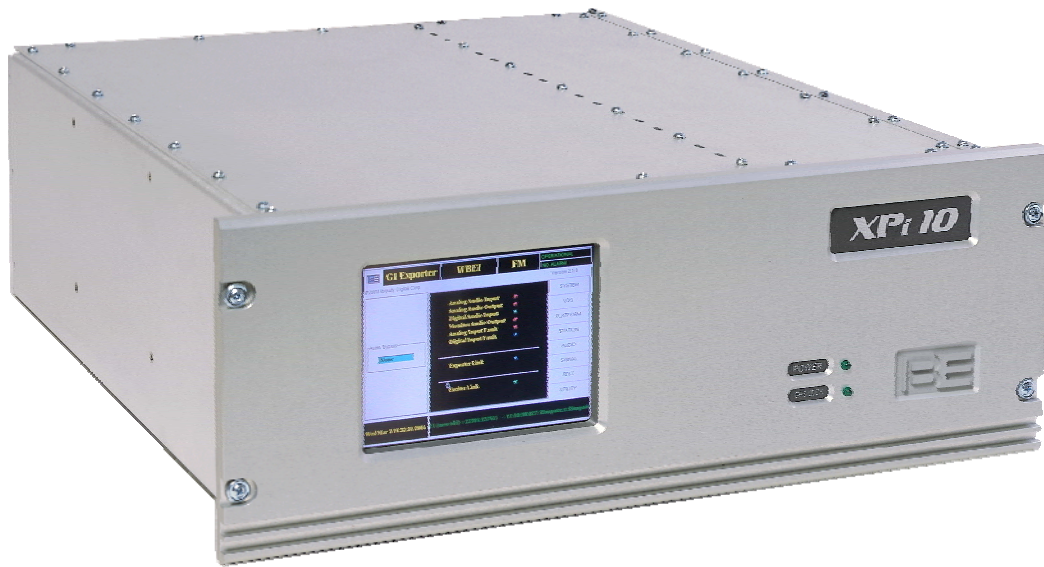




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FSi 10 HD Signal Generator to XPi 10 Exporter Conversion Application Guide Software Version 2.3.3

597-0544 Revision E
06/16/11

FSi 10 HD Signal Generator to XPi 10 Exporter Conversion Application Guide

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1. Upgrading to 2nd Generation HD Radio™ System Architecture

The block diagrams below illustrate 1st Generation HD Radio System Architecture (Figure 1) and 2nd Generation HD Radio System Architecture (Figure 2).

To convert from 1st Generation HD Radio™ System Architecture to 2nd Generation HD Radio™ System Architecture, the FSi 10 HD Signal Generator at the Transmitter Site must be converted to an XPi 10 Exporter and then relocated along with the Audio Processors to the Studio Site. Secondly, the Exgine Card must be installed into the FXi 60/250 HD Exciter at the Transmitter Site.

Note: The XPi 10, once converted, along with the Audio Processors may remain at the Transmitter Site ONLY if the LINK between the IDi 20 Data Importer and the XPi 10 Exporter is BI-DIRECTIONAL.

This document specifically describes the conversion of the FSi 10 to an XPi 10.

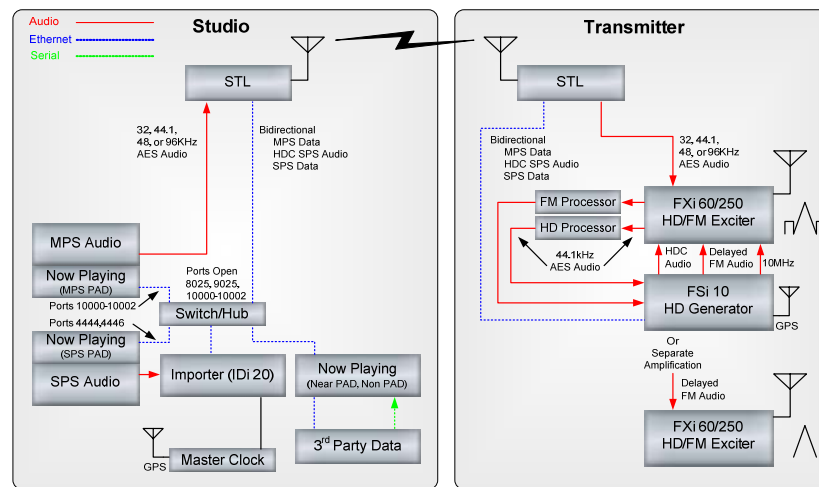


Figure 1 – 1st Generation HD Radio™ System Architecture

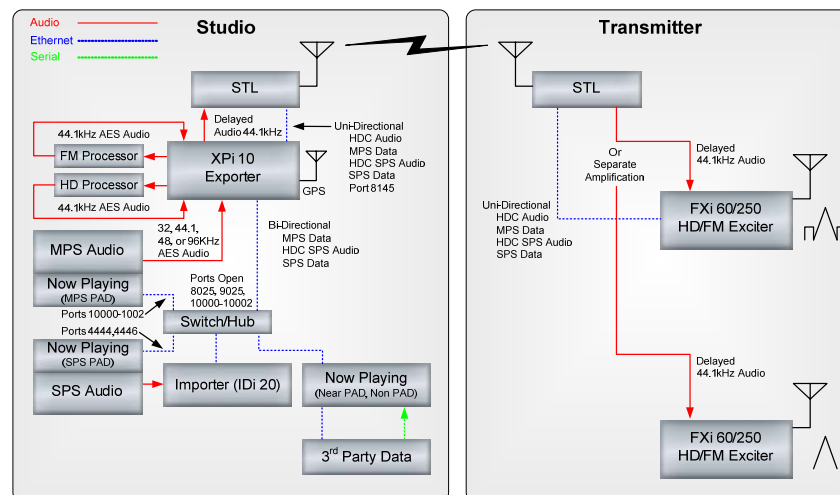


Figure 2 – 2nd Generation HD Radio™ System Architecture

2. Prepare for FSi 10 to XPi 10 Conversion

2.1. Verify Contents of Conversion Kit (909-0604)

- ☐ 597-0544 Manual, FSi 10 to XPi 10 Conversion (this document)
- ☐ 919-0550 Assy, PCB, Sample Rate Converter (SRC)
- ☐ 949-0606 Kit, Cable, FSi 10 to XPi 10 Conversion
 - ☐ 949-0548 Assy, Cable, Power
 - ☐ 949-0607 Assy, Cable, 1 PPS to Motherboard
 - ☐ 949-0608 Assy, Cable, Delayed AES Bypass Jumper
 - ☐ 949-0609 Assy, Cable, Status Output Jumper
- ☐ 549-9004 Kit, Label, FSi 10 to XPi 10 Conversion
 - ☐ 549-9005 Label, FM AES IN
 - ☐ 549-9006 Label, FM DELAYED AES OUT
 - ☐ 549-9007 Label, FM AES OUT
 - ☐ 549-9008 Label, DELAYED AES IN
 - ☐ 549-9009 Label, FM AES OUT TO STL/TX
 - ☐ 549-9010 Label, BYPASS STUDIO AES IN
 - ☐ 549-9011 Label, BLANK
 - ☐ 591-0040 Nameplate, XPi 10 Exporter
- ☐ 420-3710 Screw, M3 X 10, PPH, SS Qty (12)
- ☐ 423-4002 Splitlock, SS Qty (12)
- ☐ 421-8028 Jamnut, 1/2-28 UNEF-2B
- ☐ 423-9002 Washer, Internal Tooth, 1/2
- ☐ 403-0000 Ty-Wrap, Black Qty (2)
- ☐ 909-0604 Software Upgrade, XPi 10 Version 2.3.3
- ☐ 809-0830 Splitter, AES / EBU, (1) Female XLR to (2) Male XLRs

2.2. Tools Needed

- ☐ No. 1 Phillips Screwdriver
- ☐ 1/4" Nut Driver
- ☐ 9/16" Open End Wrench
- ☐ Side Cutters
- ☐ Exacto Knife

2.3. Estimated Time for System Upgrade

Providing you have the proper materials and tools listed above, it will take approximately 90 minutes to perform the 2nd Generation HD Upgrades to your system (45 minutes to convert the FSi 10 HD Signal Generator to an XPi 10 Exporter and 45 minutes to install the Exgine Card into the FXi 60 / 250 Exciter).



3. Converting the FSi 10 to an XPi 10 Exporter

3.1. Turn the FSi 10 OFF

From the Front Panel GUI select **SYSTEM** then **SHUTDOWN**. The FSi 10 will then go through its shutdown routine. At the end of the routine, the screen will indicate when it is okay to turn the power off. Next, turn the AC Switch OFF on the back of the unit.

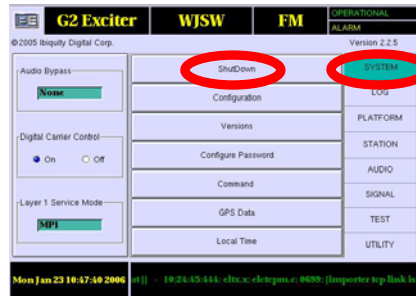


Figure 3 – Turning the FSi 10 OFF from the Main GUI

3.2. Disconnect all External Cables

Disconnect all cables, except GPS and PPS Jumpers, from the rear of the FSi 10.

Note: The FSi 10 status outputs (13 and 14) will no longer be connected to the FXi after the FSi to XPi conversion and FXi / Exgine upgrade.

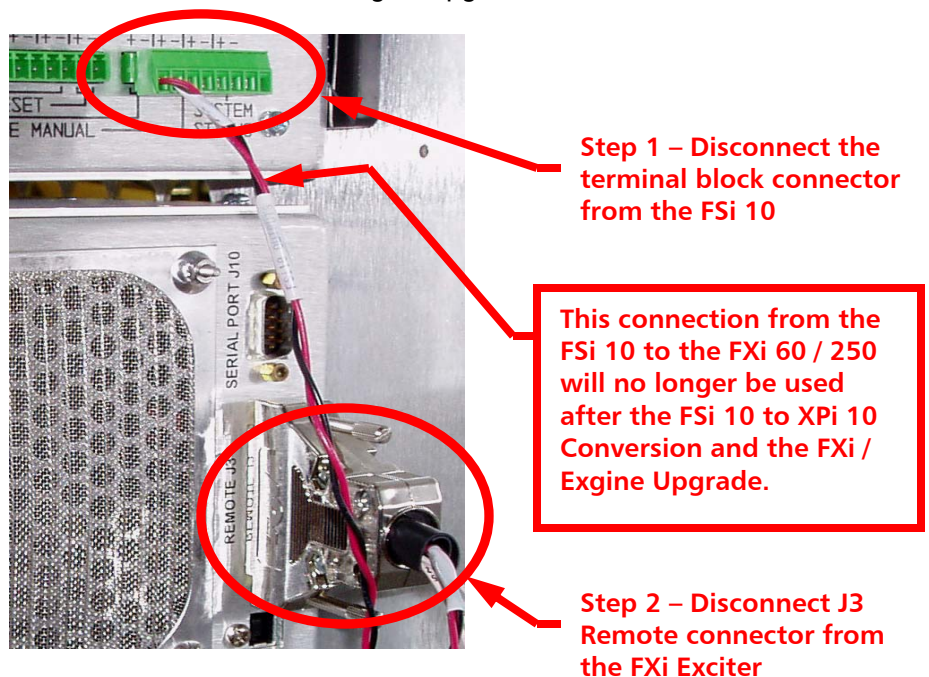
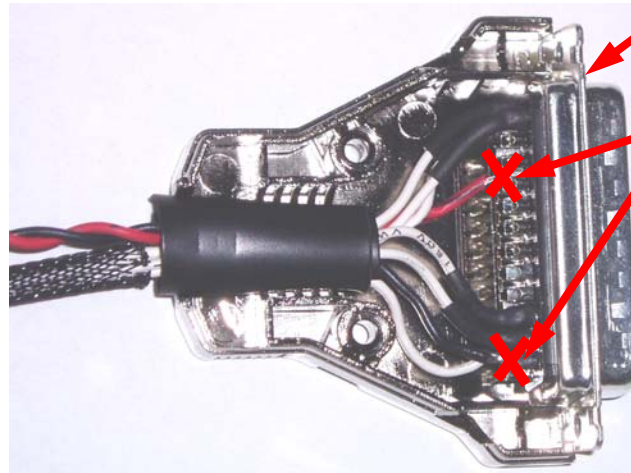


Figure 4 – FSi to FXi Status Output Cables



Step 3 – Disassemble the J3 connector

Step 4 – Cut the BLACK (pin 25) and RED (pin 4) wires as close to the solder cup terminals as possible, and then pull the wires out of the connector.

Step 5 – Re-assemble the connector and plug back into J3 on the Fxi Exciter.

Step 6 – Discard the remaining terminal block connector and wires

Figure 5 – Fxi 60/250 J3 Remote Connector

3.3. Remove from Equipment Rack

Remove the FSi 10 from the equipment rack and place on a work bench or table.

3.4. Remove Top Cover

Remove the Top Cover screws (Qty 24) from the FSi using a No. 1 Phillips Screw Driver. Next, slide the Air Filter out.

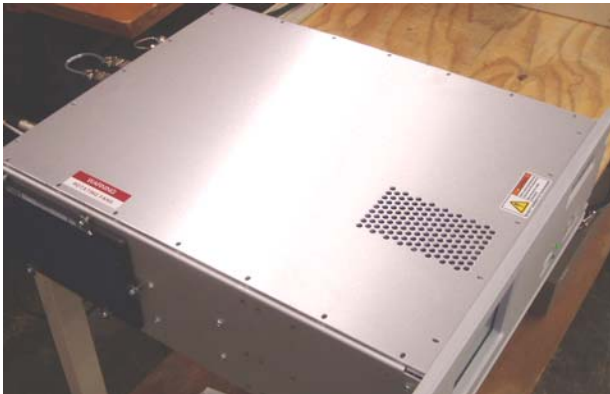


Figure 6 – Remove Top Cover and Air Filter from the FSi 10

3.5. Remove Back Panel Hardware

Remove the back panel mounting screws along the bottom and both sides at rear of the chassis (Qty 5 on bottom, Qty 3 each side).

