two types of data transfer are supported on the WJ-861XB Receiver. One type of data transfer on the IEEE-488 interface bus in ASCII. This type of transfer utilizes ASCII mnemonics to control the receiver. The termination may be CR, LF (Carriage Return, Line Feed) or LF (Line Feed) or EOI (End or Identify) set on the last character of the transfer. These mnemonics may be strung together using a semicolon. Another type of data transfer supported by the WJ-861XB Receiver is binary. This type of data transfer allows single information bytes to control the receiver. In the binary operation, each command must end with with EOI (End or Identify) set on the last byte of the command. Commands may not be strung with a semicolon or terminated with CR (Carriage Return) or LF (Line Feed). The ASCII operation format tends to be self-documenting and easy to understand. Binary, on the other hand lessens the number of bytes that must be transferred and has a faster execution speed. In the ASCII format, the message consists of a series of data bytes that form one of the mnemonics listed in **Table D-1.** Each byte is one ASCII character of the mnemonic. When the mnemonic contains a variable value, the mnemonic is followed by a number representing that value. Each digit of the number is comprised of a separate ASCII character. In the binary format, the mnemonic is one 8-bit byte containing the hexadecimal code corresponding to the mnemonic. When a variable value is to be included in the message, it is sent as one or more additional data bytes, representing the binary or hexadecimal value.

In the ASCII mode of operation, the WJ-861XB Remote Interface can accept data at a time of 300 µsec per byte. The overall time to send the message to the receiver is determined by: the number of characters in the message times 300 µsec (or: the number of bytes times the byte transfer time of the controller, whichever is greater). Once the last message byte (line feed) is accepted, the receiver carries out the command within 2 msec. A message such as RFG (n) could take significantly longer due to the receiver's method of updating this parameter. The time required could vary from 2 msec to 20 msec. When a message such as **FRQ?** is sent, the receiver will begin to return data within 2.0 msec of the time that the last message byte was sent. The response is returned at a maximum time of 70 µsec per byte. This time will vary with the speed that the controller can accept the data provided. A typical response to an **FRQ?** is 3.0 msec or less.

The Binary mode of operation permits a faster transfer of data. The interface can accept data at a time of 250 µsec per byte and the message length is considerably shorter. Processing of the message by the receiver is also shorter in this mode. After the last byte of the command is accepted the receiver carries out the message within 1.5 msec.

In both the binary and ASCII modes of the interface, the time lapse from the time the receiver acquires or loses a signal to the time that SRQ (Service Request) is set is determined by the receivers operating mode. When the receiver is at a fixed frequency and a signal comes up above the programmed COR level, the SRQ bit will be set within 2 msec. A loss of the signal causes the receiver to verify that the signal is no longer present. The SRQ is set within 10 msec of signal loss. If the receiver is tuned to a frequency where a signal is present, it sets SRQ in 15 msec. IF it is tuned from an existing signal to a frequency where no signal is present, the SRQ is set in 25 msec.

Table D-1. Table of Mnemonics

Mnemonic	Hex	Dec	Description	Refer to Table
AFC	42	66	Turn AFC on	D-5
AFC/	43	67	Turn AFC off	D-5
AFC?	44	68	Request AFC mode	D-5
AGC	45	69	Turn AGC on	D-5
AGC/	46	70	Turn AGC off	D-5
AGC?	47	71	Request AGC mode	D-5
AM	48	72	Select AM detection mode	D-4
AM?	4A	74	Request AM modulation (0-68)	D-7
ANT(a)	4B(b)	75(b)	Select antenna (1,2)	D-5
ANT?	4D	77	Request selected antenna	D-5
AUD(a)	9F(b)	159(b)	Set audio gain level (0 to 255)*	D-8
AUD?	A1	161	Request audio gain level*	D-8
AUL?	F5	245	Request audio signal level*	D-8
BFO(f)	39(p)	57(p)	Set BFO frequency (±7.99 kHz)*	D-8
BFO?	3B	59	Request BFO frequency*	D-8
BIC?	AA	170	Request reading of error*	D-8
BIN			Causes all future commands to be in binary.	D-2
	55	85	Causes all future commands to be in ASCII	D-2
BIT	A5	165	Cause BITE to start/continue*	D-8
BIT?	A7	167	Request BITE error number*	D-8
BW(a)	4E(b)	78(b)	Select BW slot (1-5) (1-10)*	D-3

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeroes need not be sent.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Table D-1. Table of Mnemonics (Continued)

