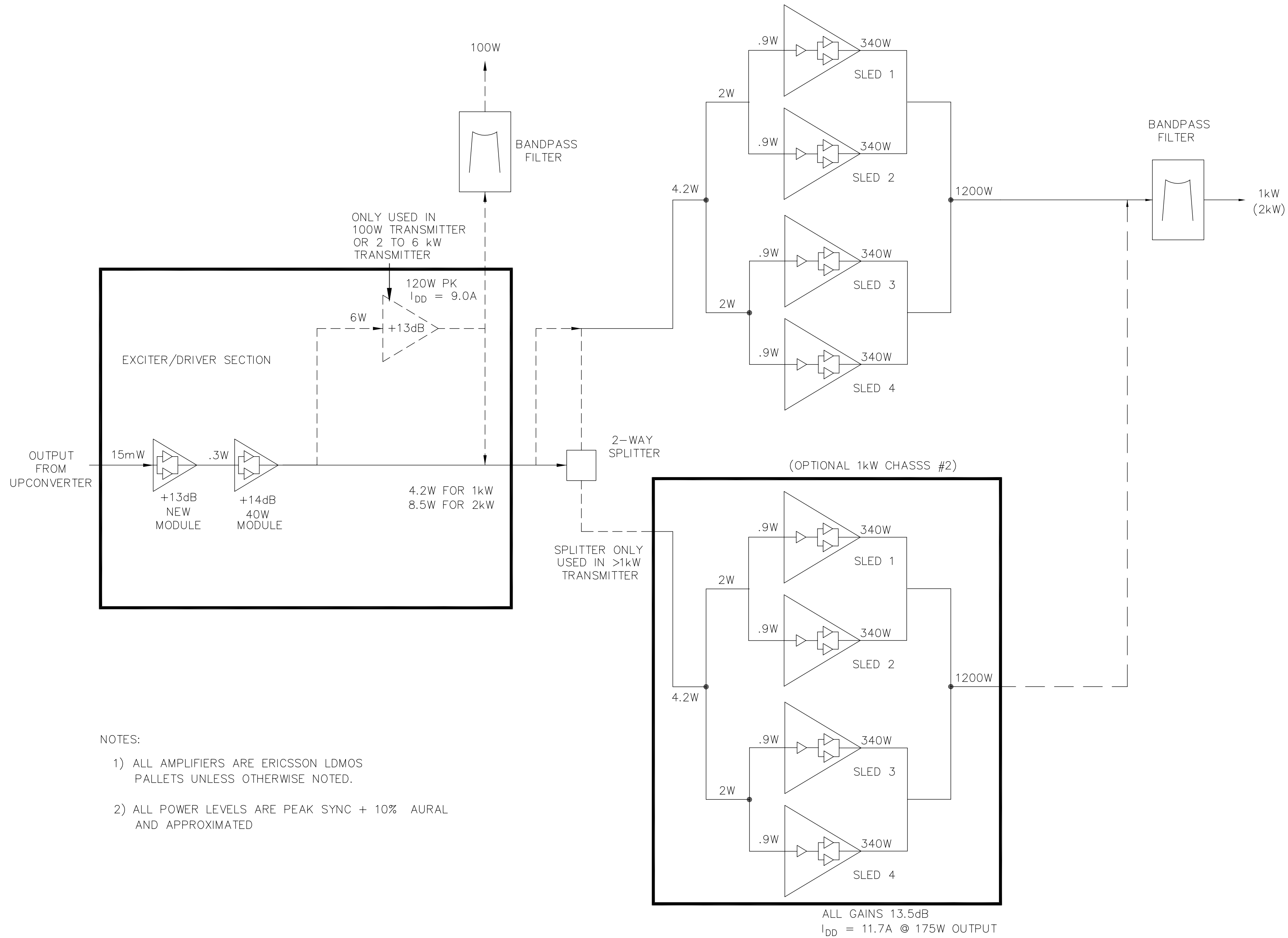


# LX SERIES AMPLIFIER LINE UP

CHASSIS #1 FOR 1kW  
EACH SLED CONTAINS (2) LDMOS PALLETS & (1) NEW MODULE.

