Extend-A-Page
VHF Transmitter

System Manual

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Preface

Scope

The **Extend-A-Page** Technical Manual contains detailed information regarding the system installation and technical description of the **Extend-A-Page** receiver and transmitter. The scope of this document is to provide the reader with a general understanding of the system and features of the **Extend-A-Page** system. The user of this manual should have a background with similar types of equipment.

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   b. Parts and accessories (other than those in the equipment) sold by Eagle Broadband, Inc.

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   e. Equipment damaged by an act of God and/or nature, war or terrorism.

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1 Introduction

The new **Extend-A-Page** VHF Transmitters specifically designed for use as a high quality exciter to Eagle's low and high power transmitters. In addition, the **Extend-A-Page** VHF Transmitter can be used as an exciter for non-Eagle Wireless International Transmitters. Furthermore, the **Extend-A-Page** can be used to provide fill-in coverage in those locations where normal paging service from a citywide paging system is not adequate. The **Extend-A-Page** system consists of the **Extend-A-Page** Receiver and the **Extend-A-Page** Transmitter unit. The **Extend-A-Page** receiver receives the control link of the standard paging frequency RF signal on any standard control link or paging frequency and converts this information into low power paging transmissions on all of the common paging frequencies. The control Link reception can be either on a local or an elevated antenna depending on the signal strength. The **Extend-A-Page** transmitter transmits the paging information on VHF frequencies up to 400 Milliwatts (mW) level directly into hard to reach locations, such as hospitals, underground structures, large industrial plants, and many locations near the outer coverage contour of paging systems. The **Extend-A-Page** system is designed to be easily installed and can be located in any part of a building without special hook-ups. If there is no control link available and receive and transmit frequencies are identical, then special caution should be used to provide directional antennas and physical separation between the receiver and transmitter. Failure to take these precautions may result in the receiver being interfered with by the signal that is being retransmitted. A minimum of 100 dB of isolation between the **Extend-A-Page** receive and transmit units is recommended. The **Extend-A-Page** VHF transmitters are ideally suited for simulcast applications handing high speed paging data.

The **Extend-A-Page VHF Transmitter** features are:

Transmitter

- VHF Digital Transmitter (fully synthesized)
- Continuous Duty Operation
- Fully Shielded and Filtered Packaging
- Power Outputs Adjustable up to 400 Milliwatt

General

- Convenient Desktop or Rackmount Enclosures with Receiver and Transmitter Separately Packaged
- Standard AC Power Connections
- Convenient Rear Mounted RF Input and Output Connections
- Interconnect Between Receiver and Transmitter Sections on a DB 9 Connector
- Analog / Digital Modulation

2 Specifications

2.1 VHF Exciter

Frequency Band	150 – 174 MHz
Frequency Generation	Synthesized
Power Output	400 Milliwatt
Channels	1 (standard), 4 (optional)
Channel Spacing	7.5 KHz
Channel Bandwidth	Narrowband (12.5 kHz)
Emission Designators	11K0F1D, 11K0F3E
Frequency Stability	± 20 ppb, -30 °C to +60 °C ambient ± 60 ppb per year, long term aging
Modulation	Analog or Digital
Modulation Rise Time	61/94/121/182 µS, selectable
Frequency Deviation	Analog, ±2.4 KHz Digital, ±2.4 KHz
Modulator	DSP based
Digital Data Rate	3200 bps
Audio Response	30 – 3300 Hz, ±2dB flat, reference to 1000 Hz @ 3 KHz deviation
Audio Distortion	<3% @ 3.0KHz Deviation
Duty Cycle	100% continuous
Spurious and Harmonics	-70 dBc or better
Adjacent Channel Noise	-70 dBc or better
Operating Temperature	-30 °C to 45 °C (Full Power)
Operating Humidity	0 to 95% relative, non-condensing

2.2 General

Power	115 VAC @ 2 Amps
Dimensions	19” L x 3.5” H x 13.5” W

3 Installation

3.1 Safety Regulation

3.1.1 FCC Requirements

FCC Regulations state that:

1. Radio Transmitters may be tuned or adjusted only by persons holding a general class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
2. The RF power output of a radio transmitter should be no more than that required for satisfactory technical operation considering the area to be covered and local conditions.
3. The frequency, deviation, and power of a base station transmitter must be maintained within specified limits. It is recommended that these three parameters be checked before the station is placed in service.
4. The power input to the final radio frequency stage shall not exceed the maximum figure specified on the current station authorization.
   This power input shall be measured and the results record:
   a. When the transmitter is initially installed.
   b. When any change is made in the transmitter, which may increase the power input.
   c. At intervals not to exceed one (1) year.

3.1.2 FCC Interference Warning

FCC Regulations state that: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Sub-part J of Part 15 of FCC Rules, which are designed to proved reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user, at owner's expense, will be required to correct the interference.

3.1.3 OSHA Safety Standards

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act, has established an electromagnetic energy safety standard with applies to the use of this equipment.

Proper use of this radio will result in exposure below the OSHA limit.

The following precautions are recommended:

DO NOT operate the transmitter of a fixed radio (base station, radio paging transmitter RF equipment) when someone is within two feet (0.6 meters) of the antenna.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

Moreover, all equipment must be properly grounded according to National & Local Electrical Codes.

3.1.4 Lightning Protection Considerations

Both the Extend-A-Page transmitter and receiver have adequate protection against high voltages. But, for all external connections, added protection against lightning attack should be considered.

For transmitters used for high power applications with tower antenna, the following measures will provide **sufficient protection against minor lightning attacks:**

- Keep the antenna tower grounding resistance as low as possible
- The ground rods should be made of copper clad and at least eight feet long. Multiple rods should be used over a single rod, if possible.
- Ground the transmission line sheath at every opportunity. Also, ground the transmission line where it is supported on poles and where it enters the building.
- Whenever possible, run at least a part of the transmission line through a length of grounded conduit.

- Tie all equipment ground together to a single point. Then, ground that point to a grounding rod using as short and as straight a ground wire as possible.
- The ground wire must be bundled with other wires in the system. Also, ground wires must not run along a metal plane.

3.1.5 Integrated Circuit Handling Procedure

Care should be taken in handling the circuit boards during installation and service. A number of IC (Integrated Circuit) used in the equipment are from the MOS (Metal Oxide Semiconductor) family and are vulnerable to damage from static discharges. Exercise the following precautions when handling these components:

- Before handling components, ground yourself by touching a ground rod or the grounded chassis of the equipment momentarily.
- Whenever, either installing or servicing the equipment, take proper static protection (e.g. wearing a conductive wrist-strap) and stand on a conductive mat, which is connected to the ground through a 100 K resistor.
- Ground all test equipment and soldering stations that are electrically powered. Always connect the ground lead of the test equipment to the Extend-A-Page ground first and then the test probe. While disconnecting, remove the test probe prior to the ground lead.

3.1.6 Equipment Unpacking and Inspection

Remove all hardware from the shipping carton and inspect the unit for damage. If shipping damage has occurred, contact the carrier immediately. Obtain a RMA number from Eagle Broadband, Inc. and return the damaged unit. Use the original customized package for shipment. All damages must be reported within 15 days of shipment.

3.2 Installation Procedure

1. Connect antenna to the **Extend-A-Page** transmitter. The Transmitter unit is equipped with a N Female connector.
2. Connect a power cable from the transmitter unit to the AC power outlet. Ensure that the AC outlet is grounded.
3. Connect the paging terminal or controller outputs to the DB9 connector labeled transmitter interface.
4. If an **Extend-A-Page** receiver is used, use the DB9 connector for interface to the **Extend-A-Page** transmitter. This

NOTE:

Use cable supplied for this connection.

5. Turn power 'ON' to the transmitter unit and the "SYS" LED indicator will turn 'GREEN'. This ensures that the **EAP** Unit is good and the RF exciter has been correctly programmed. Absence of the green LED indicates a system malfunction, check control boards are correctly seated and all cables are pushed in.
6. The **Extend-A-Page** transmitter unit should be under power for a period of 24 hours before any frequency adjustment is made.
   The "Frequency Adjust" potentiometer is accessible near the antenna connector.

4 Technical Description

4.0 Overall System

The **Extend-A-Page** VHF transmitter consists of:

1. Control “U” Board
2. Control “A” Board
3. Synthesized Exciter
4. Front Panel Display Board
5. Power Supply

The overall control system is shown in the Overall Block Diagram Page A-20. The Control “U” board in Fig. 3-D handles the frequency setup of the RF exciter and the modulation on the 10.7 MHz I/F. The Control “U” board also supervises the internal switching on the Control “A” board that allows the deviation limits to be set separately on the two different data paths, the analog modulation, and the digital modulation respectively. The composite analog signal is sent to the Control “U” board and filtered and sampled at 20 KHz. The digitized signal is then used to digitally deviate the NCO to generate the instantaneous signal for the 10.7 MHz I/F. The maximum deviation is limited to +/- 5 KHz.

4.1 CONTROL U BOARD

The purpose of the Control U PCB is to interface the data and key control lines for the data to be transmitted and setup the center frequency and the control modes to the transmitter modules. The data, key line, and frequency select data comes into the unit from the network diagnostics connector on the backplane. The Control U PCB senses the key line and samples this data with the AT89LS8252 microprocessor. The microprocessor has a power up delay to allow the hardware reference oscillators to stabilize. It then sends the setup data to the RF exciter to set its center frequency with serial programming data and clock to the power exciter. The microprocessor then enters a continuous loop waiting for the key signal. The key signal is debounced. After the microprocessor detects the debounced key signal, it samples the frequency select lines to determine the center frequency. The microprocessor then sends the setup data that corresponds with that frequency to the RF exciter. The data and clock lines are continuously sampled and mapped in the Altera chip (U1) depending on the SW1 switch modes on the Control U and then sent to the RF exciter.

In the analog mode the Control “U” board sends the SC3, SC2, SC1, SC0 signals switch lines to the Control “A” board to control the data path that is to be transmitted. The composite analog signal is sent to the Control “U” board and filtered and sampled at 20 KHz. The digitized signal is then used to digitally

deviate the NCO to generate the instantaneous signal for the 10.7 MHz I/F. The maximum deviation is limited to +/- 5 KHz.

In the digital mode the MFSK data will be sent two bits at a time to the Hi Stability exciter along with data clock, or just one bit of data and clock when in the FSK mode. After the key line is deactivated, the microprocessor sends the debounced inactive key line to the RF exciter and sets the RF exciter center frequency to the default center frequency selection. The Control U PCB presents onboard LEDs for indication of +5 volt power on, key active, data input, and frequency programming active.

4.2 CONTROL "A" BOARD

The Control A (Analog) is simply a collection of all of the analog functions required by the transmitter to accomplish its tasks. The Control A board is typically the first point in the transmitter that all audio (analog) signals are routed to. All incoming audio is transformer coupled (600 ohm) on transformer T1. The full schematic for the Control A board is contained on Page A-21

The signal flow of the Control A board shows the amplification of "incoming" audio signal. After the audio is received by the input transformer T1 it is gated by a processor controlled digital switch U2. The control of this switch originates with the master processor on the Control U board and is passed over to the Control A board via the backplane. The incoming audio is routed by U2 to an input buffer amplifier U8A where the level is raised sufficiently to drive the output audio amplifier (U1B) circuits. Audio from the final audio amplifier (U1B) is switched via U2 to the exciter. Digital data is routed from the Control U board via the backplane to the Control A board where it is presented to an amplifier (U1A) for deviation and offset adjustments. The conditioned data is then sent via U2 to the exciter. A simplified flow diagram of the audio and data paths through the Control A board is shown in appendix A-23.

The input audio level into the first audio amplifier is somewhat dependent on its source and other external factors, but should be about 1 Vptp. All factory adjustments are referenced to this input level. The audio level at TP5 should be set for 3 volts Peak to Peak under normal input conditions by adjusting R14.

Adjusting R1 sets the analog deviation while the digital deviation is set by R30. If an offset adjustment in the DC level of the digital data is required (normally not required) this is accomplished by R29.

4.3 EXTEND-A-PAGE TRANSMITTER UNIT EXCITER

The exciter module of the **Extend-A-Page** VHF transmitters utilizes advanced direct digital synthesis techniques to achieve ultra-high stability analog composite modulation or a two and four level FSK output at modulation rates 3200 baud (2 Level) and 6400 baud (4 Level) depending on the selected mode configuration. The **Extend-A-Page** exciter is divided into two parts: the exciter control board and the exciter board.

4.3.1 Exciter Control Board

4.3.1.1 Circuit Description

The EWI-FLEX-01-HS is a synthesized RF module, capable of setting the Transmit frequency within 150 MHz to 174 MHz.

The transmit mode can be selected to generate either of the following, center frequency, analog composite, binary FSK, or 4 level FSK depending on the input mode lines, ICFOVRH, IMFSKH, and IDIGMODEH. The frequency of operation is setup with the control of two Phase Lock Loop (PLL) synthesizers in the RF module FLX-150B. The interface to setup the unit is a serial data interface using a common data and clock lines, and two strobe lines. One strobe line (PLLSTB) selects the channel offset PLL the other (XINSTB) selects the modulation loop. The RF module is supplied with two inputs, the 3 MHz high stability reference frequency and the 10.7 MHz digital data modulated IF input. The 10.7Mhz IF module has a fixed peak deviation output depending on the mode of operation. The analog composite mode has a 2.4KHz peak maximum limit, but can be attenuated on the Control “A” board. The digital mode has a deviation of +/-2.4 KHz. The data rate is from dc to 3200 bps. The digital symbols that are clocked into the IF modulator. The parallel inputs for the symbols are IDTB1, and IDTB0, along with the symbol clock IDTCLKH. The data transitions are shaped using a linear ramp pulse shape. There are four shaping configurations that are selected by the two parallel bit inputs IDHDT1, and ISHDT0. There is also a transmit control line to key the transmitter on and off, TXCONT. All controls to the Model EWI-FLEX-01-HS are TTL compatible logic levels.

The transmitter will synthesize the frequency on which to transmit, determined by the “Program Data” data stream sent to it. Appendix page A-45, Figure 7A shows an example of one such data stream. The frequency data stream is written into an embedded software program and burned into the PROM memory of a microcontroller. Therefore, the

frequency is set by the manufacturer, and can only be changed by installing another PROM that has the new data written into it.

The “Program Data” data stream is determined by the formulas shown in Appendix page A-47, Figure 9. These Formulas determine the Program Reference Counter and Comparative Frequency Multiplier Values sent to set the desired frequency.

The attached user data processing should key the transmitter a minimum of 200 milliseconds prior to the application of modulation to the associated transmitter inputs.

After sending the transmit frequency and keying the transmitter, the modulation should be applied. When there is no data to transmit, the user should unkey the transmitter. There is no restriction on the time interval between the end of the message and when to unkey the transmitter.

4.3.1.2 Frequency Determining and Stabilization

The Model EWI-FLEX-01-HS uses two Phase Lock Loop Integrated Circuits MB1504. A block diagram of the application of this IC is shown in the Appendix page A-46, Figure 8.

The PLL-IC employs a pulse-swallow system, comprised of a Phase Comparator, Program Counter, Swallow Counter, Prescaler, and Reference Divider. The parameters of the Phase Lock Loop System are determined with the formulas shown in Appendix page A-47.

The MATHCAD program in Appendix page A-47 contains an example calculation to determine the programmable values needed to setup the two PLLchips. The example calculations are for an output frequency of 156.2 MHz uses a step size of 7500 Hz.

4.3.2 Exciter Board Circuit Description

4.3.2.1 Channel Phase-Locked Loop (PLL)

The main function of the channel PLL is to generate a very stable carrier frequency. The carrier frequency depends on the selected channel. The frequency range will be 139.3 to 163.3 MHz with a channel separation of 5, 6.25, or 7.5 KHz. The stabilization is achieved by phase locking to the extremely stable reference frequency generated by reference PLL. Refer to Appendix page A-44, Figure 6, Exciter Board Block Diagram.

Frequency Synthesizer

The frequency synthesizer is used to stabilize the source for the carrier (139.3 to 163.3 MHz) phased-locked to stable reference frequency of 3 MHz, supplied from the reference PLL. Hence, the carrier frequency will be very stable. The frequency synthesizer is realized with a single integrated circuit.