Mnemonic	Hex	Dec	Description	Refer to Table
BW?	50	80	Request BW slot selected	D-3
BWC?	9C	156	Request BW size	D-3
CLM	6C	108	Clear receiver & memory	D-5
CLR	51	81	Clear receiver	D-5
COR(a)	57(b)	87(b)	Set COR level 0-40/or NRT level 00-20*	D-5
COR?	59	89	Request COR level/or NRT level*	D-5
CST?	9B	155	Request COR status	D-5
CW	5A	90	Select CW detection mode	D-4
DET?	5F	95	Request detection mode selected	D-4
DWL(a)	60(b)	96(b)	Select DWELL time period	D-5
DWL?	62	98	Request DWELL number	D-5
ERR?	65	101	Request Error number	D-2
EXC	66	102	Execute current parameters	D-6
FBW	D8	216	Take full bandwidth steps in SCAN	D-3
FBW/	D9	217	Take 1/2 bandwidth steps in SCAN	D-3
FBW?	DA	218	Request selected bandwidth mode	D-3
FM	69	105	Select FM detection mode	D-4
FM?	6B	107	Request FM modulation 0-100	D-7
FMO?	AD	173	Request reading of offset 0-255	D-7
FRQ(a)	3C(p)	60(p)	Set tuned frequency in MHz	D-5
FRQ?	3E	62	Request tuned frequency	D-5
GEN	E1	225	Turn BITE signal generator on*	D8
GEN/	E2	226	Turn BITE signal generator off*	D8
GEN?	E3	227	Request status of BITE generator*	D8
LCK	94	148	Lock-Out current parameters	D-6
LGV?	71	113	Request reading of Log Video	D-7
LLO	F9	249	Enable local lockout of front panel	D-2
LLO/	FA	250	Disable local lockout	D-2
LLO?	FB	251	Request local lockout status	D-2
LSB	72	114	Select LSB detection mode*	D-4
MAN	75	117	Select Manual operation	D-6
MOD?	B3	179	Request operation mode	D-6

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

Table D-1. Table of Mnemonics (Continued)

Mnemonic	Hex	Dec	Description	Refer to Table
NRT	B4	180	Select NRT mode*	D-8
NRT/	B5	181	Disable NRT mode*	D-8
NRT?	B6	182	Request NRT status*	D-8
OPT?	DD	221	Request options installed	D-8
PLS	78	120	Select Pulse detection mode	D-4
RCL(a)	7B(b)	123(b)	Select Recall operation	D-6
RCL?	7D	125	Request current channel;	D-6
RFG(a)	7E(b)	126(b)	Enter RF Gain (0-255)	D-5
RFG?	80	128	Request RF Gain	D-5
RLG	FC	252	Enable RLOG*	D-8
RLG/	FD	253	Disable RLOG*	D-8
RLG?	FE	254	Request RLOG status*	D-8
RMT	81	129	Select Remote operation	D-2
RMT/	82	120	Disable Remote	D-2
RMT?	83	131	Request control mode	D-2
SCN(a)	84(b)	132(b)	Select Scan operation	D-6
SS?	89	137	Request Signal Strength in dBm	D-7
STO(a)	8A(b)	138(b)	Store current parameters	D-6
STP(a)	8D(b)	141(b)	Select Step operation	D-6
STS(a)	90(b)	144(b)	Sets status byte	D-2
STS?	92	146	Request device status	D-2
TIM(hh:mm)	AE(b)(b)	174(b)(b)	Set Time function*	D-8
TIM?	B0	176	Request Time setting*	D-8
USB	93	147	Select USB detection mode*	D-4
VER?	E0	224	Request Software version	D-5
VID(a)	A2(b)	162(b)	Set Video level (0 to 255)*	D-8
VID?	A4	164	Request Video level*	D-8
VIL?	F8	248	Request Video Signal level*	D-8

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.
(*) - Receiver must have appropriate option for command to be supported.

D.2.1 DEVICE DEPENDENT COMMANDS

The tables (**Tables D-2** through **D-8**) that follow provide a more detailed description of the commands listed in **Table D-1.** The commands and responses are grouped according to their command category and are provided with their ASCII, Hexidecimal and Decimal equivalents.

The command columns list messages that can be applied to the WJ-861XB Receiver as an active listener. Responses returned are messages returned when the receiver is a talker. ASCII messages may be applied with embedded spaces or any combination of upper and lower case characters. Refer to **paragraph D-1**, for specific requirements of IEEE-488 operation.

The receiver must be in the remote mode of operation to accept commands that will change operations. Queries are valid in both local and remote modes or operation.