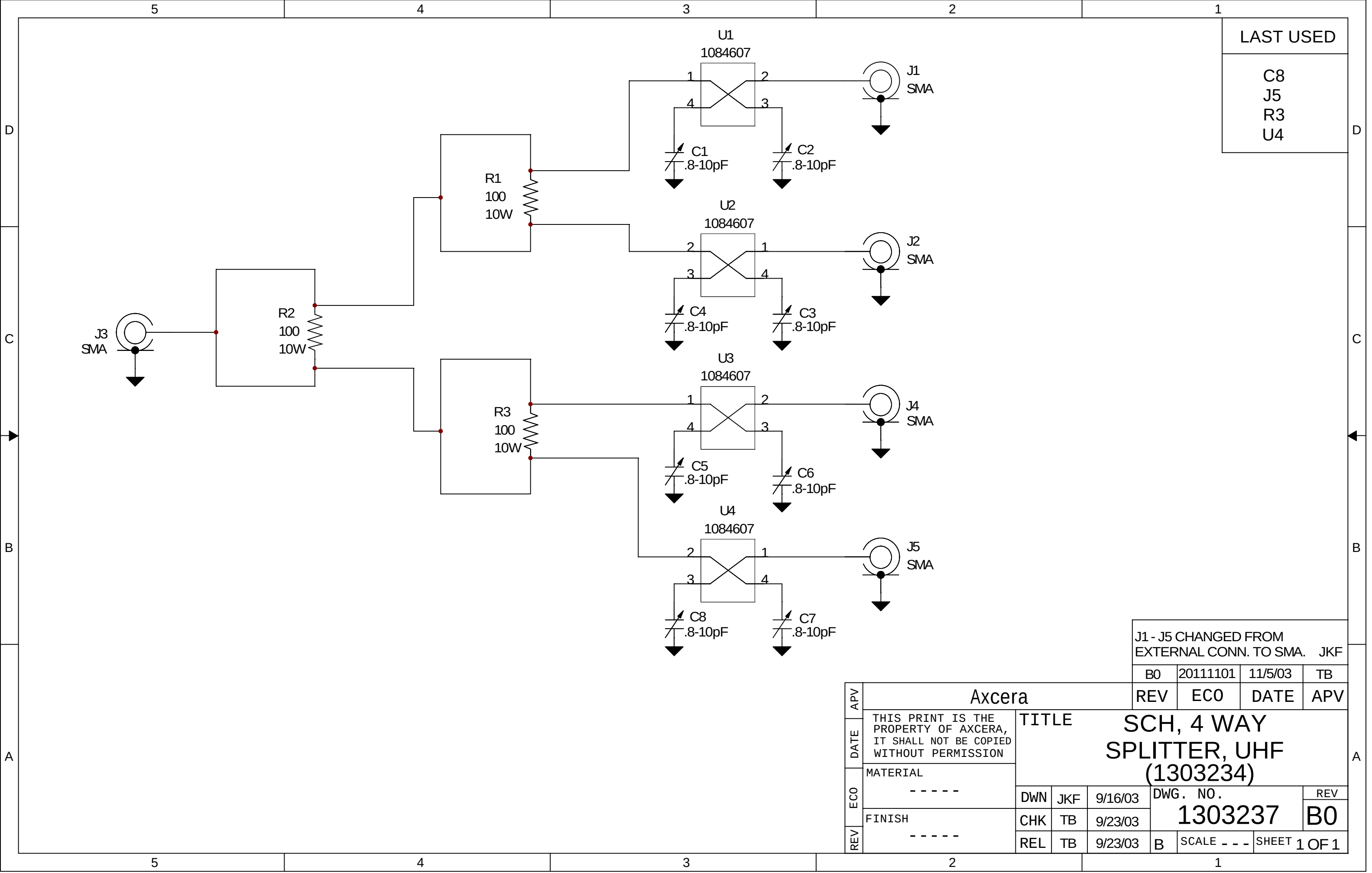


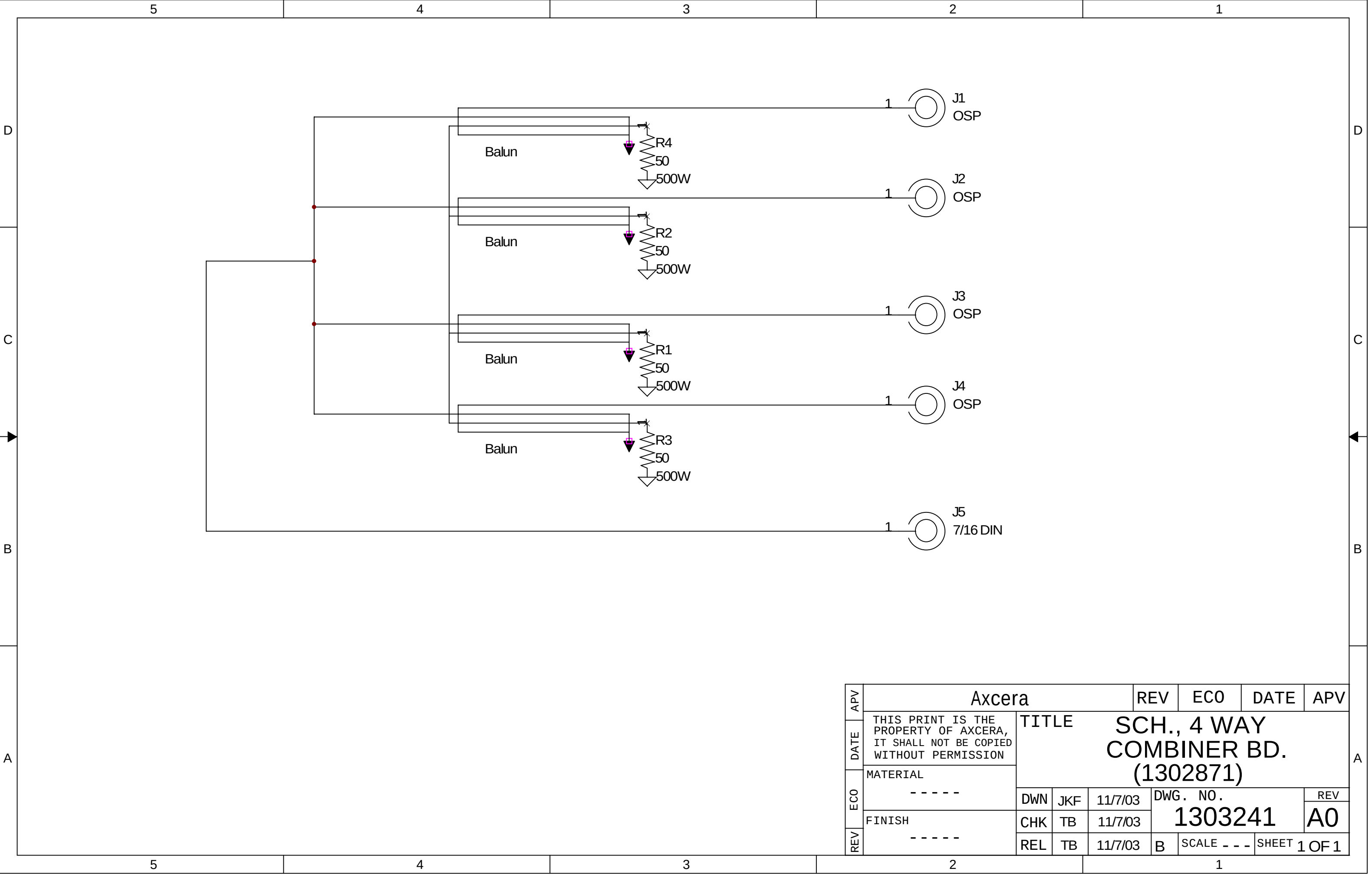
## NOTES:

- 1) ALL AMPLIFIERS ARE ERICSSON LDMOS PALLETS UNLESS OTHERWISE NOTED.
- 2) ALL POWER LEVELS ARE PEAK SYNC + 10% AURAL AND APPROXIMATED

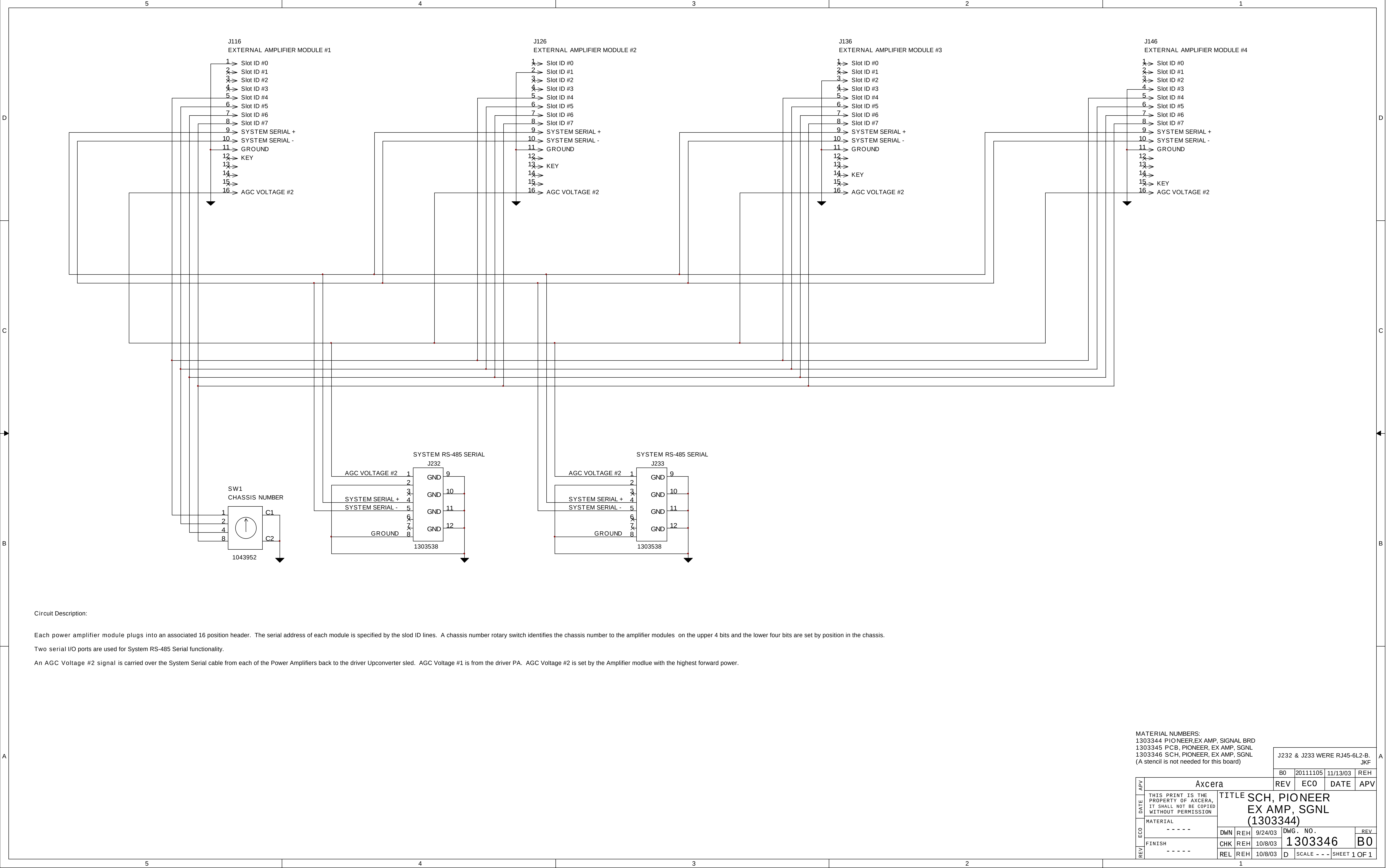


|                                                                                  |  |                                            |  |       |     |        |          |
|----------------------------------------------------------------------------------|--|--------------------------------------------|--|-------|-----|--------|----------|
| THIS PRINT IS THE PROPERTY OF AXCERA. IT SHALL NOT BE COPIED WITHOUT PERMISSION. |  | TITLE                                      |  | REV   | ECO | DATE   | APV      |
| MATERIAL                                                                         |  | B/D, LX SERIES AMPLIFIER LINE UP, 1 - 2 KW |  | DWN   | CDD | 1/9/03 | DWG. NO. |
| FINISH                                                                           |  | 1302633                                    |  | CHK   |     |        | REV      |
|                                                                                  |  | 20                                         |  | REL   |     |        | 1 OF 1   |
|                                                                                  |  | SCALE --                                   |  | SHEET |     | 1 OF 1 |          |





|      |                                                                                 |  |  |  |                                             |     |              |     |
|------|---------------------------------------------------------------------------------|--|--|--|---------------------------------------------|-----|--------------|-----|
| APV  | Axcera                                                                          |  |  |  | REV                                         | ECO | DATE         | APV |
| DATE | THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION |  |  |  | TITLE<br>SCH., 4 WAY COMBINER BD. (1302871) |     |              |     |
| ECO  |                                                                                 |  |  |  |                                             |     |              |     |
| REV  | FINISH                                                                          |  |  |  | CHK                                         | TB  | 11/7/03      | REV |
|      | -----                                                                           |  |  |  | REL                                         | TB  | 11/7/03      | B   |
|      |                                                                                 |  |  |  | DWG. NO.                                    |     | 1303241      |     |
|      |                                                                                 |  |  |  | SCALE                                       |     | SHEET 1 OF 1 |     |



Circuit Description:

Each power amplifier module plugs into an associated 16 position header. The serial address of each module is specified by the slot ID lines. A chassis number rotary switch identifies the chassis number to the amplifier modules on the upper 4 bits and the lower four bits are set by position in the chassis.