The frequency synthesizer divides the reference frequency of 3 MHz from the reference PLL. The amplified feedback of the output signal from the VCO (139.3 – 163.3 MHz) is divided into the same frequency as the reference frequency.

Since a number of channels can be used, the frequency synthesizer is supplied with channel data from CPU. The channel data consists of two divisors, which are used for the internal frequency divisions. The divisors correspond to the channel that is used. By means of the divisors, frequency steps of either 5, 6.25, or 7.5 KHz are achieved. The CPU sends the divisors in serial form on a common data line. The data will not be accessible by the frequency synthesizer until a strobe signal arrives from the CPU. A clock signal from CPU is used for loading the data. The signals labeled common data and clock signal are passed through a low-pass filter in the channel PLL.

The synthesizer detects the difference in phase between the divided reference frequency and the divided output frequency for the VCO. If there is a difference between the two signals, an output voltage will be set high or low in order to change the output frequency of the VCO. When the phase difference has been eliminated, the loop has locked and the output frequency from the VCO is phased-locked to the stable reference frequency. If the loop cannot be locked an alarm signal is sent to the CPU.

Charge Pump

The Charge Pump circuit charges and discharges a capacitor in the loop filter to provide the 12V VCO control voltage. Pulses, which control the charge pump, are fed out of PLL IC, pins R and V. When both phase detector inputs are in phase, these output signals are high except for a very short period when both pulses are low in phase. If the frequency of the f_R input to the phase detector is higher than that of the f_V input, the VCO frequency is too low. The negative-going pulses on the f_V output then become much wider and the f_R output stays essentially high. If the frequency of the f_V input is greater than f_R, the opposite occurs.

Loop Filter

The loop filter is a low-pass filter, which is designed to give the phase-locked loop the desired characteristics in response to transient change in the output voltage from the frequency synthesizer. The low-pass filter is realized as a passive filter. The filtered output signal controls that output frequency of the VCO.

Voltage-Controlled Oscillator (VCO)

The VCO generates an output frequency of 139.3 to 163.3 MHz. After phased-locking and amplification, the output frequency of the VCO is the carrier frequency (139.3 to 163.3 MHz).

Amplifier

The amplifier outside the loop is used to amplify the carrier signal from the channel PLL. The amplified carrier is fed to the mixer, where it is mixed with the modulated signal from the modulator.

4.3.2.2 Upconverter

The upconverter is designed for broadband operation. It transforms the modulated signal of 10.7 MHz ± deviation to a frequency in the range of 150 to 174 MHz.

Phase Detector

The phase detector is used to control the output frequency from the VCO and will stabilize the frequency of the VCO when the channel is maintained.

An output voltage from the phase detector controls the output frequency from the VCO. This output voltage is not sufficient to carry out a channel shift. The frequency synthesizer is used to achieve channel shifts. Inputs to the phase detector are the modulation signal of 10.7 MHz from the modulator, via an amplifier, and the intermediate frequency of 10.7 MHz from the mixer, via an amplifier.

The phase detector will detect a difference in phase between the two input signals, and the output voltage of the phase detector will depend on the size of the phase difference. The output voltage from the phase detector is DC-offset and then applied to a varactor

in the VCO. In this way, the output voltage from the phase detector controls the output frequency of the VCO.

DC-Offset Amplifier

The DC-offset amplifier offsets the output voltage from the phase detector. The amplifier is realized with an integrated circuit, containing two operational amplifiers. The DC-offset amplifier is fed with an analog voltage. The first amplifier is configured as a DC voltage follower. The second amplifier is configured as a differential amplifier.

After the DC-offset amplification, the DC voltage from the phase detector will be approximately 8-9V. This voltage is applied to a capacitance diode in the VCO and controls the VCO frequency.

Voltage-Controlled Oscillator (VCO)

The VCO generates the output frequency from the exciter (RF output). The frequency range for the output frequency of the VCO is 150 to 174 MHz. The output frequency of the VCO will be voltage-controlled from either the phase detector or the frequency synthesizer.

The phase detector will control the output frequency of the VCO, except when the channel is to be changed. The phase detector controls the frequency generated by the VCO so that this frequency will exactly follow the modulated signal 10.7 MHz ± deviation, from the modulator.

When the phase detector controls the VCO, an output voltage from phase detector is applied to the varactor, via the DC-offset amplifier. The transistor, the varactor, the inductor and the associated capacitors form an oscillating circuit. The signal is amplified in the following transistor. The output signal of the VCO is fed to an amplifier.

The output voltage from the phase detector is not sufficient to perform a channel shift. During a channel shift the output frequency of the VCO is controlled by the frequency synthesizer. The frequency synthesizer works as a digital phase detector.

Amplifier (following VCO)

The amplifier outside the loop is used to amplify the signal from the VCO. The amplified RF signal is fed to the low-pass filter.

Amplifier (before Mixer)

The amplifier is used to amplify the RF signal before it is mixed with the signal from the channel PLL. It also provides isolation for the previous blocks.

Mixer

In the mixer, the carrier (139.3 – 163.3 MHz) from the channel PLL and the decoupled RF signal (150 – 174 MHz) are mixed. In this way an intermediate frequency (IF) of 10.7 MHz ± deviation is obtained.

Amplifier (following Mixer)

The amplifiers, following the mixer, are used to amplify the signal from the mixer.

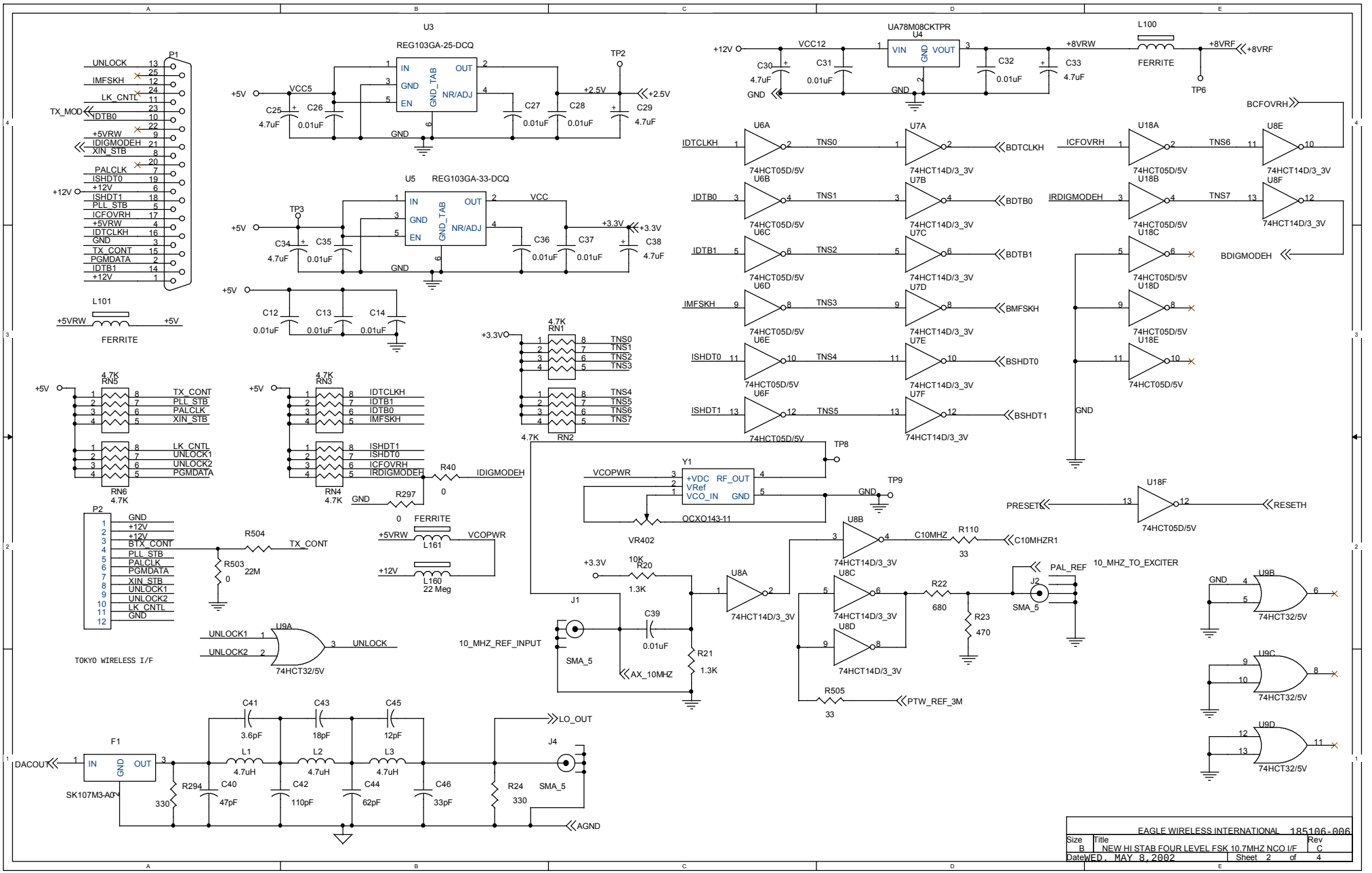
4.4 FRONT PANEL DISPLAY BOARD

The Front Panel display board for the **Extend-A-Page** transmitter contains display LEDs to indicate **Extend-A-Page** mode of operation. Descriptions of the LEDs are given in the Appendix Page A-50. Signals to this board are brought in via a 26 pin ribbon cable connectors from the Backplane (Connector P3). Signals are buffered by an inverter to drive LEDs.

4.5 POWER SUPPLY

The power supply for the **Extend-A-Page** transmitter is, a switching power supply, provides +12, -12 and +5 VDC voltages from 110 VAC input. The power supply also accepts 220 VAC for international application. The power supply has built –in short circuit protection with auto-restart and over voltage protection on 5 VDC.