Table D-2. WJ-861XB Configuration Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BIN						Causes all future expected commands to be in binary.
	55	85				Causes all future expected commands to be in ASCII. (default)
ERR?	65	101	ERR(b)	63(b)	99(b)	Returns a number (0-99) representing the two least significant digits of the error code. Zero indicates no error. Reading this register clears it.
LLO	F9	249				Causes front panel to be locked out from operator. A power-up or return to local operation will cancel LLO.
LLO/	FA	250				Cancel LLO.
LLO?	FB	251	LLO LLO/	F9 FA	249 250	Request Local Lockout status.
RMT	81	129				Select remote operation. Allows the receiver to accept commands that change operating parameters.
RMT/	82	130				Activate local operation. Only queries are allowed in this mode.
RMT?	83	131	RMT RMT/	81 82	129 130	Requests control mode (Remote/Local).
STS(a)	90(b)	144(b)				Sets status byte to cause receiver reactions in accordance with the variable (a) sent. Variables are ORED together when multiple STS(a) commands are sent. STS0 must be sent to reset status byte. STS 0 is the default. a = 0 - Resets all bits of Status byte to 0.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

Table D-2. WJ-861XB Configuration Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
						a = 1 - Send SRQ on signal acquisition. a = 2 - Cause AGC dump on new frequencies.* a = 4 - Cause receiver to enter into Scan Continue or Step Continue mode on signal acquisition. a = 8 - Cause receiver to enter into Scan Continue mode at the end of a Scan sequence.
STS?	92	146	STS(a)	90(b)	144(b)	Request device status command. Note this command does not respond with the value sent in STS. This command provides information contained in the serial poll status byte. Bit — Function 0 — Signal above COR level. 1 — Unit power-up or IEEE-488 DCL OR SDC activated SRQ. 2 — BITE activated SRQ. (Cleared by BIT?). 3 — Indicates end of scan sequence (Reset by serial poll followed SCN) 4 — Receiver responding to query. 5 — Unit error activated SRQ. (Cleared by ERR?) 6 — SRQ activated by this unit. (Cleared by serial poll followed by STS?) 7 — Not Utilized.

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

IF bandwidths for the receiver are controlled using the following commands and responses.

Table D-3. WJ-861XB Bandwidth Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BW(a)	4E(b)	78(b)				Select BW slot 1-5. 1-10 in 10 bandwidth receivers*. (WJ-861XB does not allow selection of empty BW slot).
BW?	50	80	BW(a)	4E(b)	(78(b)	Request which slot is selected. (BW 1 is default)
BWC?	9C	156	BWC(c)	9A(b)(b)	154(b)(b)	Request size of selected BW. (number returned in ASCII is in kHz). (Number returned in binary is a 2 byte (16 bit) binary number representing kHz). 6.4 kHz is returned as 6 kHz; 3.2 kHz is returned as 3 kHz.
FBW	D8	216				Select full bandwidth increments in SCAN. (truncated to kHz)
FBW/	D9	217				Select 1/2 bandwidth increments in SCAN. (truncated to kHz)
FBW?	DA	218	FBW FBW/	D8 D9	216 217	Request bandwidth mode selected.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data represenitng a number.

(b) - A single byte of binary information.

(c) - Utilized in a response as 4 bytes of ASCII data representing a number.

(__) - Represents the default mode.

* - Receiver must have appropriate option for this command to be supported.

Detection modes for the receiver are selected using the following commands and responses.

Table D-4. WJ-861XB Detection Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM	48	72				Select AM detection mode.
CW	5A	90				Select CW detection mode.
FM	69	105				Select FM detection mode.
PLS	78	120				Select PULSE detection mode.
LSB	72	114				Select LSB detection mode.*
USB	93	147				Select USB detection mode.*
DET?	5F	95	AM	48	72	Request mode of detection selected.
			CW	5A	90	
			FM	69	105	
			PLS	78	120	
			LSB	72	114	*
			USB	93	147	*

(__) - Represents the default mode.
* - Receiver must have appropriate option for this command to be supported.

Miscellaneous control of the receiver is applied using the following commands and responses.

Table D-5. WJ-861XB Miscellaneous Control Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AFC	42	66				Turn AFC on.
AFC/	43	67				Turn AFC off.
AFC?	44	68	AFC/ AFC	42 43	66 67	Request AFC mode.
AGC	45	69				Turn AGC on.
AGC/	46	70				Turn AGC off.
AGC?	47	71	AGC AGC/	45 46	69 70	Request AGC mode.
ANT(a)	4B(b)	75(b)				Select antenna. (1, 2)
ANT?	4D	77	ANT(a)	4B(b)	75(b)	Request the selected antenna. (ANT 1 is default)
CLR	51	81				Clear receiver. All conditions to default. Memory not affected.
CLM	6C	108				Clear receiver. All conditions to default. Memory cleared.
COR(a)	57(b)	87(b)				Set COR level (0-40 = on, 41 = off). Level is ≈ 1 dB steps starting at noise floor of selected IF BW. (COR 0 is default)
COR?	59	89	COR(a)	57(b)	87(b)	Request the COR level.
CST?	9B	155				What is COR status?
			CST CST/	99 9A	153 154	Signal is above COR. Signal is below COR.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(__) - Represents the default mode.