Two serial I/O ports are used for System RS-485 Serial functionality.

An AGC Voltage #2 signal is carried over the System Serial cable from each of the Power Amplifiers back to the driver Upconverter sled. AGC Voltage #1 is from the driver PA. AGC Voltage #2 is set by the Amplifier module with the highest forward power.

MATERIAL NUMBERS:  
1303344 PIONEER,EX AMP, SIGNAL BRD  
1303345 PCB, PIONEER, EX AMP, SGNL  
1303346 SCH, PIONEER, EX AMP, SGNL  
(A stencil is not needed for this board)

J232 & J233 WERE RJ45-6L2-B.  
JKF

B02011110511/13/03REH

REV

ECO

DATE

APV

APV

DATE

ECO

REV

Axcera

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MATERIAL

FINISH

TITLE

SCH, PIONEER  
EX AMP, SGNL  
(1303344)

DWN

CHK

REL

REV

9/24/03

10/8/03

10/8/03

D

DWG. NO.

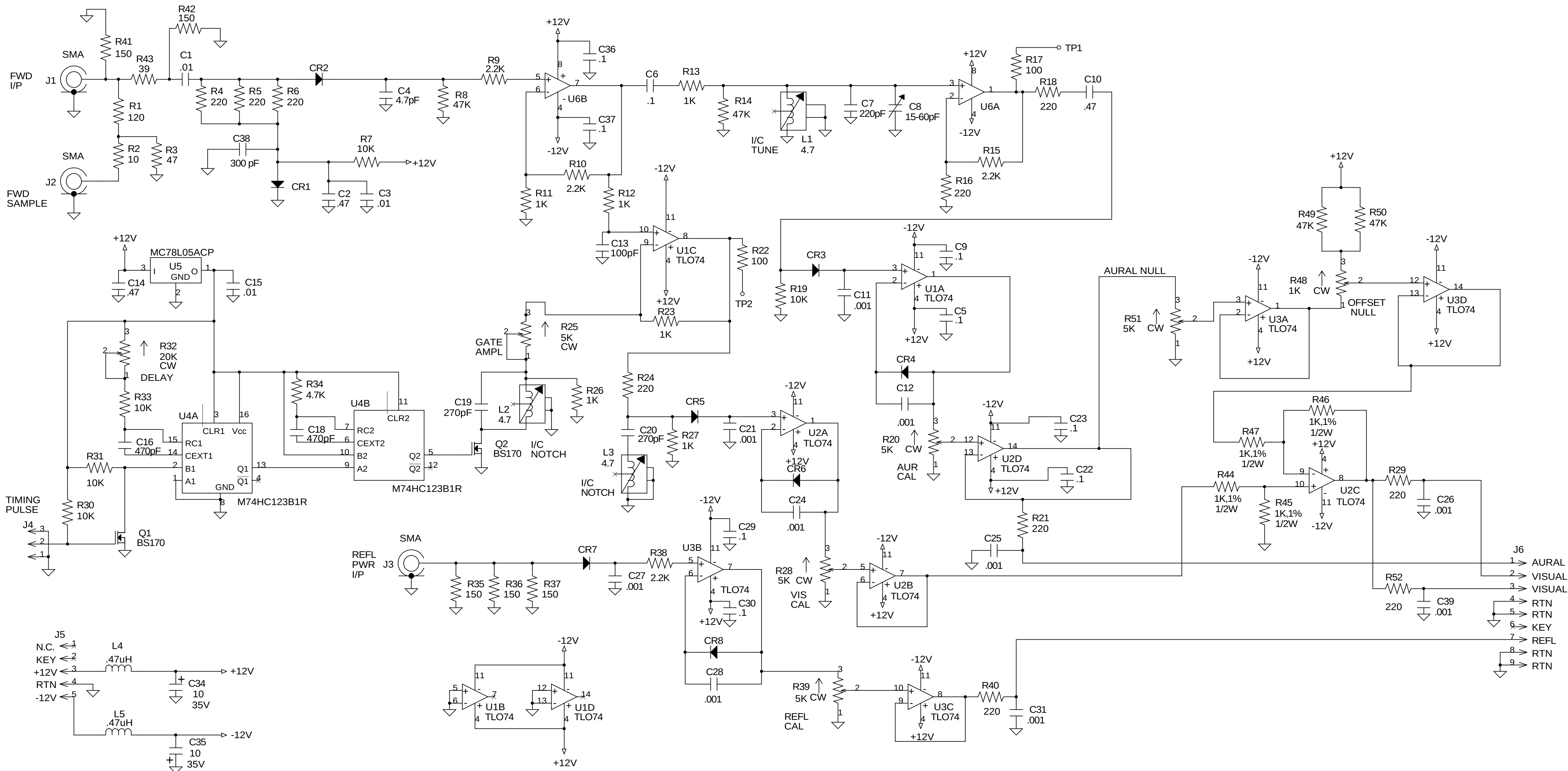
1303346

SCALE - - -

REV

B0

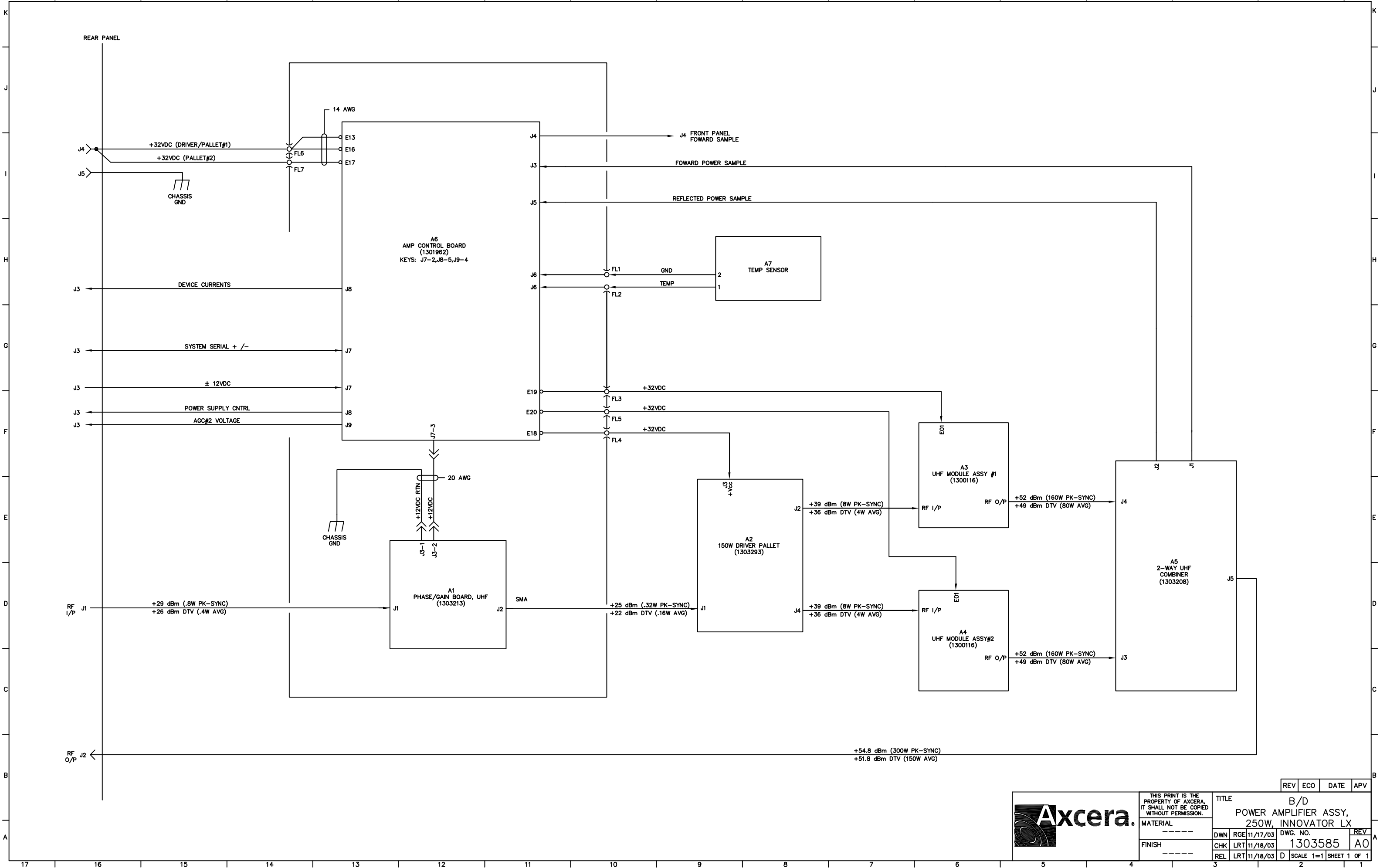
SHEET 1 OF 1



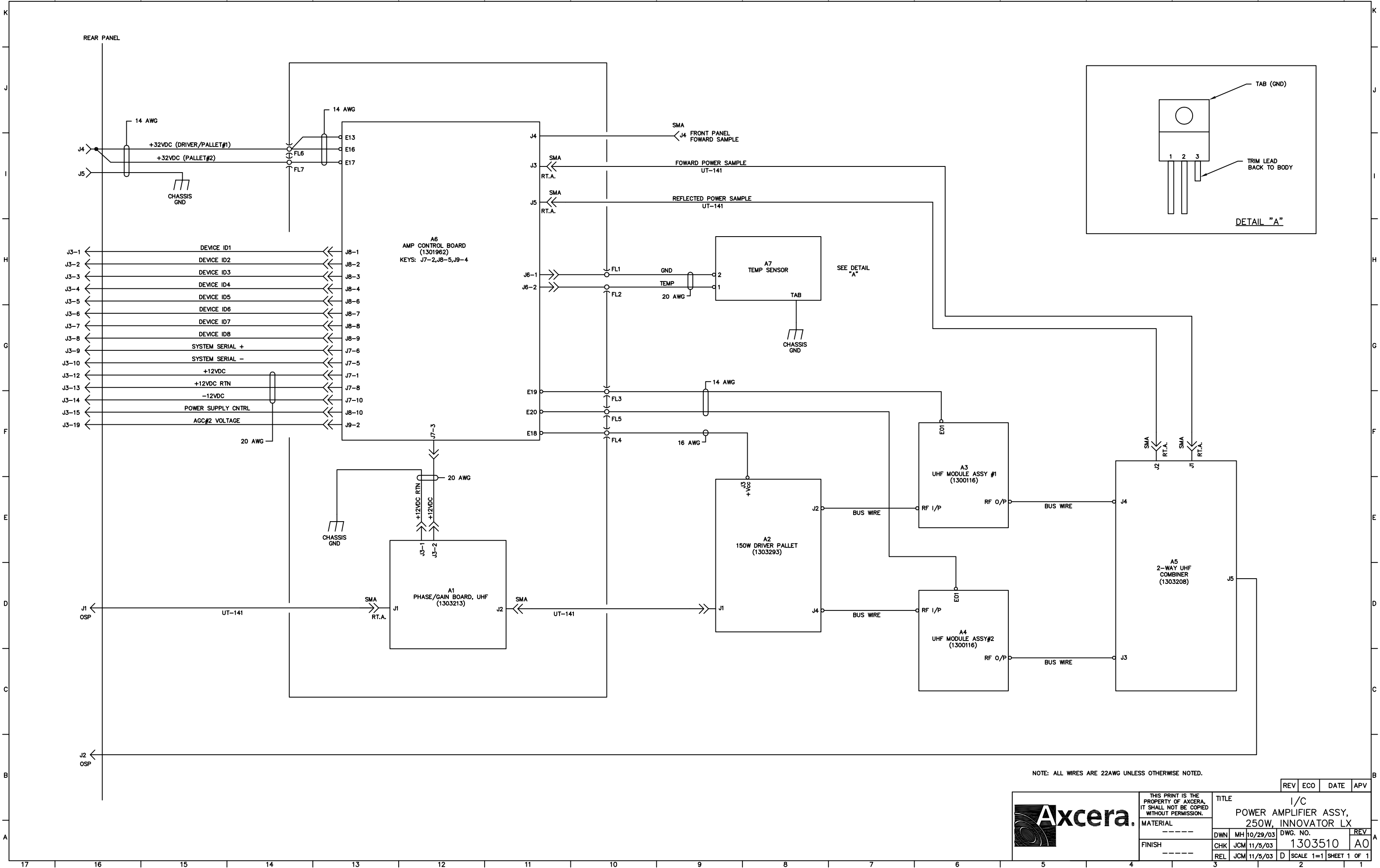
NOTES:  
1) ALL RESISTORS ARE 1/8 WATT UNLESS NOTED OTHERWISE.  
2) ALL CAPACITORS ARE uF UNLESS NOTED OTHERWISE.  
3) ALL INDUCTORS ARE uH UNLESS NOTED OTHERWISE.  
4) ALL DIODES ARE 5082-2811 UNLESS NOTED OTHERWISE.  
5) ALL TRANSISTORS ARE BS170 UNLESS NOTED OTHERWISE.  
6) U6 IS HA50231B OR LT1229CS8.

|                                                                                                                                                               |          |         |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------|-----|
| ADDED R52 AND C39. (PJK)                                                                                                                                      |          |         |     |
| A0                                                                                                                                                            | 20092325 | 5/31/01 | LRT |