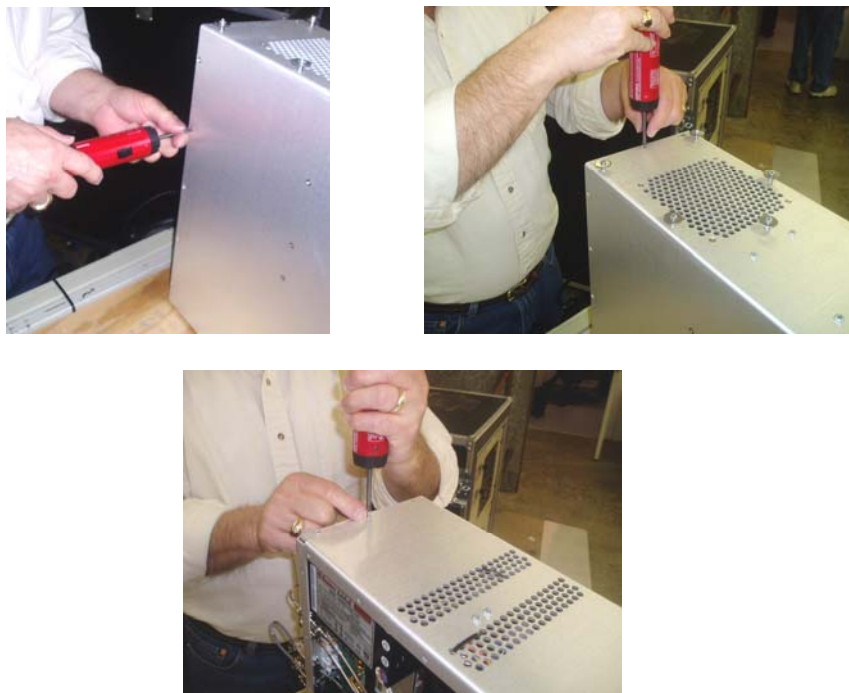


Figure 7 – Remove Back Panel Hardware

3.6. Disconnect XLR Connectors

Disconnect the (4) XLR Cables from XLR-BNC I/O PCB Assembly (919-0551) as shown in Figure 4.

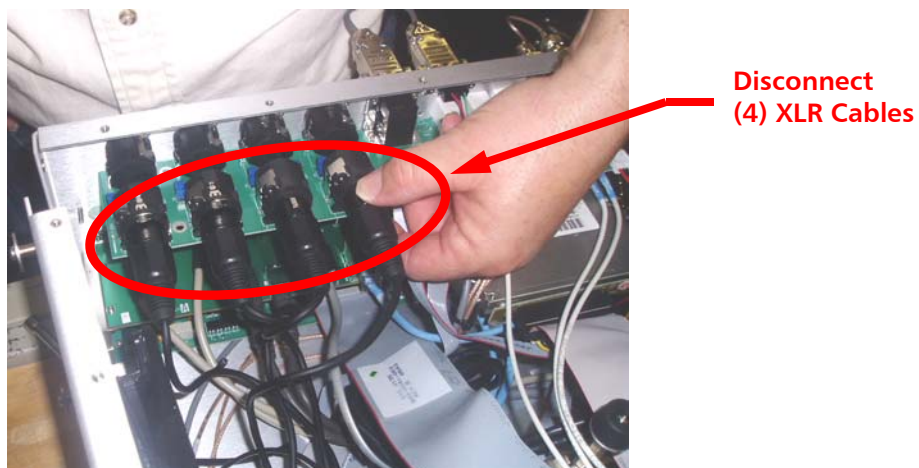


Figure 8 – Disconnect XLR Connectors

3.7. Remove ASi 10 Option Cover Plate

Carefully pull the back panel out from the chassis as far as the remaining cables allow. Next, use a 1/4" Nut Driver on the inside of the chassis to remove the (11) Kepnuts and (1) Flatwasher that are used for the mounting of the ASi 10 Option Cover Plate to the chassis.

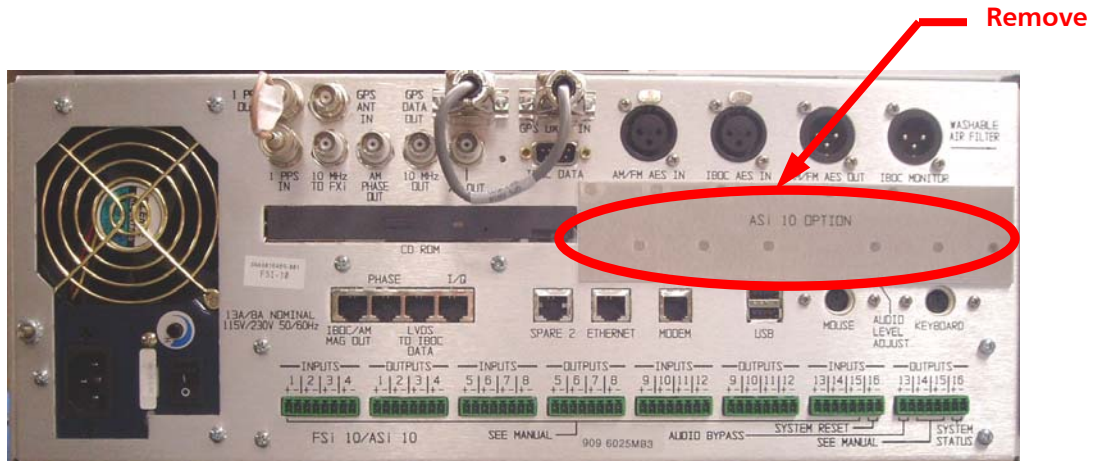


Figure 9 – ASi 10 Option Plate (Rear of Chassis)

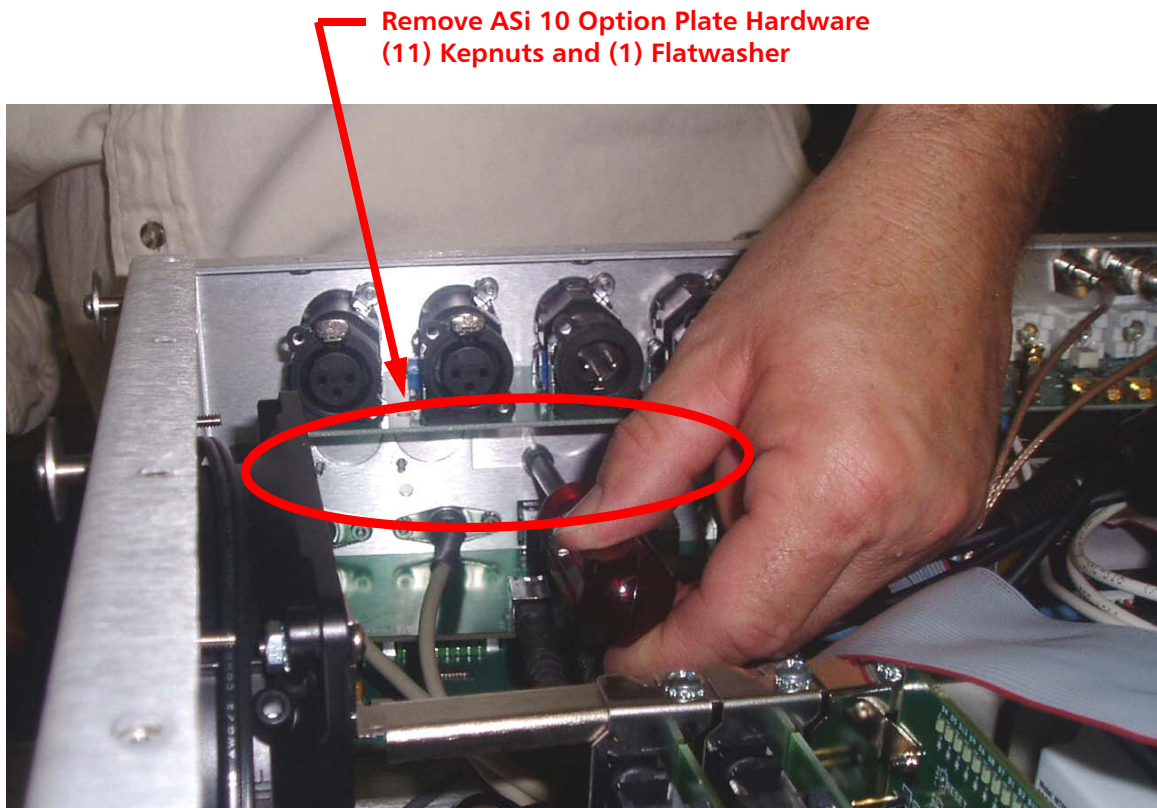


Figure 10 – Removal of ASi 10 Option Plate (Hardware Located Inside Rear of Chassis)

3.8. Install SRC PCB Assembly (919-0550) Into Chassis

Un-package the SRC PCB Assembly (919-0550) from the Kit and save the packaging. You will reuse it for the return of the DUC PCB Assembly back to Broadcast Electronics, Inc.



Figure 11 – Sample Rate Converter (SRC) PCB Assembly 919-0550

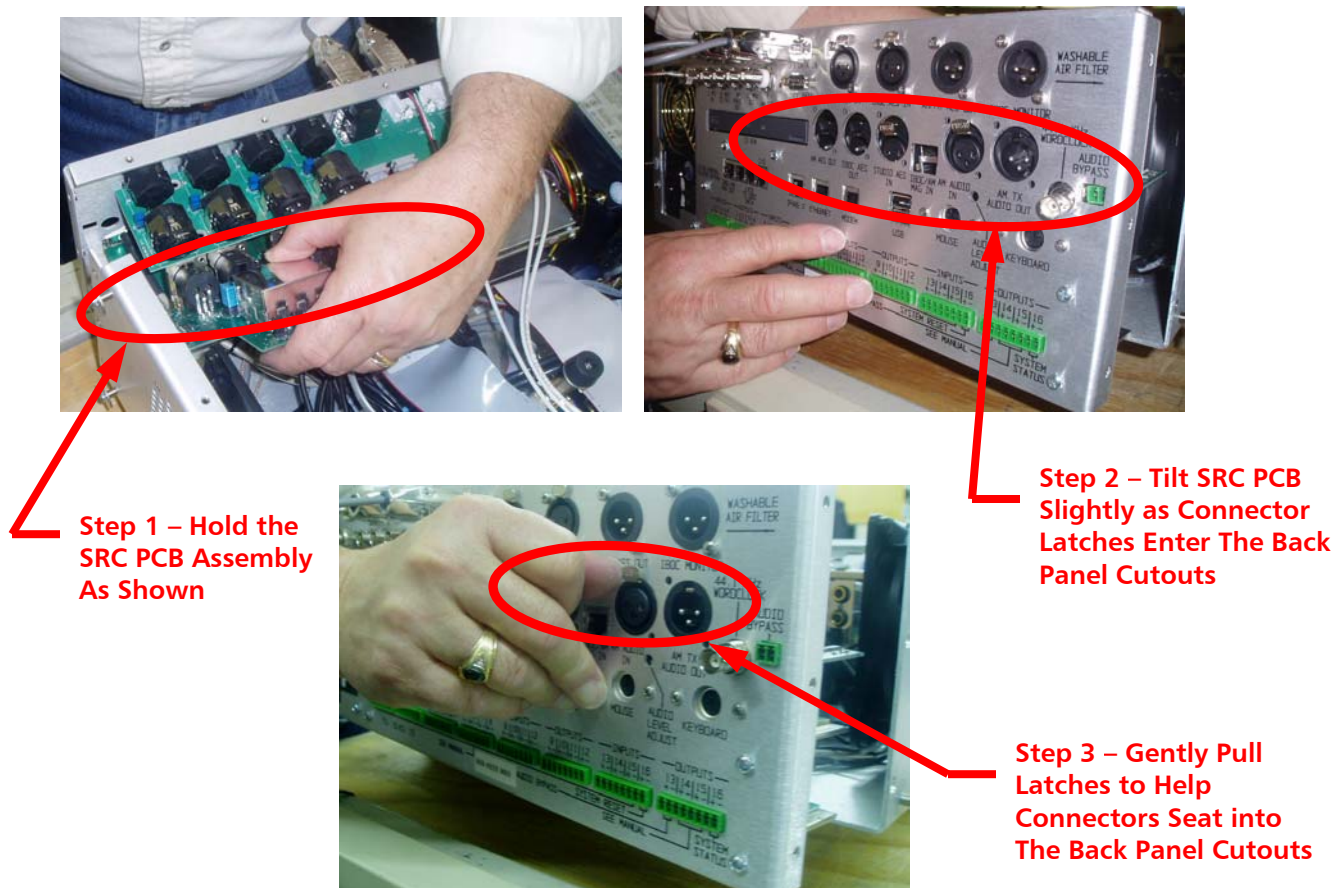
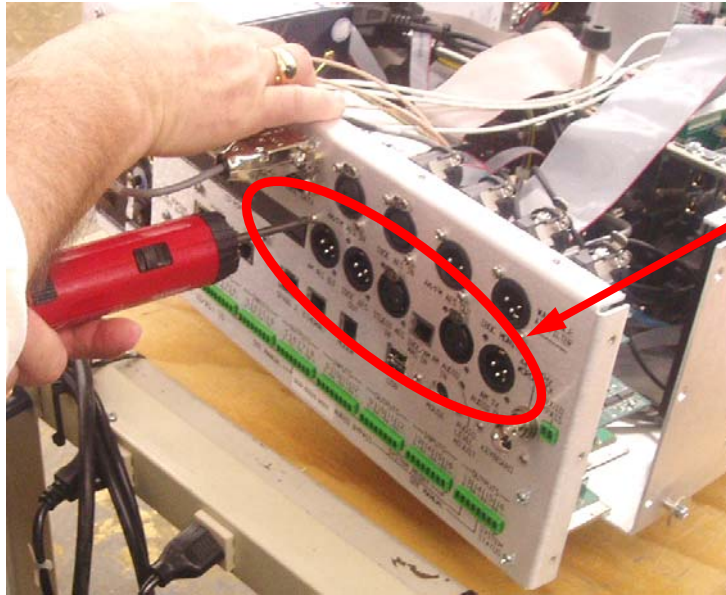


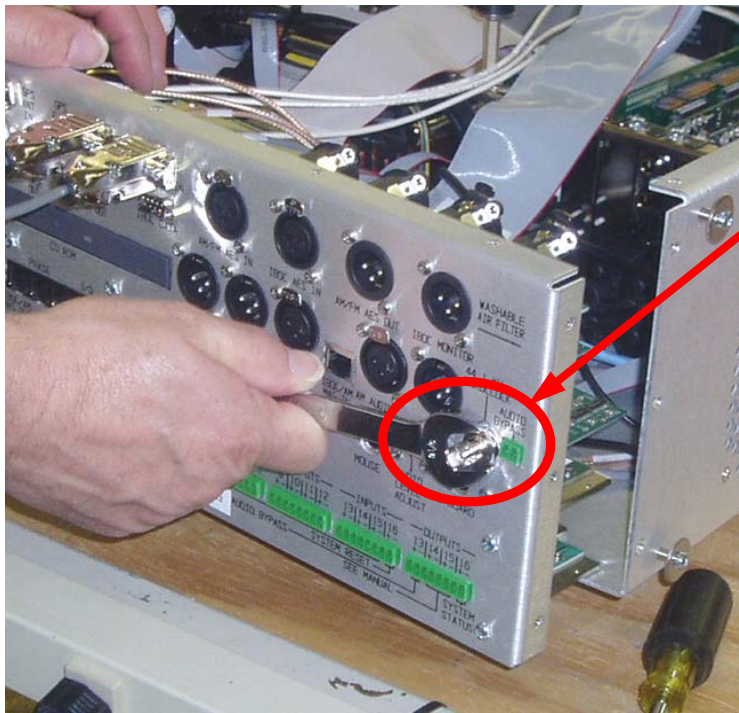
Figure 12 – Installing the SRC PCB Assembly into Chassis