Table D-5. WJ-861XB Miscellaneous Control Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
DWL(a)	60(b)	96(b)				Select the Dwell time for scan or step operation. This may be pre or post Dwell based on internal receiver configuration. The range of Dwell is from 0-2 seconds represented by a number from (0-255). Actual time is represented by $(2^{a/32}{}_{x8})-8$ in ms.
DWL?	62	98	DWL(a)	60(b)	96(b)	Request Dwell number. (DWL 0 is default).
FRQ(f)	3C(p)	60(p)				Set the tuned frequency in MHz. (0-1100 in .0001 MHz steps.) (Binary mode is packed BCD always 4 bytes.) (Upper limit 500 MHz without FE option.)* (Lower limit is 20 MHz without HFE, LFE or ELF.)*
FRQ?	3E	62	FRQ(f)	3C(p)	60(p)	Request tuned frequency. (20 MHz is default.)
RFG(a)	7E(b)	126(b)				Enter RF Gain number (0-255). 0 = minimum gain, 255 = maximum gain.
RFG?	80	128	RFG(a)	7E(b)	126(b)	Request RF Gain number. (0-255) (The RF Gain 0 is default.)
VER?	E0	224	VER - 861XB - - - - X.X.X - - - -	DE'VER -861XB - - - - X.X.X - - - -		The version response includes model and software revision. Response in binary mode is a HEX DE followed by ASCII data string terminated with EOI.
VID(a)	A2(b)	162(b)				Set Video Gain level (0 to 255).*
VID?	A4	164	VID(a)	A2(b)	162(b)	Request Video gain level.*

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(__) - Represents the default mode.

* - Receiver must have appropriate option for this command to be supported.

Control of the receiver is applied using the following commands and responses.

Table D-6. WJ-861XB Receiver Mode Control Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
EXC	66	102				Execute current parameters (only valid in Recall mode).
LCK	94	148				Lockout current frequency using bandwidth size, for lockout width.
LCK?	96	150	LCK LCK/	94 95	148 149	Request Lockout status of last recalled channel. If the recalled channel was a lockout the response is LCK. If not a lockout response is LCK/.
MAN	75	117				Select Manual operation (to exit Scan or Step, send MAN command twice).
MOD?	B3	179				Request mode of operation.
			MAN	75	117	Manual
			RCL	7B	123	Recall
			SCN	84	132	Scanning
			SCM	B2	178	Scan Continue
			STP	8D	141	Stepping
			STM	B1	177	Step Continue
			BIT	A5	165	Bite Mode
			BIM	A6	166	BITE manual indicates BITE has halted because of a failure.
STO(a)	8A(b)	138(b)				Store current parameters in channel (0-95).
RCL(a)	7B(b)	123(b)				Select Recall operation. Recall parameters in channel (0-95).
RCL?	7D	125	RCL(a)	7B(b)	123(b)	Request current channel number.
SCN	84	132				Cause active Scan to be advanced if the receiver has stopped on a signal. If the mode is SCM the SCN command will cause the receiver to return to the SCN mode.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(__) - Represents the default mode.

Table D-6. WJ-861XB Receiver Mode Control Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
SCN(a)	84(b)	132(b)				Scan the channels indicated in the argument. If the channel number is odd the Scan is from the frequency in the preceding even channel to the frequency in the specified channel. If the channel number is even a sector scan is performed for each channel pair starting with zero ending with the specified channel.
STP	8D	141				Cause an active Step to be advanced if the receiver has stopped on a signal. If the mode is STM the STP command will cause the receiver to return to the STP mode.
STP(a)	8D(b)	141(b)				Select Step operation. Start with channel 0 and step to channel number in STP command.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(__) - Represents the default mode.

Signal information for the receiver is applied using the following commands and responses.

Table D-7. WJ-861XB Signal Information Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM?	4A	74	AM(a)	48(b)	72(b)	Request reading from AM modulation. 000-068 Range
FM?	6B	107	FM(a)	69(b)	105(b)	Request reading from FM modulation. 000-100 Range
FMO?	AD	173	FMO(a)	AB(b)	171(b)	Request reading of FM offset. 000-255 Range
LGV?	71	113	LGV(a)	6F(b)	111(b)	Request reading of Log Video. 000-080 Range
SS?	89	137	SS(a)	87(b)	135(b)	Request reading of Signal Strength in dBm. (In manual, gain represents % of AM Detector (000-100).)

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

Optional commands are applied to the receiver using the following commands and responses.

