

SERVICE MANUAL

**MODEL 2100  
COMMUNICATIONS  
SERVICE MONITOR**

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**Wavetek**  
**Communications Division**  
5808 Churchman Bypass  
Indianapolis, IN 46203-6109  
(800)245-6356  
(317)788-5965  
Fax: (317)782-4607

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This warranty is in lieu of all other warranties, expressed or implied, and not representative or person is authorized to represent or assume for Wavetek any liability in connection with the sale of our products other than set forth herein.

### WARRANTY PROGRAM

Wavetek further warrants each new instrument for an additional one year period at a subassembly level. This additional year warranty is limited to board replacement, exchange or repair at the sole discretion of Wavetek.

The customer MUST obtain a RETURN AUTHORIZATION NUMBER from the Customer Service Department. Wavetek accepts no liability for any instrument or subassembly returned to the factory without that number. Any correspondence regarding that instrument or subassembly should be referenced to that number.

**WAVETEK**

COMMUNICATIONS DIVISION  
5808 CHURCHMAN BY-PASS,  
INDIANAPOLIS, IN 46203-6109  
317-788-5965  
(TOLL FREE OUTSIDE INDIANA)  
1-800-428-4424

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## THEORY OF OPERATION

The Model 2100 circuits are divided among four main circuit boards. They are:

- 1) The front panel board
- 2) The microprocessor board
- 3) The RF/IF board
- 4) The power supply board

In addition, the LCD display boards are mounted on the front panel metal-work and communicate with the microprocessor board via a ribbon cable.

The rear panel location of the power transformer and five volt regulator aids in heat dissipation.

The microprocessor board monitors the front panel keypad for new entry data. Valid entries are evaluated by the software on the microprocessor board which in turn programs the circuits on the RF/IF board and controls the front panel visual indicators.

#### RF/IF BOARD

Refer to the RF/IF board schematic in Section 7. In receive mode, RF arriving at the antenna input is coupled to the U203 and mixer MX202. U203 is a divide by 256 circuit whose output is sent to the RF counter circuitry. Mixer MX202 combines the RF input with a signal between 1 and 1023 MHz provided by a single oscillator or by two oscillators, depending on the frequency setting programmed on the front panel.

In the receive mode, when frequencies higher than 492 MHz are programmed, oscillator 1 (CR229, CR230, and related circuitry) is set to be 16 MHz above the RF setting (in even 1 MHz steps) and MX202 mixes the two signals to produce a first IF between 16 and 17 MHz. Below 492 MHz oscillator 3 (fixed at 1024 MHz) is added to the first oscillator via mixer MX203 to extend the frequency downward so the 16 to 17 MHz IF can be maintained in the low frequency range of the instrument.

Bandpass filter Q209 removes the unwanted products of the combined signals and the result is mixed with a 5.545 to 6.5449 MHz signal from oscillator 2 at MX201.

Oscillator 2 (CR201, U201 and related circuitry) provides 100 Hz step size increments. It's frequency is calculated to produce a 10.455 kHz second IF frequency when mixed with the 16 to 17 MHz first IF. Bandpass amplifier Q207 and Q208 filters and boosts this signal before driving the receive chip U202. The receive chip performs numerous functions which include demodulating and squelching the audio, providing a frequency error signal and indicating the signal strength.

In the generate mode, the signal flow through MX202 is reversed. Oscillator 2 is leveled by diodes CR206 and CR207. Then mixer MX202 combines its output with oscillator(s) 1 and/or 3 and sends the signal to the RF output connector via diode switch CR110/CR111 and relay K201. In generate, oscillator 3 switches in at 501.455 MHz. Twenty dB pads are insertable prior to output. Between the selectable pads and the vernier control introduced at the leveling circuit, any RF level between 0.1 uV and 10 mV may be generated.

In the watts mode, relay K201 connects the "RF IN/OUT" port to the "ANTENNA" (load) port. In modes other than the watts mode, a power sensor at the RF port switches the instrument to the watts mode any time it detects incoming RF greater than approximately 200 mW.

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**WARNING**

Since there is no internal load, a true 50 ohm load with cables of minimum length must be used.

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#### MICROPROCESSOR BOARD DESCRIPTION

Refer to the microprocessor board schematic in Section 7. The microprocessor board contains the largest portion of the control circuitry for the Model 2100. The circuitry is designed around 8 bit microcomputer U1 and 16K EPROM U2.

The means by which the various components operate together is largely a function of the programming software and therefore is far beyond the scope of this manual. The microprocessor board includes reference divider U20, the marker circuitry (U25, U32, U21, U40, and U38), the frequency synthesizer circuitry (U48, U51D, U51C, and U52), the subtone generators (U51B and U50), and audio amplifier U33.

#### POWER SUPPLY DESCRIPTION

Refer to the power supply schematic in Section 7. The purpose of the Model 2100 power supply board is to supply regulated DC voltages to power the instrument in the "RUN" mode and to charge the internal battery in the "RUN" and "CHARGE" modes.

The board derives supply voltages of +5V, +15V, -15V and +12V from a +12V source. The +12 volt source can be the instrument's (optional) internal battery, an external DC source, or rectified line voltage from the AC mains.

When the instrument is powered from the AC mains, the fuse/line voltage assembly on the rear panel must be configured for the proper primary windings selection and fuse size. CR1, CR2, C1, and C2 form a half-wave rectifier which provides approximately 18 volts to voltage regulator U1 and its related transistor via diode CR4. When the power switch is on, this is converted to + and -15 volts by the DC to DC converter and to +5 volts by regulator U2.

A regulator uses current from the line voltage rectifier to charge the (optional) internal battery. In the "RUN" mode, limiting resistor R3 allows for a trickle charge. In the "CHARGE" mode, a lower value resistor (R2) is switched in parallel with R3 and the battery is fast charged.

Diode CR5 isolates the internal battery from the external DC input. When the external voltage is sufficiently high enough (depending on battery option and state of battery), CR5 is forward biased and the external voltage drives the DC to DC converter and the 5 volt regulator.

The (optional) internal battery powers the instrument through CR6 when no line voltage or external DC voltage is connected to the instrument.

#### FRONT PANEL DESCRIPTION

The Model 2100 front panel holds the keyboard, the various analog controls, the indicator LEDs and the LCD display assemblies.

Each LCD assembly is modular in construction and is replaced as a unit, should failure occur. The remaining circuitry consist of passive controls or indicators. Refer to the microprocessor board schematic or the RF/IF board schematics in Section 7 for specific details.



## 5.1 INTRODUCTION

This section provides information for disassembling, testing, calibrating and troubleshooting the Model 2100 Service Monitor. Measurements and adjustments will be facilitated by placing the instrument so that the front panel faces the user.

## 5.2 SERVICE AND MAINTENANCE INFORMATION

## 5.2.1 In-Field Service

Should the Model 2100 require service, contact the Customer Service Department at (800) 245-6356 for assistance.

## 5.2.2 Disassembly Information

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**WARNING**

To reduce the risk of electrical shock, turn off the instrument and remove the AC main supply before disassembly.

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Removal of the top cover allows access to all parts inside the Model 2100.

**NOTE**

Not all harness connectors are keyed. Note connector orientations before disconnecting any harnesses.

To remove the instrument top cover, remove the six screws (three on each side) securing the top cover and lift the cover off.

To remove the individual circuit boards, remove the hardware (typically phillips head screws) that attach the boards to the studs in the metal work. Removal of the front panel board requires removal of the control knobs.

## CALIBRATION PROCEDURE

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The purpose of the calibration procedure in this section is to verify that the Service Monitor meets its published specifications (Section 1.2). Individual tests describe the method of testing, a list of equipment required, and a brief test procedure.

Critical specifications for each item of test equipment are listed in Section 5.3.2, Recommended Test Equipment. Except as detailed, settings of test equipment apply to calibration test procedures. All other test equipment operating details are omitted.

Before applying power to the Service Monitor, see Section 2 for details of electrical installation. The line voltage should be maintained at 115 or 230 volts  $\pm 10\%$ , 50 to 60 Hz  $\pm 5\%$  throughout the test. The performance test procedures are begun after a 15-minute minimum warmup of the Service Monitor in a +20 degree to +30 degree C ambient temperature range.

A copy of the Calibration Test Record is provided at the end of this section for convenience in recording the performance of the Service Monitor. It can be filled out and used as a permanent record for incoming inspection, or it can be used as a guide for routine performance testing. The Calibration Test Record lists the section, test, and specification limits. All tests refer to this record.

### 5.3.2 REQUIRED TEST EQUIPMENT

#### A. At the Bench

The following equipment is required by the technician during the Calibration Test Procedure.

1. Signal Generator: A Wavetek Model 3010 (or equivalent) referenced to 10 MHz house standard.
2. DVM: A Fluke Model 8010 or equivalent type DVM.
3. Variable frequency audio function generator: Wavetek Model 180/182 or equivalent.
4. SINAD Test Set: Helper Instruments Model S101 and accompanying interconnect devices.
5. Oscilloscope: Tektronix 2213 or equivalent.

## B. Additional Test Equipment

The following equipment should be available to the technician with appropriate cables.

1. Spectrum Analyzer: Hewlett Packard Model 8558 or equivalent.
2. Modulation Analyzer: Hewlett Packard Model 8901 or equivalent.
3. RF Power Source: VHF and UHF high and low power source and wattmeter.
4. Audio Analyzer: HP 8903A or equivalent.

## 2100 CALIBRATION PROCEDURE

0716-10-0008

I Power Supply

Turn on Unit. Using DVM, measure power supply voltages at the top connector of the Power Supply Board and record.

+ 5V \_\_\_\_\_ (+0.2VDC)  
 -15V \_\_\_\_\_ (+0.2VDC)  
 +15V \_\_\_\_\_ (+0.2VDC)

Check DC-to-DC converter voltage on lower leg of R44 (micro board) and adjust if necessary using R9 on power supply board and record. Larger (Semiconductor Circuits, Inc.) DC-to-DC converter requires 16.0V  $\pm$ 0.1V. Smaller (Conversion Devices, Inc.) requires 13.5V  $\pm$ 0.1V.

Smaller +13.5V, Larger +16.0 \_\_\_\_\_ ( $\pm$ 0.1VDC)

Turn Unit off and switch rear-panel switch to CHG position. Turn Unit on and measure voltage on anode side of CR3. If necessary, adjust R6 on power supply board for 15V and record.

+15V \_\_\_\_\_ (+0.2VDC)

Turn Unit off, switch R/P switch back to OPER position. Remove AC line cord. Remove one of the external battery clip leads. Plug battery into EXT plug on rear panel. Reconnect external battery terminal lead. Turn Unit on and check that it powers up. Turn unit off. Remove external battery terminal lead and the external plug from the rear panel. Plug AC line cord in. Turn Unit back on.

Ext Batt Check \_\_\_\_\_ (X)

II AUDIO SYNTH

Unit in GEN, AUDIO SYNTH on. Set Rate to 1 kHz, adjust AUDIO SYNTH Level Pot fully clockwise. Set Deviation Control Knob halfway, cable AUDIO SYNTH OUT to 0-scope. Cable SCOPE TRIGGER out from rear panel of 2100 to EXT SYNC input on scope and adjust scope sync. Check for 1 kHz signal of 3.9V p-p on scope and record.

3.9V p-p \_\_\_\_\_ ( $\pm$ 0.3)

Change AUDIO SYNTH frequency to 10 Hz. Check that level stays within  $\pm 0.3V$  p-p tolerance. Repeat for 10 kHz.

10 Hz & 10 kHz 3.9V p-p ( $\pm 0.3$ ) \_\_\_\_\_ (X)

III SINAD Meter

Activate 1 kHz SOURCE, cable DEMOD OUT to 0-scope. Adjust Level Pot for 1V p-p signal on scope, cable DEMOD OUT to SINAD/AUDIO IN, press SINAD button twice, and check notch for >30 dB reading. If necessary, adjust R101 and R104 on the microprocessor board for >30 dB reading.

Notch >30 dB \_\_\_\_\_ (X)

Press DEV button, activate 1 kHz SOURCE, adjust 1 kHz LEVEL POT for 5 kHz deviation. Turn Off 1 kHz SOURCE and turn AUDIO SYNTH On, set AUDIO SYNTH frequency to 3333 Hz and adjust AUDIO SYNTH LEVEL for 1240 Hz deviation on Unit. Cable DEMOD OUT to SINAD/AUDIO IN and activate 1 kHz AUDIO button. Activate SINAD button and check for 12 dB reading and record. Adjust R111 on micro board if necessary. (Set at 10 dB for a cold Unit, 11 dB for a warm unit without cover.)

12 dB  $\pm 1$  dB \_\_\_\_\_ (X)

IV Voltmeter

A) DC Voltmeter

Turn off 1 kHz AUDIO and AUDIO SYNTH, activate VOLTS button. Connect BNC cable with alligator clips on other end to AUDIO IN connector. Clip leads to power supply voltages on RF Board and compare readings with those recorded in step I. Adjust R66 (gain) and R71 (offset) on the Microprocessor Board if necessary. Record readings.

15V \_\_\_\_\_ ( $\pm 0.75VDC$ )

B) AC Voltmeter

Cable External Function Generator to Digital Voltmeter, set Digital Voltmeter to read AC Volts, set Function Generator frequency to 1 kHz at 7.07 volts RMS as read on the Digital Voltmeter. Cable the Frequency Generator Output to AUDIO IN on the Unit, press the VOLTS button on the Unit twice to read AC volts peak. Unit should read 10 volts peak  $\pm 0.5V$ . Check Unit voltmeter with a 10 Hz frequency and a 10 kHz frequency applied. If necessary, adjust Gain pot (R66) on Microprocessor Board to bring AC and DC volts into spec. If R66 adjusted, then recheck DC voltmeter Step IV A. Record 10 kHz reading.

10 kHz & 10V peak \_\_\_\_\_ ( $\pm 0.5V$ )

V Markers

## A) 5 kHz

Unit in GEN, 1 kHz AUDIO SOURCE on, 5 kHz markers on, cable DEMOD OUT on Unit to O-scope, set Vertical on O-scope to 0.2V/Div. Adjust 1 kHz modulation source level for 5 kHz deviation. Adjust R49 and R51 so that markers are coincident with  $\pm$  peaks of demod signal. Markers should be  $\pm 0.7V \pm 0.05$  from zero reference line.

+0.7  $\pm$  0.05V \_\_\_\_\_ (X)

-0.7  $\pm$  0.05V \_\_\_\_\_ (X)

## B) 600 Hz

Press Marker Button to turn on 600 Hz MARKERS, adjust 1kHz modulation source until peaks touch markers. The deviation display should read 600 Hz  $\pm 60$  Hz. Record.

600 Hz \_\_\_\_\_ (  $\pm 60$  Hz)

VI Generate

## A) Spurs

Set Unit to X1 mV, Max RF level, no modulation, Generate. Cable RF OUT to Spectrum Analyzer. Check for spurs from Carrier Frequency to  $\pm 300$  kHz at 150.5 MHz, 480.5 MHz, and 812.5 MHz. Spurs must be 35 dB below carrier.

150.5 MHz \_\_\_\_\_  $<-35$  dBc

480.5 MHz \_\_\_\_\_  $<-35$  dBc

812.5 MHz \_\_\_\_\_  $<-35$  dBc

## B) Flatness

Set Unit to X1 mV, Max RF level, GEN, No modulation. Cable RF OUT to Spectrum Analyzer. Set up Spectrum Analyzer to view 1 MHz to 1000 MHz span. Set RF STEP on 2100 to 10 MHz per increment, step RF output frequency across band, using and starting at 1 MHz. RF level must stay within  $\pm 3$  dB. Repeat for X.1 mV and X10  $\mu$ V.

X1.0 mV \_\_\_\_\_ (X)

X0.1 mV \_\_\_\_\_ (X)

X10  $\mu$ V \_\_\_\_\_ (X)

## C) Pads and RF Level Pot (20 dB Drop)

Place knob pointer on Indicator dot when pot fully CW, tighten down with Allen head driver. Adjust trim pot on back side of front panel for 20 dB drop over full range of pot as seen on \BP Spectrum Analyzer. Check the X1 mV, X.1 mV, X10  $\mu$ V pads and the RF Level Pot for 20 dB drop  $\pm 2$  dB at 150.5 MHz, 480.5 MHz and 812.5 MHz.

X1 mV	+2 dB	_____	(X)
X.1 mV	+2 dB	_____	(X)
X10 uV	+2 dB	_____	(X)
RF Level Pot	+2 dB	_____	(X)
Knob Fastened		_____	(X)

## D) Residual

Unit in Gen, 150.5 MHz, 10 mV RF OUT, cable RF IN/OUT connector to Modulation Analyzer. Enable 300 Hz and 3 kHz filters on the Modulation Analyzer front panel. Set Modulation Analyzer to read FM and press AVG Deviation button. Record FM residual. Check at 480.5 and 812.5 MHz.

150.5	_____	< 100 Hz
480.5	_____	< 100 Hz
812.5	_____	< 100 Hz

## E) Modulation

Set Unit to 150.4550 MHz. Turn on AUDIO SYNTH, set to 5 kHz deviation at a rate of 1 kHz. Cable RF IN/OUT to Modulation Analyzer set to FM, AVG Deviation, 300 Hz and 3 kHz filters On. Reading should be (3.54kHz). Adjust FM GEN pot (R301) on RF board, if necessary.

150.455	_____	3.54 kHz
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Activate Relative dB button on Modulation Analyzer, set Unit to 150.4551 MHz, and check relative dB reading.

150.4551	_____	(±0.5 dB)
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Set Unit to 150 MHz, program 150 MHz into Modulation Analyzer, and check relative dB reading.

150.00	_____	(±0.5 dB)
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## F) Bandwidth

Unit in GEN, 150.455 MHz, AUDIO SYNTH on, Audio Rate set to 1 kHz, RF OUT Cabled to Modulation Analyzer, 300 Hz and 3 kHz filters off, 15 kHz filter on, Relative dB off, AVG dB on. Adjust AUDIO SYNTH for 5 kHz Dev as read on Unit. Press Relative dB button on Modulation Analyzer to zero reading. Set AUDIO SYNTH Frequency Rate to 10 Hz and adjust Deviation on Unit for 5 kHz Dev. Record reading on Modulation Analyzer, reading should be 0 ±1.5 dB. Set Unit AUDIO SYNTH to 10 kHz and check Relative dB reading on Modulation Analyzer.

Repeat step, using Function Generator in place of 2100 Audio Synthesizer by turning Unit AUDIO SYNTH off and EXT on. Cable Function Generator Out to MOD IN on Unit.

10 Hz - 10 kHz AUDIO SYNTH \_\_\_\_\_ / \_\_\_\_\_ (+1.5 dB)  
 10 Hz - 10 kHz EXT Source \_\_\_\_\_ / \_\_\_\_\_ (+1.5 dB)

VII Receiver

A) Time Base

Set Sig Gen for 999.5 MHz, no modulation, 1 mV RF Out. Cable Sig Gen RF Out to Unit ANTENNA, Unit in REC, 999.5 MHz, FREQ ERROR on, adjust TCX0 for 0 Hz error  $\pm 20$  Hz.

Frequency Error \_\_\_\_\_ (0  $\pm 100$  Hz) [Unit Spec.]

B) Automatic Gain Control (AGC)

Clip voltmeter on pin 1 or U230, set Sig Gen to 150.5 MHz, 2.7mV RF level, cable Sig Gen to unit antenna, unit set to 150.5 MHz, Rec, adjust R367 (2k pot) so that AGC circuit is just at the threshold of activation as seen on the voltmeter. Voltmeter will read  $>14V$  when AGC circuit is not activated. Adjust 2k pot to the point where the AGC voltage just begins to drop. Set Sig Gen to 600 Hz Dev, 1 kHz rate. Demod out to O-scope 600 Hz markers on. Check pin 1 of U230 on the RF board for  $>14V$ . Increase RF output of Sig Gen to 10 mV. Check pin 1 of U230 for  $<14v$ . Increase RF output of Sig Gen to 1V. Check that 600 Hz Dev signal does not distort to  $>750$  Hz Dev. Repeat for 480.5 Mhz and 812.5 MHz.

AGC  $>14V$  \_\_\_\_\_ (X)  
 AGC  $<14V$  \_\_\_\_\_ (X)  
 $<750$  Hz \_\_\_\_\_ (X)

C) Sensitivity

Unit in Rec, 150.5 MHz, connect External Sinad meter to DEMOD OUT, set Sig Gen for 5 kHz Deviation, using the Sig Gen's Internal 1 kHz Source. Cable Sig Gen RF Out to the Unit's ANTENNA, lower RF Level of Sig Gen to result in 10 dB of Sinad on the external sinad meter. Sig Gen RF level should be less than 2uV. Check at 480.5 MHz and 812.5 MHz.

