

CONNECT SYSTEMS INCORPORATED

1802 Eastman Ave., Suite 116
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FLEX II E&M SERIES UNIVERSAL CONTROLLER

Hardware Reference Manual

Made in U.S.A.

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PRIMARY TEN POSITION CONNECTOR

RX AUDIO For the products detecting CTCSS, DCS, or LTR, or products that use the internal squelch, the RX AUDIO must be connected to the discriminator of the radio. For all other products the RX AUDIO can be connected to the discriminator, high side of the volume control, or the speaker.

TX AUDIO For products that generate CTCSS, DCS, or LTR, the TX AUDIO must be connected directly to the modulator of the transmitter. For LTR and DCS, the modulator must be true FM. For CTCSS the modulator can be phase modulated or FM modulated. For all other applications, connections to the high side of the microphone is acceptable.

It should be noted that in most communication controllers there is a separate line for voice audio and a separate line for the CTCSS, DCS, or LTR signals. This is because to combine the two the controller has to have a limiter on the voice line to prevent over modulation and other undesirable side effects. The Flex Series Controllers has a built in limiter thereby not requiring separate lines.

PTT The PTT normally hooks to the PTT of the transmitter. If you are using a Hand Held with the PTT sharing a common connection with the transmit audio, then attach a resistor with a value between 2.4K and 4.7K from the PTT to the TX Audio and attach the TX audio line to the center conductor of the microphone cable. In most product that use the PTT, the AUX relay can also be used as a PTT connection. This has the advantage of allowing positive keying or other situations where the normal open collector PTT does not work.

COS Connect to a point that has a good voltage swing when the squelch is opened/closed. The best point to connect is to the collector of the transistor that controls the busy light (if the receiver has one). Otherwise you may connect to the squelch control voltage. The minimum voltage for the COS is about 0 volts and the Maximum voltage is the supply voltage.

Some radios have that point coming out the back of the radio. It sometimes goes under the name of squelch detect, sq det, or COR. In some case a pull up or pull down resistor is necessary.

The polarity and other parameters associated with the COS is contained within the programming parameters described later. It should be noted that in most cases, the COS can be replaced with the internal squelch.

SENSE This point is used as an auxiliary input for specialized purposes in certain products. As an example, this input may be used to detect the presence of a CTCSS/DCS signal in an LTR system. The minimum voltage for the sense input is about 0 volts and the Maximum voltage is the supply voltage.

The polarity and other parameters associated with the SENSE is contained within the programming parameters if used.

AUX RELAY These two points connects to the center contact and normally open contact of the relay. The use if any depends upon the product.

+12 VDC Connect to a source of 12 volts to 15 volts DC. The Flex Series Controllers are reverse polarity protected, so a polarity mistake will not damage the product.

GND Connect the return lead to ground. All the grounds in the system are connected to each other.

SECONDARY TEN POSITION CONNECTOR

- 4W RX+** Only used in four wire mode for audio in.
4W RX-
- 4W RX/TX+** In four wire mode, provides the audio out. In two wire
4W RX/TX- mode, provides both audio in and audio out.
- CT VOLT** This is a center tap to the transmitting transformer on the secondary side of the transformer (side attaching to the radio). This will only be used in the four wire mode.
- MONITOR+** Provides a monitor function from the receiver. This is a buffered output and is transformer coupled to provide isolation and a balanced output.
- MONITOR-** Provides other side of balanced output. Should be connected to ground connection if single ended output needed.
- DIG IN** Digital input to provide monitoring of negative voltages with respect to ground. Designed for -48 Volts. Input can be between -12 Volts to -52 volts and +12 Volts to +52 Volts to consider the input active and between 0 volts to 5 volts and 0 volts to -5 volts for the input to be inactive.
- D/A OUT** Spare output to be used for undefined functions for future applications.
- GROUND** Ground for D/A output

RJ11 TELCO CONNECTOR

- L->M** Pins 2 & 5. Provides audio between the telephone and the transmitter of the radio
- M->L** Pins 3 & 4. Provides audio between the receiver of the radio and the telephone line.
- CONTROL** Pins 1 & 6. Provides a pair of uncommitted relay contacts to allow the signaling function of an E&M Type 1 protocol.