A Extend-A-Page Appendix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IMFSKH
LK_CNTL
TX_MOD
IDTB0
+5VRW
IDIGMODEH
XIN_STB
PALCLK
ISHDT0
+12V
ISHDT1
PLL_STB
ICFOVRH
+5VRW
IDTCLKH
GND
TX_CONT
PGMDATA
IDTB1
+12V
U3
REG103GA-25-DCQ
IN
GND
EN
OUT
NR/ADJ
GND_TAB
VCC5
+2.5V
TP2
U5
REG103GA-33-DCQ
VCC
+3.3V
TP3
L101
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U4
UA78M08CKTPR
VIN
VOUT
VCC12
+8VRW
L100
FERRITE
+8VRF
TP6
BCFOVRH
U6A
U6B
U6C
U6D
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U7B
U7C
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BDTB1
BMFSKH
BSHDT0
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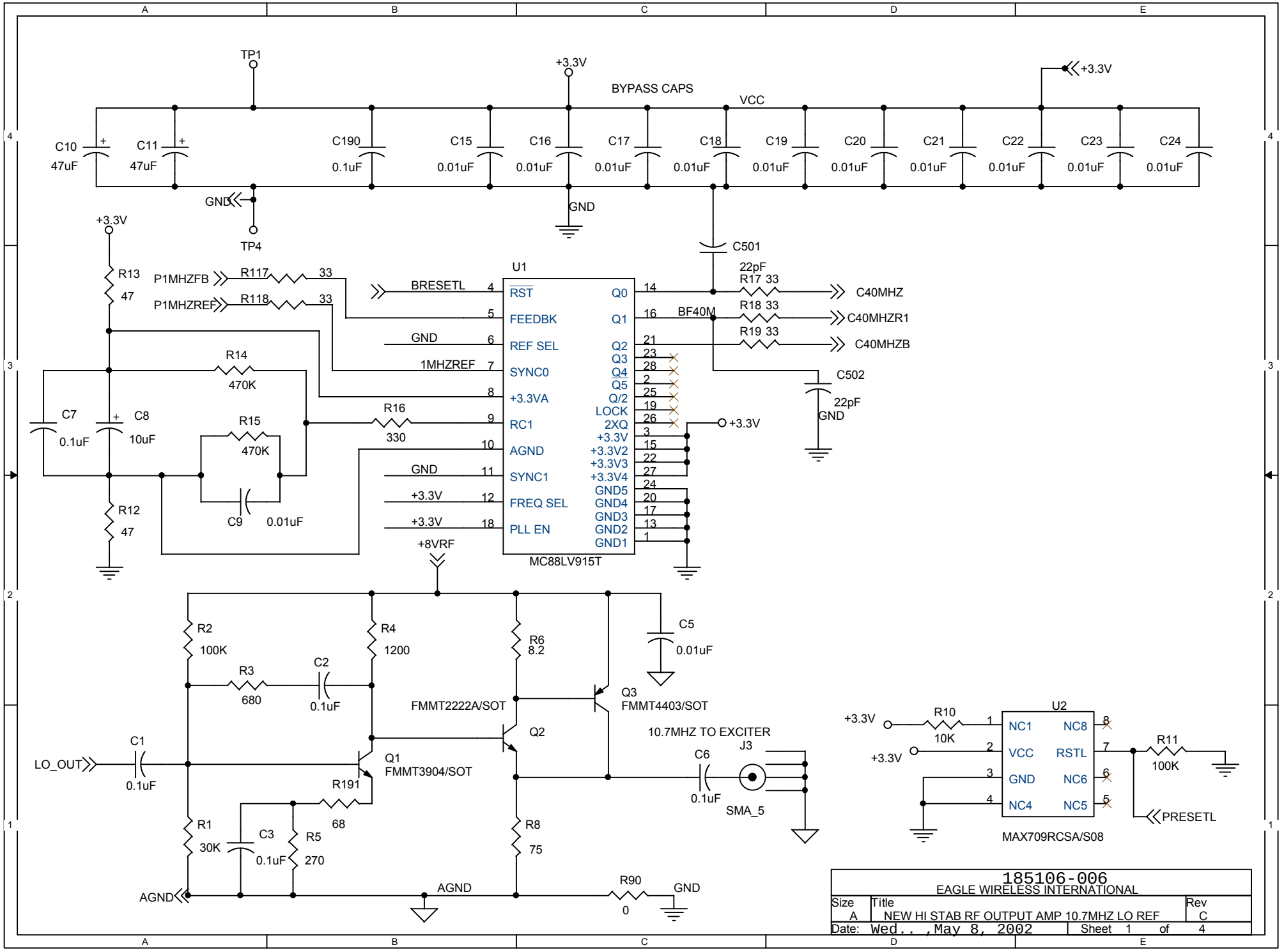
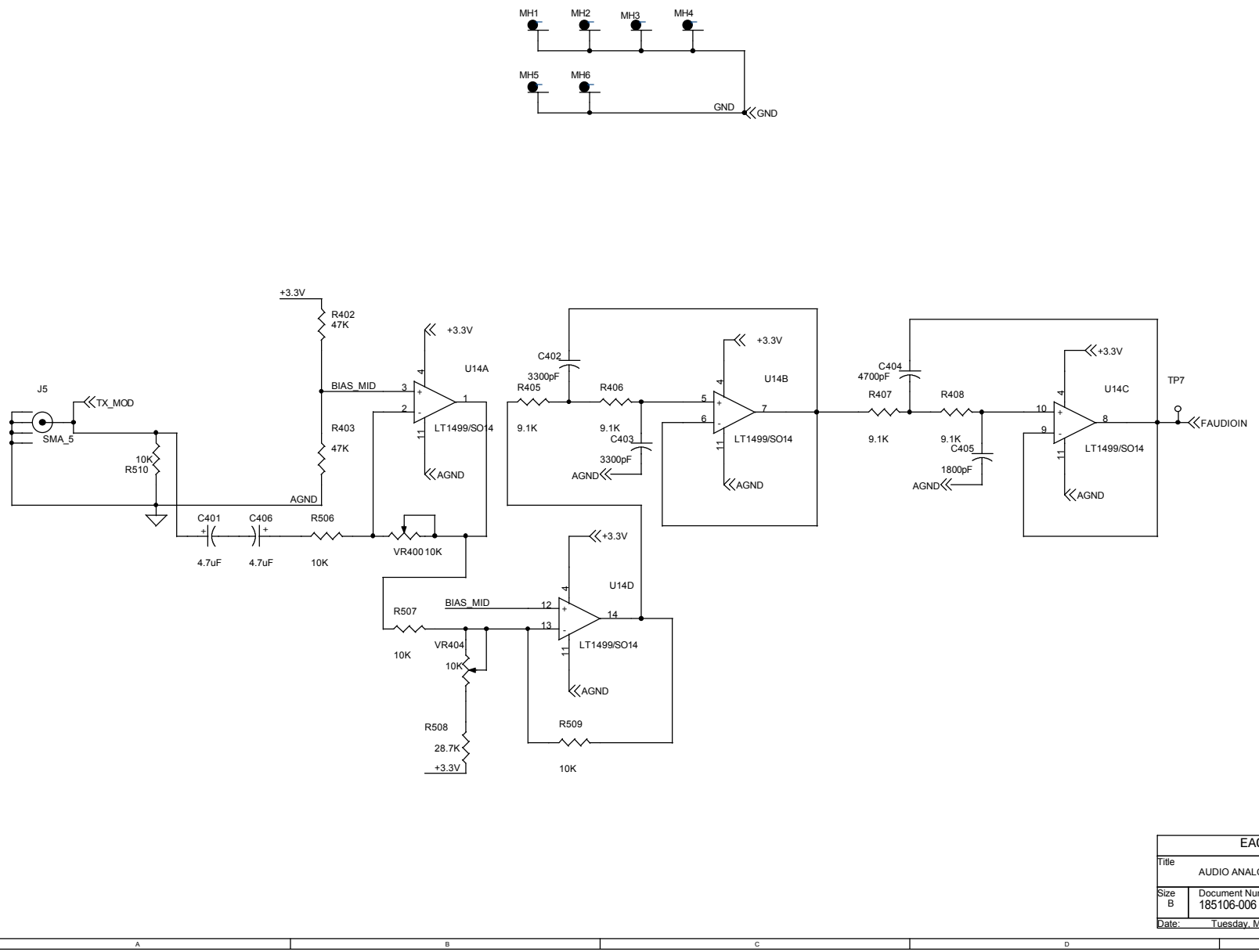
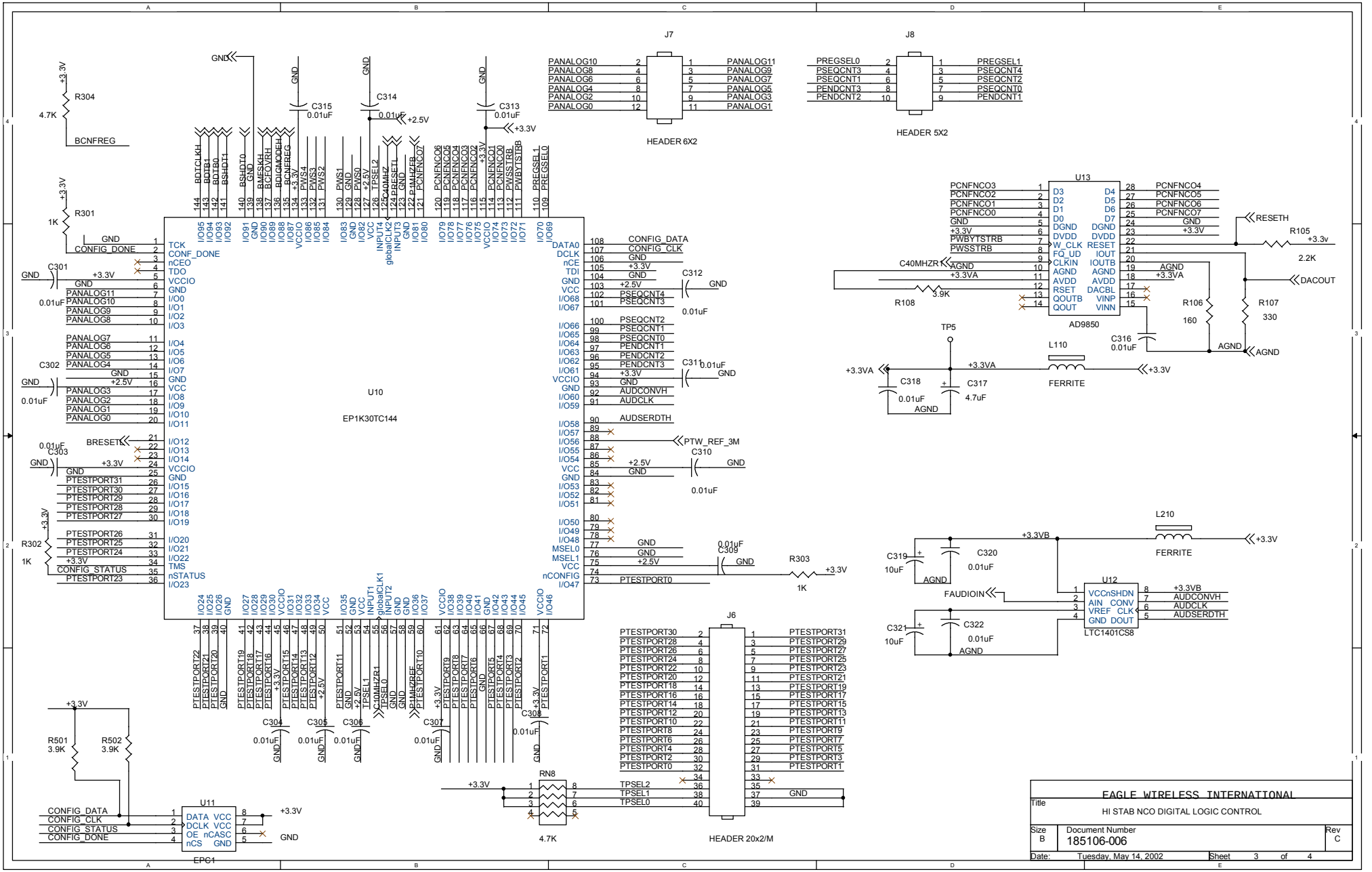
U8F
ICFOVRH
IRDIGMODEH
TNS6
TNS7
BDIGMODEH
GND
RN1
RN2
RN3
RN4
RN5
RN6
4.7K
TNS0
TNS1
TNS2
TNS3
TNS4
TNS5
TNS6
TNS7
IDTCLKH
IDTB1
IDTB0
IMFSKH
ISHDT1
ISHDT0
ICFOVRH
IRDIGMODEH
TX_CONT
PLL_STB
PALCLK
XIN_STB
LK_CNTL
UNLOCK1
UNLOCK2
PGMDATA
TP8
Y1
+VDC
VRef
VCO_IN
RF_OUT
OCXO143-11
VCOPWR
TP9
VR402
U8B
C10MHZ
R110
33
C10MHZR1
PRESET
U18F
RESETH
P2
GND
+12V
TX_CONT
PLL_STB
PALCLK
PGMDATA
XIN_STB
UNLOCK1
UNLOCK2
LK_CNTL
R504
R503
22M
R40
R297
L161
L160
22 Meg
U8A
U8C
U8D
R20
1.3K
R21
1.3K
R22
680
R23
470
R505
PTW_REF_3M
PAL_REF
10_MHZ_TO_EXCITER
J2
SMA_5
J1
10_MHZ_REF_INPUT
C39
0.01uF
AX_10MHZ
U9A
U9B
U9C
U9D
74HCT32/5V
UNLOCK
TOKYO WIRELESS I/F
F1
SK107M3-A0
DACOUT
L1
L2
L3
4.7uH
C40
C41
C42
C43
C44
C45
C46
47pF
3.6pF
110pF
18pF
62pF
12pF
33pF
R294
R24
330
J4
LO_OUT
AGND
EAGLE WIRELESS INTERNATIONAL 185106-006
Size B
Title NEW HI STAB FOUR LEVEL FSK 10.7MHZ NCO I/F
Rev C
Date WED. MAY 8, 2002
Sheet 2 of 4


TP1
+3.3V
BYPASS CAPS
VCC
+3.3V
C10 47uF
C11 47uF
C190 0.1uF
C15 0.01uF
C16 0.01uF
C17 0.01uF
C18 0.01uF
C19 0.01uF
C20 0.01uF
C21 0.01uF
C22 0.01uF
C23 0.01uF
C24 0.01uF
GND
GND
TP4
+3.3V
C501
22pF
U1
R13 47
P1MHZFB
R117 33
P1MHZREF
R118 33
BRESETL
RST
FEEDBK
REF SEL
SYNC0
+3.3VA
RC1
AGND
SYNC1
FREQ SEL
PLL EN
Q0
Q1
Q2
Q3
Q4
Q5
Q/2
LOCK
2XQ
+3.3V
+3.3V2
+3.3V3
+3.3V4
GND5
GND4
GND3
GND2
GND1
MC88LV915T
R17 33
R18 33
R19 33
C40MHZ
C40MHZR1
C40MHZB
BF40M
C502
22pF
GND
+3.3V
R14 470K
GND
1MHZREF
R16 330
C7 0.1uF
C8 10uF
R15 470K
C9 0.01uF
R12 47
GND
+3.3V
+3.3V
+8VRF
R2 100K
R3 680
C2 0.1uF
R4 1200
R6 8.2
C5 0.01uF
FMMT2222A/SOT
Q3 FMMT4403/SOT
Q2
10.7MHZ TO EXCITER
J3
C6 0.1uF
SMA_5
LO_OUT
C1 0.1uF
Q1 FMMT3904/SOT
R191 68
R1 30K
C3 0.1uF
R5 270
R8 75
AGND
AGND
R90 0
GND
U2
+3.3V
R10 10K
+3.3V
NC1
VCC
GND
NC4
NC8
RSTL
NC6
NC5
R11 100K
PRESETL
MAX709RCSA/S08
185106-006
EAGLE WIRELESS INTERNATIONAL
Size A
Title NEW HI STAB RF OUTPUT AMP 10.7MHZ LO REF
Rev C
Date: Wed. ,May 8, 2002
Sheet 1 of 4



EAGLE WIRELESS INTERNATIONAL		
Title: AUDIO ANALOG FRONT END		
Size: B	Document Number: 185106-006	Rev: C
Date: Tuesday, May 14, 2002	Sheet 4 of 4	


J7
HEADER 6X2
J8
HEADER 5X2
U10
EP1K30TC144
U13
AD9850
U12
LTC1401CS8
U11
EPC1
J6
HEADER 20x2/M
RN8
4.7K
R304
4.7K
R301
1K
R302
1K
R303
1K
R108
3.9K
R501
3.9K
R502
3.9K
R105
2.2K
R106
160
R107
330
C301
C302
C303
C304
C305
C306
C307
C308
C309
C310
C311
C312
C313
C314
C315
C316
C317
4.7uF
C318
C319
10uF
C320
C321
10uF
C322
0.01uF
L110
FERRITE
L210
FERRITE
TP5
GND
+3.3V
+2.5V
+3.3VA
+3.3VB
AGND
FAUDIOIN
RESETH
DACOUT
BRESETL
PTW_REF_3M
CONFIG_DATA
CONFIG_CLK
CONFIG_STATUS
CONFIG_DONE
PSEQCNT0
PSEQCNT1
PSEQCNT2
PSEQCNT3
PSEQCNT4
PENDCNT1
PENDCNT2
PENDCNT3
PCNFNCO0
PCNFNCO1
PCNFNCO2
PCNFNCO3
PCNFNCO4
PCNFNCO5
PCNFNCO6
PCNFNCO7
PANALOG0
PANALOG1
PANALOG2
PANALOG3
PANALOG4
PANALOG5
PANALOG6
PANALOG7
PANALOG8
PANALOG9
PANALOG10
PANALOG11
PREGSEL0
PREGSEL1
PTESTPORT0
PTESTPORT1
PTESTPORT2
PTESTPORT3
PTESTPORT4
PTESTPORT5
PTESTPORT6
PTESTPORT7
PTESTPORT8
PTESTPORT9
PTESTPORT10
PTESTPORT11
PTESTPORT12
PTESTPORT13
PTESTPORT14
PTESTPORT15
PTESTPORT16
PTESTPORT17
PTESTPORT18
PTESTPORT19
PTESTPORT20
PTESTPORT21
PTESTPORT22
PTESTPORT23
PTESTPORT24
PTESTPORT25
PTESTPORT26
PTESTPORT27
PTESTPORT28
PTESTPORT29
PTESTPORT30
PTESTPORT31
TPSEL0
TPSEL1
TPSEL2
EAGLE WIRELESS INTERNATIONAL
HI STAB NCO DIGITAL LOGIC CONTROL
Size B
Document Number 185106-006
Rev C
Date: Tuesday, May 14, 2002
Sheet 3 of 4