150.5 MHz \_\_\_\_\_  $< 2.0$  uV  
 480.5 MHz \_\_\_\_\_  $< 2.0$  uV  
 812.5 MHz \_\_\_\_\_  $< 2.0$  uV

D) Receive level 10 uV - 3 mV

Unit in Rec, 480.5 MHz, REC LEVEL Enabled, Set Sig Gen to 480.5 MHz, 10uV RF Output. Cable Sig Gen to Unit ANTENNA and adjust (10 uV) Signal Strength pot (R297) on RF board for 10 uV. Set Sig Gen to 3 mV RF Output level and adjust 3 mV pot (R293) for 2984uV-3148uV, recheck 10 uV level. Repeat for 150.5 MHz and 812.5 MHz.

10 - 3 mV \_\_\_\_\_  $\pm 1$  dB 480.5 MHz \_\_\_\_\_ (X)  
 Check  $<14$  @ 10 uV,  $<4500$  @ 3 mV  $\pm 3$  dB 150.5 MHz \_\_\_\_\_ (X)  
 Check  $> 7$  @ 10 uV,  $>2100$  @ 3 mV  $\pm 3$  dB 812.5 MHz \_\_\_\_\_ (X)

## E) Modulation

- 1) Unit in REC, AUDIO SYNTH On, AUDIO SYNTH frequency set to 1 kHz, cable AUDIO SYNTH OUT to Sig Gen Ext Audio In. Set Sig Gen to 480.5 MHz, 1 mV RF OUT. Cable RF Out to Modulation Analyzer, 300 Hz and 3 kHz filters on. Adjust Deviation level on Sig Gen for 5 kHz dev (3.54) as read on Modulation Analyzer. Cable Sig Gen RF OUT to Unit. Set Unit to 480.5 MHz, DEV Enabled, Cable Demod out to scope, FM markers on. Adjust Receive Level pot (R289 on RF board) for 5 kHz Dev. Attach Scope probe to center tap of R289 and adjust FM offset pot (R268) to achieve a centered trace.

5 kHz \_\_\_\_\_  $\pm$ 200 Hz

- 2) Repeat for 10 kHz deviation (7.07 on Modulation Analyzer)

10 kHz \_\_\_\_\_  $\pm$ 1000 Hz on Unit

- 3) Bandwidth

Unit in REC, 480.5 MHz, AUDIO SYNTH on, AUDIO FREQUENCY set to 10 Hz, AUDIO SYNTH OUT cabled to Sig Gen. Sig Gen at 1 mV RF Out, adjust Sig Gen Deviation for 3.54 on Modulation Analyzer. Mod Analyzer in Avg dB mode, 300 Hz and 3 kHz filters off, 15 kHz filter on. Cable Sig Gen RF Out to Unit ANTENNA, check Receiver Deviation, Unit should read >3500 Hz Dev or (+30%). Change AUDIO SYNTH frequency to 10 kHz, repeat above procedure and record results.

10 Hz - 10 kHz, 5 kHz DEV \_\_\_\_\_  $\pm$ 1100 Hz

## VIII Counter

## A) Audio Through Receiver

Unit in REC, AUDIO SYNTH On, Cable AUDIO SYNTH OUT to Sig Gen Ext Mod In, Sig Gen at 480.5 MHz, 1 mV RF Out, 3 kHz Dev, Set Audio Synth on 2100 to 270 Hz, AUDIO FREQUENCY COUNTER On, Record Unit Audio Counter. Repeat with AUDIO SYNTH set to 10 kHz.

**NOTE:** It is difficult to change AUDIO SYNTH Frequency with the Audio Frequency Counter On.

270 Hz - 10 kHz

<1 kHz \_\_\_\_\_  $\pm$ 3 Hz

>1 kHz \_\_\_\_\_  $\pm$ 1 Hz

## B) Subtone (through receiver)

Unit REC, AUDIO SYNTH On, Cable AUDIO SYNTH OUT to Sig Gen Ext Mod In, Sig Gen at 480.5 MHz, 1 mV, 600 Hz Dev, Set AUDIO SYNTH on 2100 to 60 Hz. Turn on SUBTONE COUNTER and Record Unit Subtone Counter reading. Repeat with AUDIO SYNTH set to 240 Hz.

60 Hz - 240 Hz \_\_\_\_\_  $\pm$  0.4 Hz

## C) Audio (through Audio In)

Unit in GEN. AUDIO SYNTH on, set AUDIO SYNTH LEVEL to 0.5v p-p, cable AUDIO SYNTH OUT into AUDIO IN, AUDIO COUNT Enabled. Vary AUDIO SYNTH from 10 Hz to 20 kHz. (Use an external source to obtain 20 kHz.) Record Unit Audio Counter.

270 Hz - 20 kHz \_\_\_\_\_  $\pm 1$  Hz

## D) Subtone (through Audio In)

Unit in Gen. AUDIO SYNTH on, set AUDIO SYNTH to 1.0v p-p, 60 Hz rate, cable AUDIO SYNTH OUT into AUDIO IN, AUDIO COUNT On. Record Unit Subtone Count. Repeat with AUDIO SYNTH rate set to 250 Hz.

60 Hz - 250 Hz \_\_\_\_\_  $\pm 0.4$  Hz

## E) Frequency Error

Set Sig Gen for 999.5 MHz, 10 mV, no modulation. Cable Sig Gen to Unit. Unit set to 999.5 MHz, Rec, FREQ ERROR Enabled. Offset Sig Gen carrier frequency from 100 Hz to 10 kHz in successive steps. Unit should track frequency error  $\pm 200$  Hz. Record results.

100 Hz - 10 kHz \_\_\_\_\_  $\pm 200$  Hz

## F) RF Counter

Unit in REC, RF COUNTER Enabled, Set Sig Gen to 999.5 MHz at 100mV RF level. Cable Sig Gen to Unit ANTENNA. Record RF frequency Count. Repeat for 30.5 MHz.

999.5 MHz, 30.5 MHz \_\_\_\_\_  $\pm 1$  kHz

## IX Wattmeter

## A) High Power Setup

1) Set Power source to 151 MHz, high power setting, connect power source output through test wattmeter to 100W load. Adjust bias voltage for 90 watts as read on the test wattmeter. Dekey the radio. Connect power source output through the test wattmeter to the 2100 front-panel "RF IN/OUT". Connect the 2100 antenna port to the 50 ohm load. Key the radio. Read the level on the 2100 wattmeter and the test wattmeter simultaneously. The 2100 should read  $\pm 9$  W of what the test wattmeter reads.

2) During setup at 151 MHz, adjust R276 on the 2100 RF board to read 90 watts.

## B) Low Power Setup

1) Set power source to 151 MHz, Low Power Setting, turn bias voltage down until 2100 is reading in 10W range (X.X Watt), then adjust bias voltage so 2100 reads 9.5W, test wattmeter

should be 9.5W  $\pm$ 1.4W. NOTE: Unit will switch into high power mode if Unit reads more than 10 watts. Measurements and adjustments need to be made with Unit reading less than 10 watts.

- 2) During setup at 151 MHz turn R278 on the 2100 RF board fully counterclockwise. Key power and adjust to 9.5 watts as read on the test wattmeter. Adjust R278 for 9.5 watts as read on the 2100 wattmeter.
- C) Repeat A1 and B1 for 445 MHz.
- D) Repeat A1 and B1 for 857 MHz with the power source set for 80 watts on the test wattmeter. The reading on the 2100 should be 80  $\pm$ 16 watts. For low power testing at 857 MHz, the reading should be 9.5  $\pm$ 1.9 watts.

151 MHz	90 W	_____	$\pm$ 9 W
445 MHz	90 W	_____	$\pm$ 9 W
857 MHz	80 W	_____	$\pm$ 16 W
151 MHz	9.5 W	_____	$\pm$ 1.4 W
445 MHz	9.5 W	_____	$\pm$ 1.4 W
857 MHz	9.5 W	_____	$\pm$ 1.9 W

## 2100 CALIBRATION RECORD

DATE \_\_\_\_\_  
 TECH \_\_\_\_\_  
 SERIAL # \_\_\_\_\_

I. Power Supply

+ 5v	+ 5v	$\pm 0.2v$	_____
-15v	-15v	$\pm 0.2v$	_____
+15v	+15v	$\pm 0.2v$	_____
DC-DC Converter Voltage	Lg. Version 16.0v	$\pm 0.1v$	_____
Battery Charge Voltage	Sm. Version 13.5v	$\pm 0.1v$	_____
Battery Check	15v	$\pm 0.2v$	_____ (X)

II. Audio Synth

Output Voltage (1kHz, Gen)	1 kHz	3.9v pp	$\pm 0.3v$	_____
Audio Band Width	10 Hz & 10 kHz	3.9v pp	$\pm 0.3v$	_____
10 Hz & 10 kHz				

III. Sinad Meter

A. Notch (1kHz @ 1v p-p, Demod Out => Sinad/Audio In)		>30dB	_____
B. Sinad (1kHz @ 5kHz Dev, Audio Synth 3333Hz, 1240 Dev)		12dB $\pm 1dB$	_____ (X)

IV. Voltmeter

A. DC Voltmeter (=> Sinad/Audio)	+15v	$\pm 0.75v$	_____
B. AC Voltmeter (20v p-p = 7.07vrms, Check 10Hz-10kHz) Record 10kHz Reading	10v peak	$\pm 0.5v$	_____

V. Markers

A. Markers $\pm 0.7v$ 0-scope at 0.2v/div	+0.7v	$\pm 0.05v$	_____ (X)
	-0.7v	$\pm 0.05V$	_____ (X)
B. 600Hz	600Hz	$\pm 60Hz$	_____

VI. Generate

- A. Spurs <35dBc +300kHz 150.5MHz \_\_\_\_\_  
 480.5MHz \_\_\_\_\_  
 812.5MHz \_\_\_\_\_
- B. Flatness x 1.0mV +3dB \_\_\_\_\_ (X)  
 x 0.1mV +3dB \_\_\_\_\_ (X)  
 x10.0uV +3dB \_\_\_\_\_ (X)
- C. Pads and RF Level Pot (20dB drop) x 1.0mV +2dB \_\_\_\_\_ (X)  
 x 0.1mV +2dB \_\_\_\_\_ (X)  
 x10.0uV +2dB \_\_\_\_\_ (X)  
 RF Level Pot +2dB \_\_\_\_\_ (X)  
 Knob Fastened \_\_\_\_\_ (X)
- D. Residual FM 150.5MHz <100Hz \_\_\_\_\_  
 480.5MHz <100Hz \_\_\_\_\_  
 812.5MHz <100Hz \_\_\_\_\_
- E. Modulation  
 Audio Synth On, 5kHz  
 Dev @ 1kHz, RF Out => Mod Analyzer  
 Avg Dev 150.455 MHz \_\_\_\_\_  
 Relative dBm 150.455MHz +0.5dB \_\_\_\_\_  
 Relative dBm 150MHz +0.5dB \_\_\_\_\_
- F. Bandwidth 150.455 MHz @ 5kHz Dev  
 10Hz-10kHz Audio Synth +1.5dB \_\_\_\_\_/  
 10Hz-10kHz Ext Source +1.5dB \_\_\_\_\_/

VII. Receiver

- A. Time Base  
 Frequency Error @ 999.9MHz, 1 mV 0Hz +100 Hz \_\_\_\_\_
- B. Automatic Gain Control  
 Sig Gen 150.5MHz, 600Hz Dev, 1kHz  
 1. AGC voltage @ 3mV RF level AGC>14v \_\_\_\_\_ (X)  
 2. AGC voltage @ 10mV RF level AGC<14v \_\_\_\_\_ (X)  
 3. Demod signal distortion @ 1v RF level <750Hz \_\_\_\_\_ (X)
- C. Sensitivity  
 1. 2uV-5kHz Dev 150.5MHz <2uV \_\_\_\_\_  
 480.5MHz <2uV \_\_\_\_\_  
 812.5MHz <2uV \_\_\_\_\_
- D. Rec Level  
 Set 10uV-3mV +3dB 480.5MHz \_\_\_\_\_ (X)  
 Check for <14 @ 10uV, <4500 @ 3mV +3dB 150.5MHz \_\_\_\_\_ (X)  
 Check for >7 @ 10uV, >2100 @ 3mV +3dB 812.5MHz \_\_\_\_\_ (X)

- E. Modulation Audio Synth @ 1kHz => Sig Gen 480.5MHz,  
 5kHz Dev, 1mV
- |                                     |           |         |       |
|-------------------------------------|-----------|---------|-------|
| 1. 1kHz Rate                        | 5kHz Dev  | + 200Hz | _____ |
| 2. 1kHz Rate                        | 10kHz Dev | + 1kHz  | _____ |
| 3. 10Hz-10kHz,<br>Record 10kHz Rate | 5kHz Dev  | +1100Hz | _____ |

VIII. Counter

- A. Audio (thru receiver) 480.5MHz, 3kHz Dev, 1mV RF  
 <1kHz +3Hz \_\_\_\_\_  
 >1kHz +1Hz \_\_\_\_\_
- B. Subtone (thru receiver) 480.5MHz, 600Hz dev. 1mV RF  
 60Hz-240Hz +0.4Hz \_\_\_\_\_
- C. Audio (Audio Synth => Audio In) 0.5v p-p, Gen  
 270Hz-20kHz (SHIFT 7 ENTER) +1Hz \_\_\_\_\_
- D. Subtone (Audio Synth => Audio In) 1.0v p-p, Gen  
 60Hz-250Hz +0.4Hz \_\_\_\_\_
- E. Frequency Error 999.5 MHz, 10uV,  
 Freq. Er. 100Hz to 10kHz +200Hz \_\_\_\_\_
- F. Counter 999.5MHz and 30.5MHz @ 100mV +1 kHz \_\_\_\_\_

IX. Wattmeter

151MHz	90W	±	9W	_____
445MHz	90W	±	9W	_____
857MHz	80W	±	16W	_____
151MHz	9.5W	±	1.4W	_____
445MHz	9.5W	±	1.4W	_____
857MHz	9.5W	±	1.9W	_____



REPLACEABLE PARTS

6.1 INTRODUCTION

This section contains lists of all replaceable parts for the instrument.

For an assembly containing one or more subassemblies, the assembly list appears first and is followed by the subassembly lists. The lists appear in the following order.

PARTS LIST	ASSEMBLY
11010-70-0006	2100 Serv. Monitor
11111-70-0009	Chassis Assy., 2100
11111-70-0010	Cabinet Assy., 2100
11118-70-0012	FP Assy., 2100
11110-70-0103	U Processor Board, 2100
11110-70-0102	Mother (RF) Board, 2100
11110-70-0104	Power Supply Board, 2100
11118-70-0013	RP Assy., 2100
11111-70-0016	Sub-Chassis Assy., 2100
11219-70-0074	XFMR Assy., 2100

6.2 MANUFACTURERS CODE

The following is a list of codes used on the parts list to identify the manufacturer.

---

A-B	ALLEN-BRADLEY	MILWAUKEE	WI
ACI	ADVANCE COMPONENTS, INC.	CENTERBROOK	CT
AER	AVX CERAMICS	MYRTLE BEACH	SC
AMD	ADVANCED MICRO DEVICES INC.	SUNNYVALE	CA
AMP	AMP, INC.	HARRISBURG	PA
APL	AMPHENOL CONNECTOR SYSTEMS	BROADVIEW	IL
ARC	ARCO ELECTRIC PRODUCTS	SHELBYVILLE	IN
ASE	AIRCO SPEER ELECTRONICS	ST. MARYS	PA
ATC	AMERICAN TECHNICAL CERAMICS	HUNTINGTON STATION	NY
BEK	BECKMAN INDUSTRIES INC.	FULLERTON	CA
BEL	BELDEN CORP.	GENEVA	IL
BER	BERG ELECTRONICS	NEW CUMBERLAND	PA
BOU	BOURNS, INC.	RIVERSIDE	CA
BUCK	BUCKEYE STAMPING CO.	COLUMBUS	OH
BURND	BURNDY CORP.	NORWALK	CT
C-D	CORNELL DUBLIER ELECT. DIV.	NEWARK	NJ
C-K	C & K COMPONENTS, INC.	WATERTOWN	MA
C-L	CENTRALAB DIV.	MILWAUKEE	WI
CBLWV	CABLEWAVE SYSTEMS, INC.	NORTH HAVEN	CT
CCM	CORCOM, INC.	CHICAGO	IL
CFI	CIRCUIT FUNCTIONS INC.	NEWBURY	CA
CHOM	CHOMERICS INC.	WOBURN	MA
CII	COMPONENTS IMPORTS INC.		
CONV	CONVERSION DEVICES		
CRYTK	CRYSTEK	FT. MEYES	FL
CTL	CENTRALAB INC.	MILWAUKEE	WI

CTS	CHICAGO TELEPHONE SYSTEMS	CHICAGO	IL
CTSYS	CT SYSTEMS, INC.	BEECH GROVE	IN
DAL	DALE TECHNOLOGY CORP.	HARTSDALE	NY
DEL	DELEVAN DIV.	EAST AURORA	NY
ELNA	ELNA	CARSON	CA
ETP	ERIE TECHNOLOGICAL PRODUCTS	ERIE	PA
F-S	FEDERAL SCREW	CHICAGO	IL
FCD	FAIRCHILD	MOUNTAIN VIEW	CA
FRXC	FERROXCUBE DIVISION	SAUGERTIES	NY
G-E	GENERAL ELECTRIC	INDIANAPOLIS	IN
G-I	GEN'L. INSTRUMENT SEMICONDUCTOR	HICKSVILLE	NY
H-P	HEWLETT-PACKARD	INDIANAPOLIS	IN
HHS	HERMAN H. SMITH, INC.	BROOKLYN	NY
HIT	HITACHI AMERICA, LTD.	SAN FRANCISCO	CA
ISTMP	ISOTEMP RESEARCH, INC.	CHARLOTTESVILLE	VA
JEF	JEFFERS	DUBOIS	PA
KEMET	KEMET UCC	GREENVILLE	SC
KMYO	KAMAYA OHM		JAPAN
LIT	LITTELFUSE, INC.	DES PLAINES	IL
LLC	LSI LOCIG CO.	MILPITAS	CA
MILSP	MILITARY SPECIFICATION	WASHINGTON	DC
MIN-C	MINI-CIRCUITS	BROOKLYN	NY
MOL	MOLEX PRODUCTS	LISLE	IL
MOT	MOTOROLA SEMI. PROD.	INDIANAPOLIS	IN
MOUS	MOUSER ELECTRONICS	LAKESIDE	CA
MSI	MSI ELECTRONICS, INC.	WOODSIDE	NY
MURA	MURA	WESTBURY	NY
MURGA	MURATA-GEORGIA	MARIETTA	GA
NAT	NATIONAL SEMICONDUCTOR CORP.	SANTA CLARA	CA
NEC	NIPPON ELECTRIC CO.	TOKYO	JAPAN
NICHN	NICHICON (AMERICA) CORP.	SCHAUMBURG	IL
OHM	OHMITE MFG. CO.	SKOKIE	IL
P-C	POWER COMPONENTS	WOODLAND HILLS	CA
PACCOM		REDMOND	WA
PAND	PANDUIT CORP.	TINLEY PARK	IL
PHC	PHILADELPHIA HANDLE CO.	CAMDEN	NJ
PLSSY	PLESSEY ENG.	SCHILLER PARK	IL
PNSNC	PANASONIC		
PRSN	PRECISION TUBE CO., INC.	NORTH WALES	PA
Q-C	QUALITY COMPONENTS	ST. MARYS	PA
QUAM		CHICAGO	IL
RCA	RCA	CAMDEN	NJ
S-I	SWITCHCRAFT, INC.	CHICAGO	IL
S-T	SARKES TARZIAN	BLOOMINGTON	IN
SIEM	SIEMENS	ISELIN	NJ
SIG	SIGNETICS CORPORATION	SUNNYVALE	CA
SOART	STATE OF THE ART, INC.	STATE COLLEGE	PA
SPR	SPRAGUE ELECTRIC CO.	INDIANAPOLIS	IN
SSS	SOLID STATE SCIENTIFIC	MONTGOMERYVILLE	PA
TI	TEXAS INSTRUMENTS	DALLAS	TX
TELYR	TELEDYNE RELAYS	HAWTHORNE	CA
THMSN	THOMPSON		FRANCE
UNCAR	UNION CARBIDE COMPONENTS	GREENVILLE	SC
USMFS	USM FASTENER DIV.	UPPER DARBY	PA