RJ11 PROGRAMMING CONNECTOR

- PROGRAM** Pins 3 & 4. A standard telephone plugs into these wire and is used for programming.
- RS485** Pins 2 & 5. Used for connecting multiple units together for an integrated system.
- DIG IN** Pin 1. Used as a uncommitted digital input for future expansion. Input can be between -12 Volts to -52 volts and +12 Volts to +52 Volts to consider the input active and between 0 volts to 5 volts and 0 volts to -5 volts for the input to be inactive.

ADJUSTMENTS

P1 HYB BAL

The Hybrid Balance control is used to null out the mobile return audio in full duplex mode. The alignment must take place on one of the phone lines the Flex Series controller will be serving. (This alignment can not be done at the shop prior to delivery to the site.)

Have a mobile place a call through the Flex Series Controller. The party answering the called phone should leave the phone off hook during the alignment procedure.

Monitor the transmitter output with a service monitor or connect an oscilloscope to the "TX OUTPUT" terminal on the rear of the Flex Series Controller. Place all four Dip switches in the off position.

Have the mobile simultaneously press digits 3 and 6 on his touch tone keypad. This will result in the transmission of a single 1477 Hz tone.

Adjust the "HYB BAL" Potentiometer to produce the least audio output. Try all possible dip position combinations and null each time. The combination which gives the minimum output is the correct position to use.

Changes made within the telephone company or rerouting of telephone lines could occasionally require re-adjustment of the hybrid.

P2 Hyb Bal 2

The Hybrid Balance control is used to balance the balanced audio coming from or to the radio. This is only necessary for the repeater operating in the full duplex mode on a two wire system. If a four wire system is used, then it is not necessary to balance the hybrid.

P3 Tel Vox

Used for detection of call progress tones and sensitivity to voice in Vox operated applications. Turning the pot clockwise increases its sensitivity.

P4 Preamp

The preamp control is used to match the audio level from your receiver to the Flex Series controller. To adjust, a signal containing 100 Hz CTCSS with about 600 Hz deviation should be applied to the receiver. Adjust the preamp control until a level of 3 volts peak to peak is observed at test point 6. If an oscilloscope is not available, read 1 volt RMS using a VOM.

- P5 RX VOX** Used in VOX mode only. Sets RX audio triggering sensitivity. Should be fully clockwise in VOX simplex applications. Reduce setting when used through repeaters if land line cannot respond to mobile during hang time due to noise or tone on the repeater carrier.
- P6 AUDIO OUT** Adjust the maximum level going to the transmitter. When turned fully clockwise, an output voltage of about five volts peak to peak is obtained. In most case the output level can also be set in the programming mode.
- P7 CONTRAST** Sets the contrast of the LCD. Adjust to what is most pleasing to the individual.
- P8 SQUELCH** Advance clockwise to a point just beyond where the front panel display "Rx" message disappears. Not all products will display the Rx message.

JUMPER STRAP OPTIONS

- JP1** **Radio Pre-emphasis.** Selects the radio audio source to be either pre-emphasized or flat
- JP2,JP18** **Preamp Gain.** With jumper 18 not installed and Jumper 2 not installed, gain is 100 with flat audio.
- With jumper 18 not installed and Jumper 2 in "A" position, gain is 10 with flat audio.
- With Jumper 18 not installed and Jumper 2 in "B" position, gain is 10 with a 3 db roll off starting at 300 Hz.
- With jumper 18 installed and Jumper 2 not installed, gain is 100 with 3 db roll off starting at 300 Hz.
- With jumper 18 installed and jumper 2 in "A" position, has a gain of 10 with 3 db roll off starting at 3 KHz.
- With jumper 18 installed and jumper 2 in "B" position, has a gain of 10 with a 3 db roll off starting at 300 Hz.
- JP3** **Software Jumper.** Product Specific. See product manual
- JP4** **Software Jumper.** Product Specific. See product manual
- JP5** **Software Jumper.** Product Specific. See product manual
- JP6** **Software Jumper.** Product Specific. See product manual
- JP7** **Software Jumper.** Product Specific. See product manual
- JP8** **Software Jumper.** Product Specific. See product manual
- JP9** **Software Jumper.** Product Specific. See product manual
- JP10** **Software Jumper.** Product Specific. See product manual
- JP11** **Telephone Pre-emphasis.** Used to select pre-emphasis from the telephone line
- JP12,JP13** **RS232 Source.** Determines if the source of the RS232 port is from the internal UART of the microprocessor or from two general I/O pins. Used for future products.