3.9. Install Hardware to Secure SRC PCB Assembly



Step 4 – Install Split Locks (423-4002, Qty 10) and Screws (420-3710, Qty 10) Supplied In The Kit Using a No.1 Phillips Screwdriver To Tighten

Figure 13 – Install SRC PCB Mounting Hardware



Step 5 – Install Internal Tooth Washer (423-9002) and Jamnut (421-8028) Supplied In The Kit Using a 9/16" Open End Wrench to Tighten

Figure 14 – Install SRC BNC Mounting Hardware

3.10. Install and Connect Power Cable to SRC PCB Assembly

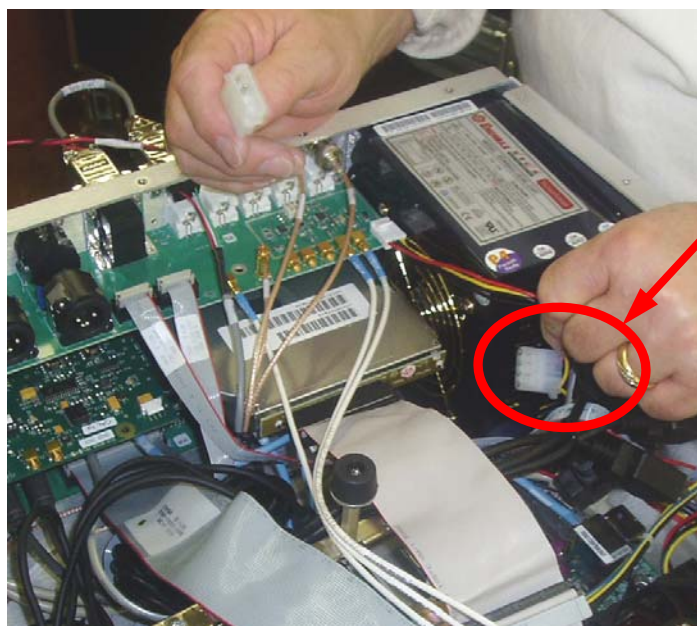


Figure 15 – Locate the Spare Power Connector Pigtail (near power supply)

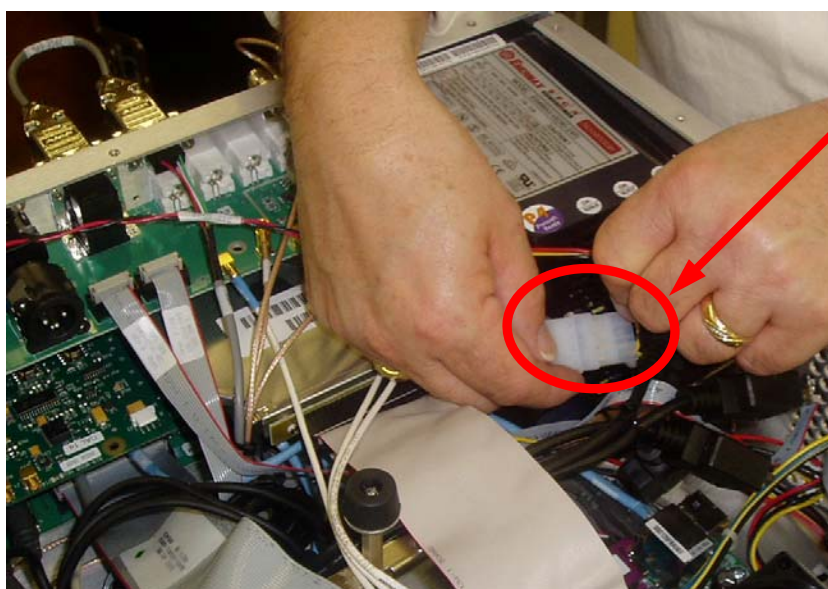



Figure 16 – Connect Cable to Pigtail Connector (near power supply)

 Next, connect the cable to J2 on the SRC PCB Assembly ensuring that the orientation of the connector / wire colors are as shown!

Step 3 – Connect the Power Cable to J2 on the SRC PCB Assembly Ensuring that the Connector and Wire Colors are oriented as shown.

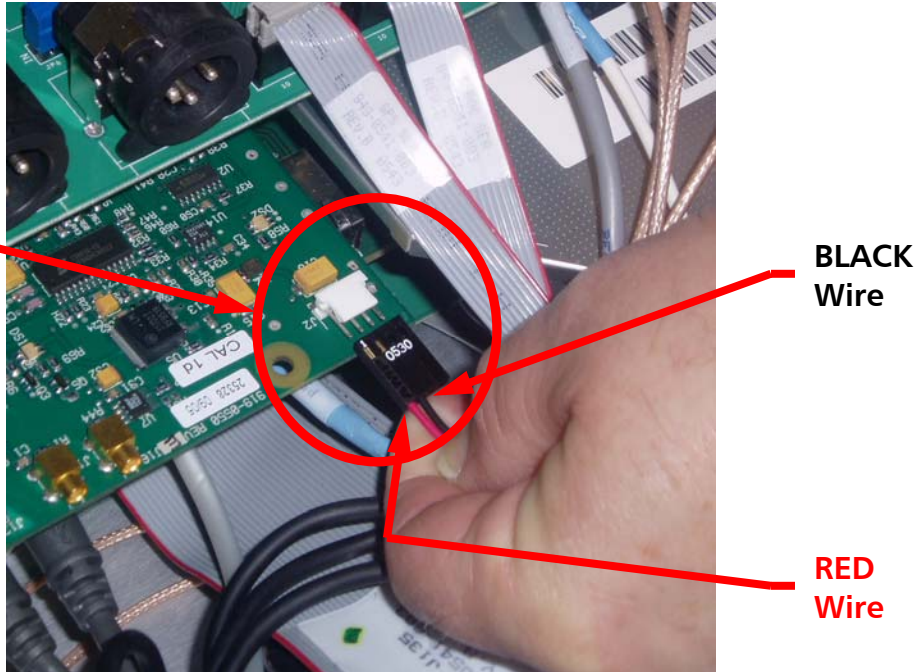


Figure 17 – Install Power Cable to SRC PCB Assembly

3.11. Disconnect and Re-route 10 MHz Cable

NOTE: Depending Upon the Version of the FSi 10 that You Originally Received, the Motherboard May Appear Differently Than Shown

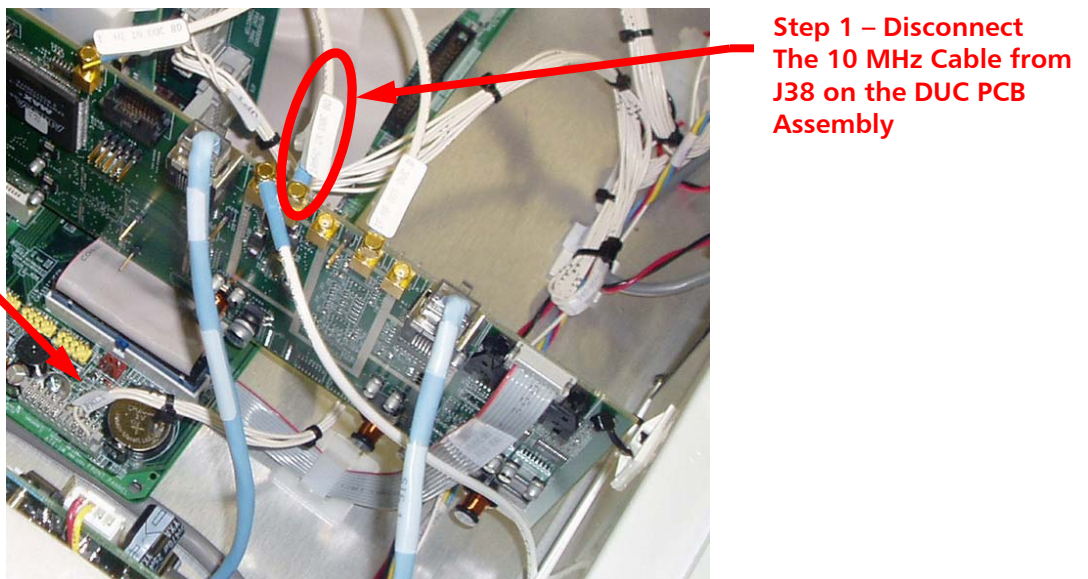


Figure 18 – Disconnect 10 MHz Cable from DUC PCB Assembly

Step 2 – Connect the 10 MHz Cable to J1 on the SRC PCB Assembly

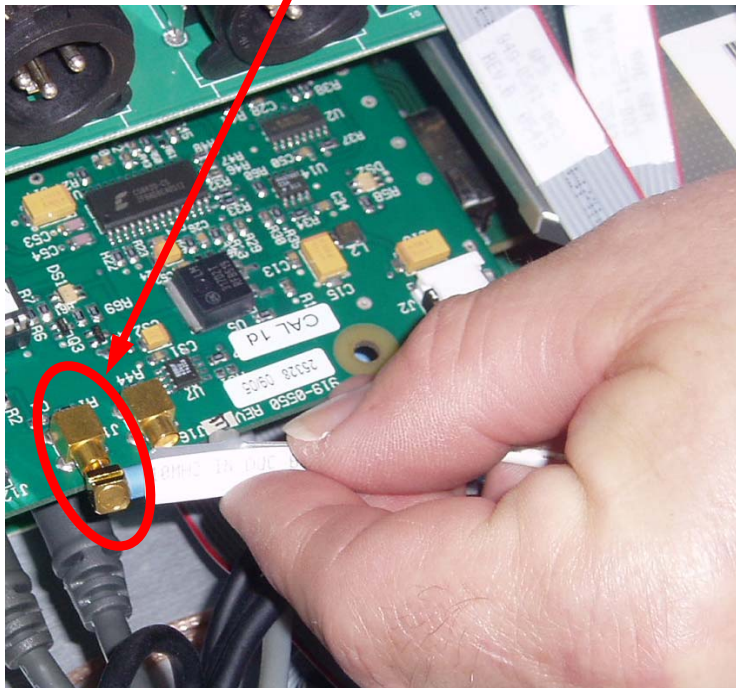
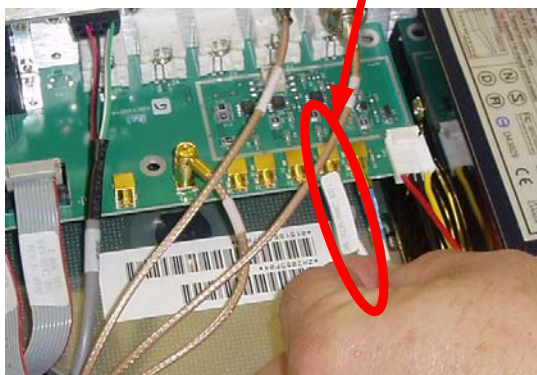


Figure 19 – Connect the 10 MHz Cable to J1 on the SRC PCB Assembly

Step 3 – Disconnect 10 MHz Cable From J6 on I/O PCB (919-0551)



Step 4 – Connect 10 MHz Cable to J7 on I/O PCB

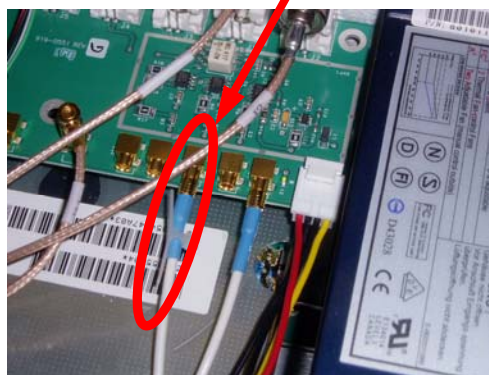


Figure 20 – Move the 10 MHz Cable from J6 to J7 on the XLR-BNC I/O PCB Assembly (919-0551)