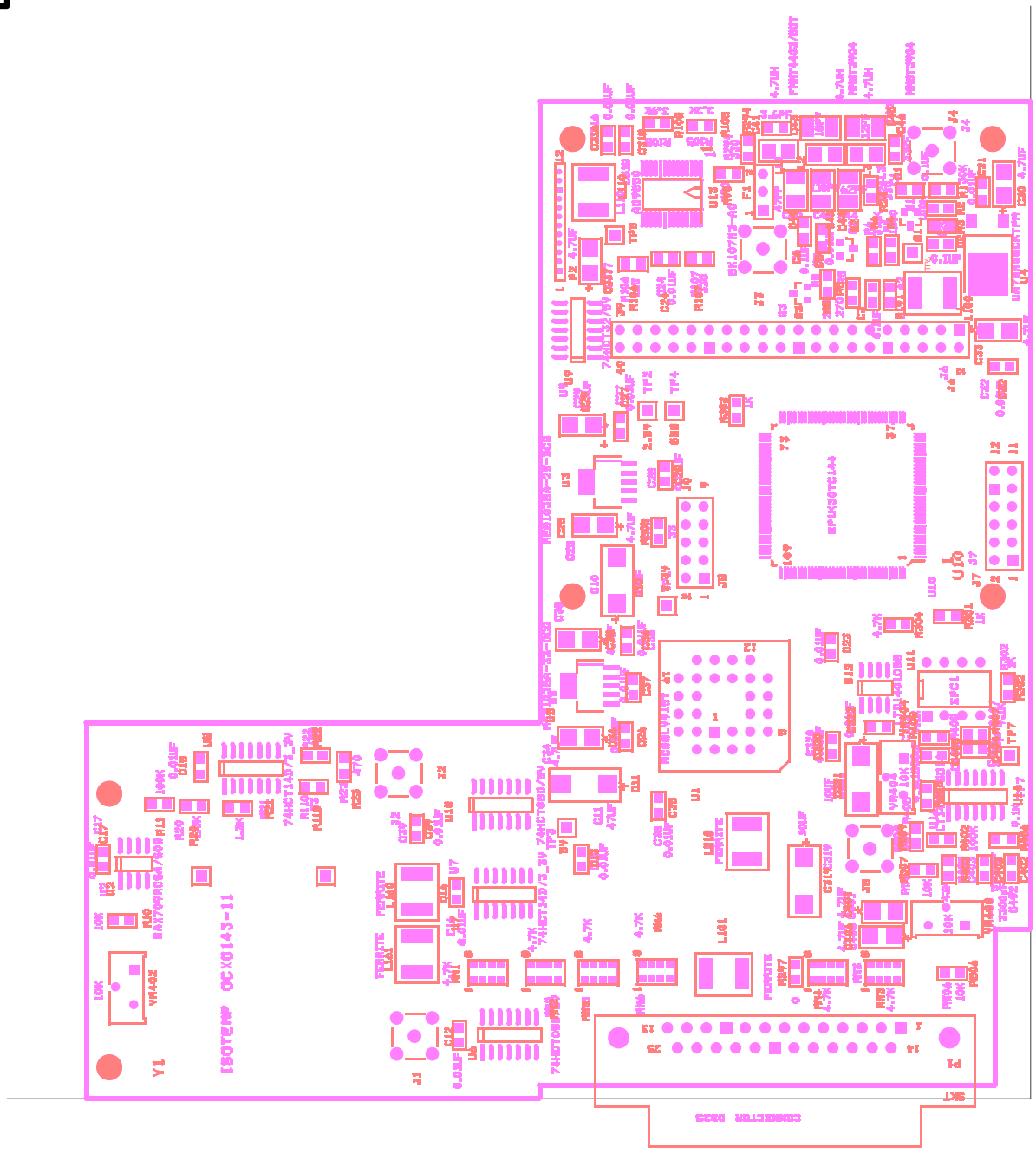

ISOTEMP OCXO143-11
Y1
CONNECTOR PADS

FIGURE 1-C – 150 MHZ EXCITER CONTROL BOARD BILL OF MATERIAL

EWI Number	Description	U of M	Qty
100106-021	Cap, 18 pF, 500 V, RF, SMT, 5%	EACH	1
100106-030	Cap, 12 pF, 500 V, RF, SMT, 5%	EACH	1
100106-032	Cap, 47 pF, 500 V, RF, SMT, 5%	EACH	1
100106-033	Cap, 120 pF, 300 V, RF, SMT, 5%	EACH	1
100106-035	Cap, 68 pF, 150 V, RF, SMT, 5%	EACH	1
100106-036	Cap, 33 pF, 150 V, RF, SM SMT, 5%	EACH	1
100106-042	Cap, .01uF, 50V, 1206, X7R, SMT, 10%	EACH	1
100106-062	Cap, 4.7uF, 16V, SMT, Tantalum, 10%	EACH	9
100106-068	Cap, 22 pF, 25V, NPO,0805 SMT, 5%	EACH	2
100106-102	Cap, 3.9 pF, 150 V, RF, SMT, 5%	EACH	1
100106-117	Cap, 0.1uF, 50V, 0805, SMT, +/- 20%	EACH	6
100106-118	Cap, 0.01uF, 50V, 0805, SMT, +/- 20%	EACH	42
100106-119	Cap, 10uF, 50V, 6032 (C), SMT, +/- 20%	EACH	3
100106-121	Cap, 47uF, 50V, 7343 (D), SMT, +/- 20%	EACH	2
100106-122	Cap, 3300pF, 50V, X7R, SMT, +/- 15%	EACH	2
100106-123	Cap, 4700pF, 50V, X7R, +/- 15%	EACH	1
100106-124	Cap, 1800pF, 50V, X7R, SMT, +/- 15%	EACH	1
100111-006	Res, 4.7K ohm, 0.100W, Concave, Array, SMT, +/- 5%	EACH	7
100111-009	Res, 9.1K Ohm, 1/8W, 0805, SMT, +/- 5%	EACH	4
100111-011	Res, 8.27 Ohm, 1/8W, 0805, SMT, +/- 5%	EACH	1
100111-016	Res, 22M Ohm, 1/8W, 1206, SMT, 5%	EACH	2
100111-034	Res, 470K Ohm, 1/10W, 0805, SMT, 5%	EACH	2
100111-056	Res, 2.2K Ohm, 1/8W,0805, SMT, 5%	EACH	1
100111-059	Res, 200 Ohm, 1/8W,0805, SMT, 5%	EACH	1
100111-078	Res, 28.7K Ohm, 0805, SMT, 5%	EACH	1
100111-087	Res, 68 Ohm, 100 mW, 0805, SMT, 5%	EACH	1
100111-089	Res, 0 Ohm, 100 mW, 0805, SMT, 5%	EACH	4
100111-099	Res, 4.7K Ohm, 1/8W, 0805, SMT, 5%	EACH	1
100111-100	Res, 10K Ohm, 1/8 W, 0805, SMT, 5%, 150V	EACH	5
100111-101	Res, 160 Ohm, 100mW, 0805, SMT, 5%	EACH	1
100111-111	Res, 30K Ohm, Flat Chip, 1/8W, 0805, SMT, +/- 5%	EACH	1
100111-112	Res, 100K Ohm, Flat Chip, 1/8W, 0805, SMT, +/- 5%	EACH	2
100111-114	Res, 1.2K Ohm, Flat Chip, 1/8W, 0805, SMT, +/- 5%	EACH	1
100111-115	Res, 270 Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	1
100111-117	Res, 47 Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	2
100111-121	Res, 680 Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	1
100128-004	Trans, PNP, Sililcon Planar, Gen Purpose, SOT23	EACH	1
100128-005	Trans, NPN, Silicon Planar, Switching, SOT23	EACH	1
100128-034	Trans, NPN, Silicon, 40V, SMT, TO-236AB	EACH	1
100130-006	Conn, Receptacle Housing, 12-pin	EACH	1
100130-134	Conn, Bd Mount, RtAngle, 25-Pin, w/Nut, Female	EACH	1
100130-541	Header, Break Away,30-Pin Double Row, Male	EACH	2

EWI Number	Description	U of M	Qty
100130-833	Conn, RF, SMA, Str Jack, SMT, Receptacle	EACH	5
100135-009	Crystal, Ovenized, 10.000MHz	EACH	1
100160-004	Ferrite, Bead, 170 ohm @ 100MHz, 0805	EACH	5
100160-030	Inductor,4.7uH, 100mAmps, SMT, 10%	EACH	3
100160-043	Filter, 10.7 MHz, ceramic	EACH	1
100111-112	Res, 100K Ohm, Flat Chip, 1/8W, 0805, SMT, +/- 5%	EACH	2
100111-113	Res, 1K Ohm, Flat Chip, 1/8W, 0805, SMT, +/- 5%	EACH	3
100111-118	Res, 330 Ohm, Flat chip, 1/8W, 0805, SMT, +/- 5%	EACH	4
100111-119	Res, 33 Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	7
100111-120	Res, 1.3K Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	2
100111-121	Res, 680 Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	1
100111-122	Res, 470 Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	1
100111-123	Res, 3.9K Ohm, Flat Chip, 1/8W, SMT, +/- 5%	EACH	3
100112-007	Pot, 10K Ohm, 12 Turn, Top Screw, 1/4" Sq	EACH	3
100130-500	Header, Single Row, Male, 36-Pin	EACH	9
100155-102	IC, PLL Clock Driver, Low Voltage, Low Skew CMOS	EACH	1
100155-109	IC, Complete DDS Synthesizer, 125 MHz, CMOS	EACH	1
100155-308	IC, Quad, 2-Input Positive Or Gates	EACH	1
100155-309	IC, Inverter, Hex, w/ Open-Drain Outputs	EACH	2
100155-311	IC, Inverter, Hex, Schmitt Trigger, CMOS	EACH	2
100155-402	IC, 12-Bit, 200ksps, ADC w/ shutdown	EACH	1
100155-403	IC, Power-Supply Monitor w/ Reset, 8 SO	EACH	1
100155-431	IC, Op Amp, Dual/Quad, Rail-toRail, 10MHz, 6V/us	EACH	1
100155-508	IC, Prgrammable Logic Device, 144-Pin	EACH	1
100155-512	IC, Config Device for SRAM-Based LUT Device, 8-Pin	EACH	1
100155-804	IC, Regulator, 500mA Low Dropout, SOT223-5, 3.3V	EACH	1
100155-811	IC, Regulator, 500mA Low Dropout, SOT223-5, 2.5V	EACH	1
100156-800	IC, Voltage Reg,+8V SMT	EACH	1
185106-006	PCB, High Stability Control Board	EACH	1

FIGURE 1-D – 150MHz EXCITER CONTROL BOARD BLOCK DIAGRAM

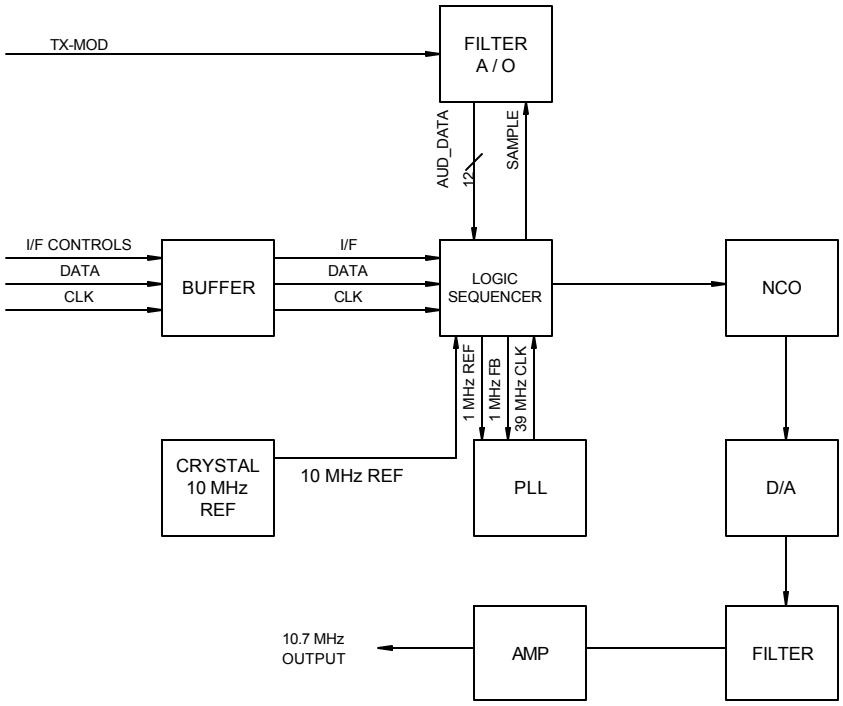
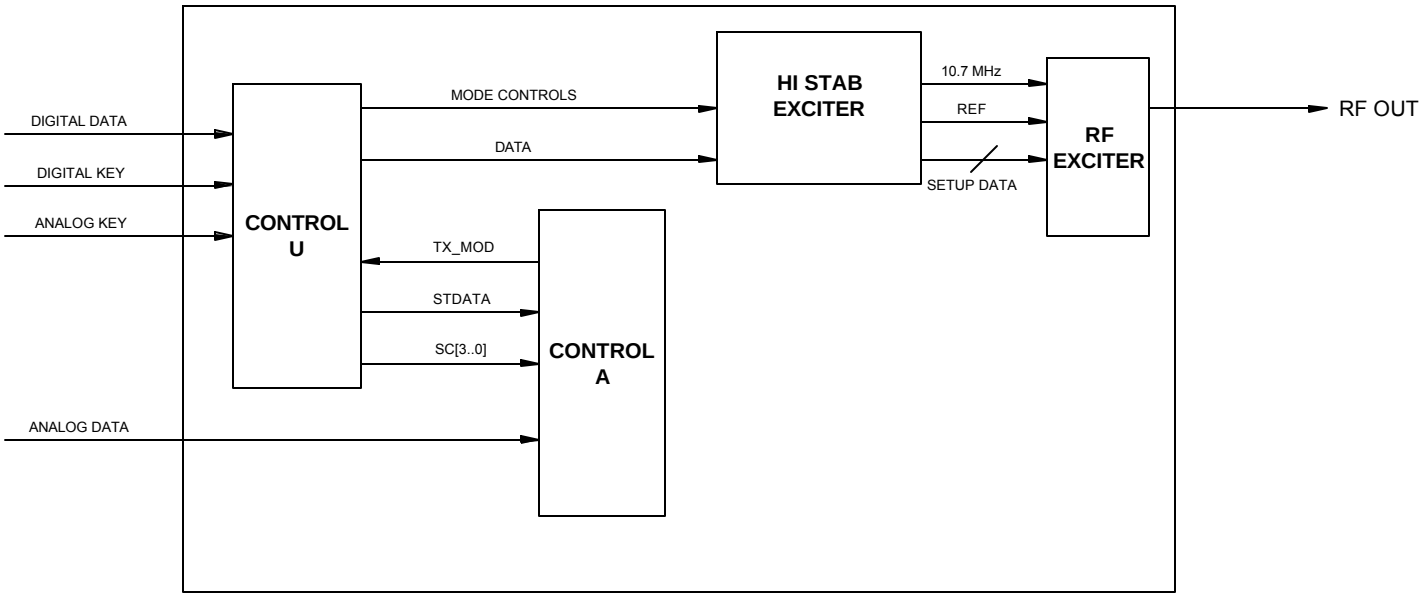
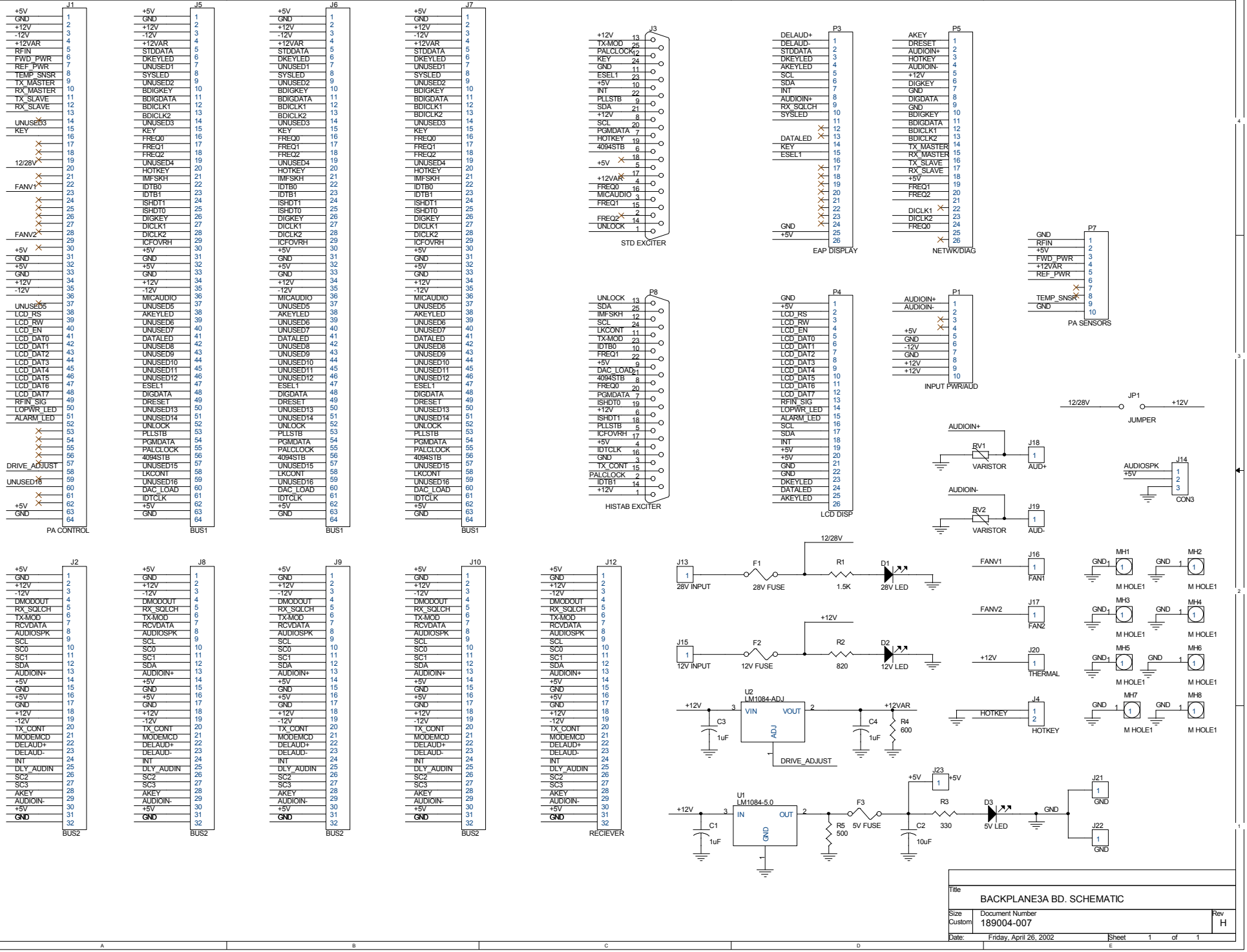


FIGURE 2 OVERALL BLOCK DIAGRAM





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Size: Custom	Document Number: 189004-007	Rev: H
Date: Friday, April 26, 2002	Sheet 1 of 1	