| R8 WAS 4.7K. (TMY)                                                                                                                                            |          |         |     |
| 5                                                                                                                                                             | 8470     | 9/30/96 | LRT |
| R7 WAS 100K. (PJK)                                                                                                                                            |          |         |     |
| 4                                                                                                                                                             | 8408     | 9/9/96  | JAG |
| ADDED R41 - R51 & C38. R13 WAS 10K, R19 WAS 2.2K, R7 WAS 10K. CHG'D U1A TO U6B. CHG'D U1D TO U1A. ADDED CIRCUIT TO U2B & U2D. ENLARGED TO "D" SIZE DWG. (TMY) |          |         |     |
| 3                                                                                                                                                             | 8052     | 7/16/96 | JAG |
| C7 WAS 160pF. J6 WAS A 7 PIN CONNECTOR. (PJK)                                                                                                                 |          |         |     |
| 2                                                                                                                                                             | 8026     | 4/2/96  | LRT |
| ADDED U6, C36, C37. ADDED NOTE #6. U5 WAS M78L05ACN. L5 WAS CONNECTED TO J5-1. U6A WAS U1A. 1A WAS U1B. U2A WAS U2A. U2A WAS U2B. U2B WAS U3D. (PJK)          |          |         |     |
| 1                                                                                                                                                             | 7999     | 3/4/96  | LRT |