3.12. Disconnect and Re-route 44.1 kHz Cable

Step 1 – Disconnect
44.1 kHz Cable from
J8 on the DUC PCB Assembly

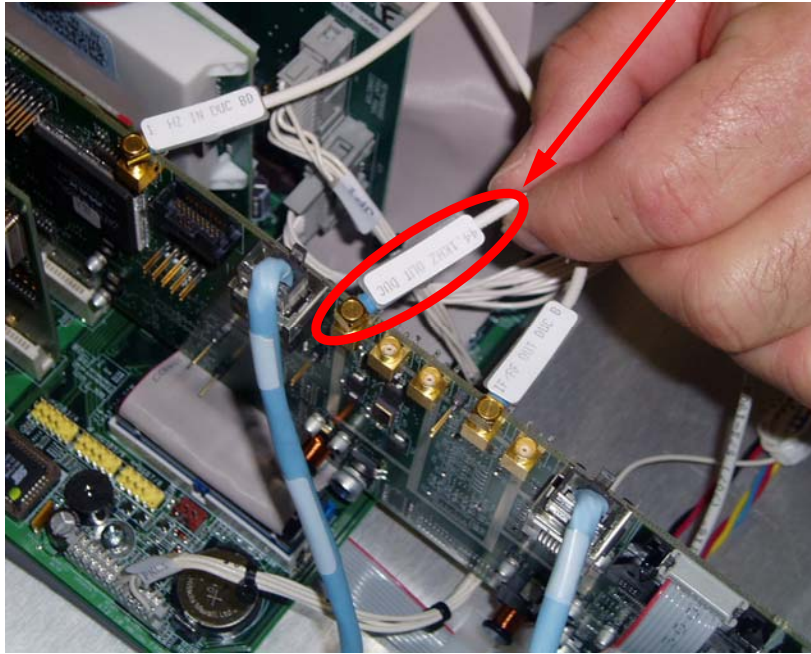


Figure 21 – Disconnect 44.1 kHz Cable from DUC PCB Assembly

Step 2 – Connect
44.1 kHz Cable to J16
on SRC PCB Assembly

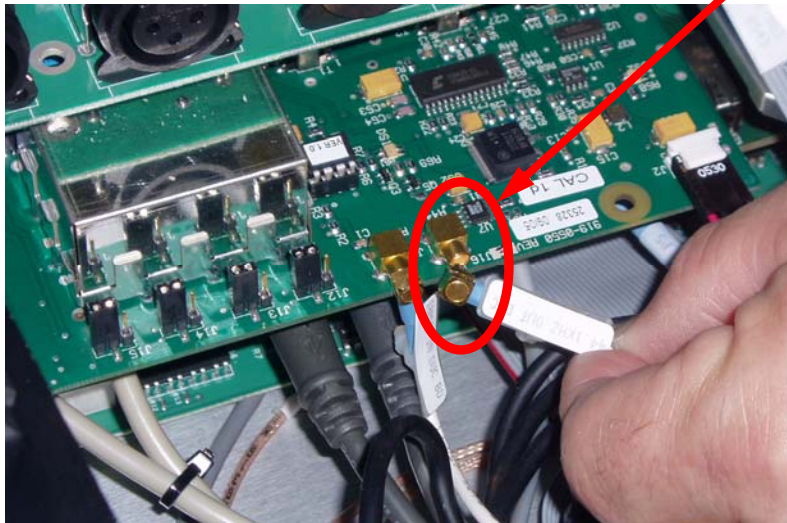
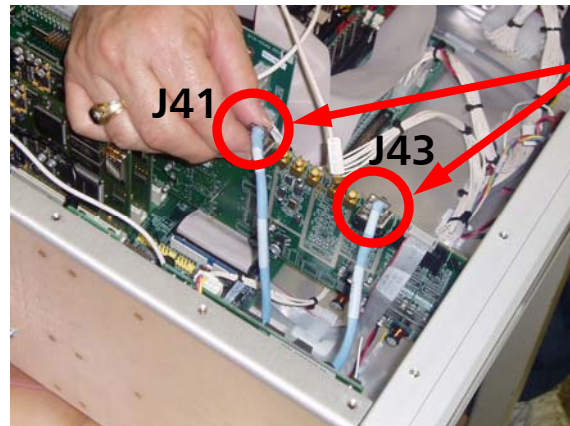
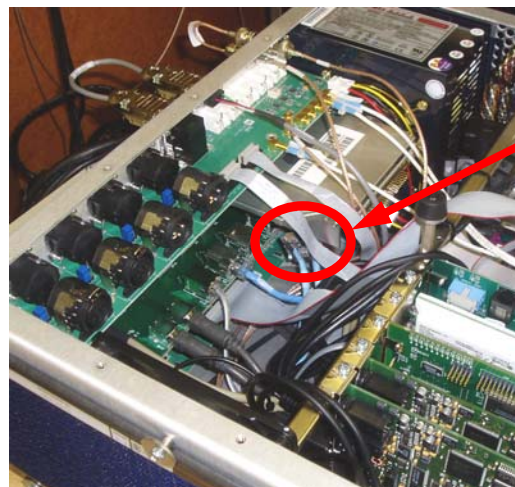


Figure 22 – Connect 44.1 kHz Cable to J16 on SRC PCB Assembly

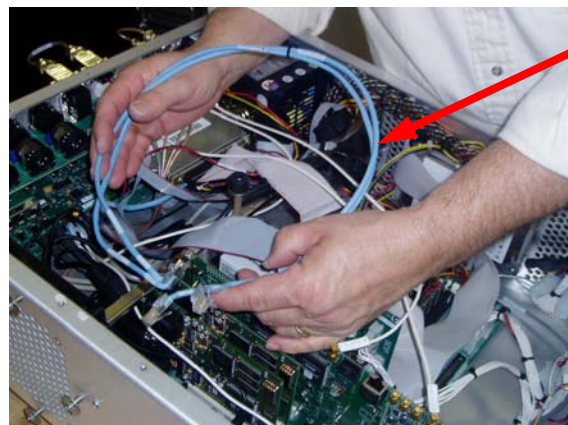
3.13. Disconnect and Remove DUC Pcb Assembly Ethernet Cables



Step 1 – Disconnect The RJ45 Cables from J41 and J43 on the DUC PCB Assembly



Step 2 – Trace the RJ45 Cables Back to Rear of Chassis and Disconnect P2 and P3 from the I/O PCB (919-0052) located Just Under the CD Drive



Step 3 – Remove both RJ45 Cables as they are No Longer Needed

Figure 23 – Disconnect and Remove RJ45 Jumper Cables

3.14. Disconnect and Remove 1 Hz In and IF/RF Out Cables

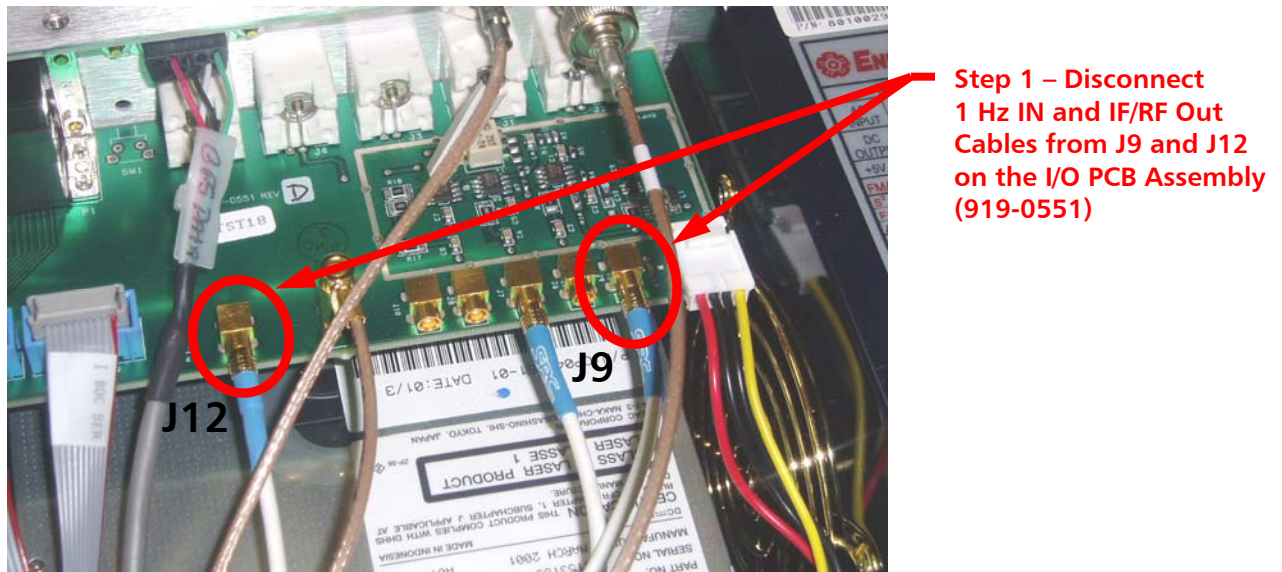


Figure 24 – Disconnect 1 Hz IN and RF/IF Out Cables from I/O PCB Assembly

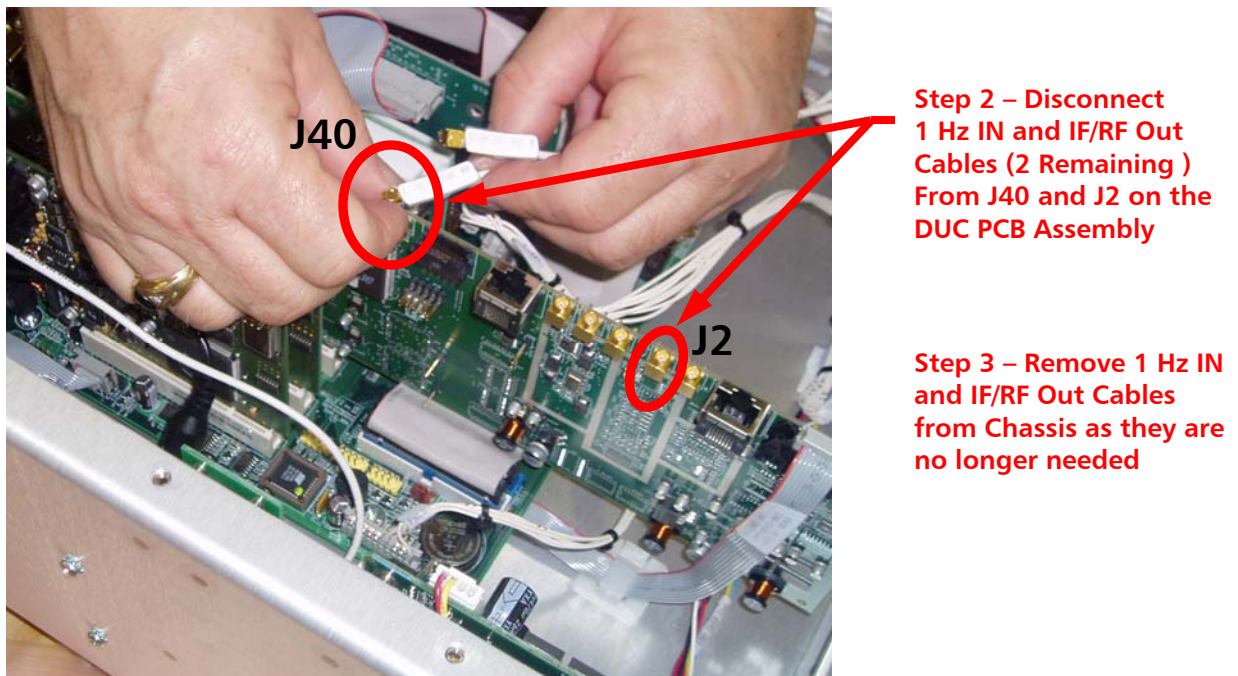


Figure 25 – Disconnect 1 Hz IN and RF/IF Out Cables from DUC PCB Assembly

3.15. Disconnect Ribbon Cable and Cut Ty-rap

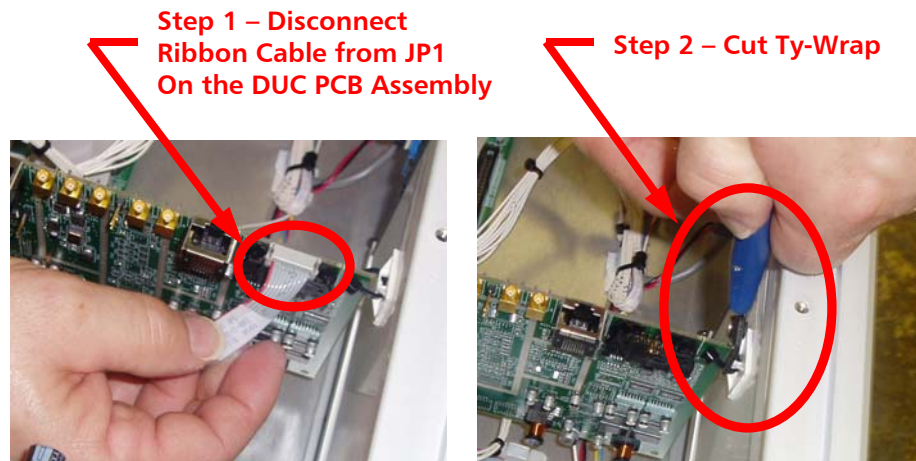


Figure 26 – Disconnect Ribbon Cable and Cut Ty-Wrap From DUC PCB Assembly

3.16. Remove DUC PCB Assembly from Chassis

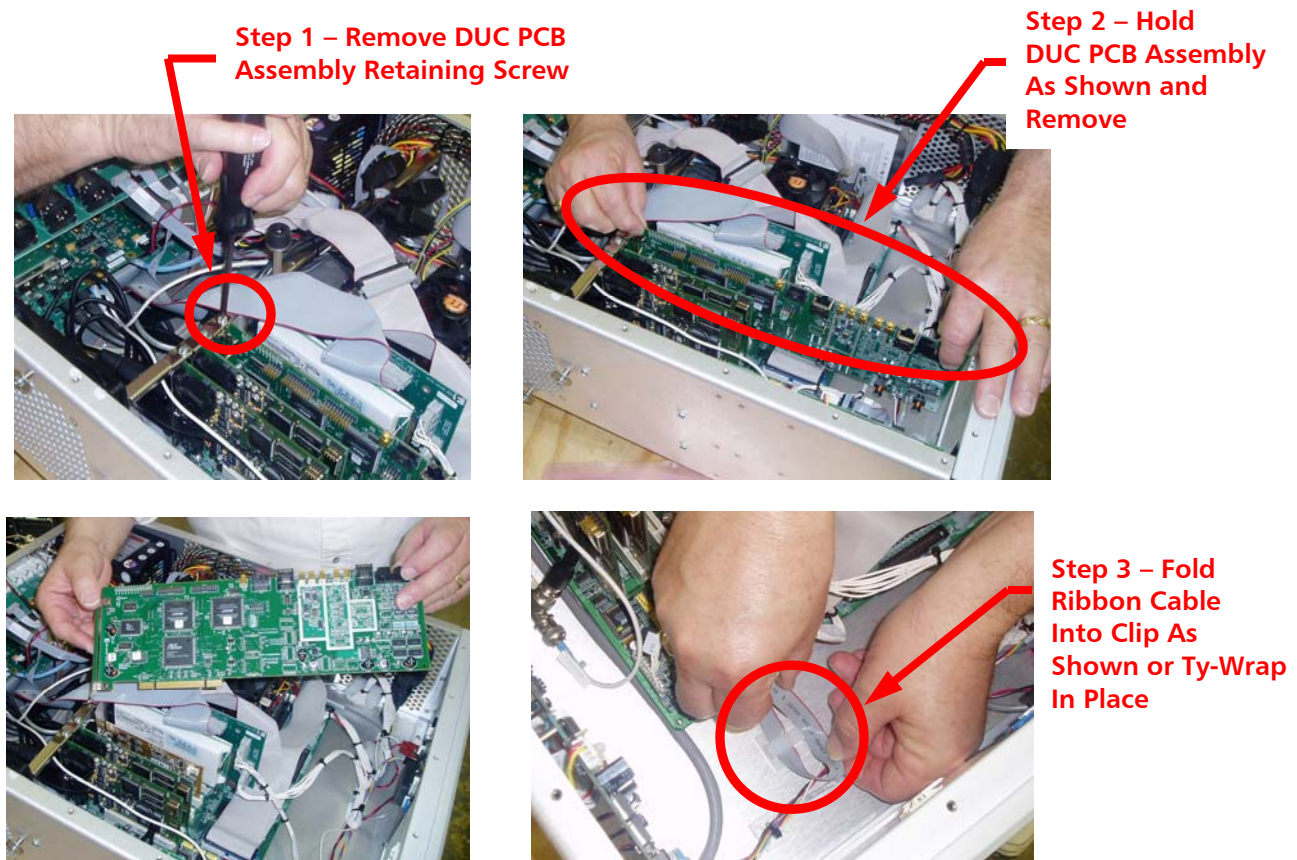


Figure 27 – Remove DUC PCB Assembly from Chassis

3.17. Package DUC PCB Assembly

Step 1 – Carefully Wrap DUC PCB Assembly in Bubble Wrap

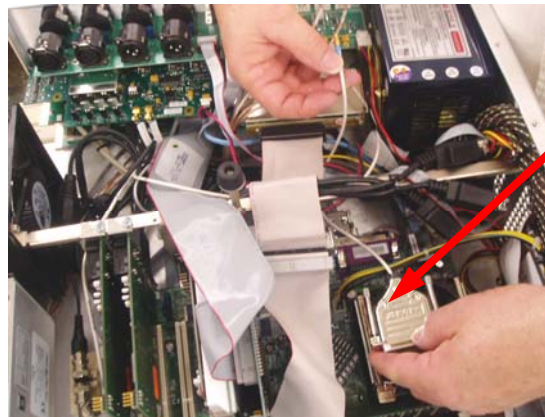


Step 2 – Insert DUC PCB Assembly Into ESD Bag and Retain as a Spare Part



Figure 28 – Package DUC PCB Assembly

3.18. Install 1 PPS Cable from Mother PCB to I/O PCB



Step 2 – Connect 1 PPS Cable to J9 on I/O PCB (919-0551)