REF DES	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USE
NA	ANTENNA.WHIF.BNC	WRABN	CNTRN	13010-16-0016	1
NA	CHASSIS ASSY. 2100	1111-70-0009	CTS	11111-70-0009	1
NA	DUST COVER. 2100	1417-80-0660	CTS	11417-80-0660	1
NA	FUSE ENVELOPE W/TAG	3010-10-0002	CTS	13010-10-0002	1
NA	FUSE. 3/8, SLO-BLO	313.375	LIT	12410-05-0052	1
NA	HANDLE	8002-529-LESS END CAPS	FHC	12810-07-0013	1
NA	HANDLE END CAP	1410-01-4120	CTS	11410-01-4120	2
NA	LINE CORD,3-COND.SVT	17507	BEL	16011-80-0006	1
NA	MANUAL. 2100	6510-00-0105	CTS	16510-00-0105	1
NA	RUBBER FEET	SJ5012	MRRUB	12810-08-0012	4
NA	SCW.PFH,6-32X1/4	18242NP	F-S	12810-52-6104	6
NA	SCW,POH.10-32X5/8	19287-BK OXIDE	F-S	12810-64-0110	2
NA	SCW:4-40X1/4 CUT	PER DESC	F-S	12810-23-0083	6
NA	TOP COVER. 2100	1417-60-0620	CTS	11417-60-0620	1

REF DES	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	BAIL,7 IN.W/FEET	40008-2	BUCK	12810-08-0005	1
NA	CABLE ASSY. RF-uP,2100	1217-80-0106	CTS	11217-80-0106	1
NA	CABLE TIE.3-1/2	SSTIM-M	PAND	12810-00-0001	2
NA	CHASSIS. 2100. REV B	1417-60-0810	CTS	11417-60-0810	1
NA	COUNTER CABLE.2100	1219-70-0070	CTS	11219-70-0070	1
NA	DISPLAY CABLE.2100	1219-70-0068	CTS	11219-70-0068	1
NA	FP ASSY. 2100	1118-70-0012	CTS	11118-70-0012	1
NA	HARNESS. SPEAKER. 2100	1219-70-0075	CTS	11219-70-0075	1
NA	INT,LOWASHER.6	1304ZF	F-S	12810-24-6000	14
NA	KEPS NUT.4-40	71500NF	F-S	12810-16-0026	4
NA	MOTHER (RF) BD. 2100	1110-70-0102	CTS	11110-70-0102	1
NA	NUT.6-32X1/4	8005NF	F-S	12810-14-6100	4
NA	NUT,KEPS.6	9225	F-S	12810-16-0027	5
NA	POWER SUPPLY BD. 2100	1110-70-0104	CTS	11110-70-0104	1
NA	RF-POWER CABLE.2100	1219-70-0066	CTS	11219-70-0066	1
NA	RF ASSY. 2100	1118-70-0013	CTS	11118-70-0013	1
NA	SCW.PPH.6-32X1/2	19046NF	F-S	12810-55-6108	4
NA	SCW.PPH.6-32X3/8	19044NF	F-S	12810-55-6106	6
NA	SCW.PPH.6-32X3/8	23044	F-S	12810-23-0058	3
NA	SCW.PPH.6-32X3/8,BK	19044-BKOXIDE	F-S	12810-65-6106	2
NA	SEMS.4-40 X 1/4.PPH	PER DESC2810-23-0085	F-S	12810-23-0085	20
NA	SPEAKER	30A05Z8	GUAM	13010-11-0005	1
NA	UPROCESSOR BD. 2100	1110-70-0103	CTS	11110-70-0103	1
NA	uP-FP CABLE.2100. 8.5	1219-70-0069	CTS	11219-70-0069	1
NA	uP-POWER CABLE.2100	1219-70-0065	CTS	11219-70-0065	1

ASSEMBLY NUMBER: 11118-70-0012 REV: 4  
DESCRIPTION: FP ASSY. 2100

REF DES	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	BRACKET.RT.ANGLE	612	KEY	12810-09-0019	6
NA	CABL ANT/RF IN OUT	1217-70-0121	CTS	11217-70-0121	2
NA	DECAL, FP. 2100	2417-14-0008	CTS	12417-14-0008	1
NA	DISPLAY.LCD,1X16	LM054	HIT	12410-03-0021	2
NA	ELASTOFDAM..062X.250	88-13127	TEKNT	13210-99-0060	12
NA	FILM.COATED RFI SHIELD	ALTAIR 20,5 MIL	S-W	13010-00-0005	.1
NA	FP PCB ASSY. 2100	1110-70-0101	CTS	11110-70-0101	1
NA	FRONT PANEL. 2100	1417-60-0610	CTS	11417-60-0610	1
NA	HEADER,14-PIN STRT	65501-414	BER	12112-07-0031	2
NA	KEPS NUT,4-40	71500NF	F-S	12810-16-0026	6
NA	KNOB,LT GY,BK LN	SSN50L(F)(L)-1LTGYBK	BUCK	12410-01-0055	5
NA	KNOB,W/BK LINE SKIRT	5870RNJ2B91TC	BUC	12410-01-2031	1
NA	LOWASHER.INT 2	1330NF	F-S	12810-24-2000	16
NA	NUT,2-56,HN101-200	6000NF	F-S	12810-14-2100	8
NA	SEMS,4-40 X 1/4.PPH	PER DESC2810-23-0085	F-S	12810-23-0085	8
NA	SPACER,RND CLR, .187	9208-B091	AMATM	12810-05-0071	8
NA	SPACER,ROUND.2X1/8	109220	F-S	12810-04-2002	8

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C1,C2	CAP,ELEC,16V.220UF	RE2-16V221MA	ELNA	11510-23-5221	2
C3	CAP,MDN,50V,15PF	RPE110C06150J50V	MURGA	11510-11-8150	1
C4,C5,C6	CAP,MDN,50V,.001UF	RPE122C06102J50N	MURGA	11510-11-8102	3
CR1,CR2,CR3,CR4, CR5,CR6,CR7,CR8, CR9,CR10,CR11, CR12,CR13,CR14, CR15,CR16,CR17, CR18,CR19	LED,RED, LOW PROF	HLMP-1350	HP	14810-02-0020	19
J1,J2,J3,J4	BNC-J(F),STR,50	28JR299-3	S-C	12110-01-1036	4
L1,L2,L3,L4	10T TOROID, 32GA	1810-05-0038	CTS	11810-05-0038	4
NA	BOARD, F.F. PCB	1717-00-0099	CTS	11717-00-0099	1
NA	KEYPAD, LEFT SIDE	SL-16-01	SHIN	15108-00-0010	1
NA	KEYPAD, RIGHT SIDE	SL-16-02	SHIN	15108-00-0011	1
NA	NUT,HEX.0-80X3/64	67000	F-S	12810-16-0021	4
NA	PLATE, BEZEL 2100	1417-30-0360	CTS	11417-30-0360	1
NA	SCHEMATIC.FP BD	2100 SCHEMATIC	CTS	10714-20-0011	1
NA	SCREW,0-80X1/2IN	64049	F-S	12810-23-0136	4
P1	HDR,DBL,STRT.50-PN	65611-250	BERG	12112-07-0085	1
R1,R3,R4,R10,R11	POT, 10K	SER200	CTS	14610-13-6103	5
R2	POT,10K,20%.LINEAR	91A1AB24B1E	BDU	14610-02-6113	1
R5	POT, 2K	3299X-1-202	BDU	14610-01-7202	1
R6,R7,R8,R9	RES,C,1/4W,5%.3.9K	CF1/43.9K	ASE	14700-15-3901	4
R12,R13,R14,R15, R16,R17,R18,R19, R20,R21,R22,R23, R24,R25,R26,R27, R28,R29,R30	RES,C,1/4W,5%,430	CF1/4-430	ASE	14700-15-4300	19

ASSEMBLY NUMBER: 11110-70-0103 REV: C  
DESCRIPTION: UPROCESSOR BD. 2100

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C1,C2	CAP,MON,50V,10PF	CN15C100K	CRL	11510-11-8100	2
C3,C5,C7,C10, C12,C13,C14,C16, C16,C18,C19,C21, C24,C44,C63,C64, C65,C71,C72	CAP,MON,50V,.1UF	C320C104MSU1CA	KEMET	11510-11-3104	18
C4,C25,C39,C66, C92	CAP,MON,50V,1UF	CZ30C105M	C-L	11510-11-3105	5
C6,C49,C83,C100	CAP,DISC,.05UF	UK25-503	C-L	11510-14-1503	4
C23	CAP,FILM,.022 UF	225P2239S1WD3	SPR	11510-61-7223	1
C26	CAP,MICA,500V,390PF	DM-15-391J	ARC	11510-50-0391	1
C27	CAP,MICA,500V,330PF	DM15-331J	ARC	11510-50-0331	1
C28,C37	CAP,FILM,.0047 UF	225P47291WD3	SPR	11510-61-7472	2
C29,C30,C34	CAP,FILM,.0027 UF	225P27291WD3	SPR	11510-61-7272	3
C31	CAP,MICA,500V,220PF	DM-15-221J	ARC	11510-50-0221	1
C32,C35	CAP,FILM,.0012 UF	225P12291WD3	SPR	11510-61-7122	2
C33	CAP,FILM,.012 UF	2225P12391WD3	SPR	11510-61-7123	1
C36	CAP,MICA,500V,120PF	DM15-121J	ARC	11510-50-0121	1
C38	CAP,MICA,500V,150PF	CM05FD151J03	C-D	11510-50-0151	1
C40	CAP,FILM,.0082 UF	225P82291WD3	SPR	11510-61-7822	1
C41	CAP,MICA,500V,560PF	DM-15-561J	ARC	11510-50-0561	1
C42,C43	CAP,FILM,.039 UF	NEM.039M100	NIC	11510-61-1393	2
C45,C46,C50,C51, C54,C59,C60,C61, C62,C77,C84,C86, C95,C96,C101, C104,C105,C106, C111,C112	CAP,TANT,20V,10UF	196D106X9020JA1	SPR	11510-25-2100	20
C47	CAP,MICA,500V,240PF	DM15-241J	ARC	11510-50-0241	1
C48	CAP,MICA,500V,100PF	DM15-101J	C-D	11510-50-0101	1
C52	CAP,FILM,.047 UF	225P47391WD3	SPR	11510-61-7473	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C53,C74,C75,C94	CAP,MON,50V,.01UF	CN30C103K	CRL	11510-11-8103	4
C55,C76	CAP,ELEC,16V.100UF	20YH100	MOUS	11510-27-6101	2
C56,C85	CAP,ELEC,16V,470UF	ECEB1CV471S	PNSNC	11510-25-8471	2
C57	CAP,FILM,.1 UF	225P010491WD3	SPR	11510-61-7104	1
C58,C102,C103,C110	CAP,TANT,20 V,15 UF	196D156X9020KA1	SPR	11510-25-2150	4
C67,C68,C69,C87,C107,C108,C109	CAP,MON,50V,.001UF	SR205A102JAA	AER	11510-13-0102	7
C70,C73	CAP,MON,50V,.01UF	CW15C103K	C-L	11510-14-4103	2
C78,C79	CAP,FILM,.22 UF	225P22491XD3	SPR	11510-62-1224	2
C80,C81	CAP,MON,50V,.015UF	SR305A153JAA	AER	11510-13-2153	2
C82,C89,C90,C91,C93,C97,C98	CAP,TANT,35V.1UF	196D105X9035HA1	SPR	11510-25-3109	7
C88	CAP.TANT,35V,22UF	196D226X9035PE4	SPR	11510-25-3220	1
C99	CAP,MON,50V.360PF	RPE110C06361J50	MURGA	11510-11-8361	1
CR1,CR2,CR3,CR8,CR9,CR10,CR11,CR12,CR13,CR19	DIODE, SIGNAL	HSCH1001	H-F	14807-01-6263	10
CR4,CR7,CR22	DIODE,ZEN,4.7V,.5W	1N5230	G-I	14801-01-5230	3
CR5,CR6	DIODE,ZENER,9.1V	1N5239	MOT	14801-01-5239	2
CR14,CR17,CR18	DIODE,SIGNAL	1N914	G-E	14807-01-0914	3
CR15,CR16,CR20	DIODE,RECT,800V	ED30015	ETP	14806-01-4006	3
CR21	DIODE,ZENER,4.3V	1N5229B	MOT	14801-01-5229	1
J1	RECEPT,50-PIN,DBL	4-102083-1	AMP	12112-25-0003	1
J2	SMB-J(M).STR,50,PC	700209	CBLWV	12110-08-0006	1
NA	IC SKT,16 PIN	DILB-16P-108	BURND	12112-00-0012	12
NA	IC SKT,8 PIN	DILB-8P-108	BURND	12112-00-0007	4
NA	IC SKT,PC,14 PIN	C931402	T-I	12112-00-0011	15

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	IC SKT,PC.24 PIN	C932402	T-I	12112-00-0013	1
NA	IC SOCKET.20-PIN	C842002	T-I	12112-00-0020	13
NA	IC, SKT.28-PIN	C842802	T-I	12112-00-0023	2
NA	PCB. UPROC. 2100	1717-00-0101	CTS	11717-00-0101	1
NA	PROM-2100	8410-70-0004	CTS	18410-70-0004	1
NA	SOCKET, IC, 64 PIN	C5W64-11	T-I	12112-00-0081	1
F1	HDR, DBL, STRT. 50-PIN	65611-250	BERG	12112-07-0085	1
F2	HDR, STRT, 7-PIN, GOLD	68001-207	BER	12112-42-0007	1
F4, F9	HDR, STRT, 2-PIN, GOLD	68001-202	BER	12112-42-0002	2
F5	HDR, STR, 18-PIN, GOLD	68001-218	BER	12112-42-0018	1
F6, F7, F8	HDR, LTCHNG, 3-PIN	69167-103	BER	12112-43-0003	3
Q1	TRANSISTOR	FN4091	NAT	14901-04-0910	1
Q2	TRANS QA039-040	2N3904	NAT	14901-03-9040	1
R1, R2, R4	RES, C, 1/4W, 5%, 20K	CF1/4-20K	ASE	14700-15-2002	3
R3, R77	RES, C, 1/4W, 5%, 470K	CF1/4-470K	ASE	14700-15-4703	2
R5, R47, R73, R79, R81, R82, R84, R120	RES, C, 1/4W, 5%, 10K	CF1/4-10K	ASE	14700-15-1002	8
R6	RES, C, 1/4W, 5%, 3.6K	CF1/4-3.6K	ASE	14700-15-3601	1
R7	RES, C, 1/4W, 5%, 10	CF1/4-10	ASE	14700-15-1009	1
R8, R9, R26, R40, R41, R53, R55, R68, R118, R132	RES, C, 1/4W, 5%, 1K	CF1/4-1K	ASE	14700-15-1001	10
R10, R25, R67, R76, R83, R89, R90, R93, R112	RES, C, 1/4W, 5%, 1M	CF1/4-1M	ASE	14700-15-1004	9
R11	RES, C, 1/4W, 5%, 470	CF1/4-470	ASE	14700-15-4700	1
R12	RS, MF, 1/8W, 1%, 69.8K	RN55D-69.8K	MILSP	14701-03-6982	1
R13, R123, R129	RES, MF, 1/8W, 1%, 140K	RN55D-140K	MILSP	14701-03-1403	3

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
R14	RES.MF, 1/8W, 1%, 80.6K	RN55D-80.6K	MILSP	14701-03-8062	1
R15	RES.MF, 1/8W, 1%, 357K	RN55D-357K	MILSP	14701-03-3573	1
R16	RES.MF, 1/8W, 1%, 348K	RN55D-348K	MILSP	14701-03-3483	1
R17	RES.MF, 1/8W, 1%, 237K	RN55D-237K	MILSP	14701-03-2373	1
R18	RES.MF, 1/8W, 1%, 52.3K	RN55D-52.3K	MILSP	14701-03-5232	1
R19	RES.MF, 1/8W, 1%, 105K	RN55D-105K	MILSP	14701-03-1053	1
R20	RES.MF, 1/8W, 1%, 191K	RN55D-191K	MILSP	14701-03-1913	1
R21	RES.MF, 1/8W, 1%, 866K	RN55D-866K	MILSP	14701-03-8663	1
R22	RES.MF, 1/8W, 1%, 182K	RN55D-182K	MILSP	14701-03-1823	1
R23	RES.MF, 1/8W, 1%, 511K	RN55D-511K	MILSP	14701-03-5113	1
R24	RES.MF, 1/8W, 1%, 133K	RN55D-133K	MILSP	14701-03-1333	1
R27, R29	RES.C, 1/4W, 5%, 2.2M	CF1/4-2.2M	ASE	14700-15-2204	2
R28, R59	RES.C, 1/4W, 5%, 24K	CF1/4-24K	ASE	14700-15-2402	2
R30	RES.C, 1/4W, 5%, 1.8K	CF1/4-1.8K	ASE	14700-15-1801	1
R31, R36	RES.C, 1/4W, 5%, 82K	CF1/4-82K	ASE	14700-15-8202	2
R32, R128	RES.MF, 1/8W, 1%, 75K	RN55D-75K	MILSP	14701-03-7502	2
R33, R101, R104, R133, R134	POT, 5K	3386W-1-502	BOU	14610-02-0502	5
R34	RES.C, 1/4W, 5%, 13K	RCF-13K-QB	CII	14700-15-1302	1
R35	POT, 50K	3386W-1-503	BOU	14610-02-0503	1
R37, R38	RES.MF, 1/8W, 1%, 45.3K	RN55D-45.3K	MILSP	14701-03-4532	2
R39	RES.C, 1/4W, 5%, 51K	CF1/4-51K	ASE	14700-15-5102	1
R42, R86	RES.C, 1/4W, 5%, 18K	CF1/4-18K	ASE	14700-15-1802	2
R43	RES.C, 1/4W, 5%, 3.3K	CF1/4-3.3K	ASE	14700-15-3301	1
R44, R45	RES.C, 1/4W, 5%, 2.7	CF1/4-2.7	ASE	14700-15-2708	2
R46	RES.C, 1/4W, 5%, 36K	CE1/4-36K	ASE	14700-15-3602	1

ASSEMBLY NUMBER: 11110-70-0103 REV: C  
 DESCRIPTION: UPROCESSOR BD. 2100

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
R48	RES, MF, 1/8W, 1%, 255K	RN55D-255K	MILSP	14701-03-2553	1
R49, R51, R66, R71	POT, 20K	3386W-1-203	BOU	14610-02-0203	4
R50	RES, C, 1/4W, 5%, 150K	CF1/4-150K	ASE	14700-15-1503	1
R52, R54, R61, R62, R64, R74, R88, R94, R131	RES, C, 1/4W, 5%, 100K	CF1/4-100K	ASE	14700-15-1003	9
R56, R58	RES, C, 1/4W, 5%, 430	CF1/4-430	ASE	14700-15-4300	2
R57	RES, C, 1/4W, 5%, 2.4M	CF1/4-2.4M	ASE	14700-15-2404	1
R60	RES, C, 1/4W, 5%, 10M	CB1065	A-B	14700-15-1005	1
R63, R65	RS, MF, 1/8W, 1%, 60.4K	RN55D-60.4K	MILSP	14701-03-6042	2
R69, R121	RES, C, 1/4W, 5%, 2K	CF1/4-2K	ASE	14700-15-2001	2
R70	RS, MF, 1/8W, 1%, 86.6K	RN55D-86.6K	MILSP	14701-03-8662	1
R72	RES, C, 1/4W, 5%, 6.8K	CF1/4-6.8K	ASE	14700-15-6801	1
R75	RES, C, 1/4W, 10%, 2M	CB2055	A-B	14700-15-2004	1
R78	RES, C, 1/4W, 5%, 200K	CF1/4-200K	ASE	14700-15-2003	1
R80	RES, C, 1/4W, 5%, 510K	CF1/4-510K	ASE	14700-15-5103	1
R85	RES, C, 1/4W, 5%, 2.2K	CF1/4-2.2K	ASE	14700-15-2201	1
R87	RES, C, 1/4W, 5%, 3.9K	CF1/4-3.9K	ASE	14700-15-3901	1
R91	RES, C, 1/4W, 5%, 1.8M	CF1/4-1.8M	ASE	14700-15-1804	1
R92	RES, C, 1/4W, 5%, 5.6K	CF1/4-5.6K	ASE	14700-15-5601	1
R95	RS, MF, 1/8W, 1%, 35.7K	RN55D-35.7K	MILSP	14701-03-3572	1
R96	RES, MF, 1/8W, 1%, 665K	RN55D-665K	MILSP	14701-03-6653	1
R97	RS, MF, 1/8W, 1%, 49.9K	RN55D-49.9K	MILSP	14701-03-4992	1
R98, R127	RES, MF, 1/8W, 1%, 100K	RN55D-100K	MILSP	14701-03-1003	2
R99	RES, MF, 1/8W, 1%, 2K	RN55D-2K	MILSP	14701-03-2001	1
R100, R106, R107	RES, MF, 1/8W, 1%, 10K	RN55D-10K	MILSP	14701-03-1002	3
R102, R103, R105	RS, MF, 1/8W, 1%, 8.25K	RN55D-8.25K	MILSP	14701-03-8251	3