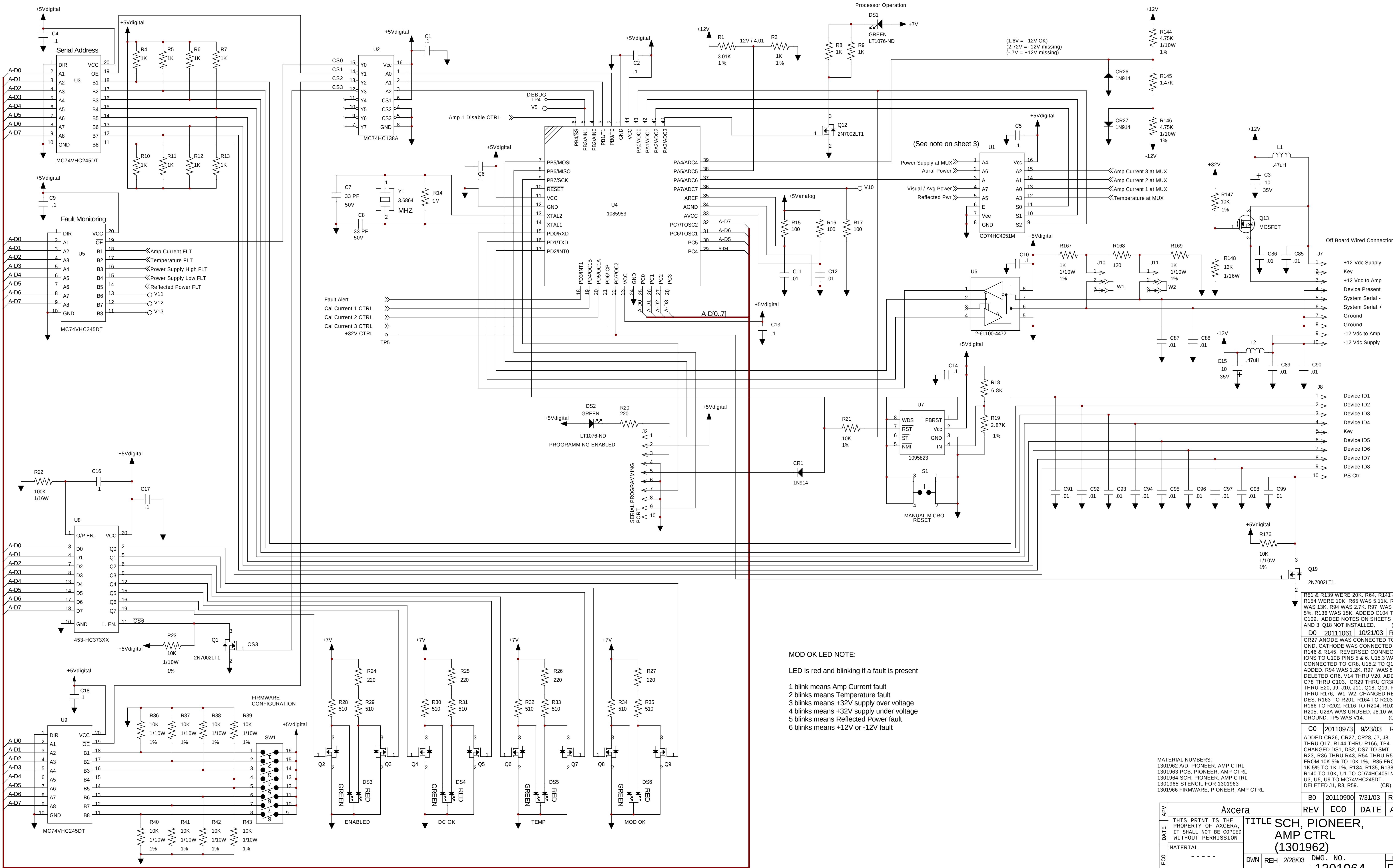
|      |                                                                              |  |  |                                                                                        |       |          |              |
|------|------------------------------------------------------------------------------|--|--|----------------------------------------------------------------------------------------|-------|----------|--------------|
| APV  | ADC Telecommunications                                                       |  |  | REV                                                                                    | ECO   | DATE     | APV          |
| DATE | THIS PRINT IS THE PROPERTY OF ADC, IT SHALL NOT BE COPIED WITHOUT PERMISSION |  |  | TITLE <b>91-00-00-50AC-61</b><br><b>SCH., VIS/AURAL MTRNG BD</b><br><b>(1265-1309)</b> |       |          |              |
| ECO  | MATERIAL                                                                     |  |  | DWN                                                                                    | PJK   | 12/21/95 | DWG. NO.     |
| REV  | FINISH                                                                       |  |  | CHK                                                                                    | DWB   | 1/3/96   | 1265-3309    |
|      |                                                                              |  |  | REL                                                                                    | DWB   | 1/3/96   | D            |
|      |                                                                              |  |  |                                                                                        | SCALE | - - -    | SHEET 1 OF 1 |



|                                                                                  |  |  |  |                                                             |          |            |          |
|----------------------------------------------------------------------------------|--|--|--|-------------------------------------------------------------|----------|------------|----------|
| THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION. |  |  |  | TITLE<br>B/D<br>POWER AMPLIFIER ASSY,<br>250W, INNOVATOR LX |          |            |          |
| MATERIAL<br>-----                                                                |  |  |  | DWG. NO.<br>1303585                                         |          | REV<br>A0  |          |
| FINISH<br>-----                                                                  |  |  |  | CHK<br>LRT                                                  | 11/18/03 | REL<br>LRT | 11/18/03 |
|                                                                                  |  |  |  | SCALE 1=1 SHEET 1 OF 1                                      |          |            |          |



|                                                                                  |  |  |  |                                              |             |          |                        |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------|-------------|----------|------------------------|
| THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION. |  |  |  | TITLE                                        |             |          |                        |
| MATERIAL                                                                         |  |  |  | I/C POWER AMPLIFIER ASSY, 250W, INNOVATOR LX |             |          |                        |
| FINISH                                                                           |  |  |  | DWN                                          | MH 10/29/03 | DWG. NO. | REV                    |
|                                                                                  |  |  |  | CHK                                          | JCM 11/5/03 | 1303510  | A0                     |
|                                                                                  |  |  |  | REL                                          | JCM 11/5/03 | D        | SCALE 1=1 SHEET 1 OF 1 |



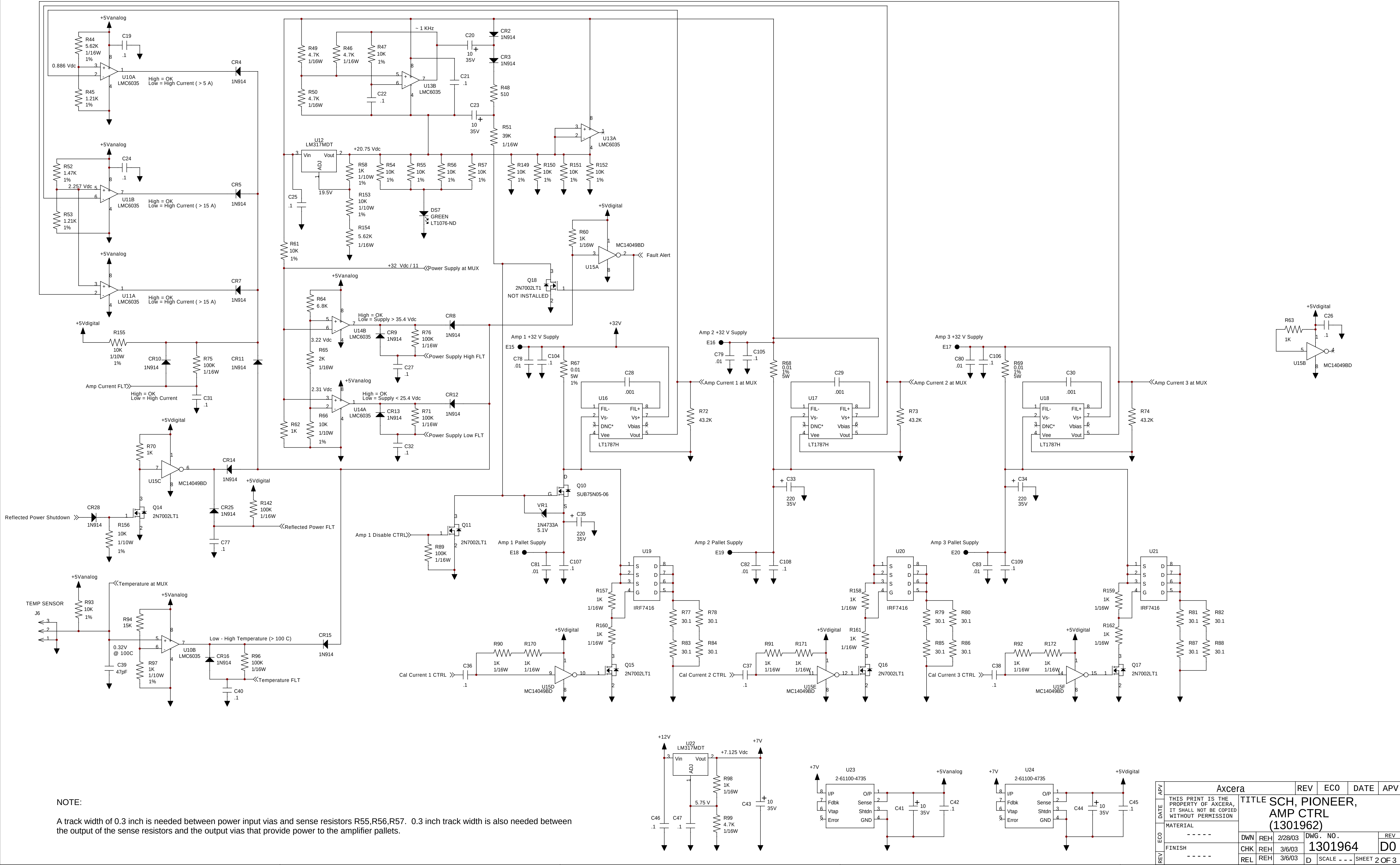
MOD OK LED NOTE:

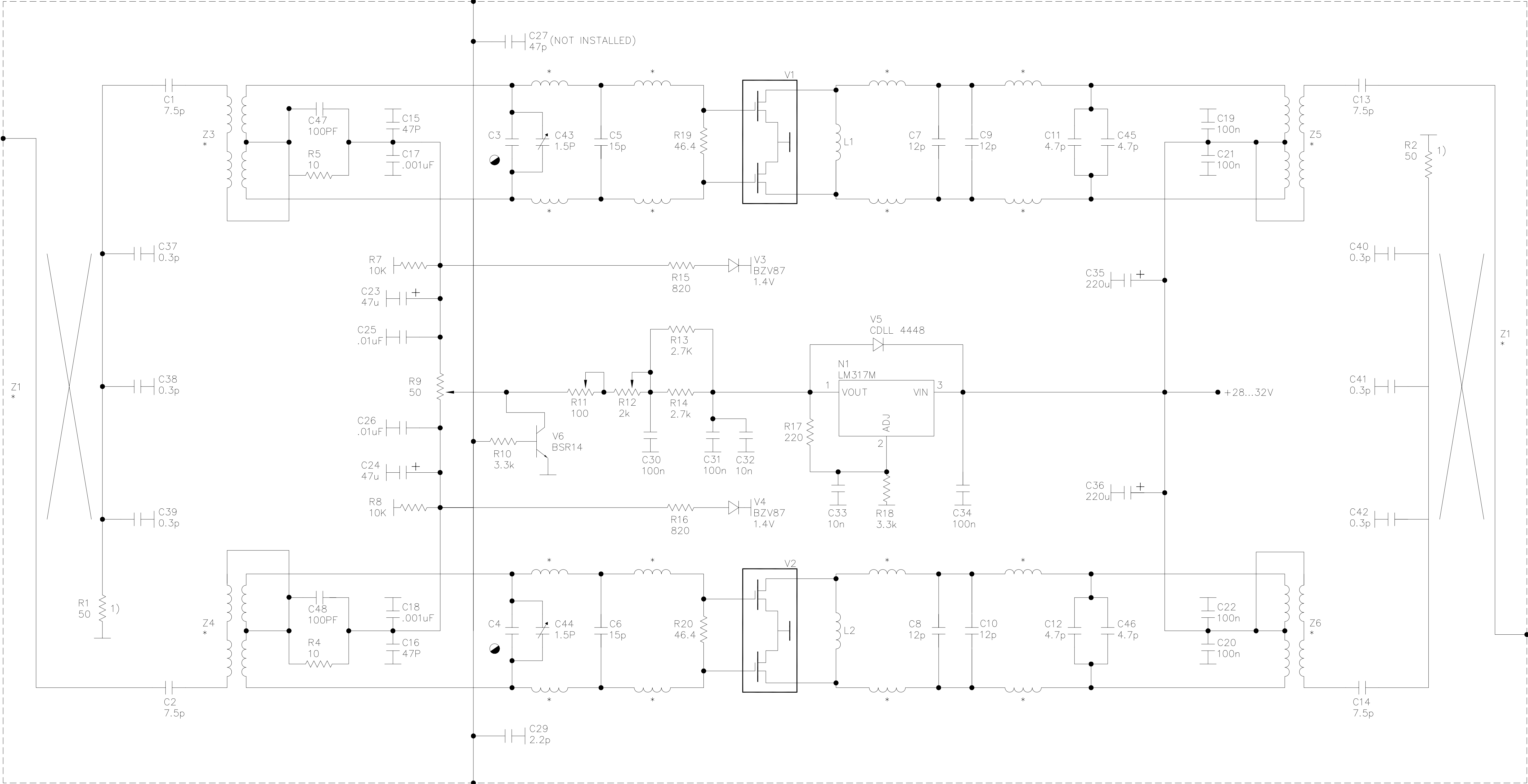
- LED is red and blinking if a fault is present
- 1 blink means Amp Current fault
  - 2 blinks means Temperature fault
  - 3 blinks means +32V supply over voltage
  - 4 blinks means +32V supply under voltage
  - 5 blinks means Reflected Power fault
  - 6 blinks means +12V or -12V fault

MATERIAL NUMBERS:  
1301962 A/D, PIONEER, AMP CTRL  
1301963 PCB, PIONEER, AMP CTRL  
1301964 SCH, PIONEER, AMP CTRL  
1301965 STENCIL FOR 1301963  
1301966 FIRMWARE, PIONEER, AMP CTRL

| APV  | Axcera                                                                          |  |  | REV | ECO | DATE | APV |
|------|---------------------------------------------------------------------------------|--|--|-----|-----|------|-----|
| DATE | THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION |  |  |     |     |      |     |
| ECO  | MATERIAL                                                                        |  |  |     |     |      |     |
| REV  | FINISH                                                                          |  |  |     |     |      |     |

|                                        |     |         |  |                            |  |     |
|----------------------------------------|-----|---------|--|----------------------------|--|-----|
| TITLE SCH, PIONEER, AMP CTRL (1301962) |     |         |  | DWG. NO.                   |  | REV |
| DWN                                    | REH | 2/28/03 |  | 1301964                    |  | D0  |
| CHK                                    | REH | 3/6/03  |  |                            |  |     |
| REL                                    | REH | 3/6/03  |  | D SCALE - - - SHEET 1 OF 3 |  |     |





\* PRINTED COMPONENT

◐ FACTORY SET VALUE

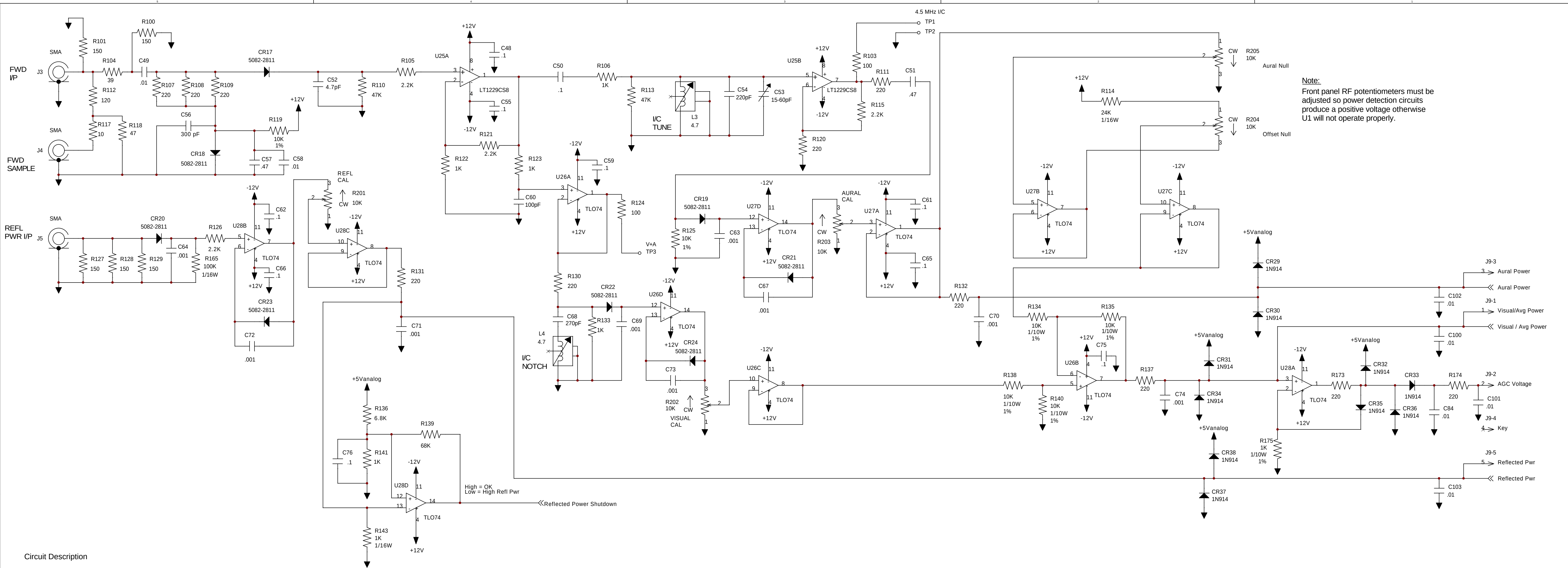
PC BOARD LAYOUT SEE  
51-5379-309-00 (2)