Step 1 – Route 1 PPS Cable (949-0607) From The Kit As Shown

Step 3 – Connect the 1 PPS Cable To the Motherboard and Ensure That The Mounting Screws Are Tightened for Proper Connector Engagement

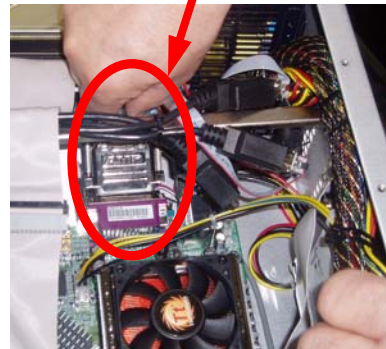
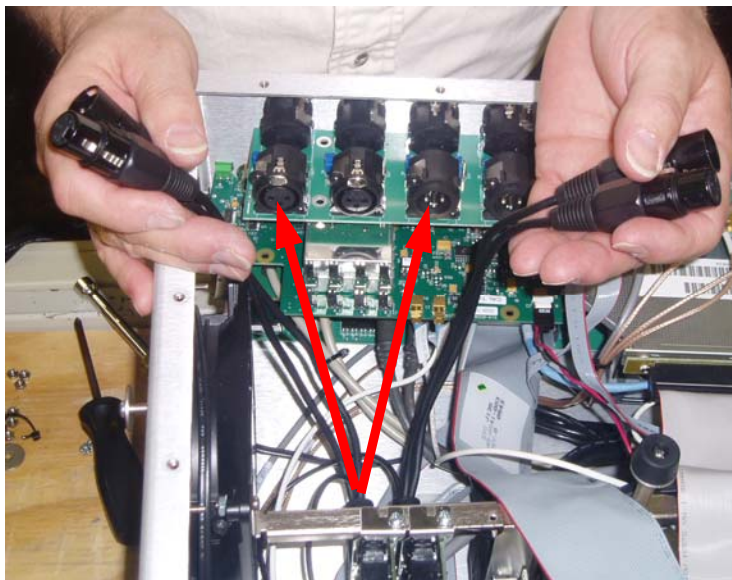


Figure 29 – 1 PPS Cable Installation

3.19. Re-connect XLR cables

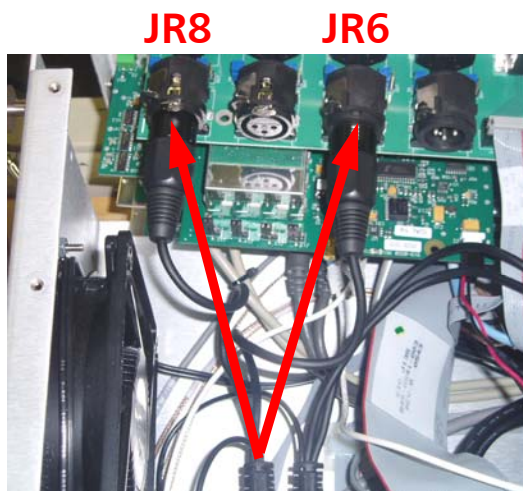
Separate the XLR Cables coming from each of the Audio Cards as shown.



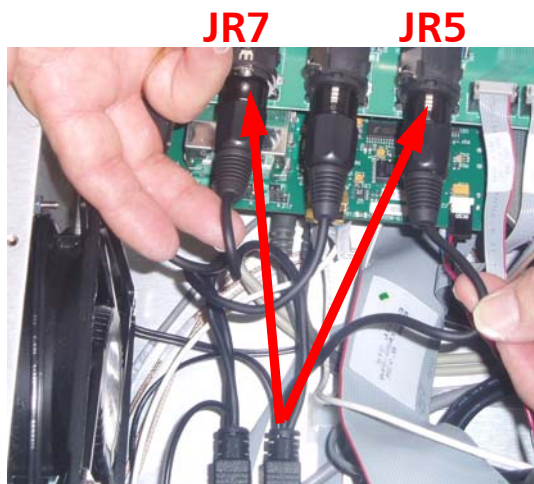
LEFT Audio Card Connections Indicated by Arrows

Figure 30 – Separate XLR Cables (viewed the Front of the Unit)

Next, plug the XLR connectors in as shown. When making these connections, ensure that the XLR cable connectors fully seat into the jacks on the I/O PCB (919-0551).



**LEFT Audio Card
Connections
Indicated by Arrows
JR8 and JR6**



**RIGHT Audio Card
Connections
Indicated by Arrows
JR7 and JR5**

Figure 31 – Connect XLR Cables

3.20. Install Back Panel

Install the back panel taking care not to pinch any cables.

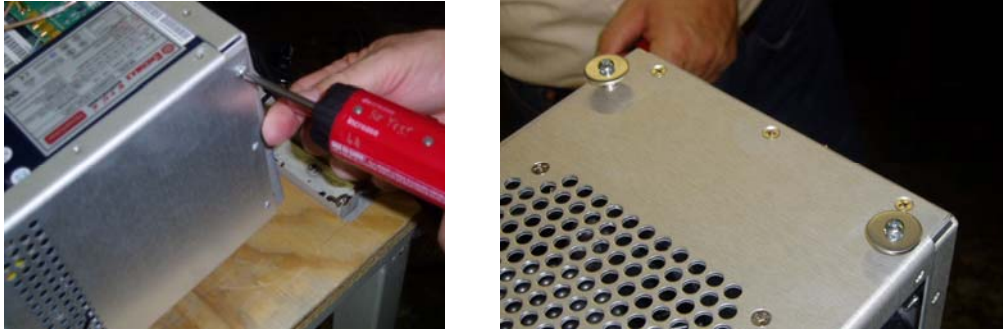


Figure 32 – Install Back Panel

3.21. Install Air Filter



Figure 33 – Install Air Filter

3.22. Apply Labels to Rear of Chassis

Use the labels provided in the Upgrade kit to re-label the back panel connections.

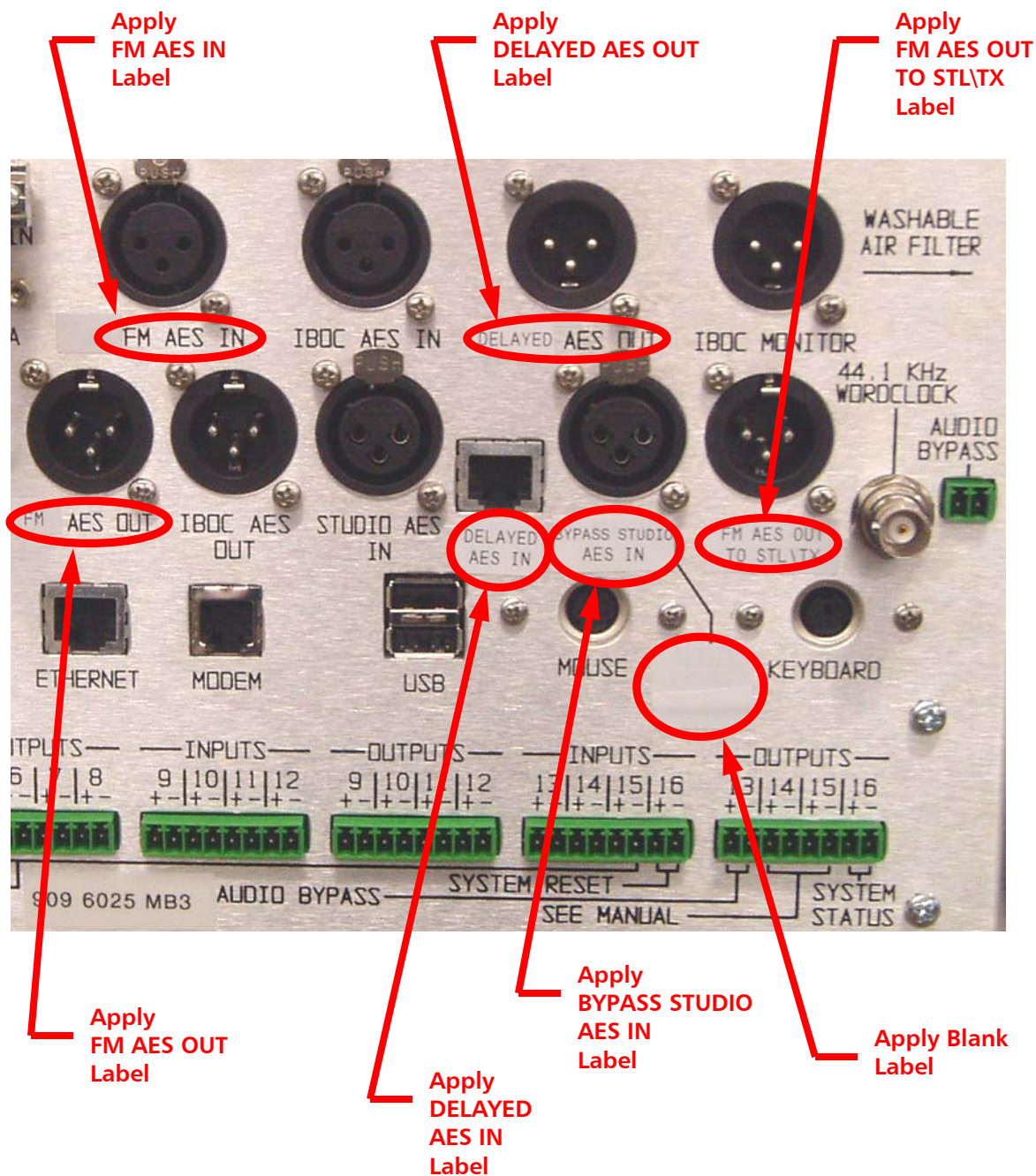


Figure 34 – Apply New Labels from Kit to rear of Chassis

3.23. Change the Nameplate

Use an exacto knife to remove the FSi 10 nameplate from the front panel. Next, install the XPi 10 nameplate included in the Kit.



Figure 35 – Change Nameplate

3.24. Install External Jumpers from the Kit

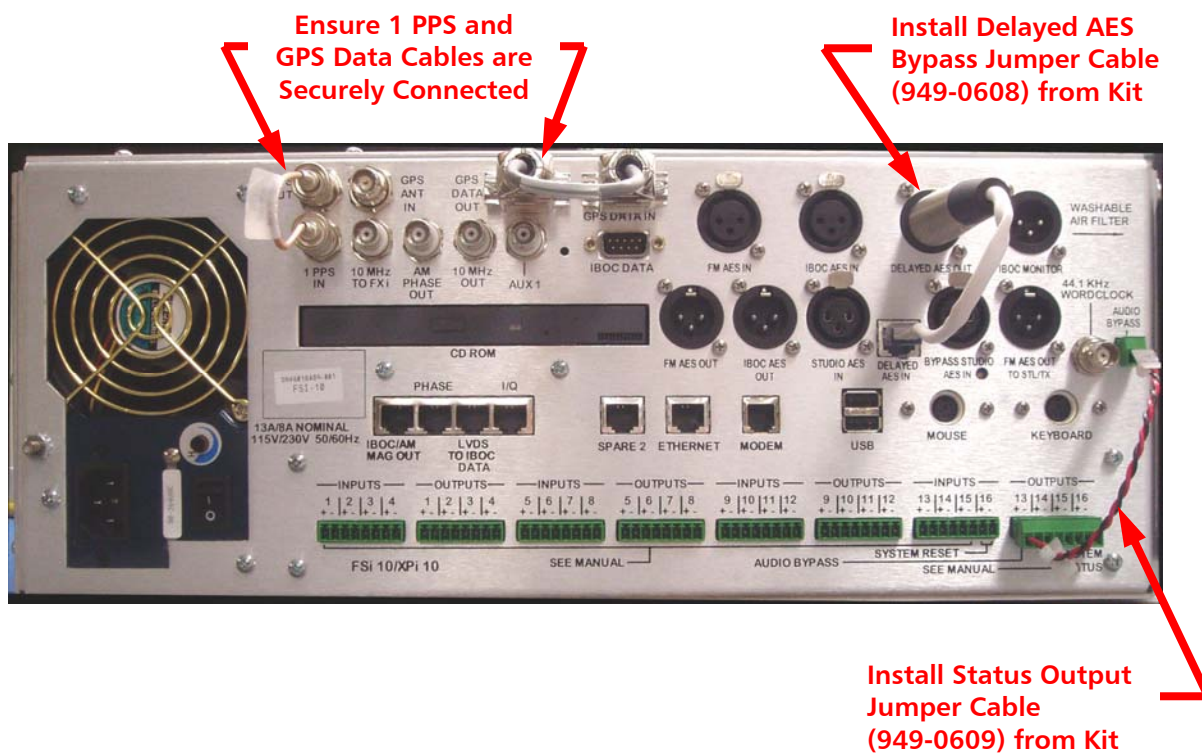


Figure 36 – External Jumpers

3.25. Install XPi 10 Upgrade Software Version 2.3.3

Included in the Field Upgrade is a the v2.3.3 Software Kit. Use the CD and Instructions to upgrade the XPi 10 Software to v2.3.3.

3.26. Install Top Cover

After everything appears to be working properly, install the Top Cover on the XPi 10 Chassis.

3.27. Install the XPi 10 at The Studio Site

Install the XPi 10 Exporter at the Studio Site. The following page lists all of the necessary connections.

3.28. XPi 10 Exporter External Connections

The following is a picture showing all of the connections that should be made to the XPi 10 Exporter for proper operation.