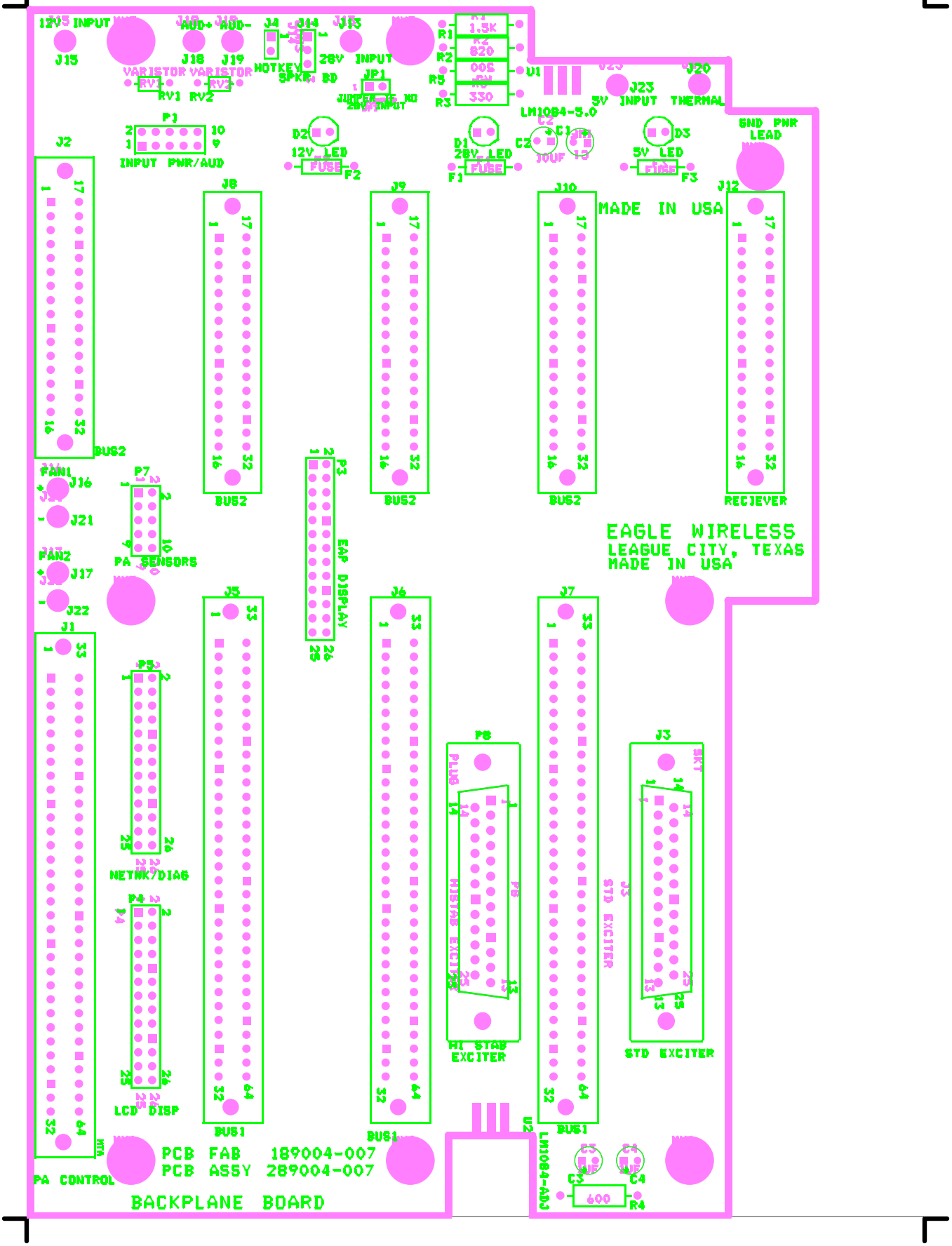
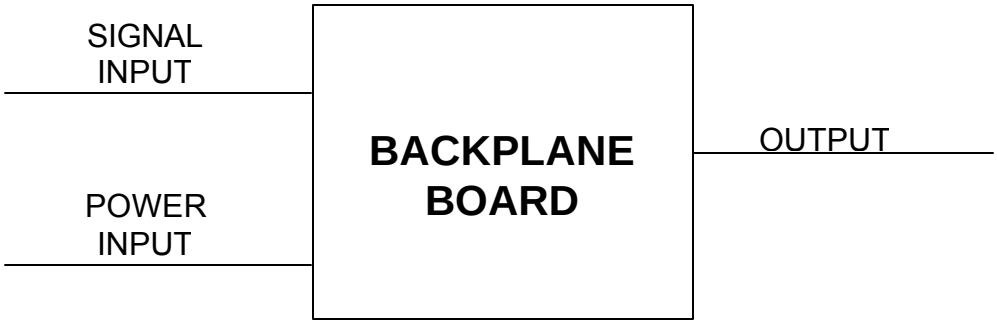
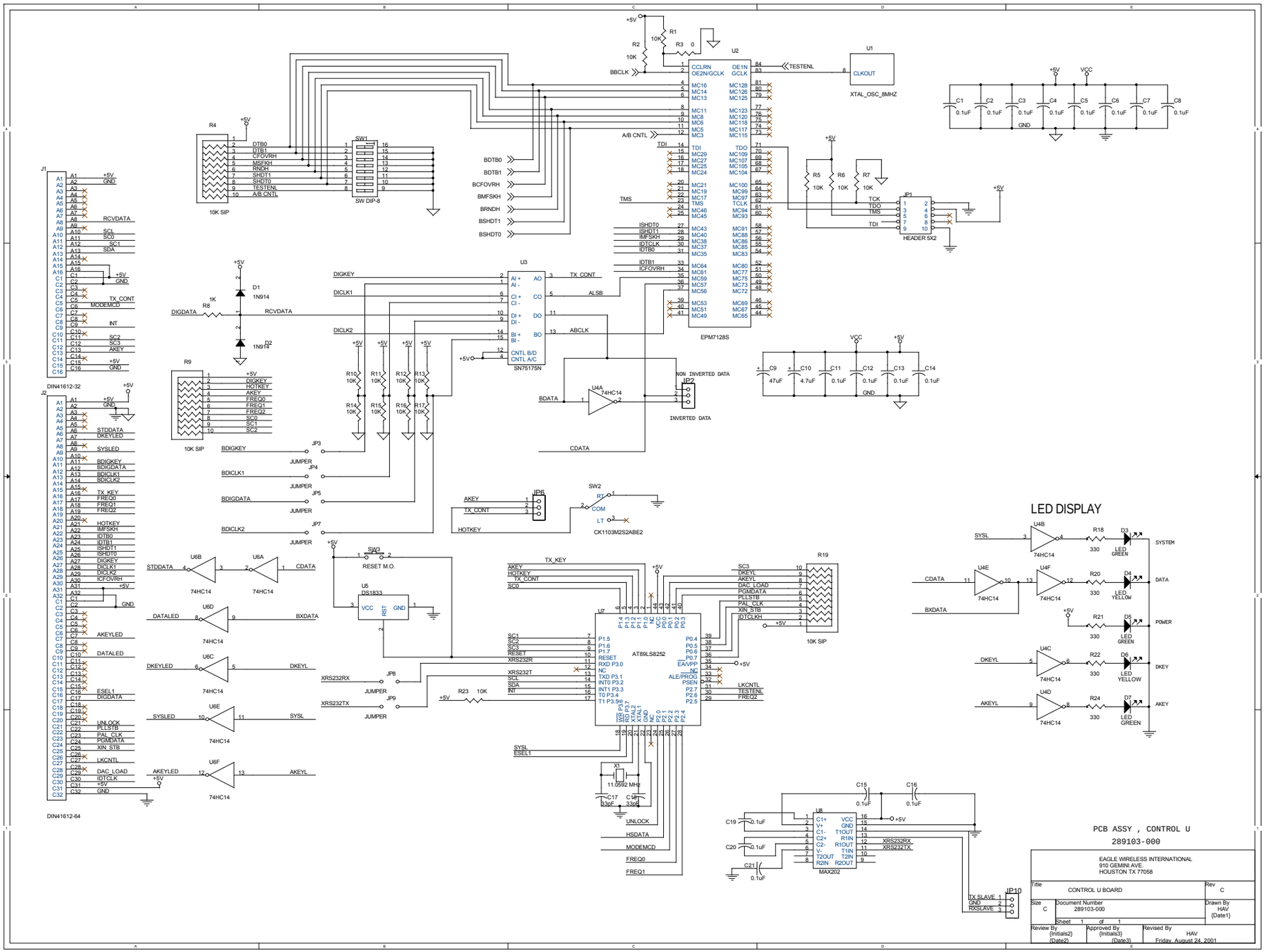

12V INPUT
J15
AUD+
AUD-
J18
J19
VARISTOR
VARISTOR
RV1
RV2
HOTKEY
SPKR BD
28V INPUT
JP1
JUMPER TO NO 28V INPUT
R1
1.5K
R2
820
R3
330
U1
LM1084-5.0
5V INPUT
THERMAL
GND PWR LEAD
P1
INPUT PWR/AUD
D2
12V LED
FUSE
F2
D1
28V LED
FUSE
F1
C2
C1
D3
5V LED
FUSE
F3
J2
J8
J9
J10
J12
MADE IN USA
BUS2
RECIEVER
FAN1
J16
J21
FAN2
J17
J22
P7
PA SENSORS
P3
EAP DISPLAY
EAGLE WIRELESS
LEAGUE CITY, TEXAS
MADE IN USA
J1
J5
J6
J7
P5
NETWK/DIAG
P4
LCD DISP
P8
MISTRAL EXCITER
HI STAB EXCITER
J3
STD EXCITER
BUS1
U2
LM1084-ADJ
C3
C4
R4
PA CONTROL
PCB FAB 189004-007
PCB ASSY 289004-007
BACKPLANE BOARD

FIGURE 3-C – BACKPLANE BOARD BILL OF MATERIAL

EWI #	Description	U of M	Qty
100001-111	Fuse, 7 Amp, PICO II, 125V, Axial Lead	Each	3
100105-005	Cap, 1uF, 35V, Tantalum, Radial 10%	Each	3
100105-014	Cap, 10uF, 35V, Tantalum, Radial 10%	Each	1
100110-009	Res, 330 Ohm, 1/4W, CF, 5%	Each	1
100110-015	Res, 604 Ohm, 1/4W, Carbon Film, 5%	Each	1
100110-167	Res, 510 Ohm, 1/4W, Carbon Film, 5%	Each	1
100110-170	Res, 806 Ohm, 1/4W, Metal Film, 1%	Each	1
100110-204	Res, 1.5K Ohm, 1/4W, Carbon Film, 5%	Each	1
100116-001	Var, Metal Oxide, 100 Amp 32pF @ 1 MHz	Each	2
100120-202	LED, Green Diffused	Each	3
100130-046	Conn, Eurocard, 64-Pin, Type C, Vert., Female	Each	4
100130-077	Conn, Eurocard, 32-Pin, Type C, Vert., Female	Each	5
100130-109	Conn, DSub, 25-Pin, Female	Each	1
100130-175	Conn, D-Sub, 25Pin, Straight PC Mount, Male	Each	1
100130-500	Header, Single Row, Male, 36-Pin	Each	2
100130-500	Header, Single Row, Male, 36-Pin	Each	1
100130-501	Header, Double Row, 36-Pin, Male	Each	1
100130-501	Header, Double Row, 36-Pin, Male	Each	3
100130-509	Header, Vert. Ejector 10-Pin, Straight contact	Each	1
100155-829	IC, Volt Reg, 5a Low Dropout Pos, +5V, TO-220 case	Each	1
100155-830	IC, Volt Reg, 5A Low Dropout Pos, Adj, TO-220 Case	Each	1
189004-007	PCB PA Backplane Bd FR-4	Each	1

FIGURE 3-D – BACKPLANE BOARD BLOCK DIAGRAM




PCB ASSY , CONTROL U
289103-000
EAGLE WIRELESS INTERNATIONAL
910 GEMINI AVE.
HOUSTON TX 77058
CONTROL U BOARD
Rev C
Size C
Document Number 289103-000
Drawn By HAV {Date1}
Sheet 1 of 1
Review By {Initials2} {Date2}
Approved By {Initials3} {Date3}
Revised By HAV Friday, August 24, 2001
LED DISPLAY
SYSTEM
DATA
POWER
DKEY
AKEY
EPM7128S
AT89LS8252
SN75175N
MAX202
DIN41612-32
DIN41612-64
10K SIP
SW DIP-8
HEADER 5X2
XTAL_OSC_8MHZ
RESET M.O.
INVERTED DATA
NON INVERTED DATA
CK1103M2S2ABE2
JUMPER