|                                                                    |          |          |     |
|--------------------------------------------------------------------|----------|----------|-----|
| DELETED PTF10159 P/N<br>FROM LDMOS. ADDED<br>C23,C24 & C27. CDD/CR |          |          |     |
| CO                                                                 | 20110221 | 5/17/02  | RE  |
| R15 AND R16 WERE 680<br>OHMS. PWN                                  |          |          |     |
| BO                                                                 | 20100316 | 04/02/02 | LRT |
| REV                                                                | ECO      | DATE     | APV |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----|
| CHANGE R3 FROM<br>A 22 OHM<br>RESISTOR TO C47,<br>SM, CAP, 100PF,<br>500WDC. FROM<br>CHANGE R6 FROM<br>A 22 OHM<br>RESISTOR TO C48,<br>SM, CAP, 100PF,<br>500WDC. FROM<br>CHANGE R4 FROM<br>A 22 OHM<br>RESISTOR TO<br>15906003SMT SM,,<br>RES, 10 OHM 5%<br>1/8W<br>CHANGE R5 FROM<br>A 22 OHM<br>RESISTOR TO<br>15906003SMT SM,,<br>RES, 10 OHM 5%<br>1/8W<br>CHANGE C17 FROM<br>A 47PF CAP<br>FIXED CERAMIC, 47<br>PF TO<br>15906160SMT SM,,<br>CAP, .001 UF, 50<br>WVDC<br>CHANGE C18 FROM<br>A 47PF CAP<br>FIXED CERAMIC, 47<br>PF TO<br>15906160SMT SM,,<br>CAP, .001 UF, 50<br>WVDC<br>ADD C23<br>1301246, SM, CAP,<br>47MF, 50V, LOW<br>ESR<br>ADD C24<br>1301246, SM, CAP,<br>47MF, 50V, LOW<br>ESR<br>ADD C25<br>15906161SMT SM,,<br>CAP, .01 UF, 50<br>WVDC<br>ADD C26<br>15906161SMT SM,,<br>CAP, .01 UF, 50<br>WVDC<br>PWN | DO 20100409/18/02 | RJ |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----|



|                                                                                            |  |                                |  |
|--------------------------------------------------------------------------------------------|--|--------------------------------|--|
| THIS PRINT IS THE<br>PROPERTY OF AXCIERA,<br>IT SHALL NOT BE COPIED<br>WITHOUT PERMISSION. |  | TITLE<br>AMPLIFIER MODULE      |  |
| MATERIAL                                                                                   |  | DWN PWN04/01/02                |  |
| FINISH                                                                                     |  | CHK LRT04/03/02                |  |
| REL LRT04/03/02                                                                            |  | DWG. NO.<br>51-5379-309-00 WSP |  |
|                                                                                            |  | REV<br>DO                      |  |
|                                                                                            |  | SCALE<br>SHEET 1 OF 1          |  |



Circuit Description

Page 1:  
Upper center of page one is U4 which is the controller. This in-circuit Atmel microcontroller is operated at 3.6864 MHz. Programming of this device is performed through J2. U4 selects the desired analog channel of U1 through the settings of PA0 - PA3. PA4 of U4 is a processor operating LED that can be flashed to show continued operation. The outputs of Port A must be set and not changed during an analog input read of channels PA5 - PA7. PA5 is used to monitor the +12 Vdc supply to the board. PA6 is the selected channel of analog switch U1. PA7 is connected to a via for future access.

U6 is our standard serial to RS-485 driver IC. U7 is a watchdog IC used to hold the microcontroller in reset if the supply voltage is less than 4.21 Vdc; (1.25 Vdc < Pin 4 (IN) < Pin 2 (Vcc)). U7 momentarily resets the microcontroller if Pin 6 (IST) is not clocked every second. A manual reset switch is provided but should not be needed.

Upper right corner U3 is used to determine where the amplifier control board is located. The eight inputs come from the main amp connector and are used to set the SCADA address of the controller. Pull-up resistors set a default condition of logic high.

U5 below U3 is used for getting digital input information of the board. Page two has several monitoring circuits that provide information on the amplifier's status. Many of these circuits automatically shut down the amplifier if a specific fault occurs.

U8 below U5 is used to control four board mounted status LEDs. A FET is turned on to shut current away from the LED to turn it off. U9 below U8 is used to enable different features within software. Actual use is TBD.

Page 2:  
  
In the lower right corner are voltage regulator circuits. U22 should allow for 0.14 amps of power using its 92 C/W rating if Ta = 60C max and Tj = 125C max. 0.26 amps can be obtained from U22 if the mounting pad is 0.5 sq. inches. The controller will not need this much current.  
  
U23 and U24 are low drop-out voltage regulators with a tolerance greater than or equal to 1%. 100 mA is available from each device but again the controller will not need this much current.

In the upper left section are circuits with U12 and U13. U12 is used to generate a regulated voltage that is about 5 Volts less than the +32 Volt supply. When the +32 Volt supply is enabled, the circuitry around U13B is used to provide gate voltage to Q10 that is 5 volts greater than the source pin of this FET. The gate of Q10 can be turned off by any one of a few different circuits.

U10A is used to turn off the gate of Q10 in the event of high current in amplifier #1. At 0.886 Vdc, the current to amplifier #1 should be about 5.12 Amps. U11 is used to turn off the FET if high current is detected in amplifier #2 or #3. With 2.26 Vdc at pin 5 and pin 3 of U11, the voltage output of current sense amplifier U17 or U18 at high current shut down should be about 13.1 Amps.

U14B is used to turn off the gate of Q10 in the event of high power supply voltage. U14A is used to keep the FET disabled if the power supply voltage is less than 26 volts.

U28D on page 3 is used to turn off the gate of Q10 in the event of high reflected power. U10B turn off the gate of Q1 if the power supply temperature gets too hot.

Current Monitoring Sections - A 0.01 ohm 1% 5 Watt thru-hole resistor is used for monitoring the current through several sections of the amplifier. The voltage developed across this resistor is amplified for current monitoring by U16, U17, or U18. The Linear Technology LT1787HVCS8 precision high side current sense amplifier accepts a maximum voltage of 60 Vdc. The 43.2 Kohm resistor from Pin 5 to ground sets the gain of the amplifier to about 17.28. This value is not set with much accuracy since the manufacture internal matches the resistors of this part but their actual resistance value is not closely defined. A trimming resistor is suggested to give a temperature stability of -200ppm/C but instead the microcontroller will determine the exact gain of the circuit and use a correction factor for measurements. Circuit loading components are located in the lower portion of each current monitoring circuit. These components allow for short duration high current loading of the supply. By measuring the current through the sense resistor with and without the additional load, the microcontroller can determine the gain of each circuit. The input to each hex inverter protects the load resistors from prolonged power dissipation. The load resistors are four 30.1 ohm 1% 1206 resistors. For very short duration pulses, a 1206 resistor can handle up to 60 watts. The Atmel processor requires 226 uSec per conversion. A supply voltage of 32 volts will pass 1.06 amps + 1% through the load resistors.

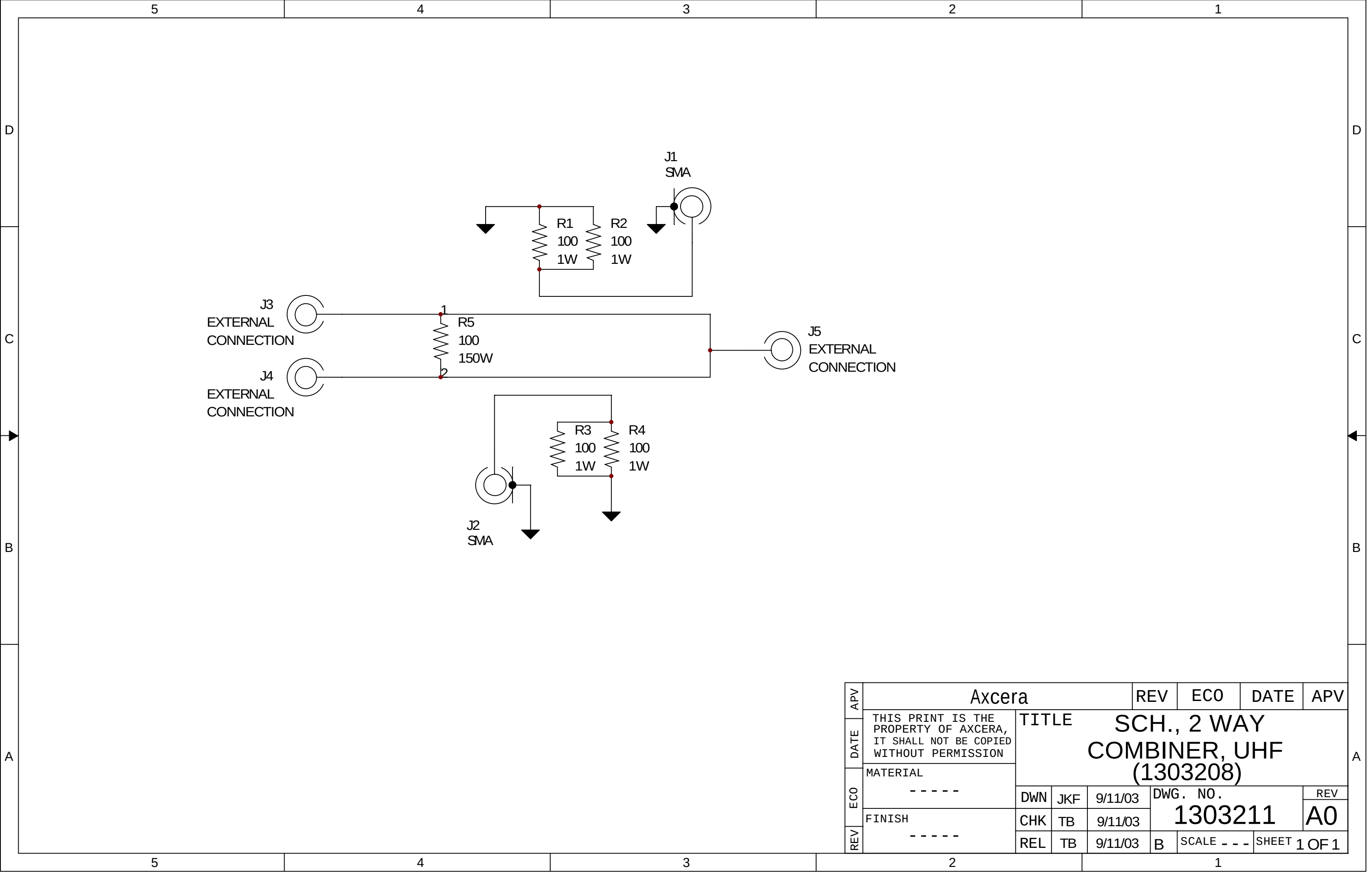
Page 3:  
  