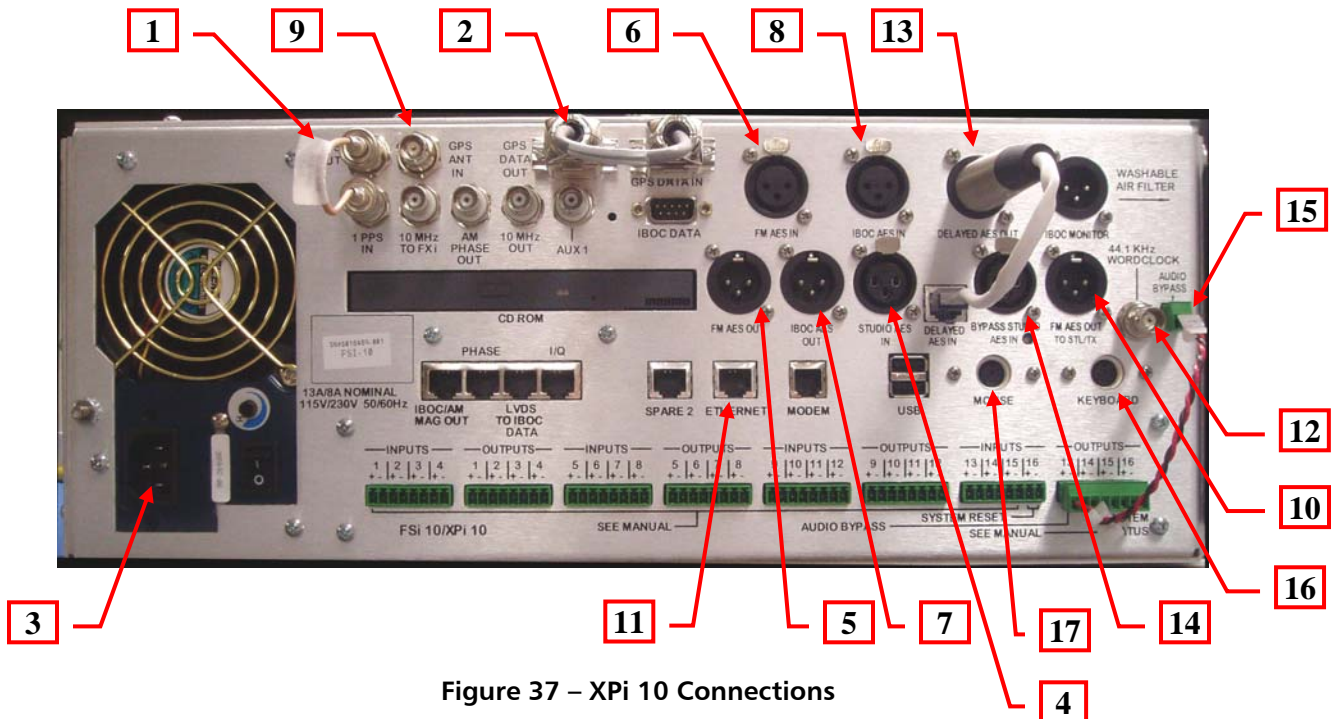


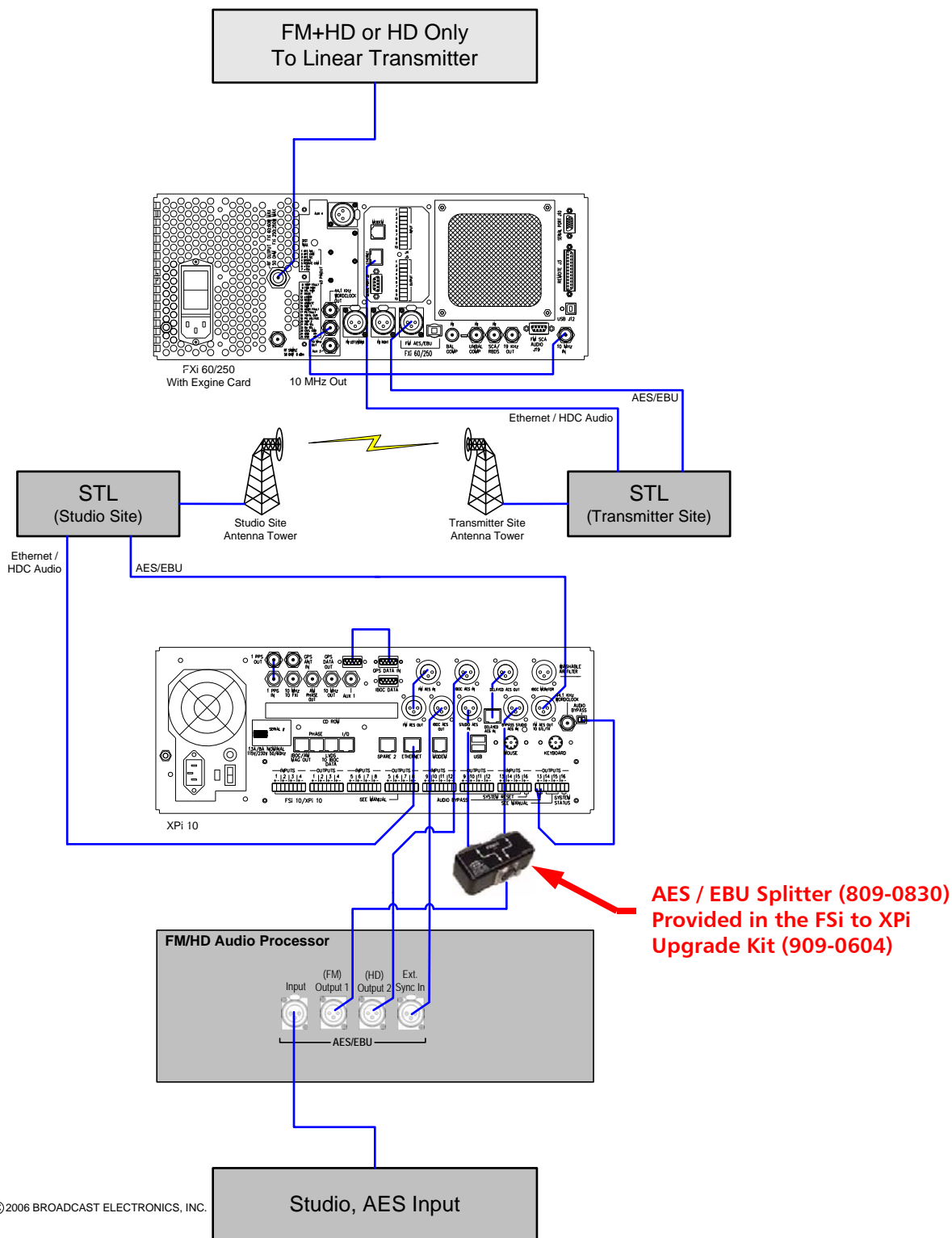
Figure 37 – XPi 10 Connections

1. 1PPS OUT to 1PPS IN
2. GPS DATA OUT to GPS DATA IN

3. **AC Power**
4. **Studio AES IN** (From Main Program Audio Source at Studio)
5. **FM AES OUT** to FM Processor
6. **FM AES IN** from FM Processor
7. **IBOC AES OUT** to HD Processor
8. **IBOC AES IN** from HD Processor
9. **GPS ANT IN** (Internal GPS Receiver Input from GPS Antenna)
10. **FM AES OUT** to STL/TX (This audio output is 44.1kHz audio and feeds to STL main audio path)
11. **ETHERNET** from Data Importer (IDi) that includes all of the secondary program service audio and PAD. If using a switch or hub between units a straight through cable is used, if connecting straight from the Importer a crossover cable is required.
12. **44.1kHz Word Clock Output** (This is used to drive the timing of your main audio source and would connect to the word clock input of this main audio source. This could be the word clock input on the sound card in an Audio Vault).
13. **DELAYED AES OUT to DELAYED AES IN** (Cable supplied in Kit) This cable must be connected to route the delayed AES output to the FM AES OUT to STL/TX connector under normal operation.
14. **BYPASS STUDIO IN** (Non-delayed input that will be applied to the FM AES OUT to STL/TX upon bypass operation, this would normally be an input you from your main source).
NOTE: In bypass mode of operation the delay supplied by the XPi 10 is not present.
15. **XPi 10 Status Output** (Cable supplied in Kit). These connections go to the 2-pin connector on the XPi 10 for bypass operation. If a fault or power fails the Bypass Audio In is routed to the FM AES OUT to STL/TX Connector.
16. **Keyboard** (**MUST** be connected if the XPi 10 has an **ITOX brand motherboard** when upgrading software or changing the I.P. Address).
17. **Mouse** (**MUST** be connected if the XPi 10 has an **ITOX brand motherboard** when upgrading software or changing the I.P. Address).



3.29. Connection Diagram (Single Audio Processor)



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Figure 38 – Connection Diagram for a Single Audio Processor

3.30. Connection Diagram (Dual Audio Processor)

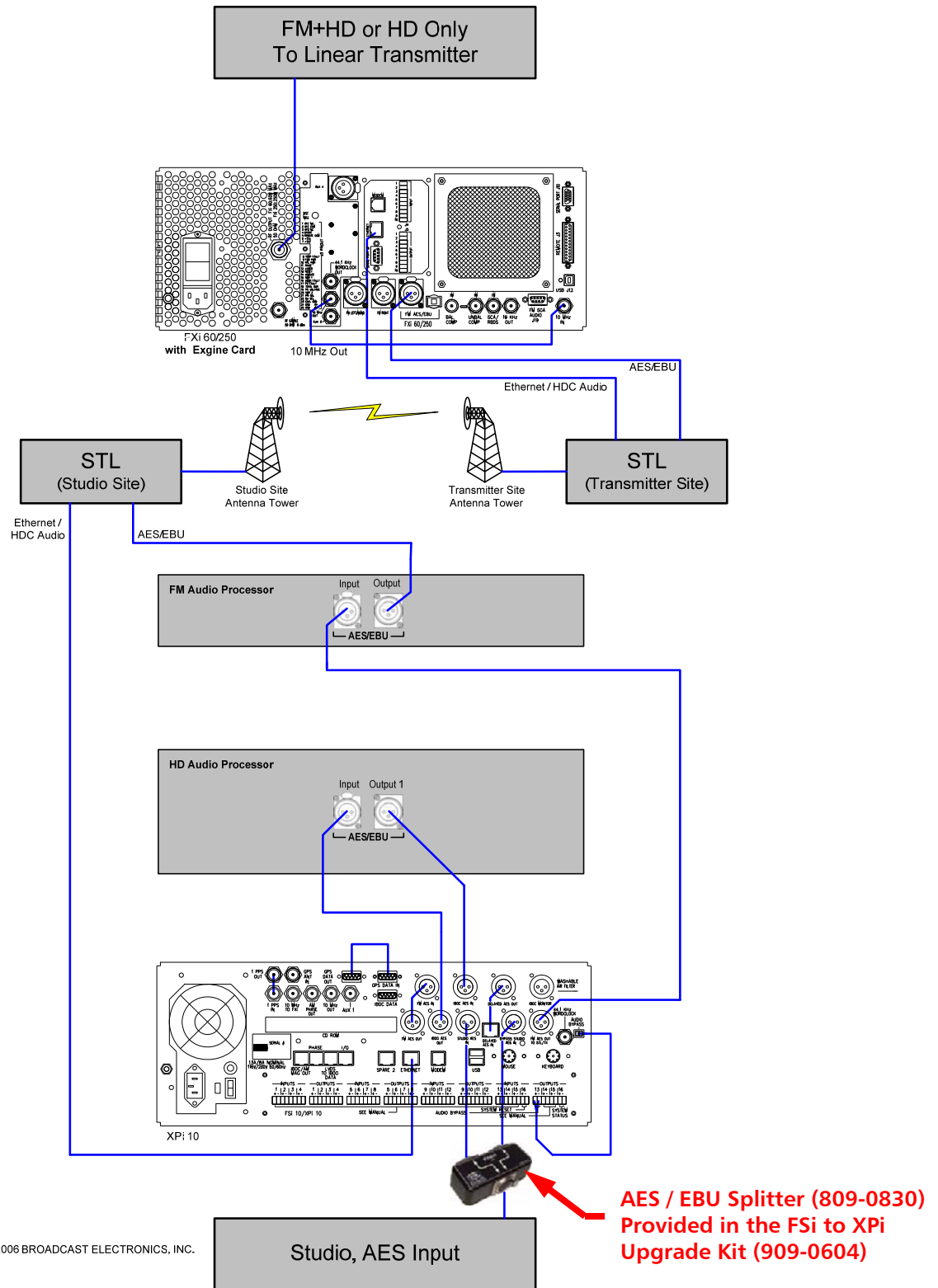


Figure 39 – Connection Diagram for Dual Audio Processors



3.31. Configure Station Call Letters

From the Main GUI, select **HD**, then enter the station's call letters in the **Short Name** field.



Figure 40 – XPi 10 Short Name Menu

3.32. Configure I.P. Addresses

Once you have connected up the cables as shown above you must make sure that the Importer (IDi) is pointing to the IP address of the Exporter (XPi 10) and the Exporter (XPi 10) is pointing to the IP address of the Engine card in the FXi 60 / 250 Exciter. Setting up the IP address for the Importer can be found in the IDi Quick Install Guide.

3.33. Configure the I.P. Address of the XPi 10

Step 1 - Select the **SYSTEM** button from the front menu.

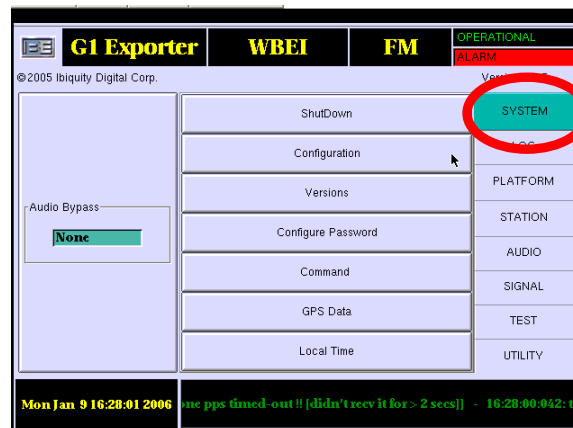


Figure 41 – XPi 10 Main GUI Menu

Step 2 - Select Command from the **SYSTEM** menu and the following will appear asking for your password. Type in the password. The default is "**password**" (all lower case).

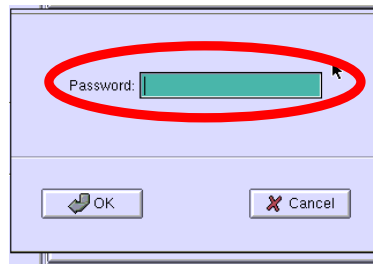


Figure 42 – XPI 10 Password Menu

Step 3 - If using an external keyboard un-check **Display virtual keyboard** then click on **linuxconf**.

Note: If your XPI 10 has an ITOX brand motherboard, the external mouse and keyboard **MUST** both be connected for either to work.

Note: To view the IP address simply click on the ifconfig button to see the IP address, Subnet Mask, and MAC address if needed.