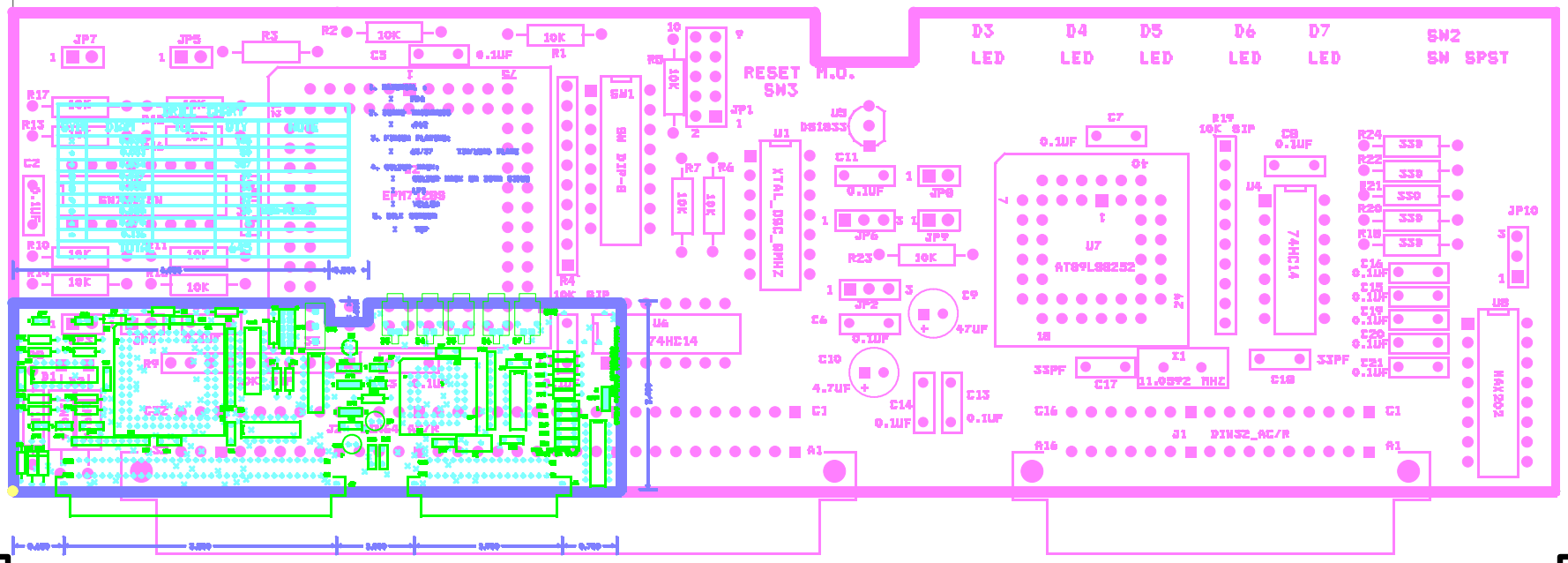

D3
LED
D4
LED
D5
LED
D6
LED
D7
LED
SW2
SW SPST
RESET
SW3
M.U.
74HC14
AT89LS8252
MAX251
11.0592 MHZ
74HC14

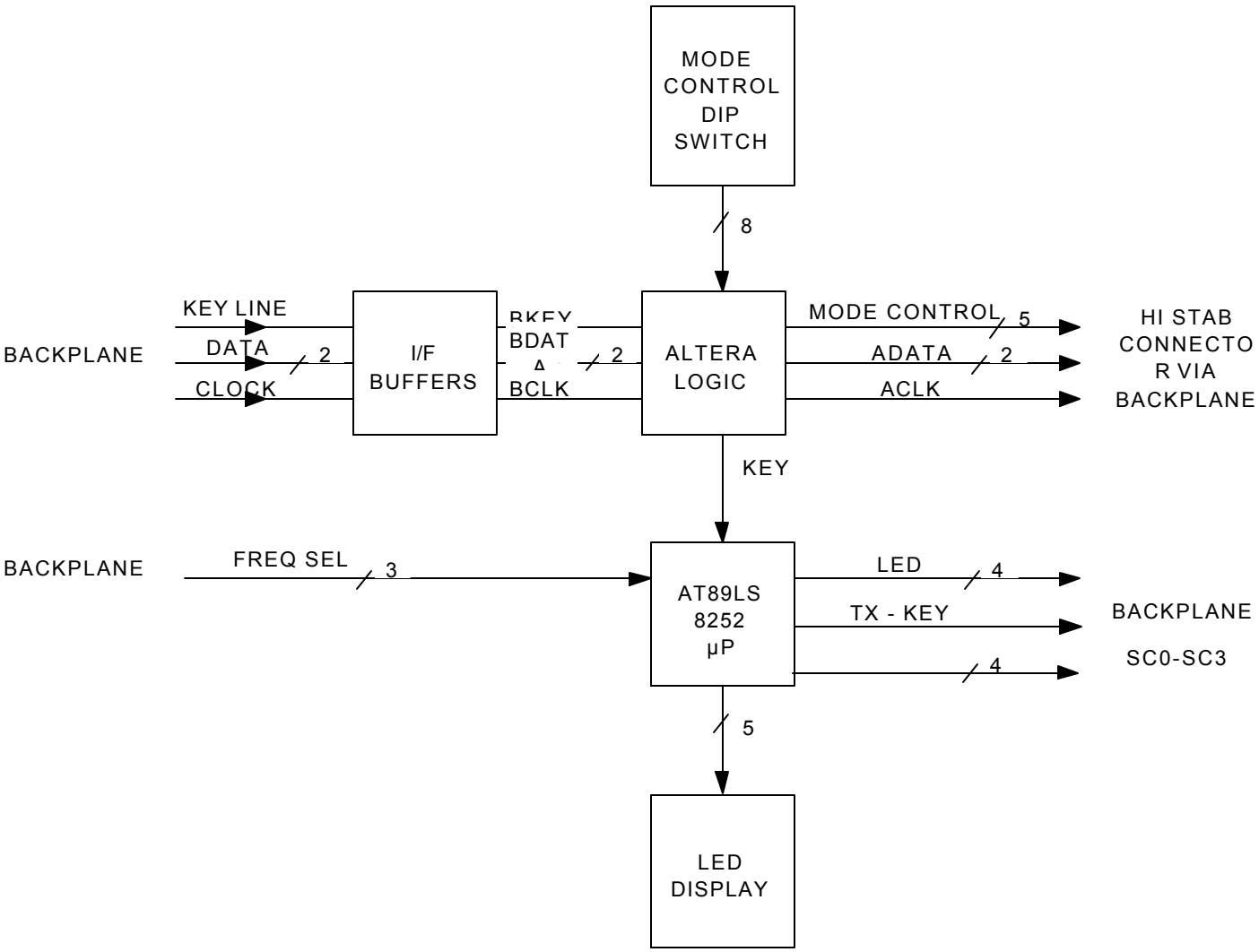
FIGURE 4-C – CONTROL U BOARD BILL OF MATERIAL

LINE NO.	REFERENCE DESIGNATION	QTY	EWI PART NO.	Description	MFG. Part No.
1	C1, C2, C3, C4, C5, C6, C7, C8, C11, C12, C13, C14, C15, C16, C19, C20, C21	17		Cap, 0.1uF, 50VDC, Polyester film, ±5%	Panas- ECQ-B1H104J Digi Key - P4593-ND
2	C9	1		Cap, 47uF, 16V, Tantalum, Electrolytic, ±20%	Panas - ECS-F1CE476 Digikey P2042-ND
3	C10	1		Cap, 4.7uF, 16V, Tantalum, Electrolytic, ±20%	Panas - ECS-F1CE475K Digikey - P2036-ND
4	C18, C17	2	100105-516	Cap, 33pF, 200V, Ceramic, Radial, 10%	CK05BX330K
5	C30, C31, C32, C33†	4	100106-099	Cap, 150pF, 50V, SMT, Ceramic, 0805, COG, ±10%	C0805C151K5GAC
6	D2, D1	2	100120-013	Diode, Switching,100V, 2A	1N914
7	D3, D5, D7	3	100120-202	LED, Green Diffused	LTL307G
8	D6, D4	2	100120-201	LED, Yellow, Diffused, T 1 3/4	IYD4911
9	D3, D4, D5, D6, D7	5	100120-212	LED Holder, T13/4, 90 Deg Mounting	909-235BLACK
10	JP1	1		Header, 5X2, .100" X .100", Pin Strip	DK - 929836-02-36-ND
11	JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10	9		Header, 0.100" Pin Strip, Straight (break into 3 pieces 3 pin long)	DK - 929834-02-36
12	J1	1	100130-076	Conn, Eurocard, 32-Pin, Type C,Rtangle, Edge,Male	650946-5
13	J2	1	100130-047	Conn, Eurocard, 64-Pin, Type C, Rtangle, Male	650945-5
14	R1, R2, R5, R6, R7, R10, R11, R12, R13, R14, R15, R16, R17, R23	14	100110-036	Res, 10K Ohm, 1/4W, CF, 5%	CF1/4 10K 5%
15	R3			Res, 0 Jumper Wire	
16	R4, R9, R19	3		Res, 10K SIP	Panasonic - Q9103-ND DK - Q9103-ND
17	R8	1	100110-018	Res, 1K Ohm, 1/4W, Carbon Film, 5%	CF1/4 1K 5%
18	R18, R20, R21, R22, R24	5	100110-009	Res, 330 Ohm, 1/4W, CF, 5%	CF1/4 330 5%
19	SW1	1		Switch, SPST Rocker, DIP, 8 Pin	Grayyhill - 76SB08 DK - GH1109-ND
20	SW2	1	100001-021	Switch, Slide, 6A, SPDT,3 Pos, On,Off,On, PC Mnt	1103M2S2ABE2

FIGURE 4-C – CONTROL U BOARD BILL OF MATERIAL (2 of 2)

LINE NO.	REFERENCE DESIGNATION	QTY	EWI PART NO.	Description	MFG. Part No.
21	SW3	1	100001-006	Switch, Push Button, Rt Angle PCB Mount, SPDT	EP11SD1AVBE
22	U1	1		CMOS/TTL Oscillators	Epson - SG-51P-8.0000MC DK - SE1707-ND
23	U2	1	100155-519	IC, Programmable Logic Device	EPM7128SLC84-15
24	U3	1		IC, Quadruple Differential Line Receivers	DK - 296-1736-5-ND TI - SN75175N
25	U4, U6	2		IC, High Speed CMOS Logic Hex Inverting Schmitt Trigger	TI - CD74HCT14E DK - 296-2093-5-ND
26	U5	1	100155-423	IC, EconoReset, 5V, TO-92 package	DS1833-10
27	U7	1	100155-215	IC, Microcontroller, 8 Bit, w/8K Byte Flash,	AT89LS8252-12JC
28	U8	1	100155-019	IC, +5V, RS-232, Transceiver, w/0.1uF External Cap	MAX202CPE
29	X1	1		Crystal, 11.0592 MHz	EC2-18-11.0592
30	U7	1		IC Socket, 44 Pin, through bd mount	MillMax - 540-99-044-24-000000 DigiKey - ED800003-ND
31	U3, U8	2	100131-004	IC Socket, 16 Pin, DIP	2-641262-3
32	U1, U4, U6	3	100131-003	IC Socket, 14 Pin, DIP	2-641261-3
33	Board	1	189103-000	PCB, Control U	

FIGURE 4-D – CONTROL U BOARD BLOCK DIAGRAM



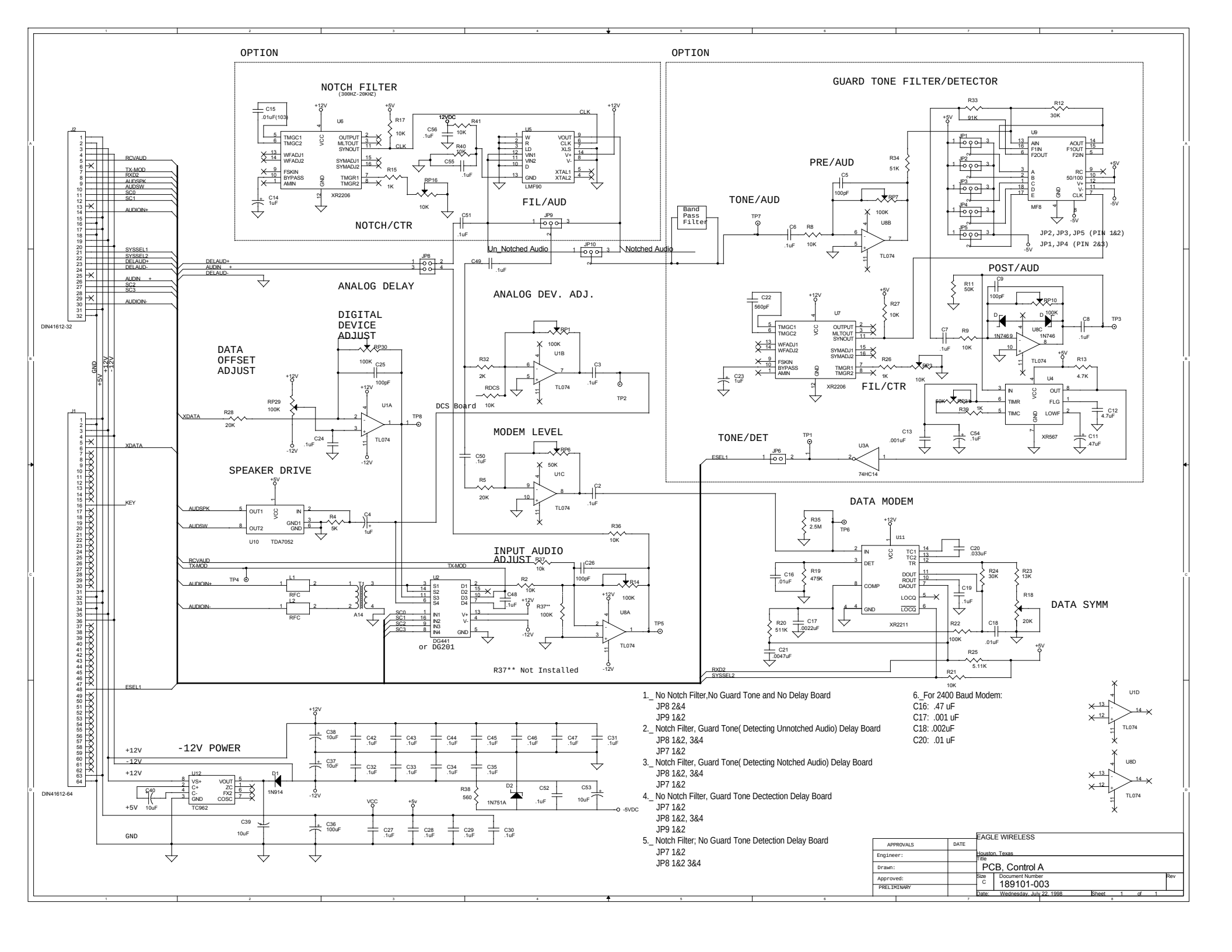

OPTION
NOTCH FILTER
(300HZ-20KHZ)
NOTCH/CTR
FIL/AUD
OPTION
GUARD TONE FILTER/DETECTOR
PRE/AUD
TONE/AUD
POST/AUD
FIL/CTR
TONE/DET
JP2, JP3, JP5 (PIN 1&2)
JP1, JP4 (PIN 2&3)
Band Pass Filter
Un_Notched Audio
Notched Audio
ANALOG DELAY
ANALOG DEV. ADJ.
DIGITAL DEVICE ADJUST
DATA OFFSET ADJUST
DCS Board
MODEM LEVEL
SPEAKER DRIVE
INPUT AUDIO ADJUST
DATA MODEM
DATA SYMM
-12V POWER
DG441 or DG201
R37** Not Installed
DIN41612-32
DIN41612-64
1._ No Notch Filter,No Guard Tone and No Delay Board
JP8 2&4
JP9 1&2
2._ Notch Filter, Guard Tone(Detecting Unnotched Audio) Delay Board
JP8 1&2, 3&4
JP7 1&2
3._ Notch Filter, Guard Tone(Detecting Notched Audio) Delay Board
JP8 1&2, 3&4
JP7 1&2
4._ No Notch Filter, Guard Tone Dectection Delay Board
JP7 1&2
JP8 1&2, 3&4
JP9 1&2
5._ Notch Filter; No Guard Tone Detection Delay Board
JP7 1&2
JP8 1&2 3&4
6._For 2400 Baud Modem:
C16: .47 uF
C17: .001 uF
C18: .002uF
C20: .01 uF
APPROVALS
DATE
Engineer:
Drawn:
Approved:
PRELIMINARY
EAGLE WIRELESS
Houston, Texas
Title
PCB, Control A
Size C
Document Number
189101-003
Rev
Date: Wednesday, July 22, 1998
Sheet 1 of 1

FIGURE 5 –B – CONTROL A BOARD LAYOUT

Digital Data Offset

Digital Data Dev.

Analog Data Dev.

Master Audio Input

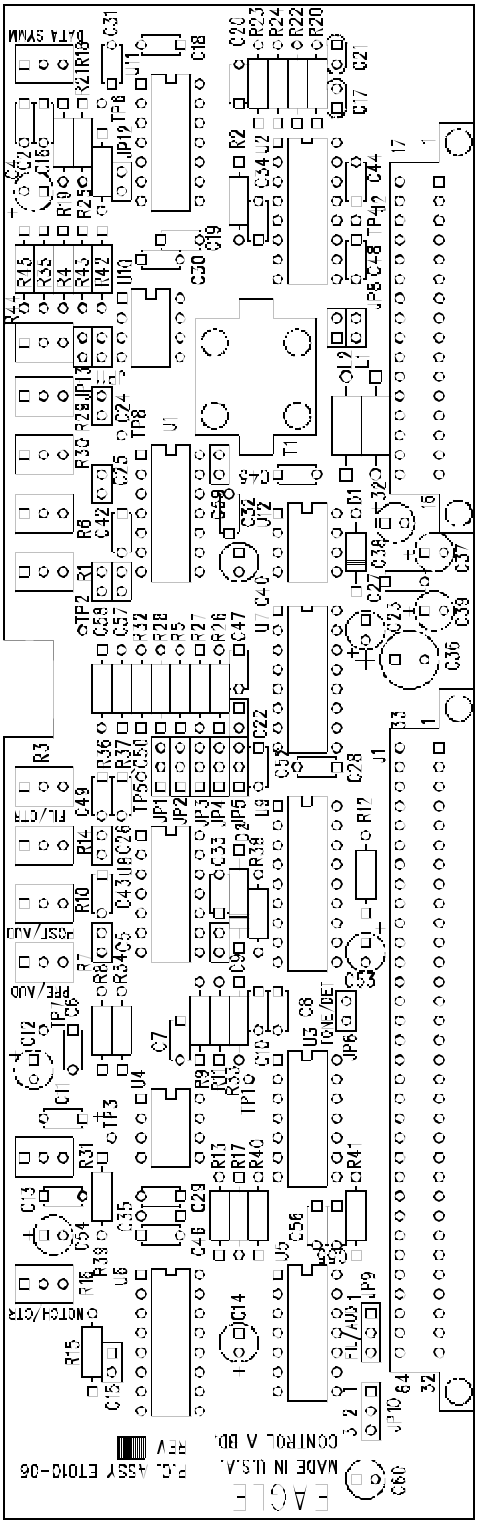
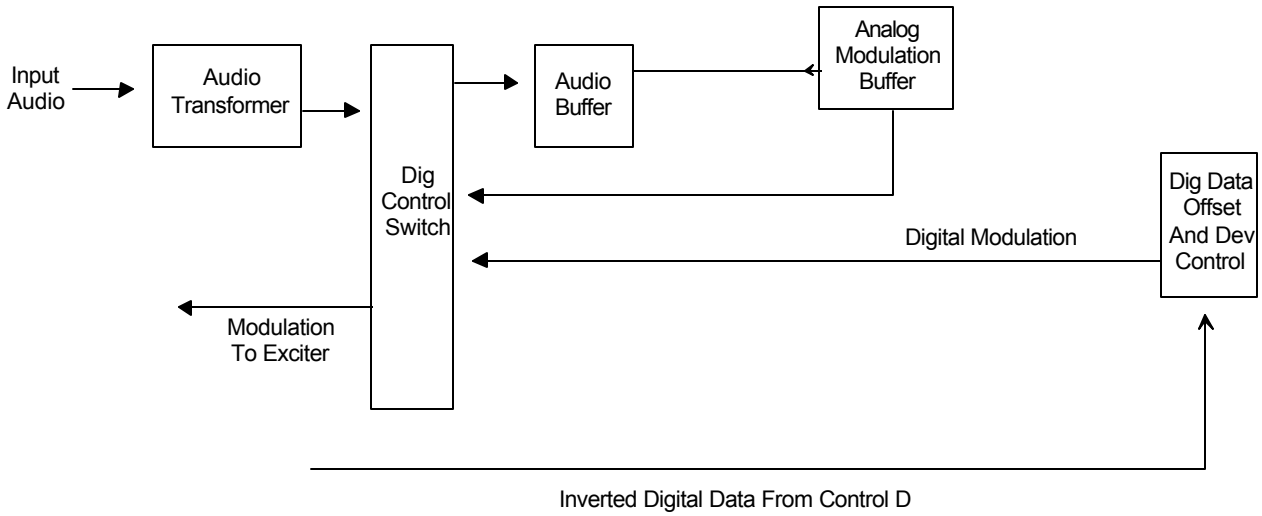