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
R108	RS.MF, 1/8W, 1%, 11.8K	RN55D-11.8K	MILSP	14701-03-1182	1
R109	RES, MF, 1/8W, 1%, 118K	RN55N-118K	MILSP	14701-03-1183	1
R110	RS, MF, 1/8W, 1%, 4.75K	RN55D-4.75K	MILSP	14701-03-4751	1
R111	POT, 10K	3386W-1-103	BOU	14610-02-0103	1
R113	RS, MF, 1/8W, 1%, 4.32K	RN55D-4.32K	MILSP	14701-03-4321	1
R114	RESISTOR, VARIABLE	3386W-1-102	BOU	14610-02-0102	1
R115, R122, R124, R130	RS, MF, 1/8W, 1%, 14.0K	RN55D-14.0K	MILSP	14701-03-1402	4
R116	RES, C, 1/4W, 5%, 360	CF1/4-360	ASE	14700-15-3600	1
R117	RES, C, 1/4W, 5%, 680	CF1/4-680	ASE	14700-15-6800	1
R119	RES, C, 1/4W, 5%, 820	CF1/4-820	ASE	14700-15-8200	1
R125	RES, MF, 1/8W, 1%, 178K	RN55D-178K	MILSP	14701-03-1783	1
R126	RS, MF, 1/8W, 1%, 17.8K	RN55D-17.8K	MILSP	14701-03-1782	1
U1	IC. 78C106-36	78C106-36	NEC	18000-78-1000	1
U2	IC. 27C128	TMS27C128-15JL	T-I	18000-27-1281	1
U3	IC. 74HC373N	MM74HC373N	NAT	18007-43-7311	1
U4	2Kx8 ZEROPOWER RAM	MK48Z02B15	THMPS	18000-48-0215	1
U5, U6, U7	IC. 74HC138N	MM74HC138N	NAT	18007-41-3811	3
U8	IC. 74HC241N	MM74HC241N	NAT	18007-42-4111	1
U9, U10, U11, U12, U13, U14, U15, U16, U17, U18, U19	IC. 74HC374N	MM74HC374N	NAT	18007-43-7411	11
U20	GATE ARRAY	L1A1407	LLC	17100-70-1900	1
U21, U22	IC. 74HC161N	MM74HC161N	NAT	18007-41-6110	2
U23	IC. 74HC03N	MM74HC03N	NAT	18000-74-0311	1
U25, U29, U30, U41, U44	DG411	DG411	SCX	17000-04-1100	5

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 DESCRIPTION: UPROCESSOR BD, 2100

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
U26,U31,U32,U43, U45,U46,U51	OP AMP	TL084CP	T-I	17000-00-8400	7
U27	PLL, RCA ONLY	CD4046BE	RCA	18000-40-4612	1
U28	DECADE COUNTER	MM74C90	NAT	18000-74-9010	1
U33	POWER AMP. AUDIO	LM380N	NAT	17000-03-8001	1
U35	IC, 74HC14N	MM74HC14N	NAT	18000-74-1411	1
U38	IC, 74HC00N	MM74HC00N	NAT	18000-74-0012	1
U39,U40	IC, 74HC74N	MM74HC74N	NAT	18000-74-7403	2
U42,U53	DUAL JFET OP AMP	TL072CP	T-I	17000-00-7203	2
U48,U50	IC, MF4CN-50	MF4CN-50	NAT	17000-00-0040	2
U49	VOLT REG, -5V	MC79L05CP	MOT	17000-79-0510	1
U52	LF13006	LF13006	NAT	17001-30-0600	1
Y1	CRYSTAL, 14.31818MHZ	FOX 143	FOX	12310-00-1431	1

ASSEMBLY NUMBER: 11110-70-0102 REV: J  
MOTHER (RF) BD. 2100

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C201, C202, C203, C204, C208, C209, C210, C211, C214, C215, C216, C217, C297, C304, C331, C356, C368	CAP, TANT, 25V, 10UF	NDT10UFM25	NIC	11510-24-4100	17
C205, C207, C218, C280, C281, C282, C283, C284, C286, C315, C317, C318, C319, C320, C321, C324, C337, C338, C339, C340, C342, C343, C344, C345, C348, C349, C350, C354, C360, C361, C364, C377, C381	CAP., CHIP, .1 MF	51C1209-B104Z	CFI	11510-00-3104	33
C206, C212, C219, C336	CAP, TANT, 20V, 47UF	196D476X9020FE4	SPR	11510-26-4470	4
C220, C223, C224, C225, C226, C227, C228, C229, C233, C236, C237, C238, C239, C240, C242, C244, C245, C246, C247, C248, C252, C254, C255, C256, C263, C268, C270, C273, C274, C275, C276, C277, C285, C291, C293, C294, C295, C296, C298, C305, C307, C309, C311, C312, C326, C328, C359, C363, C367, C369, C372, C373, C374, C378, C379, C380, C303	CAP, MON, 50V, .1UF	C320C104M5U1CA	KEMET	11510-11-3104	57
C221, C261, C325	CAP, MON, 50V, .001UF	RPE122C06102J50	MURGA	11510-11-8102	3
C222, C234, C241, C249, C250, C301, C302, C308, C327, C358, C365	CAP, MON, 50V, 1UF	CZ30C105M	C-L	11510-11-3105	11
C230, C267	CAP, MICA, 500V, 620PF	DM15-621J	ARC	11510-50-0621	2

ASSEMBLY NUMBER: 11110-70-0102 REV: J  
MOTHER (RF) BD. 2100

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY	USD
C231	CAP. MICA, 500V, 820PF	DM15-821J	ARC	11510-50-0821	1	
C232	CAP. MICA, 500V, 680PF	DM15-681J	ARC	11510-50-8681	1	
C243, C375, C381	CAP. MON, 100V, 470PF	CW15A471M	C-L	11510-14-5471	3	
C251	CAP. MICA, 500V, 330PF	DM15-331J	ARC	11510-50-0331	1	
C253	CAP. MICA, 500V, 510PF	DM-15-511J	ARC	11510-50-0511	1	
C253, C287, C288, C289, C306, C332, C341	CAP. MON, 50V, .01UF	CW15C103K	C-L	11510-14-4103	7	
C257, C260	CAP. MON, 50V, .22UF	8131-050-151-22	ETP	11510-14-6224	2	
C258, C259	CAP. MON, 50V, 270PF	RA50-271JA	MURGA	11510-11-8271	2	
C262	CAP. MON, 50V, 10PF	CN15C100K	CRL	11510-11-8100	1	
C264, C265	CAP. MON, 50V, 27PF	RA50-270JA	MURGA	11510-11-8270	2	
C269	CAP. VAR, 10-60PF	MDD10-300332-10	S-T	11510-71-0600	1	
C271	CAP. MICA, 500V, 33PF	CM05ED330J03	SPR	11510-50-0330	1	
C272	CAP. MICA, 500V, 50PF	DM15-500J	ARC	11510-50-0500	1	
C278, C279, C290, C335	CAP. CHIP, 470 PF	C0805C471J56AH	KEMET	11510-01-5471	4	
C292	CAP. MON, 50V, 680PF	RPE110C06681J50	MURGA	11510-11-8681	1	
C299	CAP. MON, 50V, 5.6PF	RA50-5R6DA	MURGA	11510-11-8569	1	
C300, C313, C314	CAP. MON, 50V, 4.7UF	SR505E475MAA	AER	11510-11-3475	3	
C310	CAP. MON, 50V, 2.2UF	3420-050-E225M	AER	11510-11-3225	1	
C316	CAP. COMP, 500V, 8.2PF	8.2PF 5%	Q-C	11510-40-0829	1	
C322, C323	CAP. CHIP, 1000 PF	ATC700A102JP50X	ATC	11510-00-6102	2	
C329, C330, C345, C347, C355, C357	CAP. FILM, .22 UF	225P22491XD3	SPR	11510-62-1224	6	
C333	CAP. RAD. ELE, 50V, 1UF	EV1M50AA	FACCOM	11510-29-0109	1	
C334, C352	CAP. .CHIP 75PF 10%	100B750KP500	ATC	11510-00-2750	2	
C346, C366	CAP. ELEC, 25V, 100UF	RE100MF25V20%	ELNA	11510-23-4101	2	

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C351	CAP. CDMP, 500V, 1PF	QC-1PF	G-C	11510-40-0010	1
C353	CAP. CDMP, 500V, 1.5PF	QC-1.5PF	G-C	11510-40-0159	1
C362	CAP. MDN, 50V, 100PF	RPE110C06101J5V	MURGA	11510-11-8101	1
C370	CAP. MIDA, 500V, 27PF	CM05ED270J03	ARC	11510-50-0270	1
C371	CAP. MIDA, 500V, 39PF	CM05ED390J03	C-D	11510-50-0390	1
C376	CAP. DISC, 50V, .47UF	1C20Z5U474Z050B	SPR	11510-11-2478	1
CR201	DIODE. TUNING, U/VHF	ZC802	MSI	14803-02-0023	1
CR202	DIODE. SCHOTTKY	5082-2835	H-P	14809-02-0002	1
CR203, CR204, CR209, CR216, CR217, CR223, CR224, CR226, CR228, CR236	DIODE, SIGNAL	1N914	G-E	14807-01-0914	10
CR205, CR206, CR207	DIODE, PIN	5082-3080	H-P	14805-02-0002	3
CR208, CR222, CR237, CR238, CR239	DIODE, SIGNAL	HSCH1001	H-P	14807-01-6263	5
CR210, CR211, CR212, CR213, CR214, CR215, CR218, CR219, CR220, CR221, CR231, CR232, CR233, CR234	DIODE, PIN, CHIP	HSMP-3800	H-P	14805-02-0035	14
CR225, CR227	DIODE. ZEN, 4.7V, 1W	1N4732	MOT	14801-01-4732	2
CR229, CR230, CR235	DIODE. VARACTOR	BBS05E	SIEM	14803-02-0020	3
FL201	XTAL FLTR. 455KHZ	CFU455B2	MURGA	12710-02-0010	1
G201	TCXD. 10 MHZ	TCXD50-17A	ISTMP	12311-00-0007	1
J201, J202, J203, J204, J205, J206, J207	BMB-J (M), STR, 50	700209	CBLWV	12110-08-0006	7
J205	PV JUMPER	65474-002	BER	12112-10-0002	1

ASSEMBLY NUMBER: 11110-70-0102 REV: J  
MOTHER (RF) BD. 2100

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
K201	RELAY, DPDT, 26.5V	712-26	TELR	14510-00-0018	1
L201, L202, L203, L204, L205, L206, L207, L208, L209, L210, L211, L212	CHOKE	VK20010/3B	FRXC	11810-09-0001	12
L213, L263	CHOKE, COATED, 22UH	08N220	JEF	11810-03-0220	2
L214, L217	CHOKE, MOLDED, 0.56UH	1025-14	DEL	11810-10-0568	2
L215, L216, L255	CHOKE, COATED 1.8UH	08N1R8	JEF	11810-03-0189	3
L218, L219, L220, L221, L223, L224, L226, L228, L236, L242, L250, L251, L253, L257, L258, L259, L260, L261, L262, L265	10T TOROID, 326A.	1810-05-0038	CTS	11810-05-0038	20
L222, L225	CHOKE, MOLDED, 100 UH	1025-68	DEL	11810-10-0101	2
L227	COIL, VAR, 330-611uH	DVC471-000V	JEF	11811-00-0030	1
L229, L230	COIL, VAR, 0.47 UH,	Y3353-N6	MURA	11811-00-0007	2
L231	CHOKE, COATED, 6.8UH	08N6R8	JEF	11810-03-0689	1
L232	COIL, VAR, 1.01/1.18U	Y3353-N3	MURA	11811-00-0006	1
L233, L234, L235, L237, L238, L239, L240	6T TOROID, 286A	1810-05-0017	CTS	11810-05-0017	7
L241	COIL, AIR, 7T, 306A.			11815-00-0187	1
L243, L247, L248, L249	10T TOROID, 306A	1810-05-0039	CTS	11810-05-0039	4
L244, L246, L254	CHOKE, COATED, .39UH	08NR39	JEF	11810-03-0398	3
L245, L256	RF CHOKE, REF ONLY	CHOKE	CTS	11819-99-9999	2
L252	COIL, AIR, 5T, 286A.			11815-00-0186	1
L264	CHOKE, COATED, 18 UH	08N180	JEF	11810-03-0180	1
L266	CHOKE, COATED, 10UH	08N100	JEF	11810-03-0100	1
MX201	MIXER, DBL. BAL.	SBL-1-DBL	MIN-C	13010-54-0004	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
MX202	MIXER, DBL. BAL.	TFM-2-DBL	MIN-C	13010-54-0005	1
MX203	MIXER, DBL BAL	SBL-1X	MIN-C	13010-54-0016	1
NA	BOX CM&CM4			11417-30-0400	1
NA	BOX COVER CM1&CM4			11417-30-0420	2
NA	BOX. CM1&4 BOTTOM	1417-30-0500	CTS	11417-30-0500	1
NA	BOX. METAL RF 2100	1417-01-0330	CTS	11417-01-0330	2
NA	CABLE ASSY. 7-1/2 IN	1217-80-0098	CTS	11217-80-0098	1
NA	CABLE. 2 1/2 IN	1217-80-0103	CTS	11217-80-0103	1
NA	CA, SRIG. 50 OHM, .056	MA50056	FRSN	16011-40-0003	4
NA	COVER, RF BOX 2100	1417-01-0340	CTS	11417-01-0340	2
NA	COVER, TCXD. 2100	1417-30-0480	CTS	11417-30-0480	1
NA	IC SKT, 8 PIN	DILB-8P-108	BURND	12112-00-0007	4
NA	IC SKT, PC, 14 PIN	C931402	T-I	12112-00-0011	5
NA	KEPS NUT, 4-40	71500NF	F-S	12810-16-0026	1
NA	PCB. MOTHER (RF)	1717-00-0100	CTS	11717-00-0100	1
NA	PCB, FIXED TANK	1717-00-0118	CTS	11717-00-0118	1
NA	RF SHIELD. 2100	1417-01-0380	CTS	11417-01-0380	1
NA	SCW. PPH, 4-40X1/4	19022NF	F-S	12810-35-4104	1
NA	SHIELD	A001-276	CTS	11410-00-3670	1
F201	HDR. STRT, 50-PIN, DBL	67999-250	BERG	12112-07-0037	1
F202	PLUG. LKG, STRT, 4-PIN	09-65-1041	MOL	12112-06-0001	1
F203	HDR. LATCHING, 3-P	69167-103	BER	12112-43-0003	1
F204	PLUG. 3-CKT	09-65-1031	MOL	12112-05-0008	1
F205	HDR. STRT, 3-PIN, GOLD	68001-203	BER	12112-42-0003	1
Q201, Q202, Q203, Q205, Q206, Q210, Q214, Q215	TRANS QA039-040	2N3904	NAT	14901-03-9040	5

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
Q204	TRANS QB000-009	MFS3702	NAT	14902-03-7020	1
Q207	TRANS QB000-020	480841	RCA	14902-40-8410	1
Q208, Q209	JFET, N-CHANNEL	2N4416	NAT	14901-04-4160	2
Q211, Q218	TRANSISTOR	PN4121-18	NAT	14901-04-1210	2
Q212, Q213	TRANS QA054-580	2N5458	MOT	14901-05-4580	2
Q216, Q217	TRANS QA051-090	2N5109	SSS	14901-05-1090	2
R201, R233, R237, R267, R282, R286, R287, R314	RES, C, 1/4W, 5%, 10K	CF1/4-10K	ASE	14700-15-1002	8
R202, R284, R303	RES, C, 1/4W, 5%, 3.9K	CF1/4-3.9K	ASE	14700-15-3901	3
R203	RES, C, 1/4W, 5%, 20K	CF1/4-20K	ASE	14700-15-2002	1
R204, R210, R300, R307, R336	RES, C, 1/4W, 5%, 2.2K	CF1/4-2.2K	ASE	14700-15-2201	5
R205, R213, R214, R217, R220, R230, R257, R262, R277, R279, R292, R294, R332, R357, R362	RES, C, 1/4W, 5%, 1K	CF1/4-1K	ASE	14700-15-1001	15
R206, R295, R331	RES, C, 1/4W, 5%, 100	CF1/4-100	ASE	14700-15-1000	3
R207, R245, R263, R265, R312, R348	RES, C, 1/4W, 5%, 150	CF1/4-150	ASE	14700-15-1500	6
R208, R211, R232, R319, R363	RES, C, 1/4W, 5%, 510	CF1/4-510	ASE	14700-15-5100	5
R209	RES, C, 1/4W, 5%, 10	CF1/4-10	ASE	14700-15-1009	1
R212	RES, C, 1/4W, 5%, 47	CF1/4-47	ASE	14700-15-4709	1
R215, R234, R235, R250	RES, C, 1/4W, 5%, 1.5K	CF1/4-1.5K	ASE	14700-15-1501	4
R216, R330, R350	RES, C, 1/4W, 5%, 5.6K	CF1/4-5.6K	ASE	14700-15-5601	3
R218	RES, C, 1/4W, 5%, 270	CF1/4-270	ASE	14700-15-2700	1
R219, R249, R296, R342	RES, C, 1/4W, 5%, 560	CF1/4-560	ASE	14700-15-5600	4

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
R221, R365	RES, C, 1/4W, 5%, 510K	CF1/4-510K	ASE	14700-15-5103	2
R222	RES, C, 1/4W, 5%, 68	CF1/4-68	ASE	14700-15-6809	1
R223, R329, R351	RES, C, 1/4W, 5%, 4.7K	CF1/4-4.7K	ASE	14700-15-4701	3
R224, R241, R244	RES, C, 1/4W, 5%, 820	CF1/4-820	ASE	14700-15-8200	3
R225, R290, R317, R358	RES, C, 1/4W, 5%, 100K	CF1/4-100K	ASE	14700-15-1003	4
R226, R309, R310, R349	RES, C, 1/4W, 5%, 470	CF1/4-470	ASE	14700-15-4700	4
R227	FOT, 500	3386W-1-501	BOU	14610-02-0501	1
R228	RES, C, 1/4W, 5%, 18K	CF1/4-18K	ASE	14700-15-1802	1
R229	RES, C, 1/4W, 5%, 1.8K	CF1/4-1.8K	ASE	14700-15-1801	1
R231	RES, C, 1/4W, 5%, 27K	CF1/4-27K	ASE	14700-15-2702	1
R236, R280	RES, C, 1/4W, 5%, 10M	CB1065	A-B	14700-15-1005	2
R238	RES, C, 1/4W, 5%, 12K	CF1/4-12K	ASE	14700-15-1202	1
R239, R242, R273	RES, C, 1/4W, 5%, 33K	CF1/4-33K	ASE	14700-15-3302	3
R240, R243, R299, R301	RES, C, 1/4W, 5%, 1.2K	CF1/4-1.2K	ASE	14700-15-1201	4
R246, R302	RES, C, 1/4W, 5%, 11K	RCF-11K-0B	CII	14700-15-1102	2
R247, R360	RES, C, 1/4W, 5%, 13K	RCF-13K-0B	CII	14700-15-1302	2
R248	RES, C, 1/4W, 5%, 16K	CF1/4-16K	ASE	14700-15-1602	1
R251	RES, C, 1/4W, 5%, 3K	CF1/4-3K	ASE	14700-15-3001	1
R252	RES, CH, 1/8W, 1%, 221	BCK2210FB	A-B	14711-03-2210	1
R253, R254	RES, C, 1/4W, 5%, 750	CF1/4-750	ASE	14700-15-7500	2
R254, R259, R326, R344	RES, CH, 1/8W, 1%, 247	BCK2470FB	A-B	14711-03-2470	4
R255, R256, R260, R261, R327, R328, R345, R346	RES, CH, 1/8W, 1%, 61.1	BCK61R1FB	A-B	14711-03-6119	8
R258, R371	RES, C, 1/4W, 5%, 1.1K	CF1/4-1.1K	ASE	14700-15-1101	2