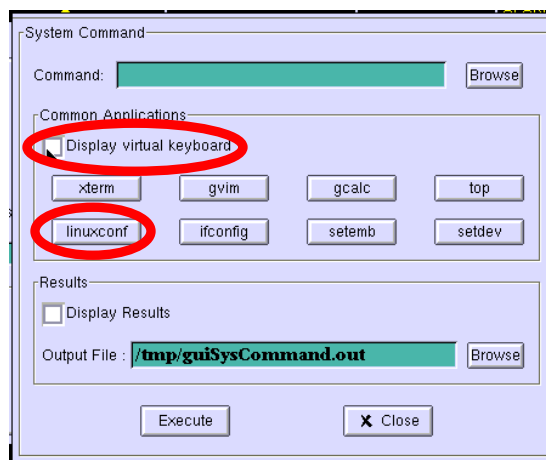


Figure 43 – XPI 10 System Command Menu

Step 4 - Highlight Networking and hit <ENTER>

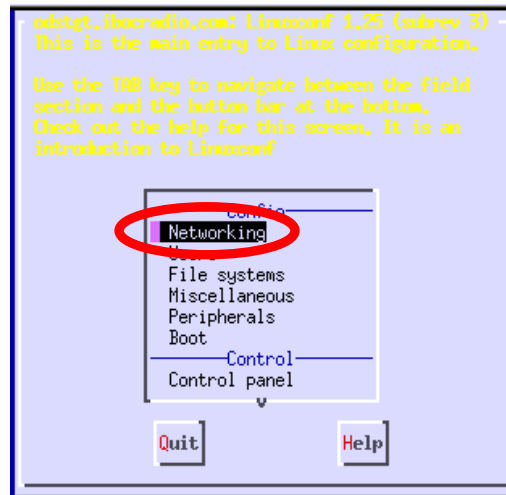


Figure 44 – XPi 10 Config / Control Menu

Step 5 - Highlight Host name and IP network devices and hit <ENTER>.

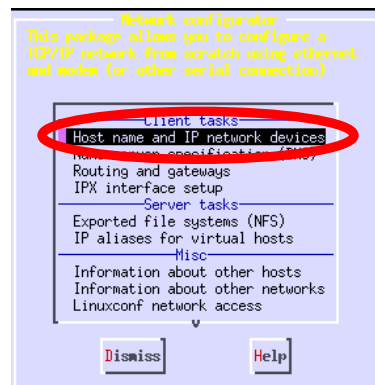


Figure 45 – XPi 10 Networking Menu

Step 6 - Use arrows to go to IP address and Netmask and change to desired value. Hit <TAB> to accept, then press <ENTER> on the keyboard.

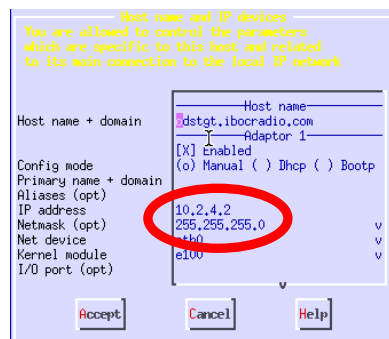


Figure 46 – XPi 10 IP Address Menu

Step 7 - Next, the Routing and Gateways Windows will appear.

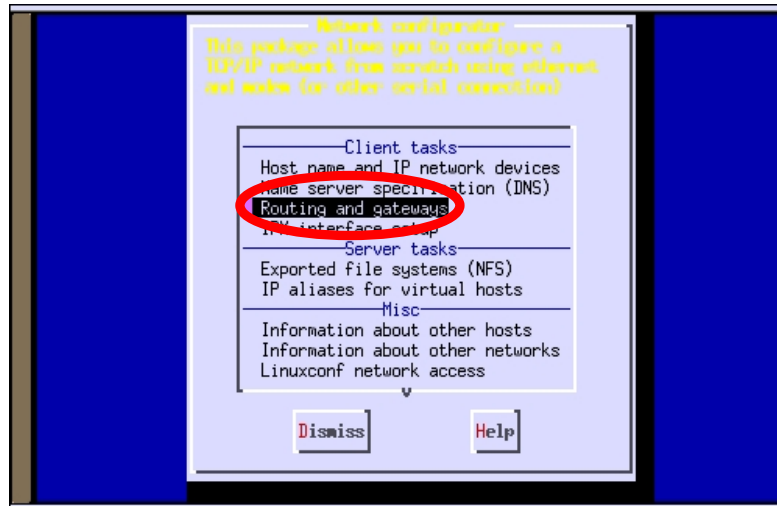


Figure 47 – XPi 10 Client , Server, and Misc Tasks Menu

Step 8 - Press <TAB> to **Accept**, then <Enter> on the keyboard.

Step 9 - Press <TAB> to **Dismiss**, then <Enter> on the keyboard.

Step 10 - Press <TAB> to **Quit**, then <Enter> on the keyboard.

Step 11 - Press <TAB> twice to highlight **Do It**, then <Enter> on the keyboard.

Step 12 - The Command window should now be displayed.

This completes the Network setup for the XPi 10 Exporter.

3.34. Obtain the I.P. Address of the FXi Exciter

If you do not already know the I.P. Address of the FXi Exciter, follow the following steps to retrieve it.

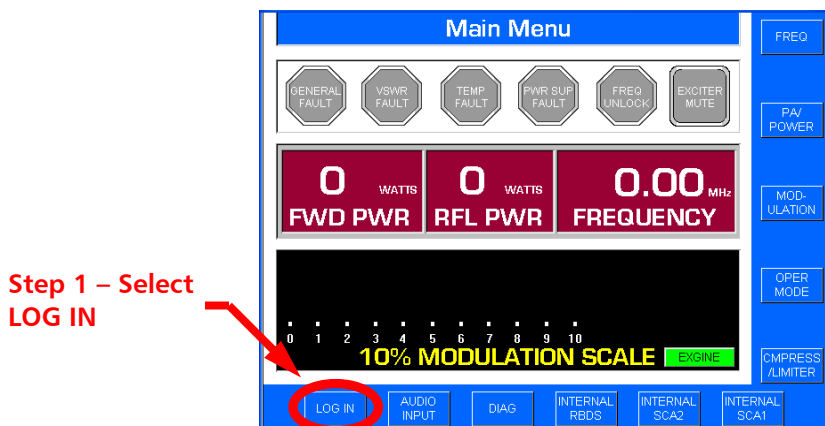
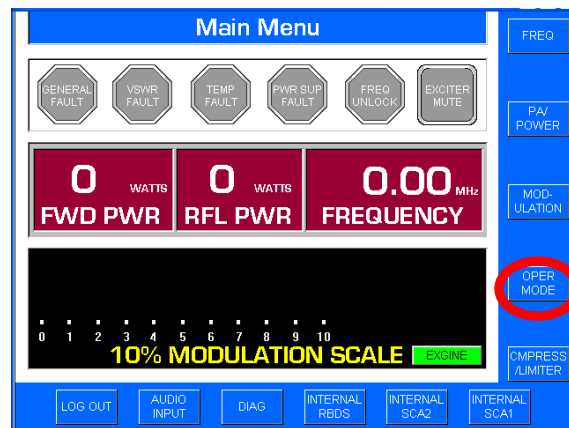


Figure 48 – FXi Exciter Main Menu Before Login



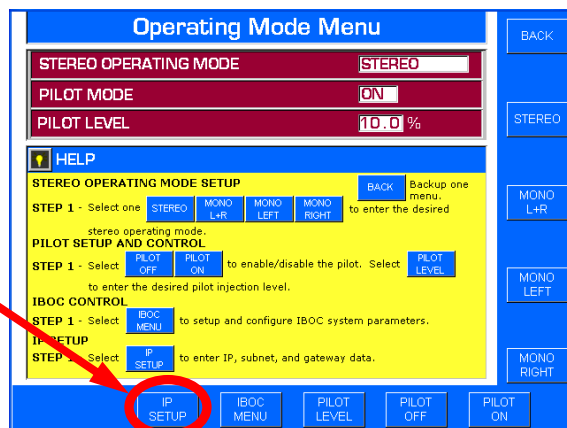
Step 2 – Using the Numeric Buttons, Enter the Password and Then Press ENTER (the default is 1 2 3 4 5 6)

Figure 49 – Login Menu



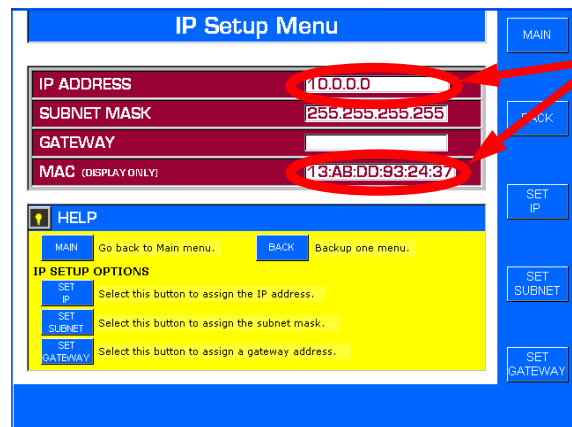
Step 3 – Select OPER MODE

Figure 50 – Main Menu After Login



Step 4 – Select IP SETUP

Figure 51 – Operating Mode Menu



Step 5 – Note the I.P. Address of the FXi Exciter and the MAC Address of the Engine / NetBurner Card in the FXi Exciter

Figure 52 – I.P. Setup Menu

Note: The MAC Address is also printed on a label that is located on the NetBurner daughter board of the Engine Card as shown in Figure 51.

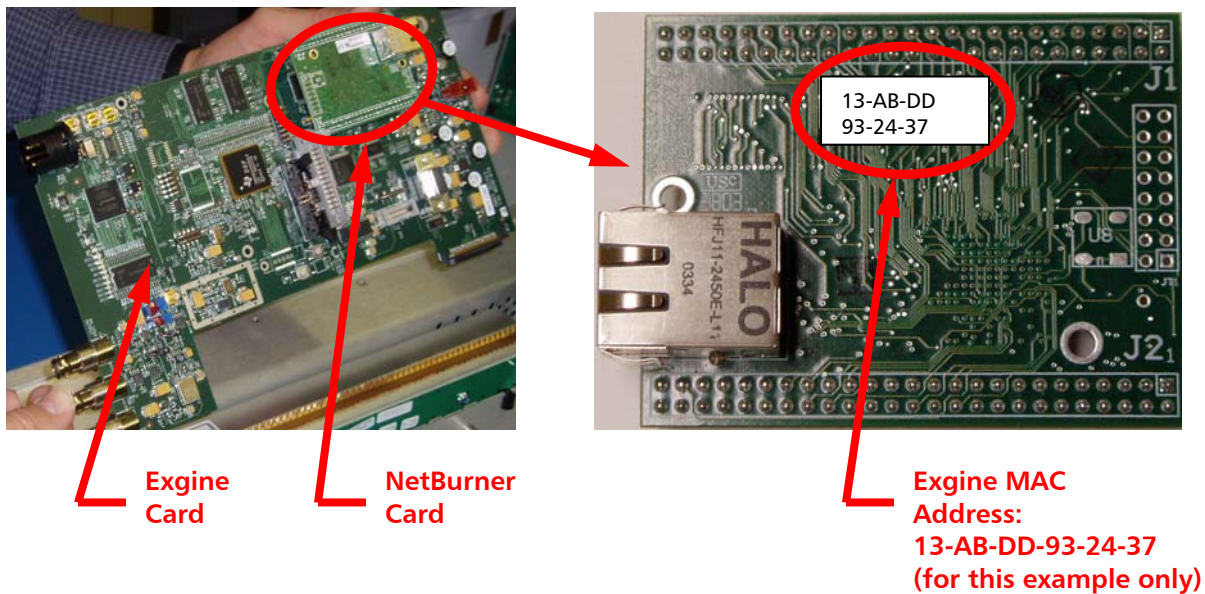


Figure 53 – MAC Address Label On the Exigne / NetBurner Daughter Card

3.35. Pointing the XPi 10 Exporter to the Engine Card

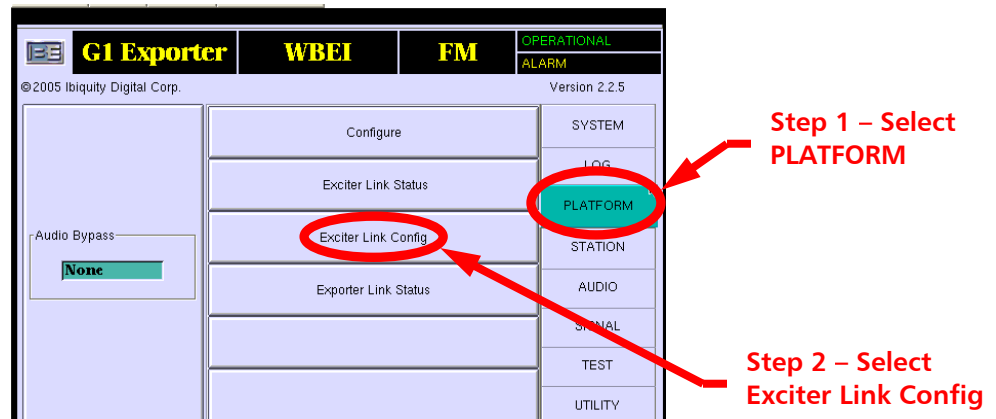


Figure 54 – XPi 10 Main Gui Menu

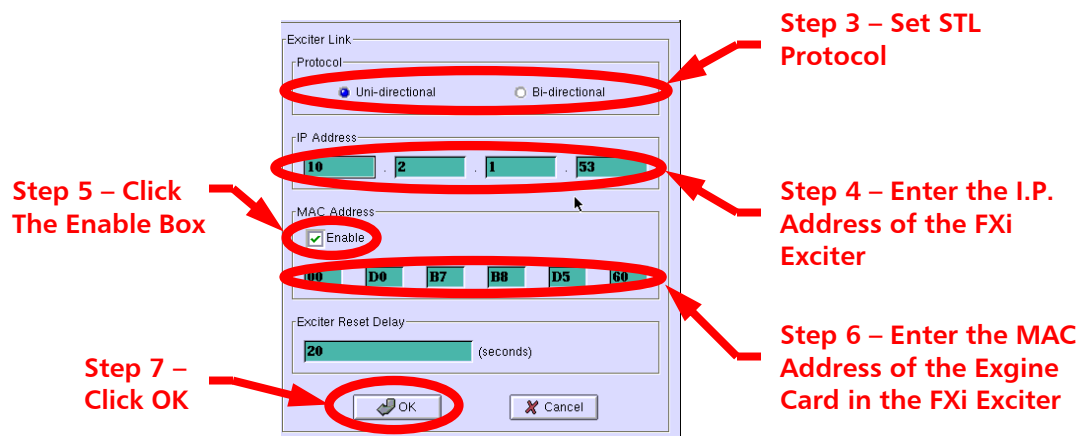


Figure 55 – XPi 10 Exciter Link Menu

Step 8 – Restart the XPi 10 Exporter when prompted by cycling the AC power (operate the power switch OFF, then ON) to restart the operating system on the new settings. Also, reset the FXi Exciter over the STL when prompted.

The communication setup for the XPi 10 Exporter to communicate with FXi 60 / 250 Exciter (with the Engine Card) is now complete.