FIGURE 5 – C – CONTROL A BOARD FLOW DIAGRAM



ARTESYN TECHNOLOGIES

NFS25 SERIES

Dual and triple output

[2 YEAR WARRANTY]

CE (LVD)

- **5.0 x 3.0 x 1.2 inch package (1U applications)**
- **Industry standard package**
- **Overvoltage and short circuit protection**
- **25W with free air convection cooling**
- **EN55022, EN55011 conducted emissions level A**
- **UL, VDE and CSA safety approvals**

The NFS25 series is a 25W universal input AC/DC power supply on a 5 x 3 inch card with a maximum component height of 1.2 inches for use in 1U applications. The NFS25 series is available with a wide range of models in the industry standard 5 x 3 inch footprint and has proven itself to be reliable and versatile product for a wide range of communication and industrial applications. The NFS25 provides 25W of output power with free air convection cooling which can be boosted to 30W with 20CFM of air. Standard features include OVP and short circuit protection. The series, with full international safety approval and the CE mark, meets conducted emissions EN55022 level A. The NFS25 series is designed for use in low power data networking, computer, telecom and industrial applications such as wireless switchers, hubs, POS terminals, PABX's and machine control. This list is not exclusive as the generic feature of the series with industry standard output configurations provide a solution for most high volume applications including many industrial applications.

SPECIFICATION

All specifications are typical at nominal input, full load at 25°C unless otherwise stated

OUTPUT SPECIFICATIONS		
Output power (See Note 2)	Continuous Peak (60s)	25W 35W
Line regulation LL to HL, FL	Main output (Output 1) Output 2 Output 3	±0.2%, max. ±1%, max. ±0.2%, max.
Total regulation (See Notes 4, 5)	Main output (Output 1) Auxiliary output 2 Auxiliary output 3	±2.0%, max. see table see table
Overshoot/undershoot	At turn-on	0%
Transient response	+5V (1.5 to 3A step)	±120mV max. dev. 500µs recovery
Temperature coefficient	All outputs	±0.02%/°C, max.
Overvoltage protection	+5V output	6.25V ±0.75V
Output power limit	Primary power limited	60W Pin limit, max. 35W Pout limit, min.
Short circuit protection		Continuous
INPUT SPECIFICATIONS		
Input voltage range	Universal input	85 to 264VAC 120 to 370VDC
Input frequency range		47 to 440Hz
Input surge current	110VAC, cold start 230VAC, cold start	15A max. 32A max.
Safety ground leakage current	132VAC, 60Hz 264VAC, 50Hz	0.62mA, max. 1mA max.

International Safety Standard Approvals

VDE0805/EN60950/IEC950/IEC1010
File No. 10401-3336-1044 Licence No. 2559, 1651

UL1950 File No. E136005

CSA C22.2 No. 950 File No. LR41062C

EMC CHARACTERISTICS		
Conducted emissions	EN55022, FCC part 15	Level A
Radiated emissions	EN55022, FCC part 15	Level A
ESD air	EN61000-4-2, level 3	Perf. criteria 1
ESD contact	EN61000-4-2, level 4	Perf. criteria 1
Surge	EN61000-4-5, level 3	Perf. criteria 1
Fast transients	EN61000-4-4, level 3	Perf. criteria 1
Radiated immunity	EN61000-4-3, level 3	Perf. criteria 2
Conducted immunity	EN61000-4-6, level 3	Perf. criteria 1
GENERAL SPECIFICATIONS		
Hold-up time	110VAC input 230VAC input	16ms 80ms
Efficiency	25W output	70% typical
Isolation voltage	Input/output Input/chassis	3000VAC 1500VAC
Switching frequency		Variable
Approvals and standards (See Note 10)		IEC950, IEC1010, EN60950 UL1950, VDE0805 CSA C22.2 No. 950
Weight		280g (9.6oz)
MTBF (See Note 9)	MIL-HDBK-217E, 25°C	170,000 hours
ENVIRONMENTAL SPECIFICATIONS		
Thermal performance (See Notes 6, 7, 8)	0°C to 50°C ambient, convection cooled 50°C to +70°C ambient convection cooled Peak (0°C to +50°C, max. 60 seconds) Non-operating	25W max. Derate to 50% load 35W –40°C to +85°C
Relative humidity	Non-condensing	5% to 95% RH
Altitude	Operating Non-operating	10,000 feet max. 30,000 feet max.
Vibration	Random vibration Three orthogonal axes 10 min. test per axis	2.4G rms approx. 5Hz to 500Hz

25 Watt
AC/DC universal input switch mode power supplies

OUTPUT VOLTAGE	OUTPUT CURRENTS			RIPPLE (3)	TOTAL REGULATION (4)	MODEL NUMBER (D)
	MIN (9)	MAX (1)	PEAK (2)			
+5.1V (I_A)	0A	2.0A	5.0A	50mV	±2.0%	NFS25-7608 (4)
+12.0V (I_B)	0A	1.5A	3.0A	120mV	±5.0%	
–12.0V	0A	0.2A	1.0A	120mV	±5.0%	
+5.1V	0A	3.0A	5.0A	50mV	±2.0%	NFS25-7628 (5)
+12.0V	0A	0.2A	1.0A	120mV	±2.0%	
–12.0V	0A	0.2A	1.0A	120mV	±2.0%	
+5.1V (I_A)	0A	2.0A	5.0A	50mV	±2.0%	NFS25-7629 (4)
+12.0V (I_B)	0A	1.5A	3.0A	120mV	±5.0%	

Notes

1 Natural convection cooling.
2 Peak output current lasting less than 60 seconds with duty cycle less than 5%. During peak loading, outputs may go outside of total regulation limits. Total peak power output is 35 Watts.
3 Figure is peak-to-peak. Output noise measurements are made across a 50MHz bandwidth using a 12 inch twisted pair, terminated with a 47µF capacitor.
4 Total regulation is defined as the static output regulation at 25°C, including initial tolerance, line voltage within stated limits, load currents within stated limits and output voltages adjusted to their factory settings. Also, $0.5 \leq I_A / I_B \leq 3$ to maintain stated regulation. This does not apply to the NFS25-7628.
5 The NFS25-7628 has separately regulated +12V and -12V outputs. The loading condition in note 4 does not apply.
6 Derate linearly from 25 Watts at 50°C to 12.5 Watts at 70°C.
7 Derating curve is application specific for ambient temperatures > 50°C, for optimum reliability no part of the heatsink should exceed 120°C and no semiconductor case temperature should exceed 125°C.
8 Caution: Allow a minimum of 1 second after disconnecting the power before making thermal measurements.
9 A 4 Watt minimum load is required to achieve design MTBF.
10 This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

PIN CONNECTIONS			
J1	**-7608**	**-7628**	**-7629**
Pin 1	AC Line	AC Line	AC Line
Pin 2	AC Neutral	AC Neutral	AC Neutral
J2			
Pin 1	+12V	+12V	+12V
Pin 2	+5.1V	+5.1V	+5.1V
Pin 3	+5.1V	+5.1V	+5.1V
Pin 4	Return	Return	Return
Pin 5	Return	Return	Return
Pin 6	–12V	–12V	N/C
P1			
Pin 1	Safety Ground		

AC mating connector

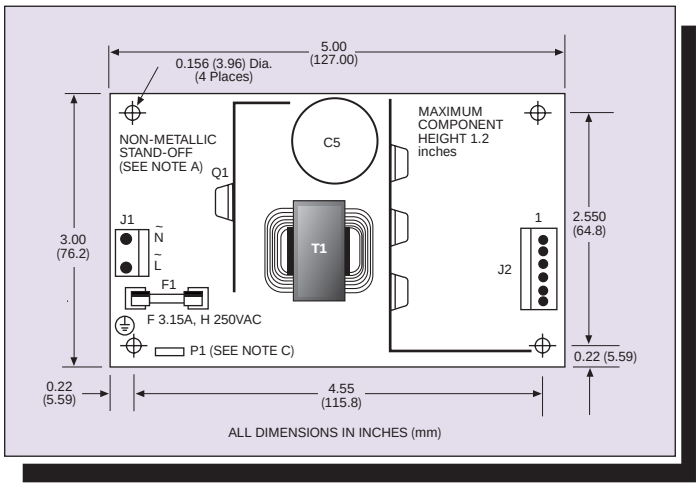
Molex 09-50-3031 or equivalent with Molex 08-50-0105 crimp terminals or equivalent

DC mating connector

Molex 09-91-0600 or equivalent with Molex 08-50-0164 crimp terminals or equivalent

Mechanical notes

A In order to meet safety requirements, a non-metallic stand-off is mandatory for one hole as specified in the mechanical drawing above.
B The ground pad of the mounting hole near P1 allows system grounding through a metal stand-off.
C To improve conducted noise, the ground pad of the mounting hole near the output connector should be connected with the ground pad of the mounting hole near P1. Use metal stand-offs attached to a common metal chassis. This connection also significantly attenuates common mode noise.
D A standard L-bracket and cover is available for mounting which contains all screws, connectors and necessary mounting hardware. Details are on page 72. Order part number 'NFS40 COVER KIT'.