Table D-8. WJ-861XB Optional Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
OPT?	DD	221	OPT (a),(a), (a)	DB (b)(b)(b)		Requests the options in the receiver. The response is returned as 3 byte encoded numbers. Each number has a range from 0 to 255. The bit values are indicated below: BIT BYTE 1 BYTE 2 BYTE 3 VALUE 0 RTC LFE PSS 1 1 EM HFE 488 2 2 LCK FEX 232 4 3 TPC FE ASO 8 4 RLOG SSB DAV 16 5 CUR VBFO MX 32 6 M/S BIT - 64 7 SLO NRT - 128
BITE Option						
BIT	A5	165				This command enables BITE mode. It starts BITE if current operating mode is other than BITE. It continues the BITE operation if the current mode is BITE active.
BIT?	A7	167	BIT(a)	A5(b)	165(b)	This command returns the current BITE test number. If a 0 is returned it indicates BITE has completed. Reading this register causes bit 2 of the status byte (STS?) to be cleared.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

Table D-8. WJ-861XB Optional Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BIC?	AA	170	BIC(a)	A8(b)	168(b)	This command returns the last A/D reading used for a failed BITE test. Refer to the BITE option manual for the range of the returned number and its meaning.
GEN	E1	225				This command allows the BITE Signal Generator to be turned on while in manual mode.
GEN/	E2	226				Turn Bite signal generator off.
GEN?	E3	227	GEN GEN/	E1 E2	225 226	Request status of BITE generator.
BFO Option						
BFO(f)	39(p)	57(p)				Set BFO frequency in kHz. (-7.99 to +7.99). Binary is sent as four packed BCD bytes. The sign is bit 3 of second byte. First and last byte are zeros. Byte 2 is kHz, Byte 3 is 100s of Hz, and 10s of Hz.
BFO?	3B(p)	59	BFO(-)(f)	39(p)	57(p)	Request BFO frequency. (0 kHz is default)
DAV Option						
AUD(a)	9F(b)	159(b)				Set audio gain level (0-255).
AUD?	A1	161	AUD(a)	9F(b)	159(b)	Request audio gain level.
AUL?	F5	245	AUL(a)	F3(b)	243(b)	Request the audio signal level. The number returned is between 0 and 99. Zero represents no audio energy and 99 maximum audio energy.

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

Table D-8. WJ-861XB Optional Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
VID(a)	A2(b)	162(b)				Sets video gain level (0-255).
VID?	A4	164	VID(a)	A2(b)	162(b)	Request video gain level.
VIL?	F8	248	VIL(a)	F6(b)	246(b)	Request the video signal level. The number returned is between 0 and 99. Zero represents no video energy and 99 maximum.
NRT Option						
NRT	B4	180				Enables NRT.
NRT/	B5	181				Disables NRT.
NRT?	B6	182	NRT NRT/	B4 B5	180 181	Requests NRT status.
COR(a)	57(b)	87(b)				Sets NRT level (0-20).
COR?	59	89				Requests set NRT level.
RTC Option						
TIM (HH:MM)	AE(b) (b)	174(b) (b)				Set time in hours and minutes. Seconds are set to 0 upon receiving this command. (ASCII format is HH:MM) (Binary is 2 packed BCD bytes, the first byte is hours and the second byte is minutes.)
TIM?	B0	176	TIM (HH:MM:SS)	AE(b) (b)(b)	174(b) (b)(b)	Request time. Returns hours, minutes and seconds. (ASCII format is HH:MM:SS) (Binary is 3 packed BCD bytes, hours, minutes and seconds.)

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

* - Receiver must have appropriate option for this command to be supported.

Table D-8. WJ-861XB Optional Commands and Responses (Continued)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
RLOG Option						
*RLG	FC	252				Enables RLOG mode.
*RLG/	FD	253				Disables RLOG mode.
*RLG?	FE	254	RLG	FC	252	Requests RLOG status.
			RLG/	FD	253	

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as group of ASCII numbers representing a frequency. This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents default mode.

* - Receiver must have appropriate option for this command to be supported.

The response to an **AM?** mnemonic is a number from 000 to 068 representing the level of AM Video present at the output of the receiver. Each unit increment represents approximately 13 mV rms of AM Video. For **FM?**, the response is a number ranging from 000 to 100, representing the percentage of FM modulation. Each unit increment represents a 1 percent increment with 100 equaling 100% modulation and 000 equaling no modulation. For **FMO?**, the response is a number from 0-255, representing the FM Discriminator offset. The number 127 represents a signal at tuned frequency. For tuned frequencies of 500 MHz or less, received signals greater than the tuned frequency produce returned values less than 127 and for received signals less than the tuned frequency, returned values are greater than 127. However, if the Frequency Extender option is installed and the receiver tuned frequency is greater than 500 MHz, the returned values are reversed. Thus, when the receiver is tuned to 600 MHz and the received signal frequency is greater than the tuned frequency the returned number is greater than 127 and when the signal frequency is less than the tuned frequency, the returned number is less than 127.

LGV? provides a number from 000 to 080 representing the Log video level of the receiver. This number represents the signal level above the theoretical noise floor of the receiver, with each unit increment representing approximately a 0.5 dB change. 000 represents the theoretical noise floor and 080 represents 40 dB above that level.

The response to **SS?** provides a signal strength number in dBm from -125 to -20. In manual gain this number represents the level of the AM detector from 0-100%.