- JP14** **Secondary D/A.** When connected, this allows a secondary D/A converter to be connected to pin 9 of the primary 10 position screw type of terminal block. When used in this mode, the aux relay cannot be used.
- JP15** **RS485 Terminating Resistor.** The terminating resistor when used for RS485 communication. Only use one per system.
- JP16** **Output D.C. Coupling.** When inserted, allows the TX Audio output to be DC coupled.
- JP17** **Receive Audio Select.** Select between single ended and balance audio from receiver.
- JP18** See Jumper 2
- JP19** **Voice Storage Select.** Selects the audio source for the voice recorder to be either from the telephone/programming jack or the radio
- JP25** Not on board

SETTING THE JUMPERS TO SELECT BETWEEN DIFFERENT RADIOS

For the four wire balanced audio without center tap, insert the following jumpers: JP23,JP24,JP30.

For the four wire balanced audio with the center tap transformer, insert the following jumpers: JP26, JP27, JP30.

For two wire balanced audio, insert the following jumpers: JP20,JP21,JP22,JP24,JP28,JP29,JP30

DETERMINING POSITION OF THE THREE POSITION JUMPERS

Jumper 1 Radio Pre-emphasis. This jumper selects flat audio or pre-emphasized audio. If the audio out is going directly to the modulator of the radio, then pre-emphasized audio should be selected. If the audio out is going to the microphone connector of the radio, then flat audio should be selected.

If connecting between the center pin and the pin to the right that is closest to R70, then you are selecting flat audio. If connecting between the center pin and the pin to the left that is closest to C45, then you are selecting pre-emphasized audio.

Jumper 2 Preamp Gain. Flat audio is selected if the audio is coming from a point past the de-emphasis network such as the speaker or the high side of the volume control. If the de-emphasis network is used, the audio source must come directly from the FM detector of the radio before the de-emphasis network.

If connecting between the center pin and the pin to the right that is closest to C28, then you are selecting flat audio with a gain of 10. If connecting between the center pin and the pin to the left that is closest to 41, then you are selecting de-emphasized audio with a gain of 10.

Jumper 11 Telephone Pre-emphasis. This jumper selects flat audio or pre-emphasized audio. If the audio out is going directly to the modulator of the radio, then pre-emphasized audio should be selected. If the audio out is going to the microphone connector of the radio, then flat audio should be selected.

If connecting between the center pin and the pin to the right that is closest to C116, then you are selecting flat audio. If connecting between the center pin and the pin to the left that is closest to R136, then you are selecting pre-emphasized audio.

Jumper 12 RS232 Source. This jumper selects which of the microprocessor resources will be used to control the RS232. If an internal Ethernet controller is used, then the selection should be from the port pins, else the connection should be to the microprocessors internal UART.

If connecting between the center pin and the pin to the right that is closest to JP3, then you are selecting the internal UART. If connecting between the center pin and the pin to the left that is closest to R127, then you are selecting port pins.

Jumper 13 RS232 Source. This jumper selects which of the microprocessor resources will be used to control the RS232. If an internal Ethernet controller is used, then the selection should be

from the port pins, else the connection should be to the microprocessors internal UART.

If connecting between the center pin and the pin to the right that is closest to JP3, then you are selecting the internal UART. If connecting between the center pin and the pin to the left that is closest to R127, then you are selecting port pins.

Jumper 17 Receive Audio Select. This jumper selects whether the audio is coming from the single ended audio source of the primary 10 position connector or the balanced audio source of the secondary 10 position connector.

If connecting between the center pin and the pin to the right that is closest to P4, then you are selecting the single ended audio source. If connecting between the center pin and the pin to the left that is closest to TP-4, then you are selecting the balanced audio source.

Jumper 19 Voice Storage Select. This jumper selects whether the audio source for the voice storage chip is coming from the radio or the telephone line/programming jack. Except for the situation where it is important to get the best possible audio recording from the radio, the user should select the audio source from the telephone line/programming jack. If the radio is selected, the user cannot preprogram the audio prompts that are used in many products.