4. Terms and Definitions

AAS	Advanced Application Services
AES/EBU	Audio Engineers Society/European Broadcast Union
AM	Amplitude Modulation
EASU	Exciter Auxiliary Service Unit
EOC	Ensemble Operations Center
FM	Frequency modulation
IBOC	In-Band On-Channel
MF	Medium Frequency
MPA	Main Program Audio
MPS	Main Program Service
PAD	Program Associated Data
QoS	Quality of Service
SIS	Station Information Service
SPS	Supplemental Program Service
VHF	Very High Frequency
WAN	Wide Area Network
LAN	Local Area Network
CM	Connection Manager
LP	Logistics Processor
IDi	Broadcast Electronics' brand name for an Importer
FSi	Broadcast Electronics' IBOC Signal Generator
FXi	Broadcast Electronics' Digital Exciter
XPi	Broadcast Electronics' Digital Exporter

Figure 56 - Terms and Definitions



5. RF Technical Services Contact Information

RF Technical Services -

Telephone: (217) 224-9617

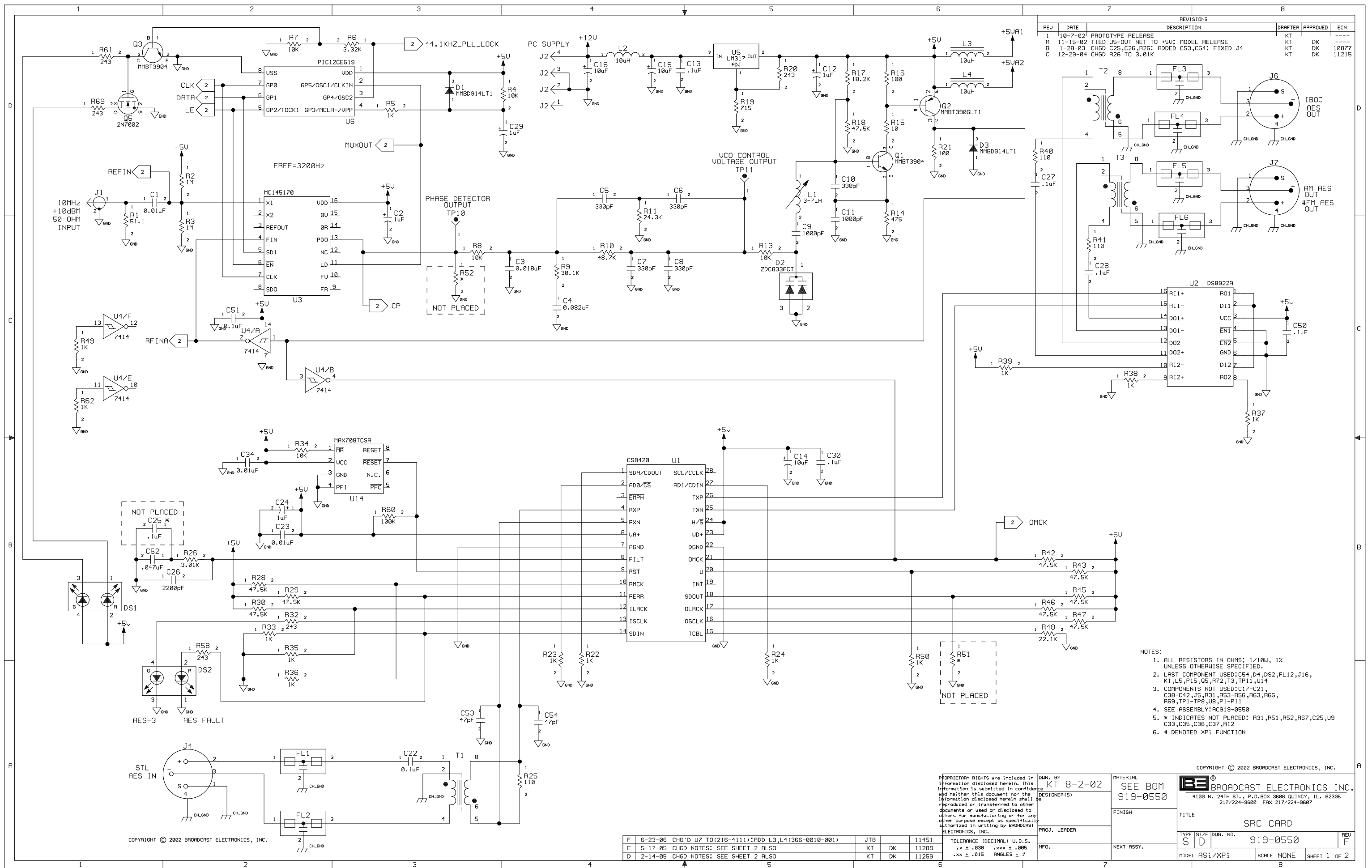
E-Mail: rfservice@bdcast.com

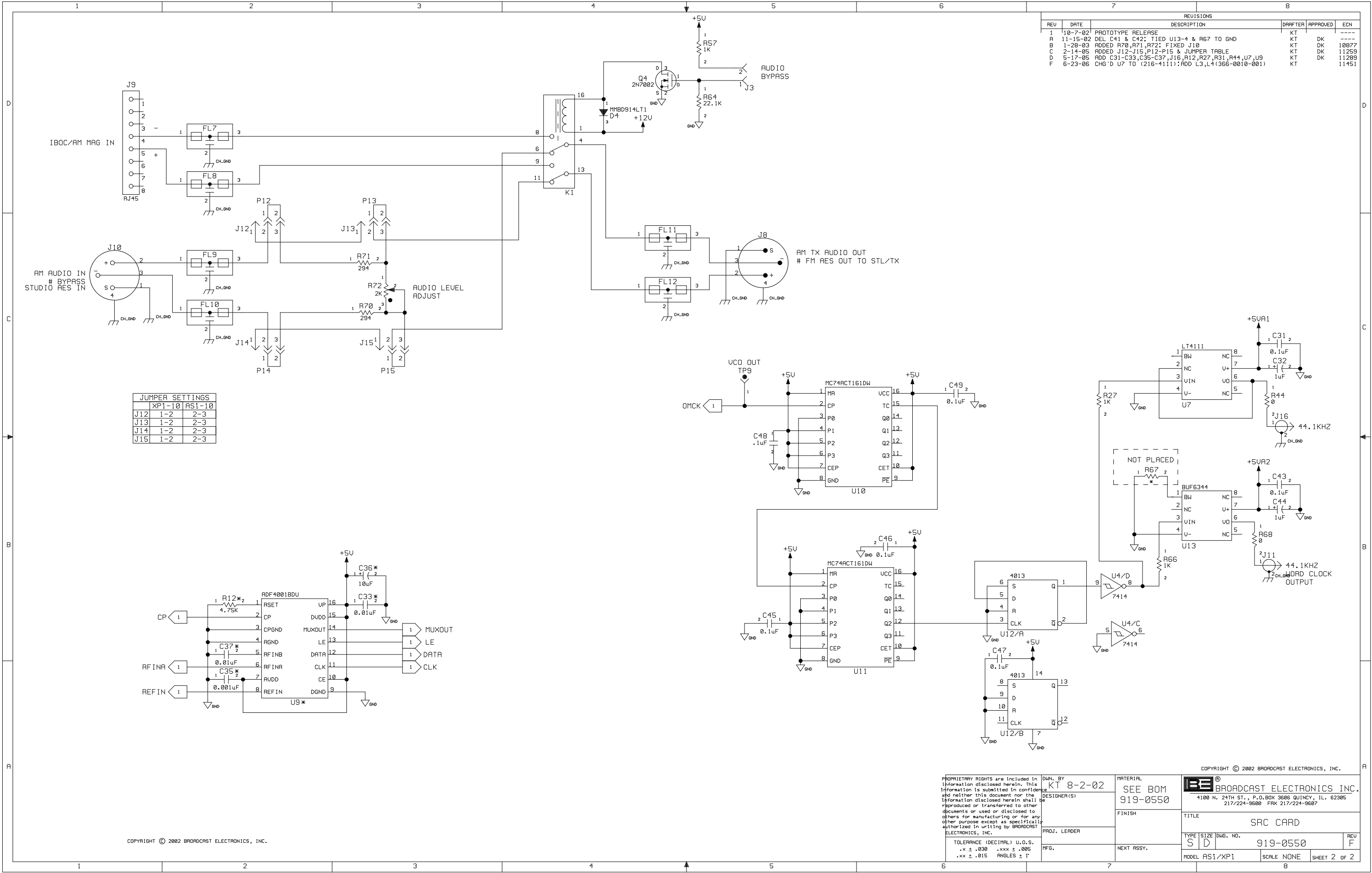
Fax: (217) 224-6258

www.bdcast.com

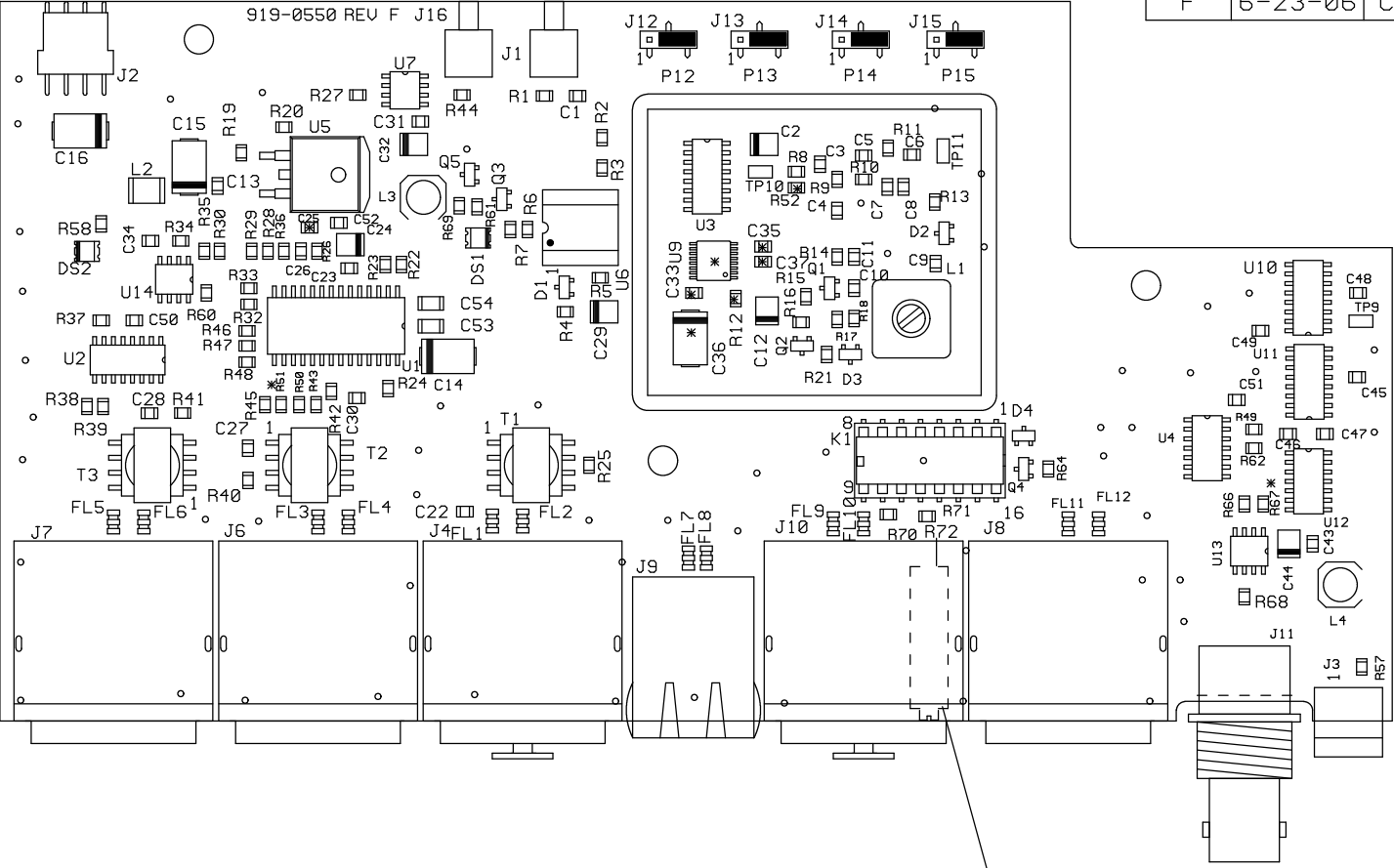
6. Schematic - Sample Rate Converter PCB Assembly





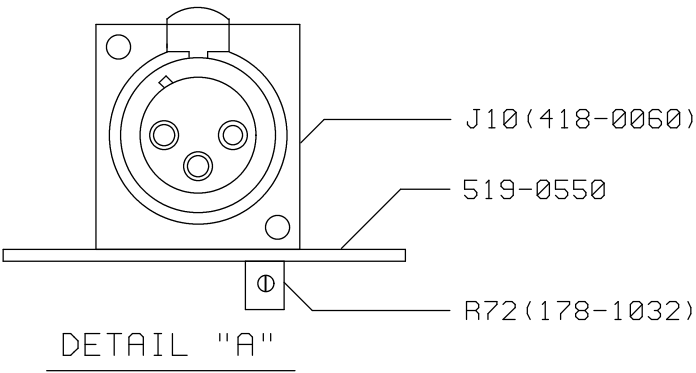


REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
1	9-26-02	PROTOTYPE RELEASE	KT		----
A	11-15-02	FIXED L1; DEL C41 & C42, CHGD NETS: MODEL BUILD	KT	DK	----
B	1-29-03	ADDED R70-R72,C53,C54; CHGD C26,R26; MARKED C25 AS NOT PLACED; FIXED J4 & J10	KT	DK	10877
C	12-29-04	CHGD R26 TO 102-3011	KT	DK	11215
D	2-15-05	ADDED J12-J15,P12-P15; MADE BOARD 0.300" WIDER	KT	DK	11259
E	5-18-05	ADDED C31-C37,J16,R12,R27,R31,R44,U7,U9	KT	DK	11289
F	6-23-06	CHG,D U7 TO (216-4111):ADD L3,L4(366-0010-001)	JTB		11451



NOTES:

- 1) * INDICATES PART NOT PLACED (C25,C33,C35-C37,R12,R51,R52,R67,U9)
- 2) INSTALL SOFTWARE 979-0550-U6 VER 1.0, BEFORE ASSEMBLY
- 3) INSTALL R72 ON SOLDER SIDE BEFORE INSTALLING J10.



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	DESIGNER(S)		BE ® BROADCAST ELECTRONICS INC. 4100 N. 24TH ST. P.O.BOX 3606 QUINCY,IL. 62305 217/224-9600 FAX 217/224-9607		
	PROJ. LEADER		TITLE SRC CARD		
	MFG.	NEXT ASSY.	TYPE A	SIZE B	DWG No. 919-0550
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES + 1°			REV F		
			MODEL ASi/XPi	SCALE 1/1	SHEET 1 OF 1