The WJ-861XB Receiver is capable of activating the SRQ line indicating controller service is required. Four different stimuli cause the receiver to set the SRQ line indicating the reasons for this assertion. These include: errors, power-up, clear and signal activity. If an error occurs during operation of the receiver, it sets the SRQ line and bits 5 and 6 of the status byte. If the BITE option is installed, the completion of BITE or upon an error acquisition, SRQ is set with bits 2 and 6 of the status byte. When the receiver is powered-up or sent SDC or DCL commands, it sets SRQ and bits 1 and 6 of the status byte.

The remaining stimuli that cause the SRQ line to become active is the acquisition or loss of a signal (signal level above or below COR level). This sets bit 6 of the status byte. Signal activity SRQ must be enabled by sending STS 1 to enable this interrupt.

A serial poll clears the SRQ line as defined by the IEEE-488 specification. The status byte read by the computer while doing the serial poll is defined in **Table D-9.**

Table D-9. SRQ Status Byte

Bit	Set Indicates	Cleared Indicates	Cleared By
0	Signal above COR	No signal above COR	Non-latched indicator
1	Unit Power-up SRQ		Requesting receiver status (device dependent command)
2	BITE complete or error found		Requesting BITE status (device dependent command)
3	End of Scan sequence (when status byte previously set with STS 8)		Reset by serial poll followed by SCN
4	Responding to request for data		Non-latched indicator
5	Error condition occurred	Error condition cleared	Requesting Error status (device dependent command)
6	SRQ has occurred	SRQ not active from this device	Requesting Receiver status or Error status (device dependent command)

As a response to an **STS?** instruction or serial poll, a status byte is returned to indicate the receiver status. This response is a three-digit decimal number that corresponds to the binary number contained in the returned byte (0 = 00000000; 127 = 01111111).

D.2.2 EXAMPLES OF REMOTE OPERATION

The examples that follow (**Tables D-10** through **D-15** provide examples of control operations, using an HP85 as a controlling device. These examples are shown in the ASCII and binary modes. Similar type messages will use a similar format.

Table D-10. Sending a Tuned Frequency of 25 MHz to the WJ-861XB Using as HP85 (WJ-861XB Device #6)

Message: Send tuned frequency of 25.0000 MHz

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "FRQ25"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
ASCII message may have leading zeros.	3	1	0	26		861XB LISTEN
Total none blank character count 15,	4	0	0	46	F	
for single commands. Exponential	5	0	0	52	R	DATA TO
format is not supported. IE: "FRQ	6	0	0	51	Q	WJ-861XB
0025.0000 is valid message.	7	0	0	32	2	
EOI may be terminator.	8	0	0	35	5	
	9	0	0	0D	(CR)	
	10	0	0	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 60, 0, 37, 0, 0	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
All bytes must be sent with no spaces	3	1	0	26		861XB LISTEN
or terminator characters.	4	0	0	36	60	FREQ CODE
	5	0	0	00	0	BYTE 1
	6	0	0	25	37	BYTE 2
	7	0	0	00	0	BYTE 3
	8	0	1	00	0	BYTE 4

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-11. Sending a COR "OFF" Command

Message: Send COR off (41)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "COR 41"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	43	C	DATA TO
	5	0	0	4F	O	WJ-861XB
	6	0	0	52	R	
	7	0	0	34	4	
	8	0	0	31	1	
	9	0	0	0D	(CR)	
	10	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 87, 41	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	57	87	COR CODE
	5	0	1	29	41	VALUE

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-12. Sending a Frequency Request

Message: Request Frequency (assume 25 MHz last sent)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "FRQ"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
Instruct WJ-861XB to prepare to output	3	1	0	26		861XB LISTEN
frequency information when made a	4	0	0	46	F	
talker.	5	0	0	52	R	DATA TO
	6	0	0	51	Q	WJ-861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
	12	1	0	46		861XB TALK
	13	0	0	46	F	
	14	0	0	52	R	
	15	0	0	51	Q	DATA FROM
A $ will contain "FRQ 0025.0000".	16	0	0	20		WJ-861XB
	17	0	0	30	0	
	18	0	0	30	0	
	19	0	0	32	2	
Frequency response is always 15 characters.	20	0	0	35	5	
	21	0	0	2E	.	
	22	0	0	30	0	
	23	0	0	30	0	
	24	0	0	30	0	
	25	0	0	30	0	
	26	0	0	0D	(CR)	
	27	0	1	0A	(LF)	TERMINATOR

Table D-12. Sending a Frequency Request (Continued)