If connecting between the center pin and the pin to the right that is closest to P5, then you are selecting the audio source from the radio. If connecting between the center pin and the pin to the left that is closest to JP-18, then you are selecting the audio source from the telephone line/programming jack.

Jumper 30 Center Tap Select. This jumper will allow the user to select balanced audio output to be from the Center Tap transformer that is used for keying the radio via a constant DC current going through the transformer or from the standard two or four wire balanced audio circuitry.

If connecting between the center pin and the pin closet to the front of the unit, then you are selecting the center tap transformer. If connecting between the center pin and the pin closest to the rear, then you are selecting the audio source from the standard two or four wire balanced audio.

GENERAL CIRCUIT DESCRIPTION

Telephone Interface

Telephone call comes in Telco Jack J1. This six position jack has four wire 600 ohm balanced audio path and a control point. Transformer T1 transfers audio from the telephone line to the radio transmitter and transformer T2 transfers audio from the radio receiver to the telephone line. Relay RL1 is used to control and E&M port by passing an external voltage source of typically minus 48 volts to the voltage detector of the attached equipment.

Receive Telephone Audio

The output of T1 is presented to U1D where the Op-Amp provides an anti-aliasing filter to the Voice storage chip U17 and the DTMF decoder U3. The receive telephone audio passes to the Analog to Digital Converter on the microprocessor as the signal AD-TELCO and to the circuitry surrounding U1A where the function of Telephone Vox is implemented.

Telephone Pre-Emphasis

U18-C forms a pre-emphasis network for those situations where the audio is going to be presented directly to the modulator of the transmitter.

Transmit Telephone Audio

The output of the Digital to Analog Converter from the microprocessor (DA_TELCO) is passed to U19 which forms a five pole low pass filter. This circuitry is needed properly reconstruct the data coming from the microprocessor. U1B provides gain before being outputted to the telephone line.

Voice Storage Chip

The voice storage chip is used to store up to two minutes of voice from either the telephone, programming port, or the radio.

The connection from the radio to the voice storage chip is not direct. To accomplish this task, the unit digitizes the voice from the radio and then outputs it to the telephone. If the telephone line relay is not pulled in or the system is not connected to the telephone line, then the hybrid is not balanced and the audio to the telephone output will be reflected back to the telephone audio input where it then has a clear path to the voice storage chip.

Telephone DTMF Decoder

The audio from the telephone is decoded by the DTMF decoder U3. When pin 15 on the DTMF decoder chip is high, it signals to the microprocessor pin that data is waiting where it is then read.

Radio Receive Audio

U5A provides a low pass filter used to get rid of high frequency garbage from the radio. U5B provides the de-emphasis network. The audio from U5B goes to the RX-VOX, DTMF decoder, zero crossing detector, and the 6 pole high pass filter consisting of U10A, U10B, and U10D. The output of the filter is used to remove sub audible CTCSS, DCS, or LTR tones from the radio before being presented to the microprocessors A/D converter.

The receive audio also goes to U13A-U13D, U18A and U18B which is a squelch detector. The squelch detector is used to determine the presence of squelch noise from the radio receiver.

Radio Pre-Emphasis

U5-D forms a pre-emphasis network for those situations where the audio is going to be presented directly to the modulator of the transmitter.

Radio Transmit Audio

The output of the microprocessors D/A converter is reconstructed by U20, a five pole low pass filter. U4C is used to get rid of any high frequency clock noise from the audio and U4D is used to amplify the results before being presented as transmit audio.

Balanced Audio

There are two transformers and the appropriate nulling circuitry that allows the radio audio to be either two wire balanced audio or four wire balanced audio. There are jumpers that select between these two configurations.

Squelch Detector

U13A and U13B act as a four pole high pass filter to remove any low frequency signals below about 11KHz. U13 act as a gain stage where it is then detected by U13D. R110 and C92 act as a smoothing filter where it is then presented to the microprocessor via U18B

Zero Crossing Detector

U6D and U6C act as a four pole low pass filter designed to pass only the CTCSS, DCS or LTR subaudible signals. U6A and U11C along with the transistors act as a zero crossing detector where it is then presented as a digital signal to the microprocessor.