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
R264	RES, CH, 3W, 5%, 1K	2512-1001FSWB-3	TXL	14711-55-1001	1
R266	RES, CH, 1/8W, 5%, 50	WA4PS-50J	MINI	14711-05-5009	1
R268, R276, R278, R289, R293, R297, R304, R370	POT, 10K	3386W-1-103	BOU	14610-02-0103	8
R269	RES, C, 1/4W, 5%, 560K	CF1/4-560K	ASE	14700-15-5603	1
R270, R271, R281	RES, C, 1/4W, 5%, 39K	CF1/4-39K	ASE	14700-15-3902	3
R272	RESISTOR, VAR. 1K	3386W-1-102	BOU	14610-02-0102	1
R274, R338	RES, C, 1/4W, 5%, 7.5K	CF1/4-7.5K	ASE	14700-15-7501	2
R275	RES, C, 1/4W, 5%, 51	CF1/451	ASE	14700-15-5109	1
R283	RES, C, 1/4W, 5%, 30K	CF1/4-30K	ASE	14700-15-3002	1
R285	RES, C, 1/4W, 5%, 91K	CF1/4-91K	ASE	14700-15-9102	1
R288	RES, C, 1/4W, 5%, 1.3M	CB1355	A-B	14700-15-1304	1
R291, R318, R359	RES, C, 1/4W, 5%, 51K	CF1/4-51K	ASE	14700-15-5102	3
R298	POT, 5K	3386W-1-502	BOU	14610-02-0502	1
R305, R306	RES, C, 1/4W, 5%, 24K	CF1/4-24K	ASE	14700-15-2402	2
R308, R372	RES, C, 1/4W, 5%, 47K	CF1/4-47K	ASE	14700-15-4702	2
R311, R347	RES, C, 1/4W, 5%, 91	CF1/4-91	ASE	14700-15-9109	2
R313, R333	RES, C, 1/4W, 5%, 2.7K	CF1/4-2.7K	ASE	14700-15-2701	2
R315	RES, CH, 1/8W, 5%, 680	ERJ-86CJ681D	FNSNC	14711-05-6800	1
R316	RES, CH, 1/8W, 5%, 1.8K	RMC1/8-1800	KMYD	14711-05-1801	1
R320, R321	RES, C, 1/4W, 5%, 5.1K	CF1/4-5.1K	ASE	14700-15-5101	2
R322, R323	RES, C, 1/4W, 5%, 180K	CF1/4-180K	ASE	14700-15-1803	2
R324, R325, R337, R353, R356, R361	RES, C, 1/4W, 5%, 9.1K	CF1/4-9.1K	ASE	14700-15-9101	6
R334	RES, C, 1/8W, 5%, 100	CF1/8-100	ASE	14700-05-1000	1
R335	RES, C, 1/8W, 5%, 1.8K	CF1/8-1.8K	ASE	14700-05-1801	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
R339	RES,C, 1/4W, 5%, 43	CF1/4-43	ASE	14700-15-4309	1
R340	RES,C, 1/2W, 5%, 220	CF1/2-220	ASE	14700-25-2200	1
R341, R343	RES,C, 1/4W, 5% 1.3K	CF1/4-1.3K	ASE	14700-15-1301	2
R352	RES,CH, 1/8W, 470	RMC1/8-470	KMYD	14711-05-4700	1
R354, R355	RES,C, 1/4W, 5%, 430K	CF1/4-430K	ASE	14700-15-4303	2
R366	RES,C, 1/4W, 5%, 2K	CF1/4-2K	ASE	14700-15-2001	1
R367	RES,MF, 1/8W, 1%, 1.96	RN55D-1.96K	MILSP	14701-03-1961	1
R368	RES,MF, 1/8W, 1%, 162K	RN55D-162K	MILSP	14701-03-1623	1
T201, T202	RF XFMR, BIFILAR	1210-43-0011	CTS	11814-00-0021	2
TP201, TP204, TP206	HDR, STRT, 1-PIN, GOLD	68001-201	BER	12112-42-0001	3
U201	VCO, 200 MHZ	MC1648N	MOT	17000-16-4800	1
U202	IC, SL6652	SL6652	FLSSY	17000-66-5200	1
U203, U225	IC, SF4740	SF4740	FLSSY	18000-47-4000	2
U204, U205, U207, U229	OP AMP	TL084CP	T-I	17000-00-8400	4
U206, U211, U230	DUAL JFET OP AMP	TL072CP	T-I	17000-00-7203	3
U208	VOLTAGE REG, 12	LM78L12ACZ	NAT	17000-78-1220	1
U209	DAC, 8-BIT	DAC-08EQ	AMD	18000-00-0800	1
U210	IC, SP8718	SP8718	FLSSY	18000-87-1800	1
U212	DIVIDE-BY-10, ECL	11C90DC	FCD	18000-11-9000	1
U213, U221	WIDEBAND AMP, MAR-6	MAR-6	MIN-C	17000-00-0006	2
U214	1 GHz PRESCALER	UP5876	NEC	18000-05-8700	1
U215	OCTAL D-FLIP FLOP	MC74HC273N	MOT	18007-42-7300	1
U216, U217	IC, MC145146	MC145146	MOT	18014-51-4610	2
U218	OP. AMPL. LOW NOISE	NE5532AN	SIG	17000-55-3201	1
U219	WIDEBAND AMPL, MAR-7	MAR-7	MIN-C	17000-00-0007	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
U220	WIDEBAND AMP, MAR-4	MAR-4	MIN-C	17000-00-0004	1
U223	PHASE DETECTOR	MC4044P	MOT	18000-40-4400	1
U224	IC, 74HC74N	MM74HC74N	NAT	18000-74-7403	1
U226	DECADE COUNTER	MM74HC162N	NAT	18007-41-6211	1
U227	IC, 74HC14N	MM74HC14N	NAT	18000-74-1411	1
U228	VOLT REG, -12	LM79L12ACZ	NAT	17000-79-1210	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C1,C2	CAP.ELEC,35V,3300UF	UBU1V322MRA	NICHN	11510-23-1332	2
C3	CAP,TANT,25V.10UF	NDT10UFM25	NIC	11510-24-4100	1
C4,C5	CAP.ELEC,25V,470UF	226H471P025	CDE	11510-20-8471	2
CR1,CR2	DIODE	MRS01	MOT	14806-02-0007	2
CR3,CR4,CR5,CR6	DIODE,SCHOTTKY	1N5820	MOT	14809-01-5820	4
F1	FUSE PC MOUNT, 3A	MB3	BEL	12410-05-0051	1
L1,L3	INDUCTOR,100UH,2.5A	92102K	PULSE	11810-13-0007	2
NA	KEPS NUT,4-40	71500NF	F-S	12810-16-0026	1
NA	MTG INSLTOR TIP 32	60-12 5791 1674	CHOM	12810-11-0007	1
NA	PCB.POWER SUPPLY	1717-00-0109	CTS	11717-00-0109	1
NA	SCW.PPH,4-40X3/8	23024	F-S	12810-23-0053	1
NA	SH WASHER	DF137A	RCA	12810-27-0001	1
P1,P3	CONN,MALE,8-PIN	09-65-1081	MOL	12112-05-0013	2
P2	PLUG, 3-CKT	09-65-1031	MOL	12112-05-0008	1
P4	PLUG,6-PIN KONEKTON	09-65-1061	MOL	12112-05-0002	1
P5	HEADER,7-PIN STRT	65501-407	BER	12112-07-0005	1
P6	CONN, MALE, 2-PIN	09-65-1021	MOL	12112-05-0010	1
R2,R7	RES.WW,5W,5%..1	45JR10	DHM	14702-65-1007	2
R3	RES.WW,3W,1%.1	RS2B-3W-1-1%	DAL	14702-55-1008	1
R4	RES,C,1/4W,5%.240	RDF-240-0B	CII	14700-15-2400	1
R5	RES.C,1/4W,5%. 2.4K	CF1/4-2.4K	ASE	14700-15-2401	1
R6	POT.500	3386W-1-501	BOU	14610-02-0501	1
R8	RES.C,1/4W,5%,270	CF1/4-270	ASE	14700-15-2700	1
R9	POT.5K	3386W-1-502	BOU	14610-02-0502	1
U1	POS, VOLTAGE REG.	LM317T	NAT	17000-03-1700	1
X1	DC-DC CONVERTER.	1215D12H	CONV	14010-00-00 <del>3</del>	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
J2	RECEPT..DC	722-A	S-I	12112-32-0008	1
NA	BNC-J(F).STR,50	31-221	APL	12110-01-1022	1
NA	CABLE TIE.3-1/2	SSTIM-M	PAND	12810-00-0001	5
NA	CORD WRAP	PP40055	BUCK	12810-08-0008	2
NA	DECAL.REAR PANEL	2417-14-0016	CTS	12417-14-0016	1
NA	FOOT.EXTENSION	PP-40058	BUCK	12810-08-0031	2
NA	FUSEHLDR/LINE RECEPT	6VJ1	CCM	12410-05-0017	1
NA	FUSE.3/4AMP	313750	LIT	12410-05-0019	1
NA	GROUND LUG,#6.INT	38-111	F-S	12112-03-0003	1
NA	HARNESS. POWER SWT	1219-70-0071	CTS	11219-70-0071	1
NA	HARNESS. PS/RP	1219-70-0073	CTS	11219-70-0073	1
NA	HARNESS. TIP RP/PS	1219-70-0072	CTS	11219-70-0072	1
NA	INT,LOWASHER.6	1304ZF	F-S	12810-24-6000	3
NA	LOWASHER.INT 2	1330NF	F-S	12810-24-2000	2
NA	MTG INSULATOR TIP 32	60-12 5791 1674	CHDM	12810-11-0007	3
NA	NUT.2-56,HN101-200	8000NF	F-S	12810-14-2100	2
NA	PLATE, RS232. 2100	1417-01-0400	CTS	11417-01-0400	1
NA	FD VOLTAGE REG.	UA7805UC	FCD	17000-78-0523	1
NA	REAR PANEL. 2100	1417-60-0660	CTS	11417-60-0660	1
NA	RIVET,AL,1/8X1/8	AD42ABS	USMFS	12810-30-0015	2
NA	SCOPE-TRIGGER CABLE	1219-70-0067	CTS	11219-70-0067	1
NA	SCW.PPH.2-56X1/4	19002NF	F-S	12810-55-2104	2
NA	SCW.PPH.4-40X1/4	19022NF	F-S	12810-55-4104	3
NA	SH WASHER	DF137A	RCA	12810-27-0001	3

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	SLVNG, SHRINKABLE, 1/8	FIT-221-1/8	AWC	16011-20-2000	1
NA	SLVNG, SHRINKABLE, 3/8	FIT-221-3/32	AWC	16011-20-1500	15
NA	SOLDER LUG	1497	HHS	12112-03-0026	1
NA	TERMINAL, FEMALE	61454-1	AMP	12113-22-0011	1
NA	TRANSISTOR, POWER	TIP31	MOT	14902-00-0311	1
NA	XFMR ASSY	1219-70-0074	CTS	11219-70-0074	1
S1	SWITCH, SLIDE, DPDT	1201-M1-Z3-Q-E	C-K	15105-00-0026	1
U1	POS. VOLTAGE REG.	LM317T	NAT	17000-03-1700	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	CONN.FEMALE,8-PIN	09-50-3081	MDL	12113-06-0027	1
NA	CONTACT.MC000-131	08-50-0106	MDL	12113-07-0002	8
NA	TERMINAL,FEMALE	61454-1	AMP	12113-22-0011	7
NA	WIRE,18,BK	8522-BK	BEL	16012-31-8000	6
NA	WIRE,18,BL	8522-BL	BEL	16012-31-8666	6
NA	WIRE,18,GY	8522-GY	BEL	16012-31-8888	6
NA	WIRE,18,RD	8522-RD	BEL	16012-31-8222	6
NA	WIRE,18,VI	8522-VI	BEL	16012-31-8777	6
T1	POWER XFMR. 2300	511-P-4B	CMAG	15610-00-0080	1



SCHEMATICS

7.1 INTRODUCTION

This section contains all schematics for the instrument. A schematic index is given in paragraph 7.3.

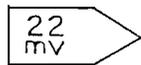
7.2 SCHEMATIC NOTES

The following notes and abbreviations pertain to all schematics. Additional notes pertaining to specific schematics are included on each schematic if required.

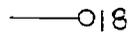
All values are shown in the following units unless otherwise specified.

<u>Components</u>	<u>Units</u>
Resistor	ohms
Capacitor	picofarads
Inductor	microphenries

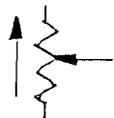
 Denotes DC voltage reading in volts unless otherwise specified.

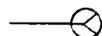
 Denotes high impedance crystal detector reading in volts unless otherwise specified.

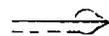
 Denotes 50 ohm crystal detector reading in volts unless otherwise specified.

 Signal or voltage source.

 Connects to indicated signal or voltage source.

 Arrow indicates clockwise rotation of wiper.

 Coaxial jack.

 Coaxial plug.

 Coaxial cable.

\* Factory adjusted part.

 Denotes a front-panel device.

 Denotes a rear-panel device.

LEVEL Denotes a PC board adjustment or accessible module adjustment.

(LEVEL) Denotes an internal module adjustment not accessible without removing module cover.

A	ampere
AC	alternating current
CW	continuous wave
cw	clockwise
ccw	counterclockwise
dB	decibel
dBm	decibel referred to 1 mW
dBmV	decibel referred to 1 mV
DC	direct current
DS	indicating device, lamp
F	farad
F.P.	front panel
H	henry
Har	harmonic
Hz	hertz
IF	intermediate frequency
	ohm
pp	peak-to-peak
RF	radio frequency
RMS	root-mean-square
R.P.	rear panel
TP	test point
V	volt
VA	voltampere
W	watt

## SCHEMATIC REFERENCES

A	assembly	OC	opto-coupler
C	capacitor	P	plug
CR	diode	Q	transistor
F	fuse	R	resistor
U	integrated circuit	S	switch
J	jack	T	transformer
K	relay	V	vacuum tube
L	inductor	W	cable assembly
M	meter	X	crystal

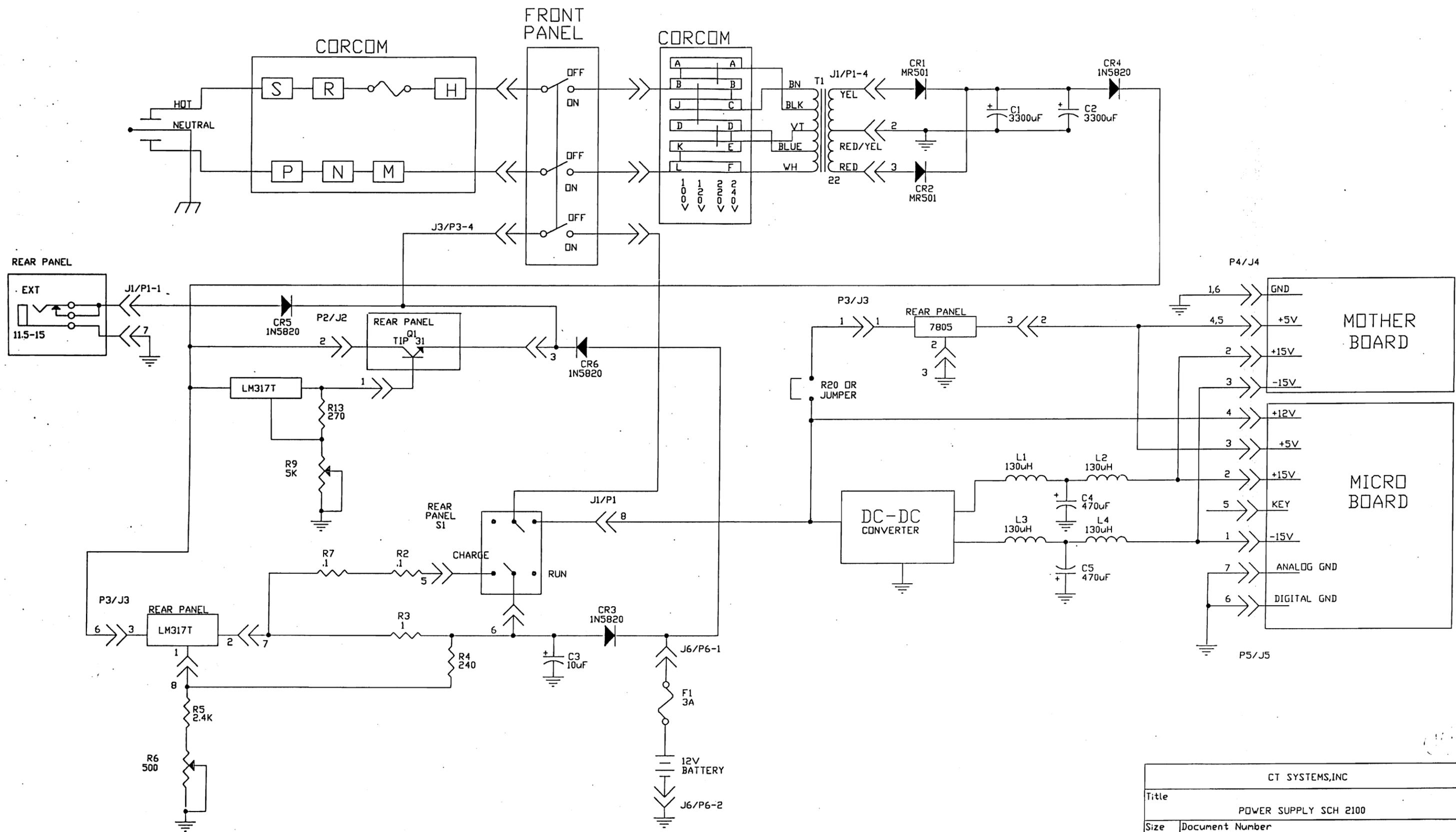
## SCIENTIFIC PREFIXES

G = giga	k = kilo	m = milli
M = mega	c = centi	u = micro
		p = pico

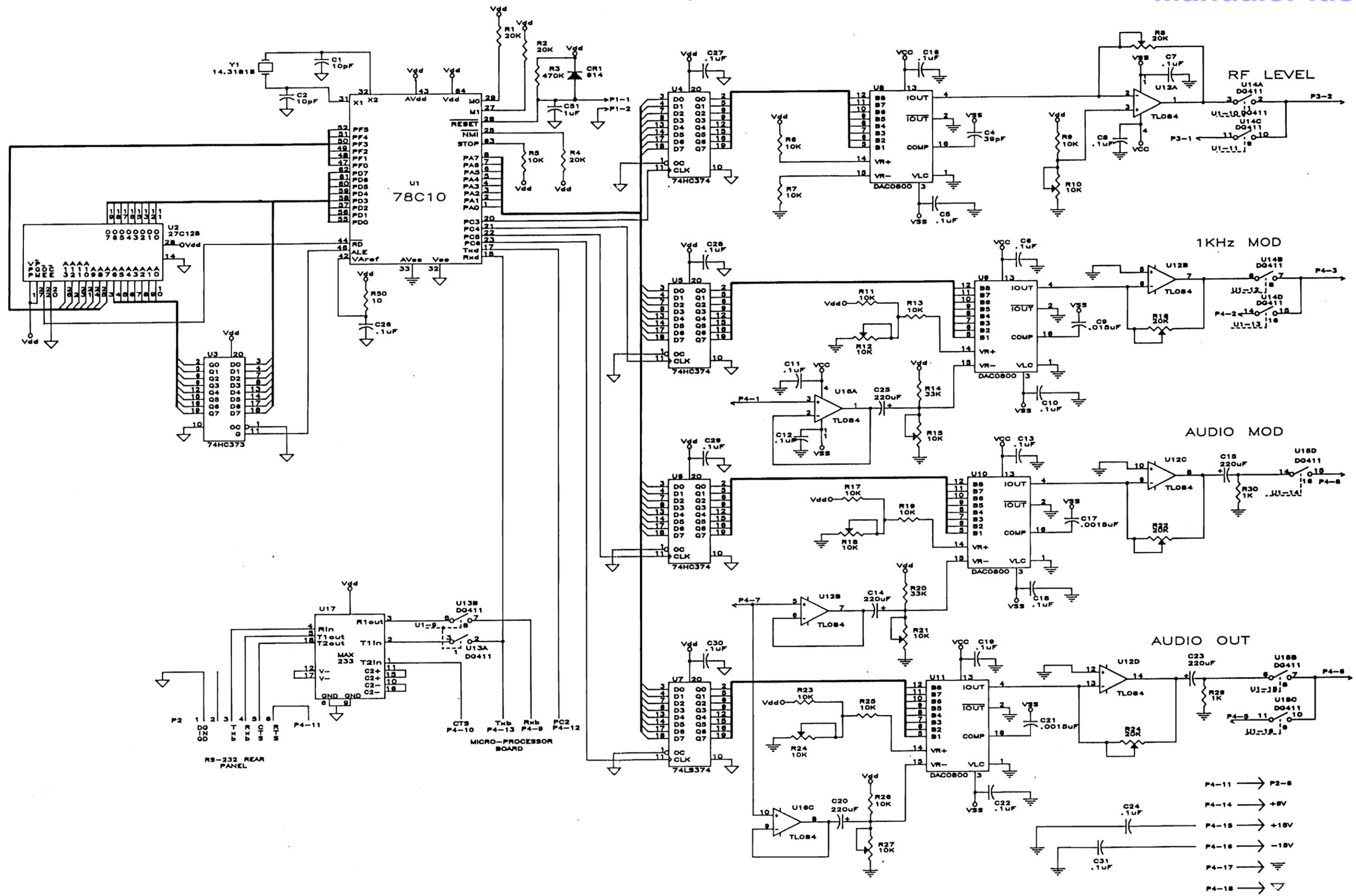
## 7.3 SCHEMATIC INDEX

The schematics appear following the parts layout, when applicable, in the following order:

Interconnection Diagram  
 Front Panel Board  
 u Processor Board  
 Mother Board  
 Power Supply Board  
 RS-232 Board



CT SYSTEMS, INC	
Title	POWER SUPPLY SCH 2100
Size	Document Number
B	10714-20-0109
Date:	March 1, 1989
Sheet	1 of



RS-232 REAR PANEL

MICRO-PROCESSOR BOARD

**DS411 POWER SUPPLIES**

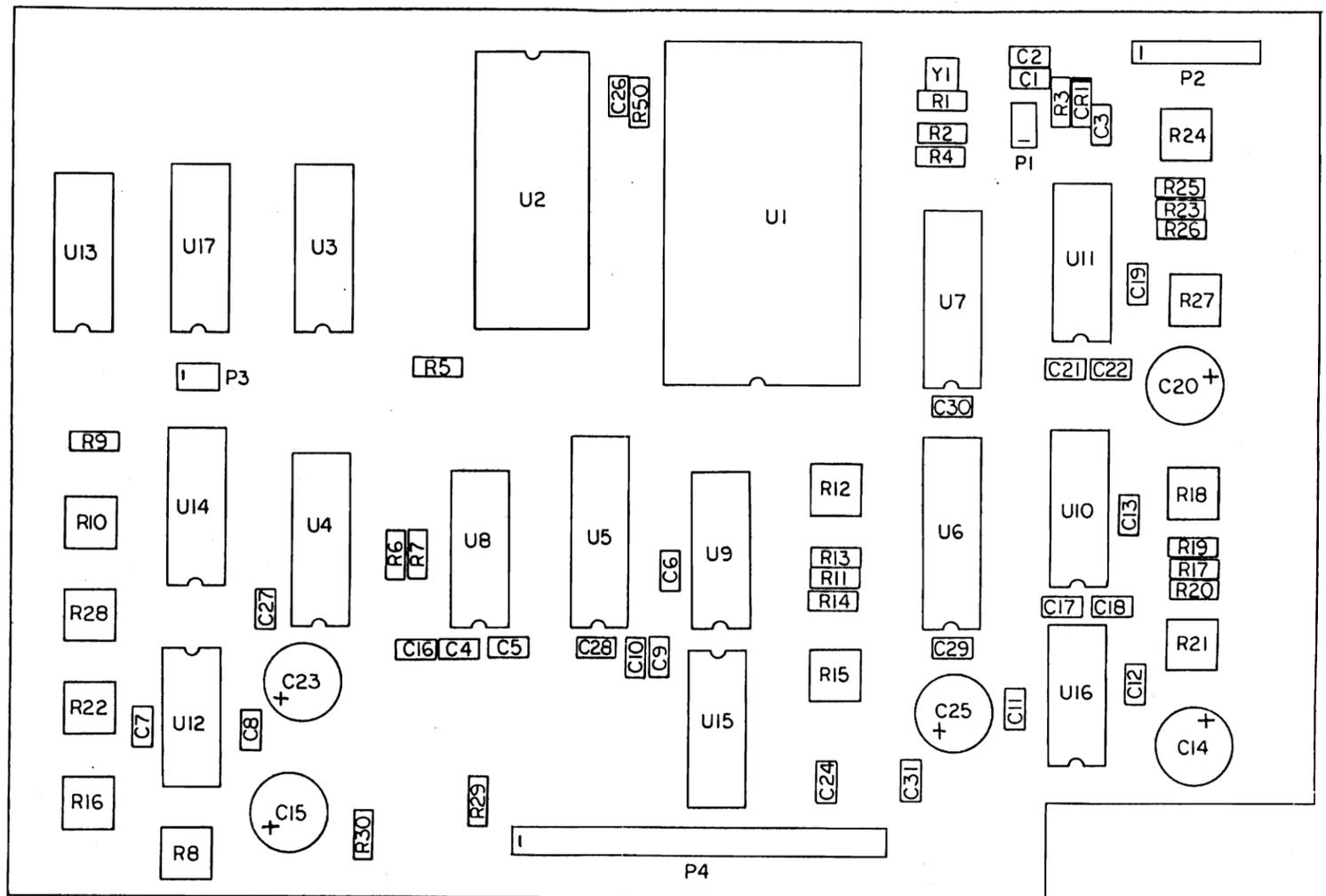
5	==	GROUND
4	==	-15V
12	==	+5V
13	==	+15V

**VOLTAGE SUPPLIES**

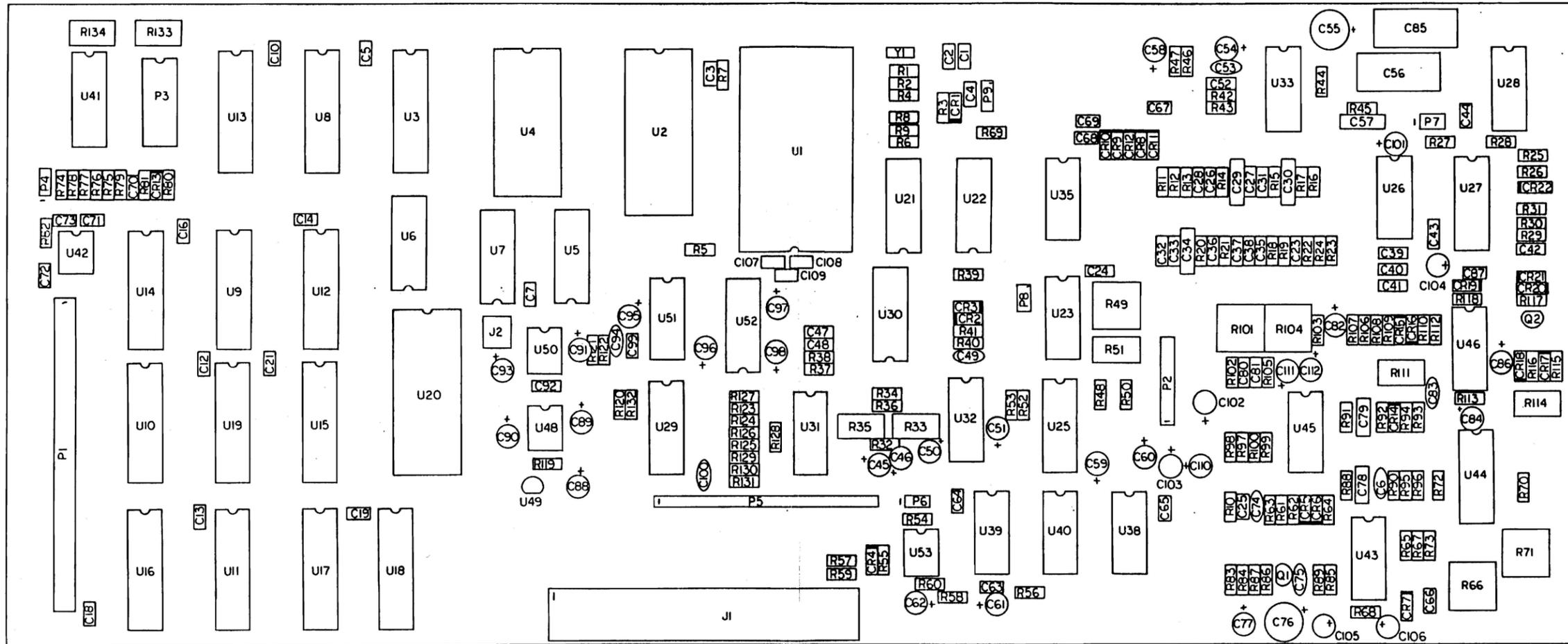
Vdd	--	+5V
VCC	--	+15V
VSS	--	-15V

- P4-11 → P2-8
- P4-14 → +5V
- P4-15 → +15V
- P4-16 → -15V
- P4-17 → GND
- P4-18 → GND

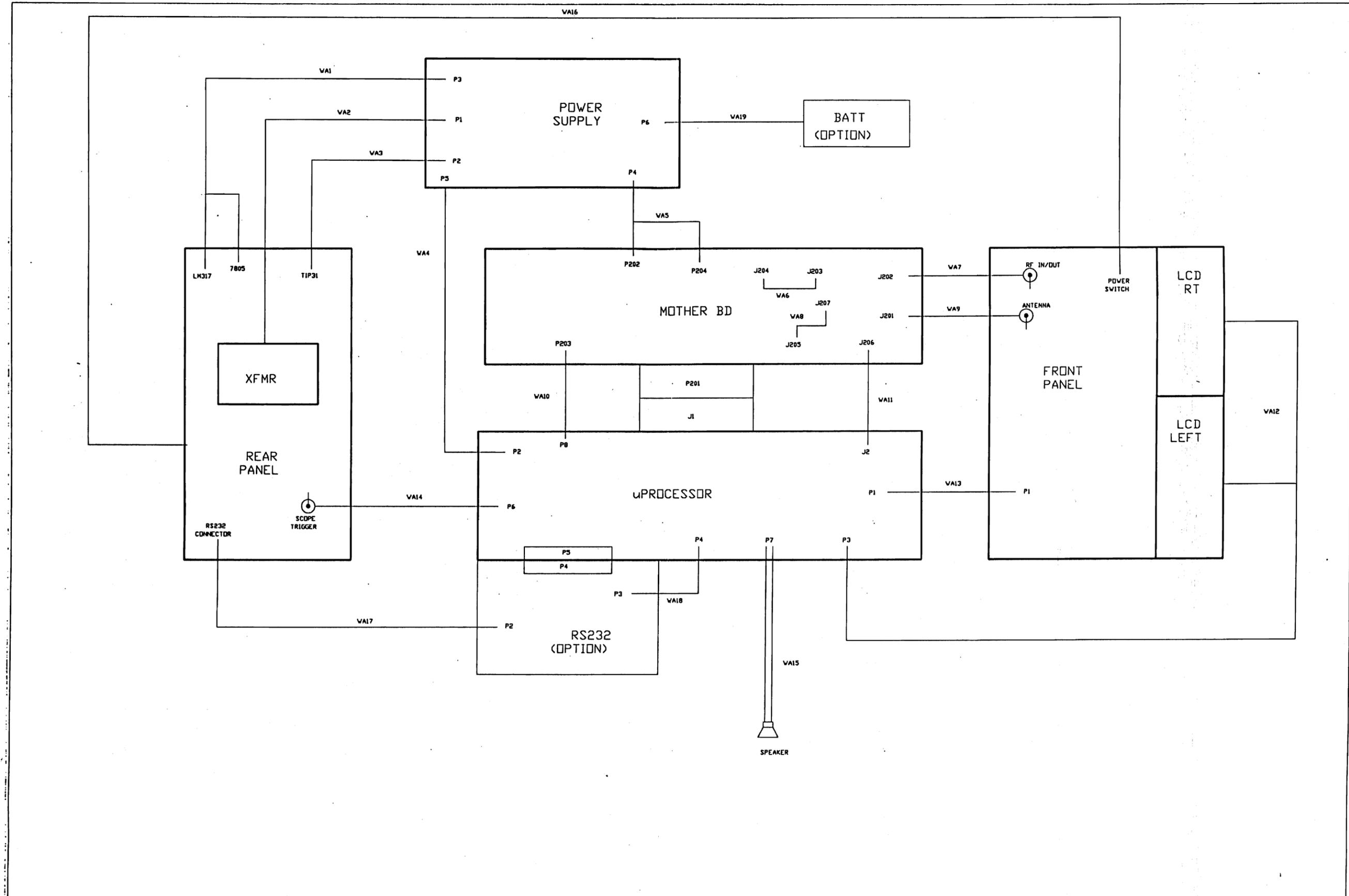
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±.004 .01 ±.30° XXX ±.005		CONTRACT NO.		CT SYSTEMS, INC. RS232 BD COMP LAYOUT 2100	
MATERIAL		APPROVALS			
FINISH		DATE		DRAWN JD CLUTINGER 1-30-89	
NEXT ASSY		CHECKED		RELEASED	
USED ON		RELEASER		SIZE	
APPLICATION		DO NOT SCALE DRAWING		CODE IDENT NO. <b>C 4J835</b>	
				DRAWING NO. 10712-50-0116	
				SCALE 2x	
				SHEET 1 OF 1	

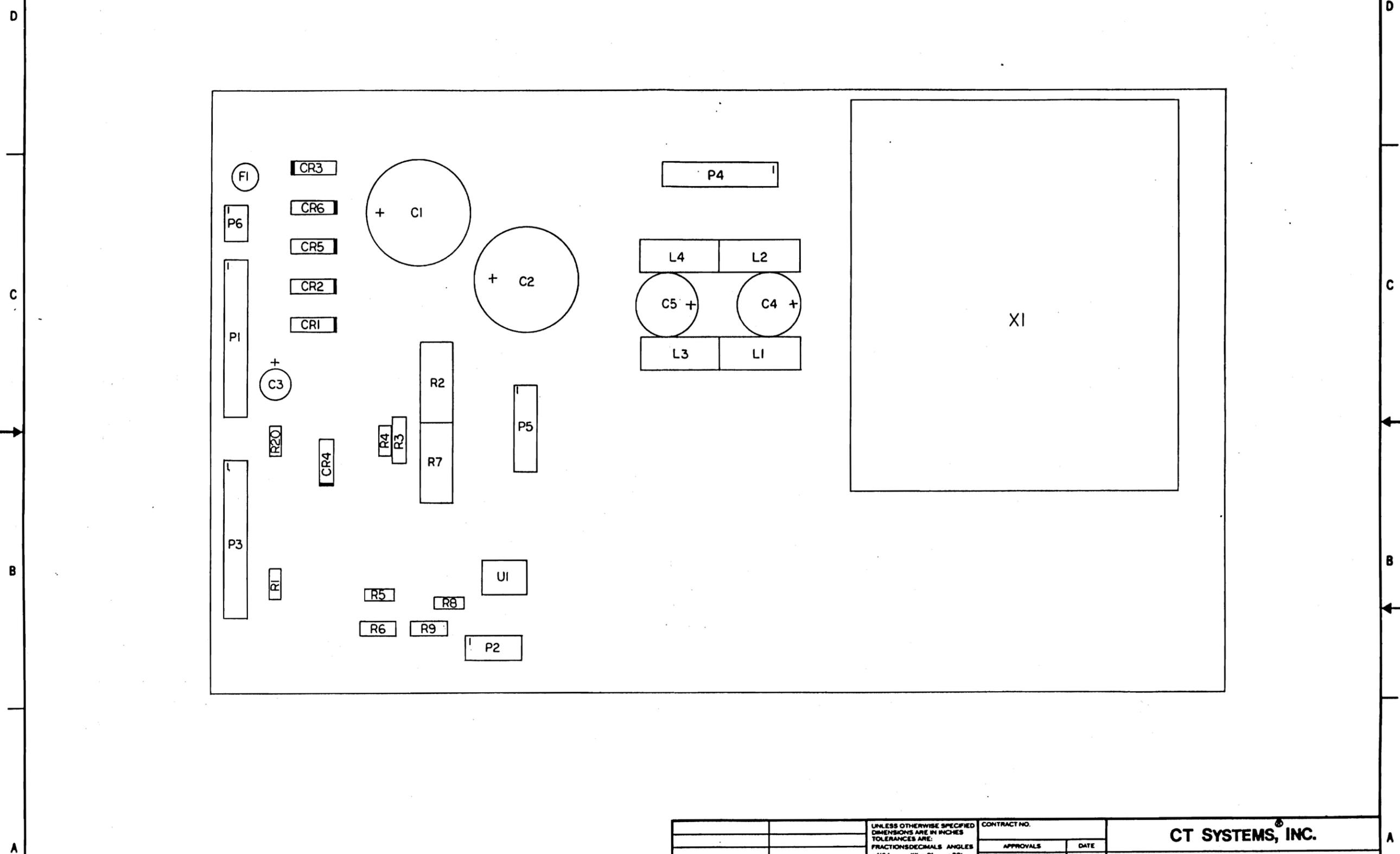


UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS—DECIMALS—ANGLES 1/64 0.01 1:30		CONTRACT NO.		CT SYSTEMS, INC.	
DRAWN JD CANTINER		APPROVALS		μPROCESSOR BD COMPLAYO 2100	
CHECKED		DATE 1-31-89		SIZE D	
RELEASED		MATERIAL		CODE IDENT NO. 4J835	
FINISH		RELEASED		DRAWING NO. 10712-50-0113	
NEXT ASSY 2100		RELEASED		SCALE 2x	
USED ON		RELEASED		SHEET 1 OF 1	
APPLICATION		DO NOT SCALE DRAWING			



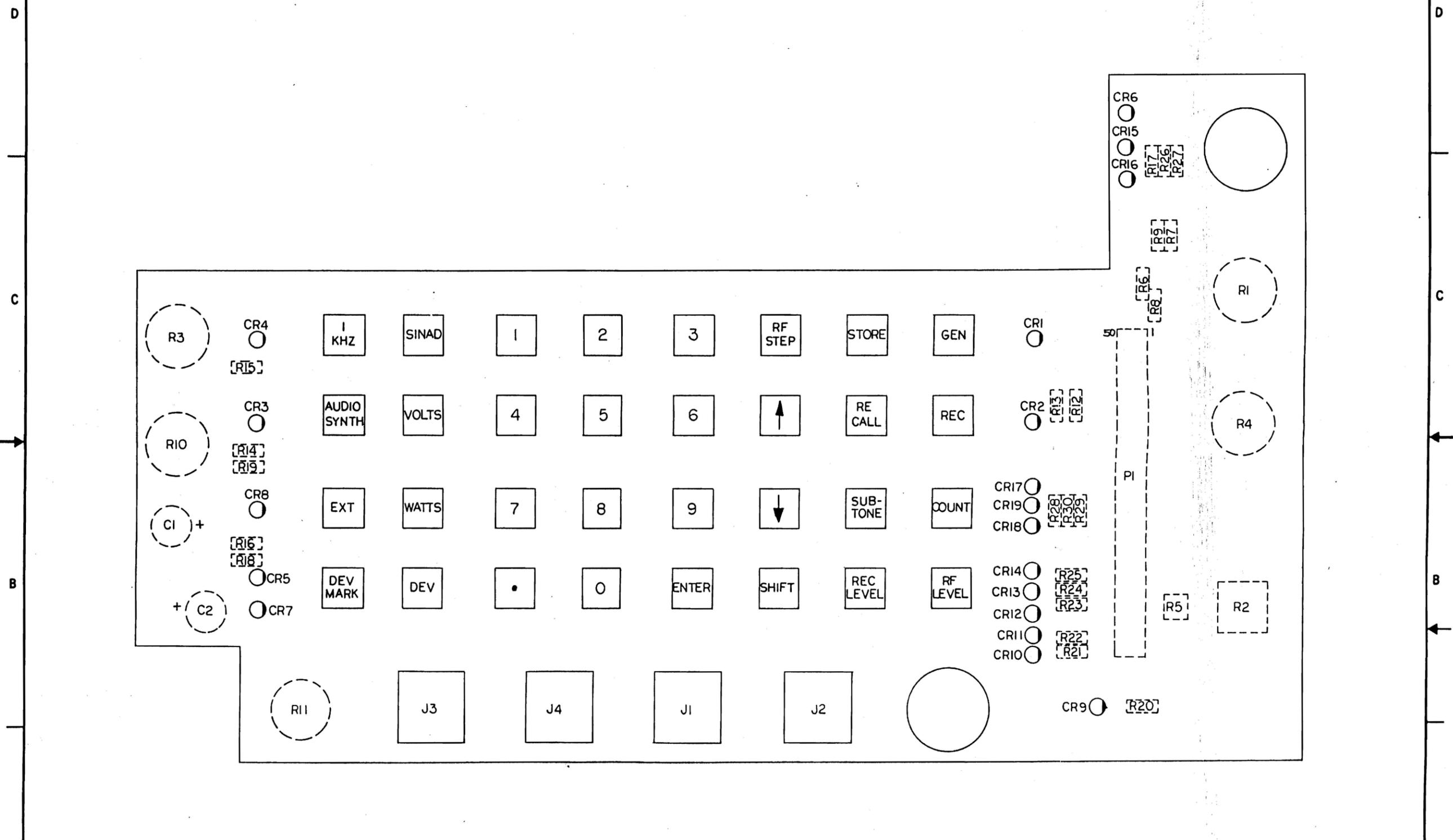
CT SYSTEMS, INC		
Title	INTERCONNECTION DIAGRAM 2100	
Size	Document Number	REV
C	10714-20-0010	
Date	March 2, 1989	Sheet 1 of 1