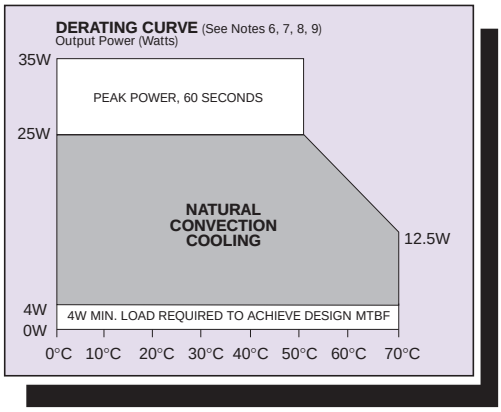


FIGURE 7 – DISPLAY BOARD

FIGURE 7-A – DISPLAY BOARD SCHEMATIC

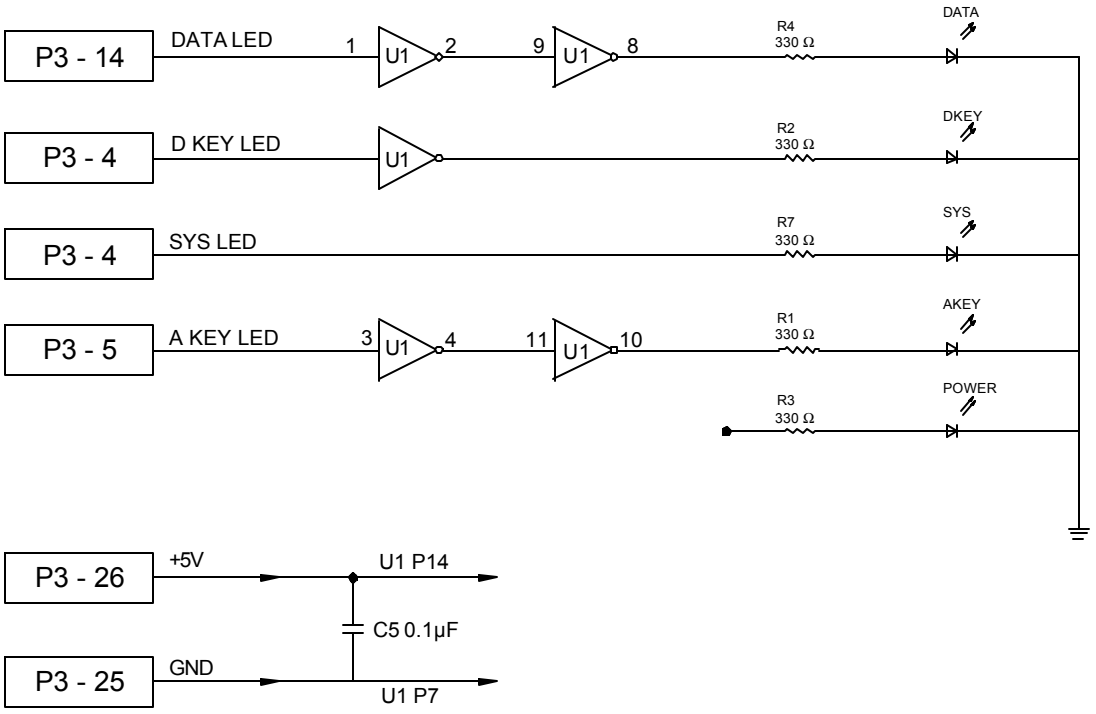


FIGURE 7-B – DISPLAY BOARD LAYOUT

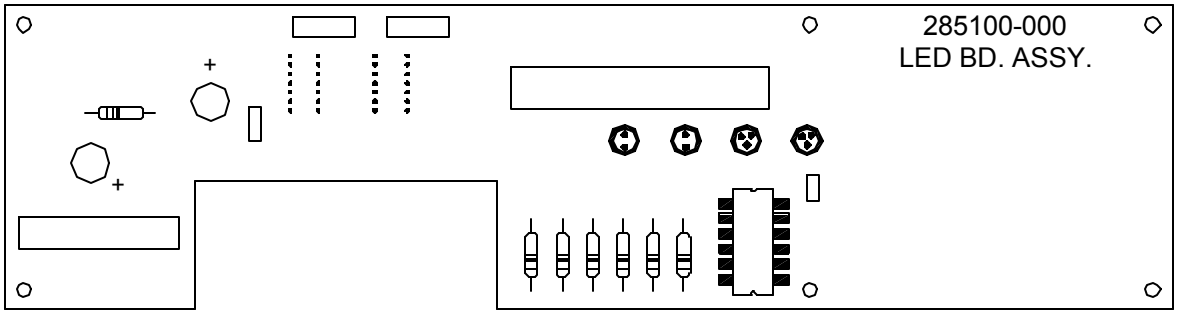
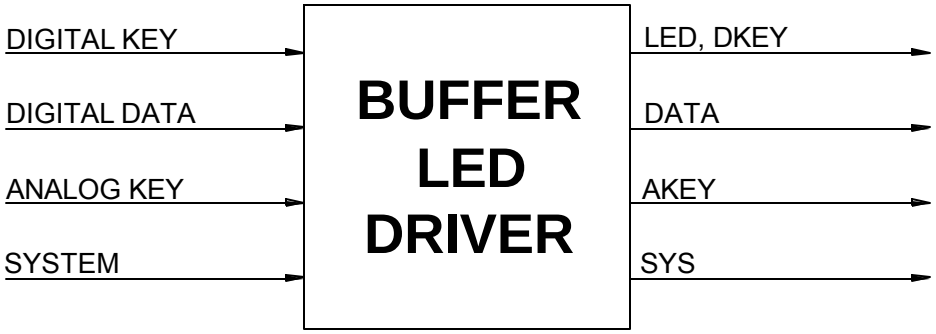
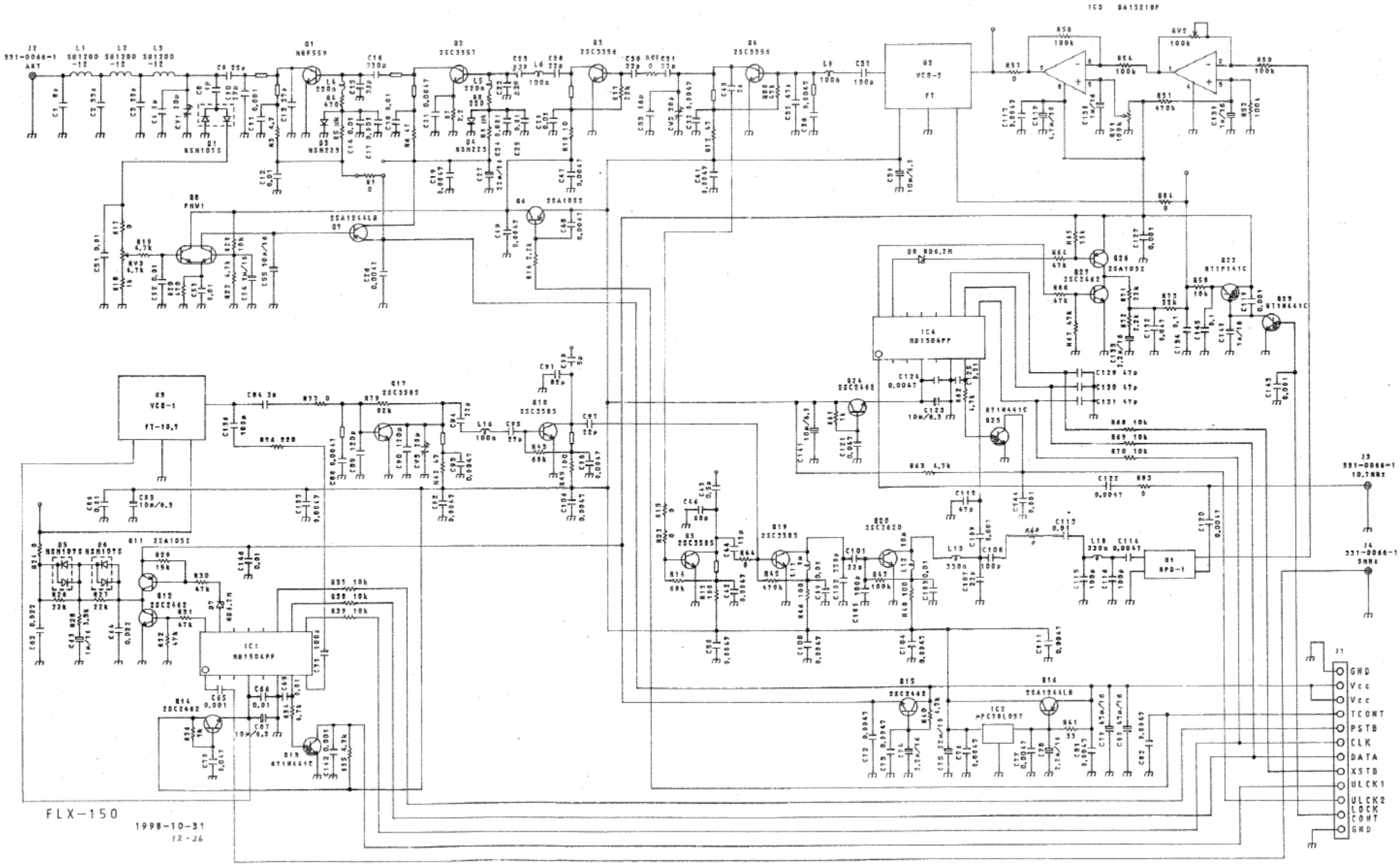


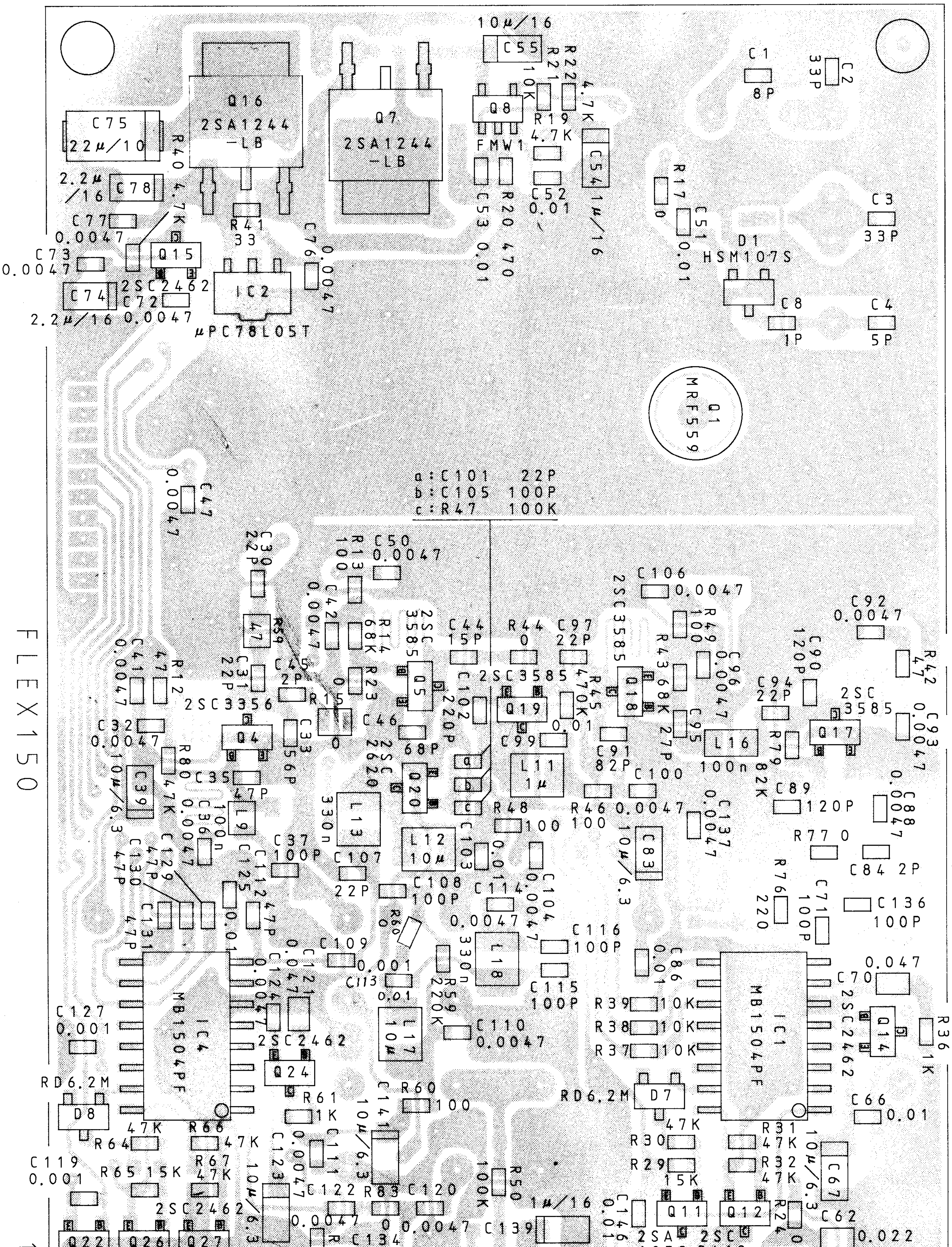
FIGURE 7-C – DISPLAY BOARD BILL OF MATERIALS

Bill Number	Description		
Item Number	**Description**	**U of M**	**Qty**
100105-019	Cap, 100uF, 16V, Tantalum Radial, 10%	EACH	2
100105-527	Cap, 0.1uF, 50V, Ceramic, Radial 10%	EACH	4
100110-009	Res, 330 Ohm, 1/4W, CF, 5%	EACH	7
100120-201	LED, Yellow, Diffused, T 1 3/4	EACH	2
100120-202	LED, Green Diffused	EACH	3
100130-501	Header, Double Row, 10-Pin, Male	EACH	2
100131-003	IC Socket, 14 Pin, DIP	EACH	1
100155-311	IC, Inverter, Hex, Schmitt Trigger, CMOS	EACH	1
185800-000	PCB, X Page, LED, Old	EACH	1

FIGURE 7-D – DISPLAY BOARD BLOCK DIAGRAM




IC3 BA15218F
J2 331-0066-1 ANT
L1 SU1200 -12
L2 SU1200 -12
L3 SU1200 -12
Q1 NHF559
Q2 2SC3357
Q3 2SC3356
Q4 2SC3356
L9 100n
C51 100p
U2 VCO-2 FT
R56 100k
RV2 100k
R54 100k
R50 100k
R57 0
R51 470k
RV1 100k
C117 0.0047
C118 4.7u/10
C131 1u/16
C132 1u/16
R52 100k
D1 NSH107S
D3 NSH223
D4 NSH223
Q8 FHV1
Q7 2SA1244LB
Q6 2SA1052
R84 0
U3 VCO-1 FT-10.7
Q17 2SC3585
Q18 2SC3585
L16 100n
R54 220
C84 2p
C134 100p
C83 10u/6.3
C137 0.0047
C92 0.0047
C104 0.0047
C91 82p
C98 5p
C97 22p
C94 22p
C95 27p
R63 68k
R49 100
C96 0.0047
C93 0.0047
R42 4.7k
C90 120p
C89 120p
C88 0.0047
C86 0.01
C87 0.01
R79 82k
R77 0
C124 0.0047
C123 10u/6.3
C125 0.01
R62 4.7k
C121 0.0047
C141 10u/6.3
R61 1k
Q24 2SC2462
IC4 HB1506FF
Q26 2SA1052
Q27 2SC2462
Q22 RT1P141C
Q23 RT1N441C
Q25 RT1N441C
D8 RD6.2M
R64 47k
R65 15k
R66 47k
R67 47k
R71 22k
R72 22k
R58 10k
R59 10k
R70 10k
R69 10k
R68 10k
C127 0.001
C128 2.2u/16
C132 0.047
C134 0.1
C135 0.1
C136 1u/16
C119 0.001
C143 0.001
C129 47p
C130 47p
C131 47p
R83 0
C122 0.0047
C144 0.001
C115 47p
C113 0.01
C120 0.0047
C109 0.001
C108 100p
C107 22p
L13 330n
L18 330n
C114 0.0047
C116 100p
C115 100p
U1 RPD-1
J3 331-0066-1 10.7MHz
J4 331-0066-1 5MHz
R15 0
R23 0
C46 68p
C43 0.5p
Q5 2SC3585
R14 68k
R13 100
C42 0.0047
R44 100
R45 470k
C44 15p
Q19 2SC3585
Q20 2SC2620
C101 22p
C102 220p
C105 100p
R47 100k
L12 15n
R48 100
C103 0.01
C100 0.0047
C104 0.0047
C111 0.0047
C50 0.0047
D5 NSH107S
D6 NSH107S
R24 0
R26 22k
R27 22k
R28 3.9k
C43 1u/16
C45 0.022
C42 0.022
R29 15k
R30 47k
R31 47k
R32 47k
Q12 2SC2462
Q11 2SA1052
C146 0.01
D7 RD4.2M
R51 10k
R38 10k
R39 10k
C99 100p
IC1 HB1504FF
C65 0.001
C66 0.01
C69 0.01
C67 10u/6.3
R34 4.7k
Q14 2SC2462
R36 1k
C70 0.0047
Q13 RT1N441C
C142 0.001
R35 4.7k
Q15 2SC2462
Q16 2SA1244LB
R40 4.7k
IC2 MPC581057
R41 33
C72 0.0047
C73 0.0047
C74 2.2u/16
C75 22u/16
C76 0.0047
C77 0.0047
C78 2.2u/16
C79 47u/16
C80 47u/16
C81 0.0047
C82 0.0047
J1
GND
Vcc
Vcc
TCONT
PSTB
CLK
DATA
XSTB
ULCK1
ULCK2
LOCK
CONT
GND
FLX-150
1998-10-31
12-26



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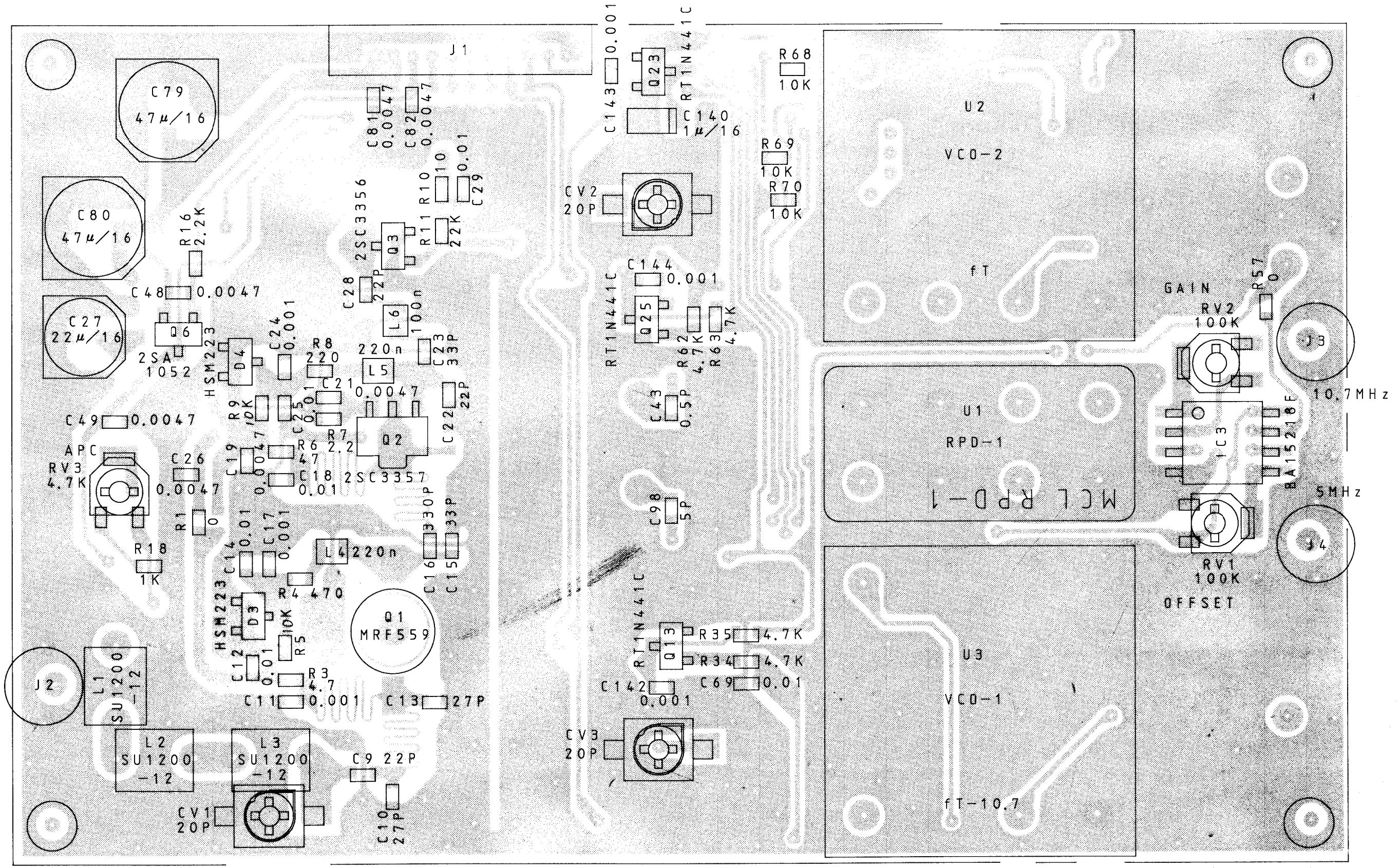
12-26



FLEX150

1998-10-31