COS Detector

U4B acts as a buffer between the outside world and the A/D converter on the microprocessor. The logic within the microprocessor determines if the COS should be derived from the COS detector or the Squelch detector.

Push To Talk

Transistor Q9 acts as a buffer between the microprocessor and the outside world. D14 is used to protect the circuit against any transients.

Sense Detector

U4A acts as a buffer between the outside world and the A/D converter on the microprocessor. The logic within the microprocessor determines the function of that signal.

Eeprom

The EEPROM is used for parameter storage and occasionally certain real time data. The part is read and written to by the IIC port on the microprocessor.

Computer Interface

U12 converts the RS232 levels to levels compatible with the first UART internal to the microprocessor.

External Network

U16 converts the levels from the second UART built into the microprocessor to the appropriate levels compatible with RS485 communications. This can be used to tie multiple flex series controller together.

LCD Interface

The microprocessor talks to the LCD controller via a four bit interface.

Aux Relay

The microprocessor can turn on and off the auxiliary relay by means of a control pin attached to R93.

JTAG Interface

The microprocessor can be reprogrammed via a JTAG interface. This allows the user to change the characteristic of the controller by means of software available on our web site.

Power Supply

The power supply generates 12 volts, 5 volts, and 3.3 volts from a 12 volt or greater power source.

REVISION HISTORY

July 14, 2003 First Release

CONNECT SYSTEMS INC. 1802 EASTMAN AVE #116 VENTURA, CA. 93003	PARTS LIST PCBA, MODEL FLEX II E&M	REV B
SHEET 1 OF 7		

DRAWN BY J. WANGER	APPROVED	DATE APPROVED
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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
1	1		P.C.B., MODEL FLEX II	MODEL FLEX II
2	4		CAP, SMD 0805, 33 pF 08055A330JAT2A	C43,C50,C60,C61
3	1		CAP, SMD 0805, 82 pF 08055A820JAT2A	C99
4	5		CAP, SMD 0805, 120 pF 08055A121JAT2A	C9,C25,C30,C102,
5				C104
6	1		CAP, SMD 0805, 270 pF 08055A271JAT2A	C13
7				
8	5		CAP, SMD 0805, .001 uF 08055C102JAT2A	C54,C70,C71,C72,
9				C73
10	5		CAP, SMD 0805, .0022 uF 08055C222JAT2A	C10,C87,C88,C89,
11				C90
12	2		CAP, SMD 0805, .0047 uF 08055C472JAT2A	C28,C38
13	10		CAP, SMD 0805, .01 uF 08055C103JAT2A	C24,C40,C44,C45
14				C45,C46,C47,C48,
15				C49,C91,C110
16				
17	1		CAP, SMD 0805, .015 uF 08055C153JAT2A	C39
18	1		CAP, SMD 0805, .022 uF 08055C223JAT2A	C111
19	3		CAP, SMD 0805, .047 uF 08055C473JAT2A	C27,C37,C112
20				
21				
22				
23				
24				

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SHEET 2 OF 7		

DRAWN BY J. WANGER	APPROVED	DATE APPROVED
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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
25	46		CAP, SMD 0805, .1 uF 08055C104KAT2A	C1,C4,C12,C16,
26				C17,C19,C20,C21,
27				C22,C23,C32,C33,
28				C34,C36,C41,C42,
29				C55,C56,C57,C59,
30				C62,C63,C64,C65,
31				C66,C67,C68,C74,
32				C75,C76,C77,C78,
33				C79,C81,C84,C86,
34				C93,C96,C98,
35				C100,C101,C107
36				C108,C113,C115,
37				C116
38	1		CAP, SMD 0805, .22 uF 08053C224KAT2A	C29
39				
40	6		CAP, 1 uF, 50V, ELECT, 50TWSS1	C5,C14,C18,C31,
41				C92,C109
42	2		CAP, 2.2 uF, 50V, ELECT, 50TWSS2R2	C94,C95
43	3		CAP, 4.7 uF, 50V, ELECT, 50TWSS4R7	C26,C51,C58
44	3		CAP, 10 uF, 50V, ELECT, 50TWSS10	C3,C8,C114
45	5		CAP, 33 uF, 25V, ELECT, 25TWSS33	C2,C15,C82,C83,
46				C85
47				
48	2		CAP, 47 uF, 35V, ELECT, 35TWSS47	C35,C103