REVISIONS			
ZONE	LTR	DESCRIPTION	DATE

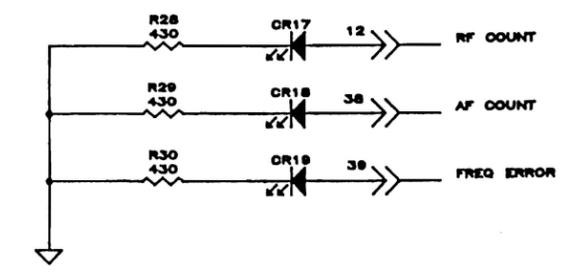
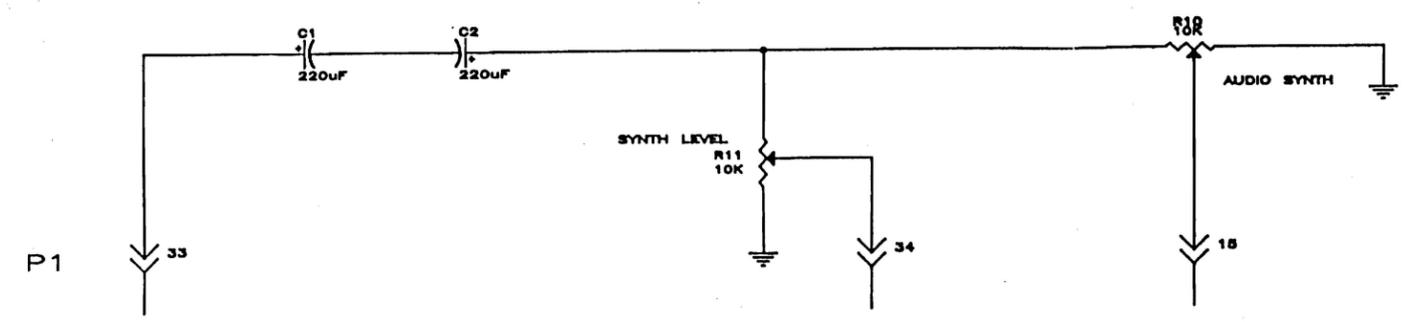
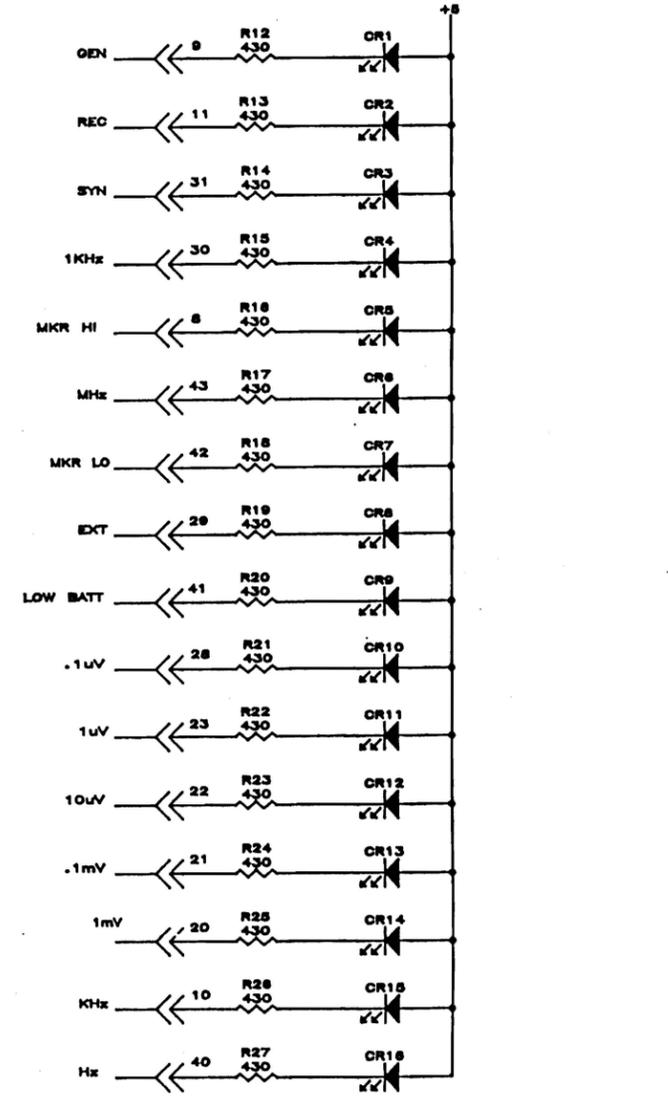
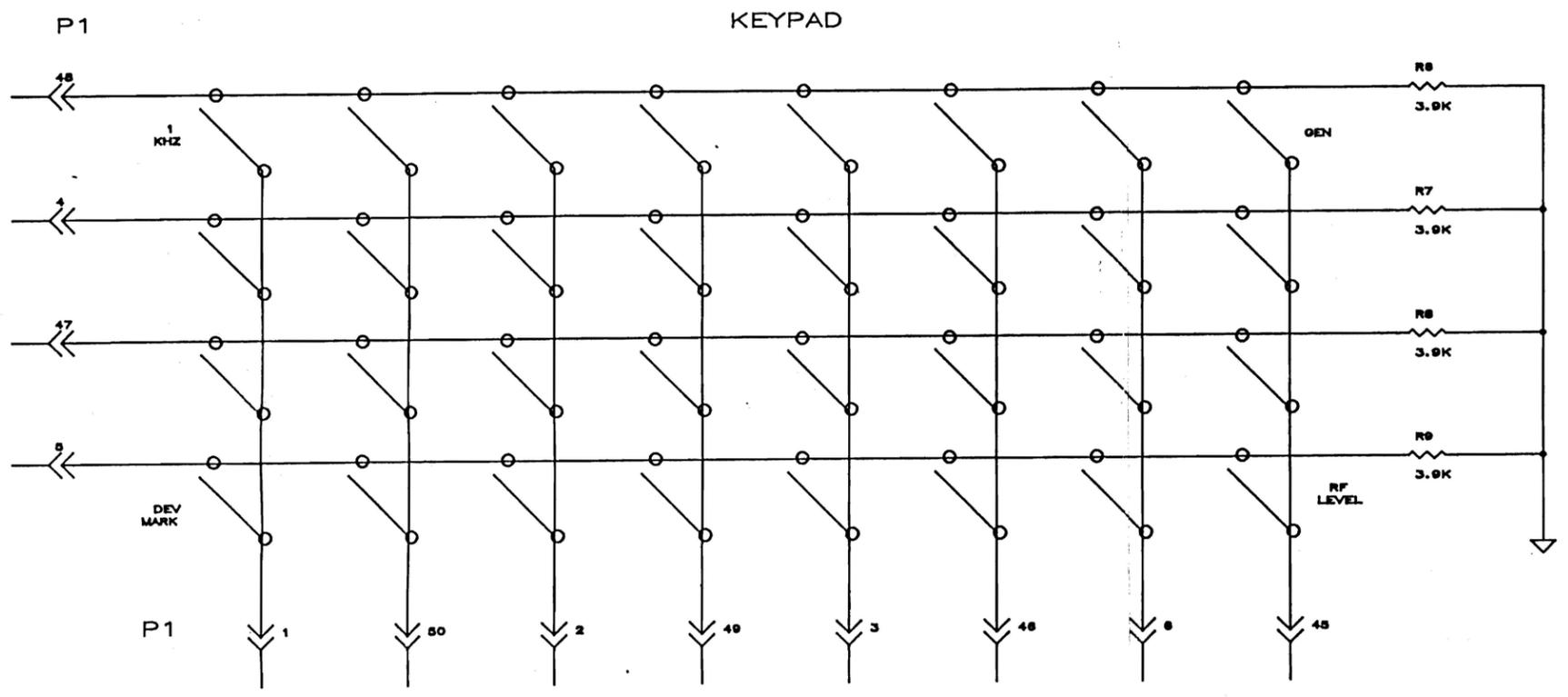
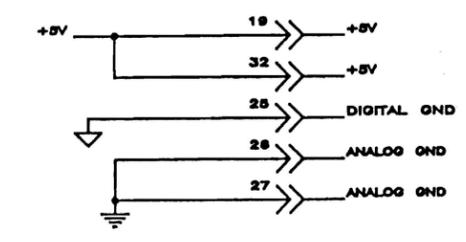
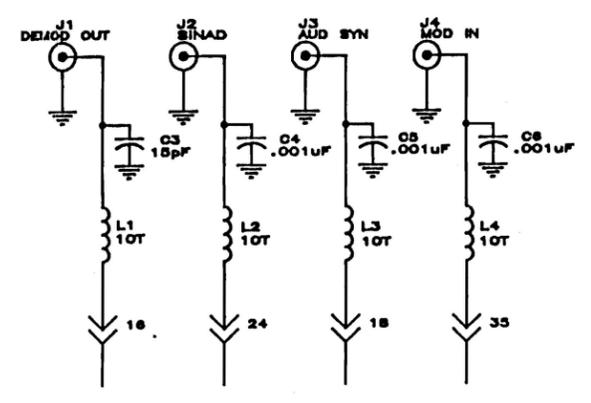
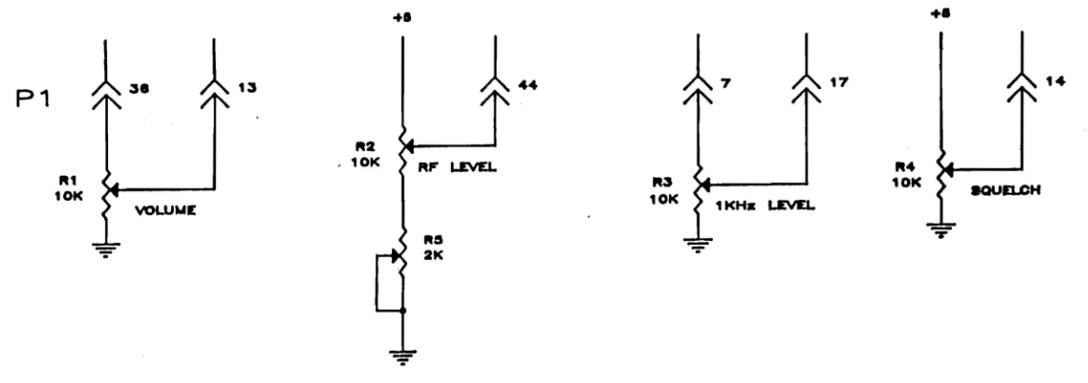


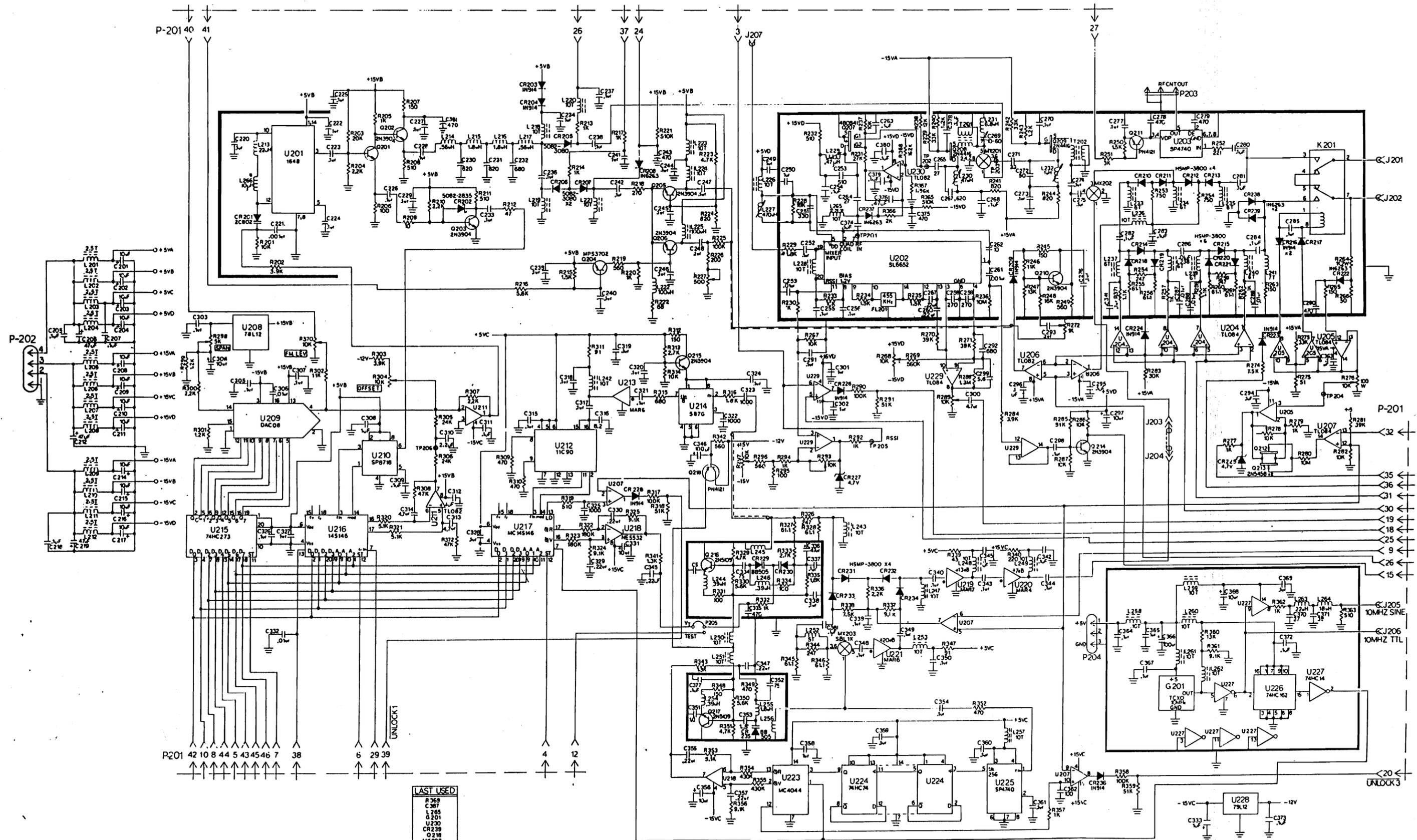
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/64    .XX ± .01    ± 30° XXX ± .005		CONTRACT NO.		<b>CT SYSTEMS, INC.</b>	
APPROVALS		DATE			
DRAWN JD CLUTINGER		1-26-89		PWR SUPPLY COMPONENT LAYOUT 2100	
CHECKED		RELEASED			
MATERIAL		FINISH		SIZE <b>C</b>	
NEXT ASSY		USED ON		CODE IDENT NO. <b>4J835</b>	
APPLICATION		DO NOT SCALE DRAWING		DRAWING NO. 10712-50-0112	
				SCALE 2x	
				SHEET 1 OF 1	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



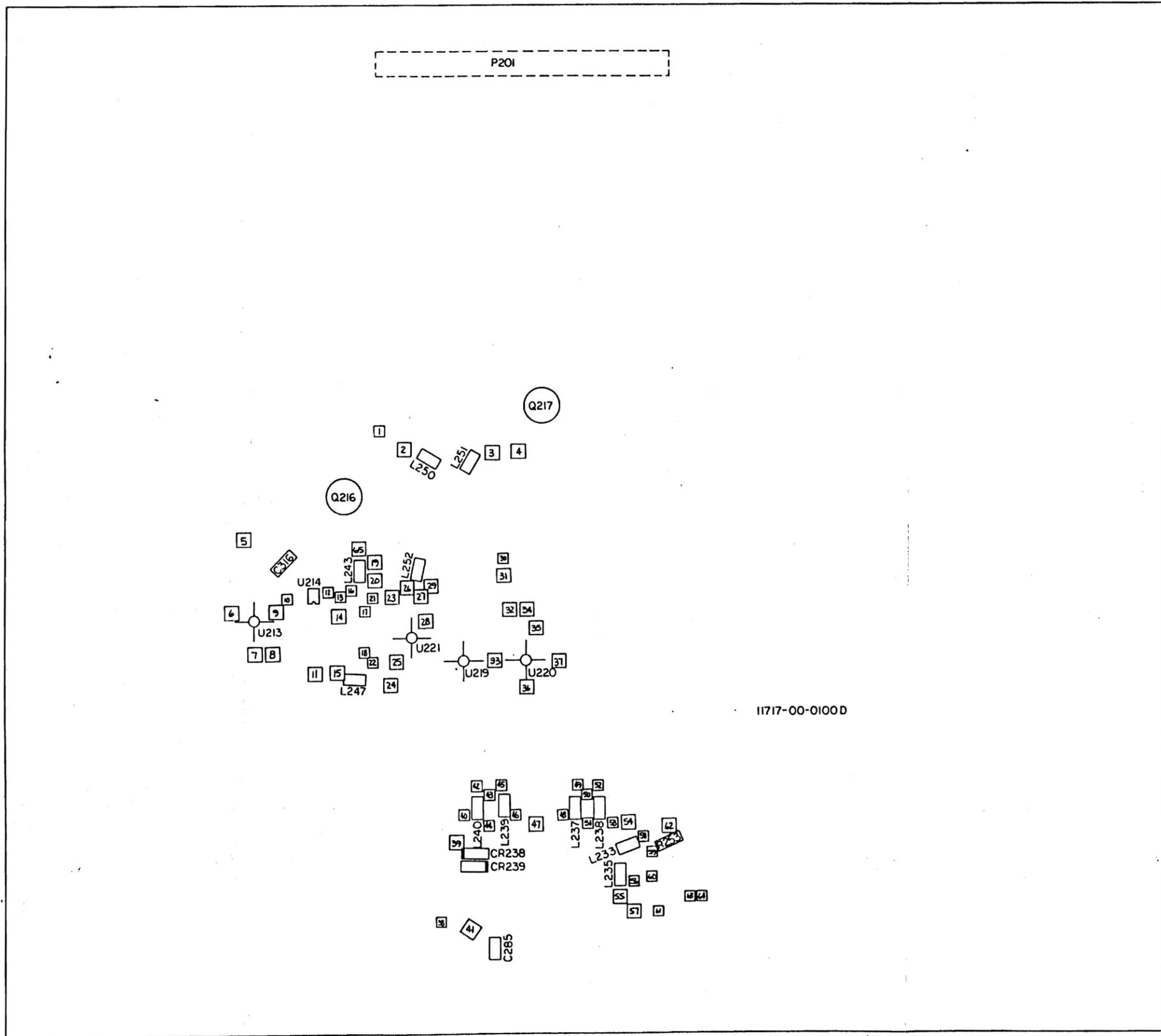
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/64 .01 .30° XXX .005		CONTRACT NO.		CT SYSTEMS, INC.	
MATERIAL		APPROVALS			
FINISH		DATE		FRONT PANEL BD COMP LAYOUT 2100	
NEXT ASSY		DRAWN JD CLUTINGER		SIZE C	
USED ON		CHECKED		CODE IDENT NO. 4J835	
APPLICATION		RELEASED		DRAWING NO. 10712-50-0114	
DO NOT SCALE DRAWING		THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND IS THE PROPERTY OF CT SYSTEMS, INC. IT IS TO BE USED ON THE PROJECT AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR APPROVAL IN WRITING OF CT SYSTEMS, INC.		SCALE 1:1	
				SHEET 1 OF 1	