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 62	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	1	3E		REQUEST FREQUENCY
Enter 706 using "#%, #%K"; A$	1	0		3F		UNLISTEN
	1	0		35		HP85 LISTEN
Image causes enter to terminate on EOI	1	0		46		861XB TALK
only.	0	0		3C	60	FREQ CODE
	0	0		00	0	BYTE 1
A$ will contain frequency data in packed BCD.	0	0		25	37	BYTE 2
	0	0		00	0	BYTE 3
	0	1		00	0	BYTE 4

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-13. Sending a Bandwidth Size Request

Message: Request size of selected IF bandwith (assume 10 kHz)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "BWC?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
Instruct 861XB to output size of	3	1	0	26		861XB LISTEN
selected BW in kHz when made an	4	0	0	42	B	
active talker.	5	0	0	57	W	DATA TO
	6	0	0	43	C	WJ861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contain "BWC 10".	12	1	0	46		861XB LISTEN
	13	0	0	42	B	
	14	0	0	57	W	DATA FROM
	15	0	0	43	C	WJ-861XB
	16	0	0	20		
	17	0	0	20		
	18	0	0	31	1	
	19	0	0	30	0	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR
	(Assume 4 MHz)					
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contain "BWC 4000".	12	1	0	46		861XB TALK
	13	0	0	42	B	
	14	0	0	57	W	DATA FROM
	15	0	0	43	C	WJ-861XB
	16	0	0	34	4	
	17	0	0	30	0	
	18	0	0	30	0	
	19	0	0	30	0	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR

Table D-13. Sending a Bandwidth Size Request (Continued)

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 158	1	1	0	3F		UNLISTEN
	2	1	0	55		HP TALK
	3	1	0	26		861XB LISTEN
	4	0	1	9E	158	BW SIZE REQUEST
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	B5		HP85 LISTEN
	7	1	0	46		861XB TALK
A$ will contain binary BW size	8	0	0	9C	156	BW CODE
information.	9	0	0	00	0	BINARY CODED
	10	0	1	0A	10	BANDWIDTH IN kHz
			(Assume 4 MHz)			
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
Byte 1, Byte 2	6	1	0	35		HP85 LISTEN
A$ will contain binary BW size information.	7	1	0	46		861XB TALK
	8	0	0	9C	156	BW CODE
	9	0	0	0F	15	BINARY CODED
	10	0	1	A0	160	BANDWIDTH IN kHz

*Control Statement: Control 7,16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB).

Table D-14. Sending a Detection Mode Request (Cont'd.)

(Assume current detection mode is AM)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "DET?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP TALK
	3	1	0	26		861XB LISTEN
	4	0	0	44	D	
	5	0	0	45	E	DATA TO
	6	0	0	54	T	WJ-861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contian "AM."	12	1	0	46		861XB TALK
	13	0	0	41	A	
	14	0	0	4D	M	DATA FROM
	15	0	0	20		WJ-861XB
	16	0	0	0D	(CR)	
	17	0	1	0A	(LF)	TERMINATOR
	(Assume PLS)					
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contian "PLS."	12	1	0	46		861XB TALK
	13	0	0	50	P	
	14	0	0	4C	L	DATA FROM
	15	0	0	53	S	WJ-861XB
	16	0	0	0D	(CR)	
	17	0	1	0A	(LF)	TERMINATOR

Table D-14. Sending a Detection Mode Request (Cont'd.)

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 95	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	1	5F		REQUEST DETECTION MODE
	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 TALK
Enter 706; using "#%, #%K"; A$	7	1	0	46		861XB LISTEN
A$ will contain 1 byte binary information.	8	0	1	48		AM CODE
			(Assume PLS)			
	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 TALK
Enter 706; using "#%, #%K"; A$	7	1	0	46		861XB LISTEN
A$ will contain 1 byte binary information.	8	0	1	78		PLS CODE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB)

Table D-15. Sending a COR Level Request (Cont'd.)

Message: Request COR level, (assume off)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "COR?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		861XB LISTEN
	4	0	0	43	C	
	5	0	0	4F	O	DATA TO
	6	0	0	52	R	WJ-861XB
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		
	11	1	0	35		
	12	1	0	46		
	13	0	0	43	C	
A$ will contain "COR 041".	14	0	0	4F	O	
	15	0	0	52	R	
	16	0	0	20		
	17	0	0	30	0	
	18	0	0	34	4	
	19	0	0	31	1	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
		1	0	3F		UNLISTEN
*Print using "B"; 89		1	0	55		HP85 TALK
		1	0	26		861XB LISTEN
		0	1	59	89	REQUEST COR
Enter 706 using "#%, #%K"; A$		1	0	3F		UNLISTEN
		1	0	35		HP85 LISTEN
A$ will contain 2 bytes binary		1	0	46		861XB TALK
information.		0	0	57	87	COR CODE
		0	1	29	41	VALUE

*Control Statement Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-861XB)