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SHEET 3 OF 7		

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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
49	5		CAP, 220 uF, 35V, ELECT, 35TWSS220	C52,C53,C80,
50				C105,C106
51	2		CONNECTOR, RJ11, 6 POS, 66011-002	J1-J2
52	2		CONNECTOR, 10 POS BARR BLK 70810C	J3,J7
53	1		CONNECTOR, 8P HDR, LONG PIN, 22-03-2082	J4
54	1		CONNECTOR, DP9S, RT ANG, DE9S318,104951	J5
55	1		CONNECTOR, 2 x 5,FAN-10SGS	J8
56	2		HEADER, 2 x 4 PIN TDB-08SGS	JP3-JP10
57	1		HEADER, 14 PIN, 2X7, 10-88-1141	LCD
58	13		CONNECTOR, 2 PIN HEADER, TD-2SG	JP14,JP15,JP16,
59				JP18,JP20,JP21,
60				JP22,JP23,JP24,
61				JP26,JP27,JP28,
62				JP29
63	8		CONNECTOR, 3 PIN HEADER, TD-3SG	JP1,JP2,JP11,
64				JP12,JP13,JP17,
65				JP19,JP30
66	30		CONNECTOR, SHORTING BLOCK, DM-2GM-0	JP1-JP30
67	1		DIODE, 1N5245B,ZENER, 15V, CMBZ5245B	D14
68	4		DIODE, 1N4004	D3,D13,D16,D17
69	8		DIODE, 1N4148, MMBD4148	D6,D7,D8,D9,D10,
70				D11,D18,D19
71				
72	1		LED ASSY, RED, LL64233R, LTL-523-11	D15

CONNECT SYSTEMS INC. 1802 EASTMAN AVE #116 VENTURA, CA. 93003	PARTS LIST PCBA, MODEL FLEX II E&M	REV B
SHEET 4 OF 7		

DRAWN BY J. WANGER	APPROVED	DATE APPROVED
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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
73	1		LED, RED, SMALL, 35BL504	D12
74				
75	1		FUSE, 2 AMP, 473.002	F3
76	2		I.C. H11AA4.S, OPTOISOLATOR	Q2, Q16
77				
78	7		I.C. LF347M, QUAD OP AMP	U1, U4, U5, U6, U10,
79				U13, U18
80	1		I.C. LM324M, QUAD OP AMP	U11
81	2		I.C. M-88L70-01S, DTMF DECODER	U3, U7
82	1		I.C. uA78M33CKC, 3.3 V REGULATOR	U8
83	1		I.C. LM78L05ACM, 5.0 V REGULATOR	U9
84	1		I.C. MAX5380LEUX, D/A CONVERTER	U2
85	1		I.C. MAX3221CAE, RS232 INTERFACE	U12
86	1		I.C. 24LC256I/SN, 256K IIC EEPROM	U14
87	1		I.C. C8051F124, MICROPROCESSOR	U15
88	1		I.C. SP3485CN, RS485 TRANCEIVER	U16
89				
90	1		I.C. ISD4002-120S, VOICE RECORDER	U17
91	2		I.C. MAX7413CUA, 5th ORDER BESSEL FLTR	U19, U20
92				
93	1		POT, 2K, 3386P-1-202	P2
94	5		POT, 10K, 3386P-1-103	P3, P4, P5, P6, P7
95	1		POT, 100K, 3386P-1-104	P8
96				

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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
97	3		RELAY, G5V-2-DC12	RLY1,RLY2,RLY3
98				
99	2		RESISTOR, 1/2 W, 220, CARBON FILM	R9,R12
100	1		RESISTOR, 1/2 W, 1K, CARBON FILM	R3
101	2		RESISTOR, 1/2 W, 3.3K, CARBON FILM	R4,R14
102				
103				
104	5		RESISTOR, 1/4 W, 620, CARBON FILM	R5,R16,R20,R121,
105				R124
106	1		RESISTOR, SMD 0805, 0	R1
107	2		RESISTOR, SMD 0805, 100	R21,R122
108	2		RESISTOR, SMD 0805, 240	R79,R120
109	1		RESISTOR, SMD 0805, 470	R52
110	1		RESISTOR, SMD 0805, 620	R83
111	11		RESISTOR, SMD 0805, 1K	R26,R39,R59,R73,
112				R78,R82,R84,R90,
113				R96,R115,R136
114	2		RESISTOR, SMD 0805, 1.1K	R32,R64
115	1		RESISTOR, SMD 0805, 2K	R114
116	11		RESISTOR, SMD 0805, 2.2K	R17,R27,R44,R62
117				R85,R86,R87,R97,
118				R107,R110,R127
119	1		RESISTOR, SMD 0805, 3.3K	R104
120	2		RESISTOR, SMD 0805, 4.7K	R43,R103