LAST USED  
 R365  
 C367  
 L265  
 Q201  
 U230  
 CR239  
 Q218  
 M203  
 P205  
 FL201

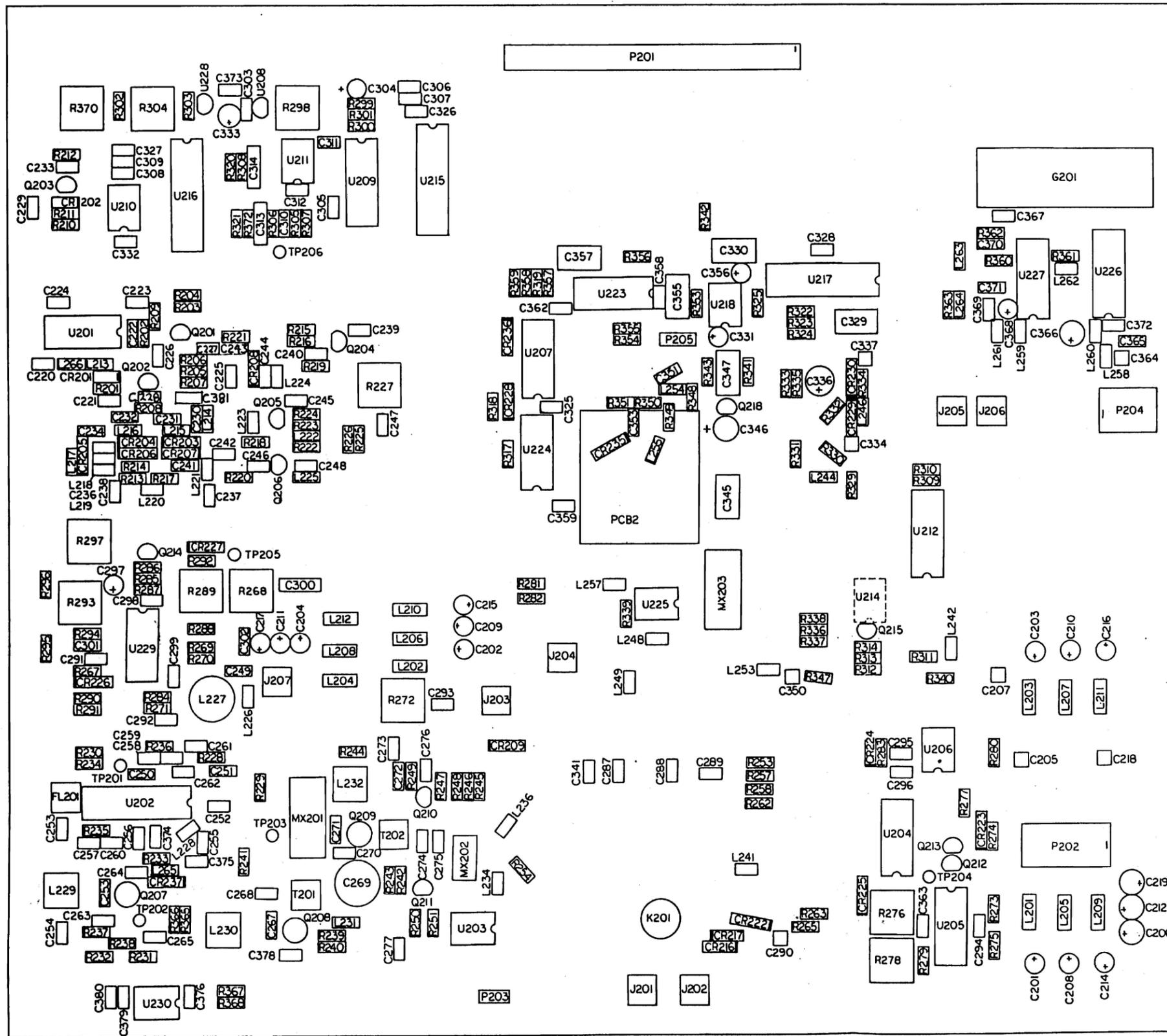
CT SYSTEMS, INC.			
1	ECN 89033, 89047	4-11-89	6M
2	ECN 89048	5-1-89	6M
3	ECN 90021, 90039	1-1-90	RM
2100		MOTHER (RF) BD.	
4J835 10714-40-0030			



11717-00-0100D

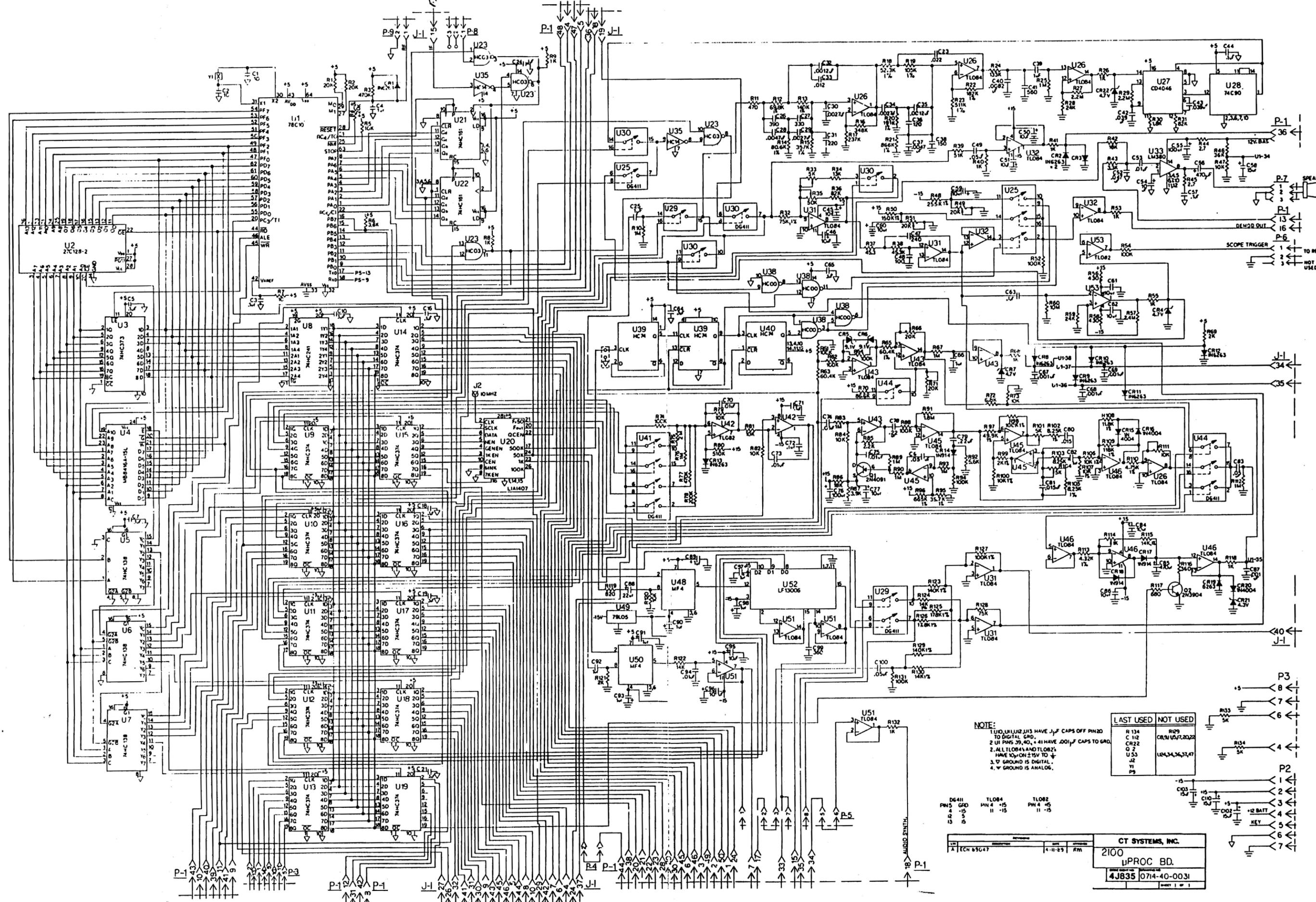
REF CHART	
ITEM	REF DES
1	C335
2	C338
3	C377
4	C352
5	C315
6	C317
7	C318
8	C319
9	C321
10	R315
11	C320
12	C322
13	R316
14	C324
15	C339
16	C323
17	CR231
18	CR232
19	R327
20	R328
21	CR233
22	CR234
23	C381
24	C340
25	C349
26	R345
27	R344
28	C348
29	R346
30	R352
31	C354
32	C361
33	C343
34	C360
35	C345
36	C342
37	C344
38	R266
39	C284
40	CR221
41	R264
42	R261
43	R259
44	CR215
45	R260
46	CR220
47	C286
48	CR218
49	R255
50	R254
51	CR214
52	R256
53	CR219
54	C282
55	C281
56	CR213
57	C280
58	CR210
59	CR211
60	CR212
61	R252
62	C283
63	C279
64	C278
65	R326

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±.004 ±.005 ±.007		CONTRACT NO.	
MATERIAL		APPROVALS	DATE
FRSH		J.D. CUTLER	2-21-87
NEXT ASSY		RELEASED	
APPLICATION		<b>CT SYSTEMS, INC.</b> MOTHER BD COMP LAYOUT 2100 SIZE <b>D</b> CODE IDENT NO <b>4J835</b> DRAWING NO <b>10712-50-0115</b> SCALE <b>2x</b> SHEET <b>2</b> OF <b>2</b>	



PCB1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±.004 ±.005 ±.005 ±.005 ±.005 ±.005		CONTRACT NO.		CT SYSTEMS, INC.	
APPROVALS		DATE		MOTHER BD COMP LAYOUT 2100	
DRAWN BY J.D. CHAMBERLAIN		2-11-89		SIZE D	
CHECKED		RELEASED		CODE IDENT NO. 4J835	
MATERIAL		FRSH		DRAWING NO. 10712-50-0115	
HERTASBY		APPLICATION		SCALE 2x	
USED ON		DO NOT SCALE DRAWING		SHEET 1 of 2	



NOTE:  
 1. U0, U1, U2, U3 HAVE .1µF CAPS OFF PIN20 TO DIGITAL GND.  
 2. U1 PINS 39, 40, 41 HAVE .001µF CAPS TO GND.  
 3. ALL TLO84s AND TLO82s HAVE 10µΩ ON ±15V TO GND.  
 4. V<sub>DD</sub> GROUND IS DIGITAL.  
 5. V<sub>SS</sub> GROUND IS ANALOG.

LAST USED	NOT USED
R134	R129
C112	CR29, U57, 20, 22
CR22	Q2
U53	U8, 34, 36, 37, 47
J2	
P9	

DG411 TLO84 TLO82  
 PINS 4 -15 50  
 2 2 5  
 13 5

CT SYSTEMS, INC.  
 2100  
 uPROC BD.  
 4J835 0714-40-0031  
 Rev 1 of 1

RS-232 OPERATION

The following pages define basic instructions for operating the Model 2100 via RS-232 serial interface. The operator can control all the keypad functions, audio synthesizer level, 1 kHz level, audio out level, and RF level by the host computer.

The characteristics of the external controlling device must be set as follows to communicate with the 2100:

BAUD RATE:	1200
PARITY:	NONE
DATA:	8 bits
STOP BITS:	1

The following is a list of 2100 functions, their RS-232 command equivalents and the command field available. To get into the RS-232 mode on the 2100, type "SHIFT 8 ENTER".

OUTPUT COMMANDS

MODEL 2100 FUNCTION	RS-232 COMMAND	VALUE FIELD	EXAMPLES
ENTER	F	All functions that normally require an ENTER in normal operation must be followed by an "F".	G12.345FX A+1000FX
GEN	G	Sets unit to Generate mode .4 - 999.9999 MHz	G57.365FX GX
REC	R	Sets unit to Receive .4 - 999.9999 MHz	R123.56FX RX
AUDIO SYNTHESIZER	A+, A- A+????FX	A+ = Audio on, A- = Audio off 10 - 10000 HZ A+????FX changes Audio freq.	A+X, A-X A+1525FX
1 kHz	K+, K-	K+ = 1 kHz on, K- = 1 kHz off	K+X K-X
EXTERNAL	E+, E-	E+ = Ext on, E- = Ext off	E+X K-X
AUDIO MODULATION LEVEL	AM????X	Sets audio modulation level 10 - 9999 Hz dev	AM9999X AM15X
1 kHz MODULATION LEVEL	KD????X	Sets 1 kHz modulation level 10 - 9999 Hz dev	KD7356X KD25X
AUDIO OUT LEVEL	A0????X	Sets Audio Out level 10 - 9999	A01234X A010X
MARKERS	MS, MF, M-	MS = $\pm 600$ Hz, MF = $\pm 5$ kHz, M- = off	MSX, MFX, M-X
STEP SIZE	P, PU, PD	Sets RF step size 1 - 999.6 PU=Step Up PD=Step Down	P25.7FX PUX, PDX
RECALL	U, UU, UD	Sets recall # 0 - 19 UU - Recall Up, UD - Recall Down	U7FX, UUX, UDX
RF LEVEL	T	Set RF level .1 - 9999uV	T9.37X
SQUELCH	Q+, Q-	Opens or Closes the Squelch	Q+X, Q-X
RECEIVE IMAGE	IR	Shifts the Rec. Frequency to the Image Frequency	IRX
LOCAL OPERATION	Z	Return unit back to normal operation	ZX

INPUT COMMANDS

The following commands will set the 2100 to the proper mode and then return the results back to the host device.

MODEL 2100 FUNCTION	RS-232 COMMAND	VALUE RETURNED	EXAMPLE
DEVIATION	D	Returns the deviation of modulation source.	DX
VOLTS	VD, VA	Returns the DC or AC reading. VD = DC, VA = AC	VDX, VAX
SINAD	SD, SP	Returns the SINAD or distortion reading. SD = SINAD, SP = dist.	SDX, SPX
WATTS	W	Returns the watts reading	WX
RECEIVE LEVEL	L	Returns the Rec Level reading	LX
COUNTING	CA, CE CF, C-	CA = count audio frequency CE = count frequency error CF = count RF frequency C- = turns count off	CAX CEX CFX C-X
SUBTONE	B+, B-	Counts subtone B+ = subtone, B- = off	B+X B-X

## NOTES

- To put the 2100 into the RS-232 mode, key in "SHIFT 8 ENTER" on the 2100 front panel. This will lock out the 2100 front panel.
- Any entry that requires an "ENTER" in normal keyboard operation must be followed by an "F" in RS-232 operation. EX: G32.7FX, A+5000FX
- All entry strings must be terminated with an "X". EX: K+A+X, G32FX, DX, RWX.
- A string can contain more than one function, but must not exceed 11 characters. EX: G32FK+MSX, R152.7FMFX, GA+E+K+T99X.
- All number entries do not require leading zeros. EX: G7FX, AM73X, KD100X, T.9X
- It is not possible to switch from generate to receive or vice versa while in the COUNT mode.

## NORMAL OPERATION

The Model 2100 powers up under front panel (local) control. When in remote operation, local control is returned by transmitting a "ZX" from the host computer. This returns control of the instrument back to the front panel.

## LEVEL CONTROL

When transferring control to the RS-232 interface, the 1 kHz modulation level, audio synthesizer level, audio "out" level, and RF level pots on the front panel continue to control their respective levels. This condition remains until the levels are changed by the host computer. This is done by the AM??X, AO??X, KD??X, T??X functions. Once each specific level is changed by the controlling device, it will no longer be affected by its respective front panel control.

## CONNECTIONS

These are the connections for an AT Computer to the CT Systems Model 2100. Both ends of the cable are 9 pin connectors.

<u>9 PIN ON AT (FUNC.)</u>		<u>2100 SIDE (FUNC.)</u>	
1	DCD	1	N.C.
2	Rxd	3	Txd
3	Txd	2	Rxd
4	DTR	4	N.C.
5	GND	5	GND
6	DSR	6	N.C.
7	RTS	7	N.C. CTS
8	CTS	8	N.C. RTS
9	N.C.	9	N.C.

The disc provided has programs which contain basic information on the disc, a program to control the 2100 by remote, and a basic wiring diagram for the cable between the host computer and the Model 2100. This will display the names and brief descriptions of the other two programs.

To load the program, enter "GWBASIC", or "BASIC". Then load "JFBCOM.BAS" or "RS232.BAS" and then RUN.



REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	L.NUT.4-40 1/4X.076	9040	F-S	12810-15-0009	2
NA	RS232 BD.ASSY	1110-70-0125	CTS	11110-70-0125	1
NA	RS232 INTFCE HARNESS	RS232 INTERFACE HARN	CTS	11219-70-0079	1
NA	RS232 RF LEVEL HARN	RS232 RF LEVEL HARN	CTS	11219-70-0080	1
NA	SCREWLOCK,PAIR.F	205817-1	AMP	12810-09-0022	1
NA	SEMS.4-40 X 1/4.PPH	PER DESC	F-S	12810-23-0085	4
NA	SH WASHER	DF137A	RCA	12810-27-0001	2
NA	SPACER.4-40X13/16	9733-B-0440-3	AMATM	12810-05-0068	4

ASSEMBLY NUMBER: 11110-70-0125 REV:  
DESCRIPTION: RS232 BOARD ASSEMBLY

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
C1,C2	CAP,MON,50V,10PF	CN15C100K	CRL	11510-11-8100	2
C3	CAP,MON,50V,1UF	CZ30C105M	C-L	11510-11-3105	1
C4	CAP,MON,50V,39PF	RA50-390JA	MURGA	11510-11-8390	1
C5,C6,C7,C8,C10, C11,C12,C13,C16, C18,C19,C22,C24, C26,C27,C28,C29, C30,C31	CAP,MON,50V,.1UF	C320C104M5U1CA	KEMET	11510-11-3104	19
C9	CAP,MON,50V,.015UF	SR305A153JAA	AER	11510-13-2153	1
C14,C15,C20,C3, C25	CAP,ELEC,16V,220UF	RE220MF16V20%	ELNA	11510-23-5221	5
C17,C21	CAP,MON,50V,.0015UF	SR205A152JAA	AER	11510-13-0152	2
CR1	DIODE,SIGNAL	1N914	G-E	14807-01-0914	1
NA	BOARD,P.C. RS232	1717-00-0131	CTS	11717-00-0131	1
NA	IC SKT,16 PIN	DILB-16P-108	BURND	12112-00-0012	7
NA	IC SKT,PC,14 PIN	C931402	T-I	12112-00-0011	2
NA	IC SOCKET,20-PIN	C842002	T-I	12112-00-0020	6
NA	IC, SKT,28-PIN	C842802	T-I	12112-00-0023	1
NA	SOCKET,IC, 64 PIN	C5W64-11	T-I	12112-00-0081	1
P1,P5	HEADER,STRT,2 PIN	65501-402	BER	12112-07-0007	2
P2	HEADER,6-PIN,STR.	65501-406	BER	12112-07-0008	1
P4	SOCKET,19 PIN	ESW-119-44-TS	SAMTC	12112-00-0082	1
R1,R2,R4	RES,C,1/4W,5%,20K	CF1/4-20K	ASE	14700-15-2002	3
R3	RES,C,1/4W,5%,470K	CF1/4-470K	ASE	14700-15-4703	1
R5,R6,R7,R9,R1, R13,R17,R19,R23, R25,R26	RES,C,1/4W,5%,10K	CF1/4-10K	ASE	14700-15-1002	11

ASSEMBLY NUMBER: 11110-70-0125 REV:  
 DESCRIPTION: RS232 BOARD ASSEMBLY

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USE
R8,R10,R16,R2,R28	POT,20K,RP131-320	3386R-1-203	BOU	14610-00-3203	5
R12,R15,R18,21,R24,R27	POT,10K	3386W-1-103	BOU	14610-02-0103	6
R14,R20	RES,C,1/4W,5%,33K	CF1/4-33K	ASE	14700-15-3302	2
R29,R30	RES,C,1/4W,5%,1K	CF1/4-1K	ASE	14700-15-1001	2
R50	RES,C,1/4W,5%,10	CF1/4-10	ASE	14700-15-1009	1
U1	IC, 78C10G-36	78C10G-36	NEC	18000-78-1000	1
U2	IC, 27C128	TMS27C128-15JL	T-I	18000-27-1281	1
U3	IC, 74HC373N	MM74HC373N	NAT	18007-43-7311	1
U4,U5,U6,7	IC, 74HC374N	MM74HC374N	NAT	18007-43-7411	4
U8,U9,U10,11	DAC.8-BIT	DAC-08EQ	AMD	18000-00-0800	4
U12,U16	OP AMP	TL084CP	T-I	17000-00-8400	2
U13,U14,15	DG411	DG411	NAT	17000-04-1100	3
U17	RS232 DRIVER/RECVR	RS233	MAXIM	18000-02-3300	1
Y1	CRYSTAL, 14.31818MHZ	CY14A	CRYTK	12310-00-1431	1

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	ADPTR.BNC-UHF	KC-94-13	KINGS	12110-00-2002	1
NA	BOX. BLACK TUTONE	2140	CPKG	13010-10-0001	1
NA	CABLE ASSY, 36 IN	WXKIT-1	CTS	11217-80-0078	2
NA	PROBE. X1	4503-2	PMAS	13010-16-0017	1
NA	TEST LEADS	2630	POMONA	16012-00-0005	1

ASSEMBLY NUMBER: 11019-70-0020  
DESCRIPTION: OPT. 2100 BATTERY

REFERENCE DESIGNATOR	PARTS DESCRIPTION	ORIGINAL MFG PART NO.	MFG ID	PART NUMBER	QTY USD
NA	BATTERY CABLE.2100	1219-70-0064	CTS	11219-70-0064	1
NA	BATTERY. 12V	NF4-12	YUASA	14010-00-0030	1
NA	BRACKET, BATT MTG.	1417-60-0670	CTS	11417-60-0670	1
NA	INT.LOWASHER.6	1304ZF	F-S	12810-24-6000	4