D.3 PARTS LIST

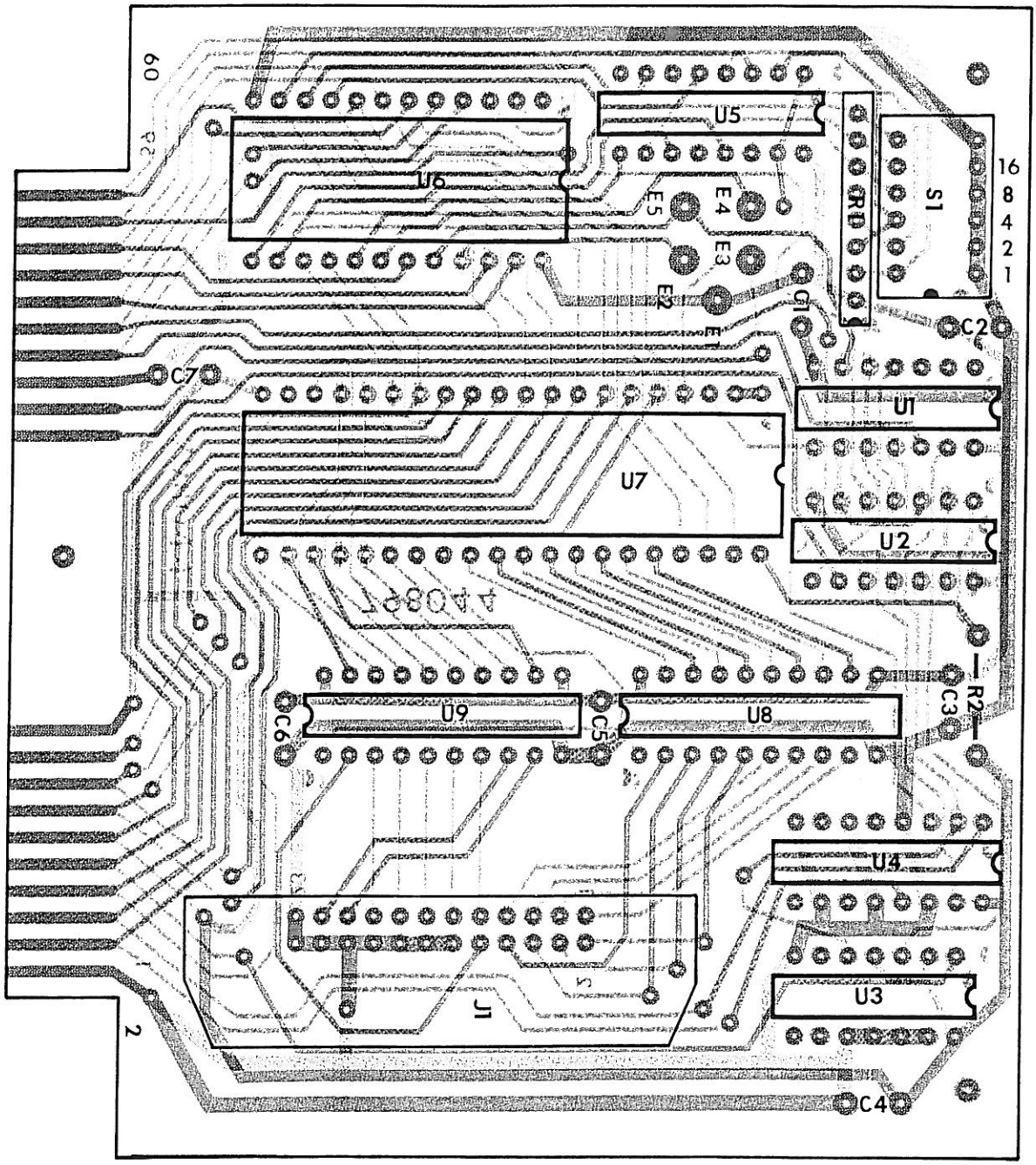

Figure D-2. Type 798044-1 IEEE-488 Interface (Option 4), Location of Components

D.3.1 TYPE 798044-1 IEEE-488 INTERFACE

REF DESIG PREFIX OPT 4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision B				
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	7	34453-1	14632	
C2 Thru C7	Same as C1				
J1	Connector, Receptacle, Multipin: 24 pins	1	102160-5	00779	
R1	Resistor, Network: 47 kΩ	1	4308R-101-473	80294	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
S1	Switch, Toggle	1	76PSB06S	81073	
U1	Integrated Circuit	1	SN74LS00N	01295	
U2	Integrated Circuit	1	SN74LS04N	01295	
U3	Integrated Circuit	1	MM74C74N	27014	
U4	Integrated Circuit	2	MM80C97N	27014	
U5	Same as U4				
U6	Integrated Circuit	1	190169-21	14632	
U7	Integrated Circuit	1	MC68B488	04713	
U8	Integrated Circuit	1	841137-1	14632	
U9	Integrated Circuit	1	841137-2	14632	