RF power detector circuits. Gain of power measurements will be done through software. Only the Aural Null and Offset Null need to be done through front panel pots.

NOTES:  
1) ALL RESISTORS ARE 1/8 WATT UNLESS NOTED OTHERWISE.  
2) ALL CAPACITORS ARE uF UNLESS NOTED OTHERWISE.  
3) ALL INDUCTORS ARE uH UNLESS NOTED OTHERWISE.

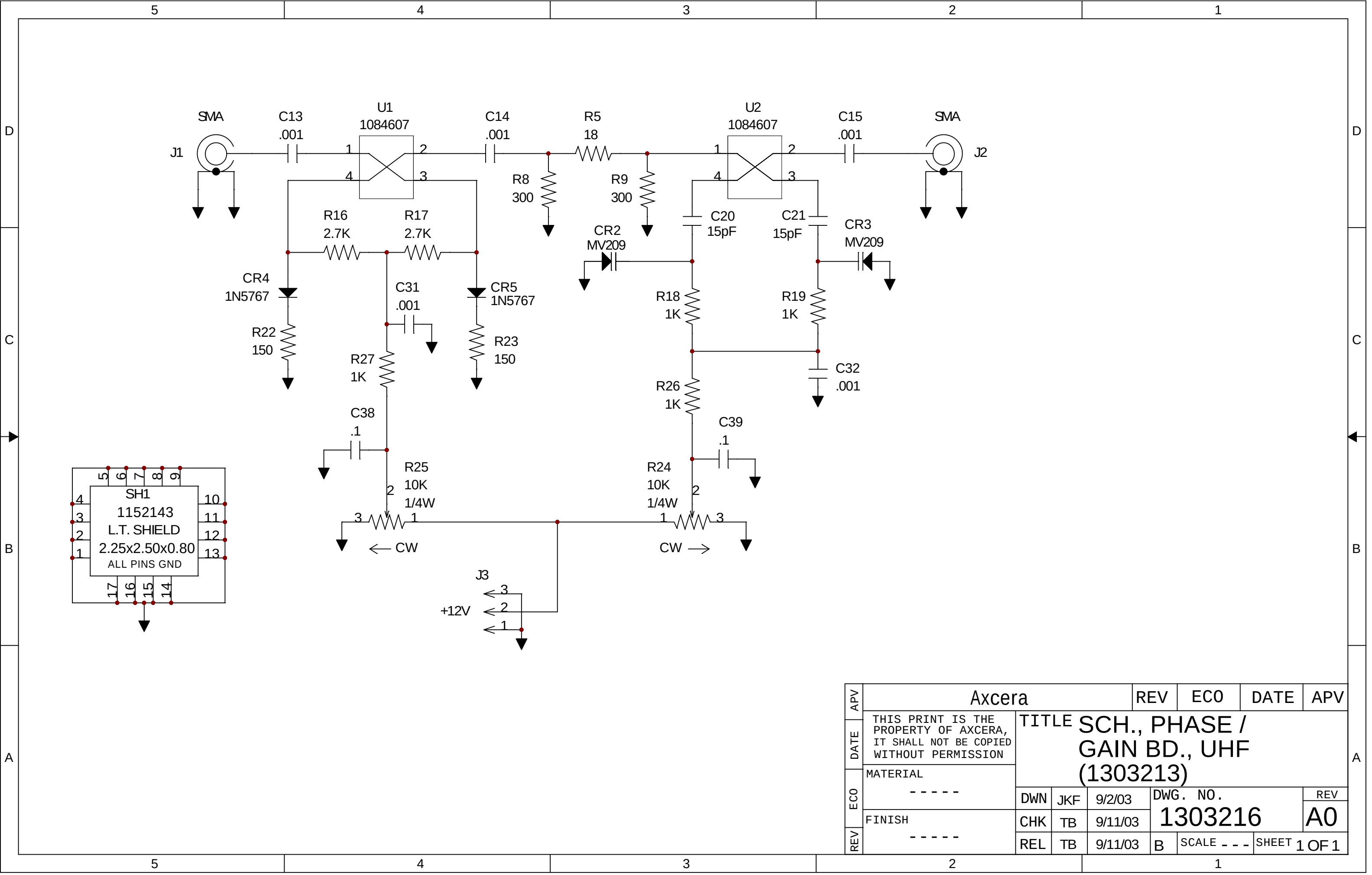
Note:  
Front panel RF potentiometers must be adjusted so power detection circuits produce a positive voltage otherwise U1 will not operate properly.

|      |                                                                                 |  |  |  |                                        |     |         |                          |
|------|---------------------------------------------------------------------------------|--|--|--|----------------------------------------|-----|---------|--------------------------|
| APV  | Axcera                                                                          |  |  |  | REV                                    | ECO | DATE    | APV                      |
| DATE | THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION |  |  |  | TITLE SCH, PIONEER, AMP CTRL (1301962) |     |         |                          |
| ECO  | MATERIAL                                                                        |  |  |  | DWN                                    | REH | 2/28/03 | DWG. NO.                 |
| REV  | FINISH                                                                          |  |  |  | CHK                                    | REH | 3/6/03  | 1301964                  |
|      |                                                                                 |  |  |  | REL                                    | REH | 3/6/03  | D                        |
|      |                                                                                 |  |  |  |                                        |     |         | SCALE - - - SHEET 3 OF 3 |





|      |                                                                                 |  |  |  |                                              |     |                     |              |
|------|---------------------------------------------------------------------------------|--|--|--|----------------------------------------------|-----|---------------------|--------------|
| APV  | Axcera                                                                          |  |  |  | REV                                          | ECO | DATE                | APV          |
| DATE | THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION |  |  |  | TITLE<br>SCH., 2 WAY COMBINER, UHF (1303208) |     |                     |              |
| ECO  |                                                                                 |  |  |  |                                              |     |                     |              |
| REV  | FINISH                                                                          |  |  |  | CHK                                          | TB  | 9/11/03             | REV          |
|      | -----                                                                           |  |  |  | REL                                          | TB  | 9/11/03             | A0           |
|      | -----                                                                           |  |  |  |                                              |     | DWG. NO.<br>1303211 |              |
|      |                                                                                 |  |  |  |                                              |     | SCALE - - -         | SHEET 1 OF 1 |



| APV  | Axcera                                                                          |  |                                             |    |         | REV     | ECO         | DATE         | APV |
|------|---------------------------------------------------------------------------------|--|---------------------------------------------|----|---------|---------|-------------|--------------|-----|
| DATE | THIS PRINT IS THE PROPERTY OF AXCERA, IT SHALL NOT BE COPIED WITHOUT PERMISSION |  | TITLE SCH., PHASE / GAIN BD., UHF (1303213) |    |         |         |             |              |     |
| ECO  |                                                                                 |  |                                             |    |         |         |             |              |     |
|      | - - - - -                                                                       |  |                                             |    |         |         |             |              |     |
| REV  | FINISH                                                                          |  | CHK                                         | TB | 9/11/03 | 1303216 |             | A0           |     |
|      | - - - - -                                                                       |  | REL                                         | TB | 9/11/03 | B       | SCALE - - - | SHEET 1 OF 1 |     |