CONNECT SYSTEMS INC. 1802 EASTMAN AVE #116 VENTURA, CA. 93003	PARTS LIST PCBA, MODEL FLEX II E&M	REV B
SHEET 6 OF 7		

DRAWN BY J. WANGER	APPROVED	DATE APPROVED
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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
121	15		RESISTOR, SMD 0805, 5.1K	R10,R25,R58,R72,
122				R81,R91,R94,R98,
123				R108,R109,R113,
124				R119,R133,R134,
125				R135
126	2		RESISTOR, SMD 0805, 8.2K	R63,R106
127	3		RESISTOR, SMD 0805, 10K	R38,R41,R76
128	1		RESISTOR, SMD 0805, 12K	R70
129	1		RESISTOR, SMD 0805, 13K	R105
130	2		RESISTOR, SMD 0805, 15K	R30,R47
131	2		RESISTOR, SMD 0805, 18K	R29,R46
132	4		RESISTOR, SMD 0805, 22K	R22,R31,R95
133	2		RESISTOR, SMD 0805, 27K	R18,R116
134	17		RESISTOR, SMD 0805, 33K	R2,R8,R65,R68,
135				R80,R88,R89,R92,
136				R93,R99,R100,
137				R101,R102,R112,
138				R123,R126,R129
139	3		RESISTOR, SMD 0805, 47K	R66,R67,R125
140	2		RESISTOR, SMD 0805, 51K	R53,R54
141	3		RESISTOR, SMD 0805, 62K	R55,R56,R69
142	1		RESISTOR, SMD 0805, 75K	R51
143				
144				

CONNECT SYSTEMS INC. 1802 EASTMAN AVE #116 VENTURA, CA. 93003	PARTS LIST PCBA, MODEL FLEX II E&M	REV B
SHEET 7 OF 7		

DRAWN BY J. WANGER	APPROVED	DATE APPROVED
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ITEM	QTY		DESCRIPTION	REF DESIGNATION
	UNIT	ISSUED		
145	12		RESISTOR, SMD 0805, 100K	R24,R34,R35,R37,
146				R40,R42,R48,R50,
147				R57,R61,R111,
148				R117
149	1		RESISTOR, SMD 0805, 150K	R36
150	1		RESISTOR, SMD 0805, 180K	R71
151	2		RESISTOR, SMD 0805, 220K	R60,R77
152	5		RESISTOR, SMD 0805, 300K	R23,R33,R49,R74,
153				R118
154	2		RESISTOR, SMD 0805, 470K	R28,R75
155	2		RESISTOR, SMD 0805, 1M	R7,R128
156	1		RESISTOR, SMD 0805, 1.5M	R45
157	1		SWITCH, 4 POSITION DIP, CTS-206-4	S2
158	5		TRANSFORMER, 671-1898	T1,T2,T3,T4,T6
159			TRANSFORMER, CENTER TAP	T5
160	3		TRANSISTOR, MMBT2907A/MMBT2907A-LT1	Q5,Q7,Q12
161	5		TRANSISTOR, MMBTA13/MMBTA13-LT1	Q6,Q10,Q13,Q14
162				Q15
163	3		TRANSISTOR, MMBT2222A/PMBT2222A	Q8,Q9,Q11
164				
165	1		XTAL, 3.58 MHz, KD0048FCB	Y1
166	1		XTAL, 22.1184 MHz, FOX 221	Y2
167	1		HARDWARE, HEATSINK, 6230B-TT	U8
168	1		LABOR, ASSEMBLY, 9900 PCB	

















