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RDi 20 RDS Subcarrier Generator

Quick Installation Guide

Firmware v0.152

597-9170 Revision D
12/04/06

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Quick Installation Guide

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1. Overview

The **RDi 20 Radio Data System (RDS) Generator** adds text to FM programming in the form of station branding, Program Associated Data (PAD) and other information.

Listeners want to know "what's happening now". To improve the immediacy of PAD, the RDi 20 RDS generator increases the rate at which receiver RadioText is refreshed. RadioText is the 64-character message display available on more sophisticated receivers. When an event occurs, such as a new song starting, the RDi will decrease the time necessary for new information to be displayed.

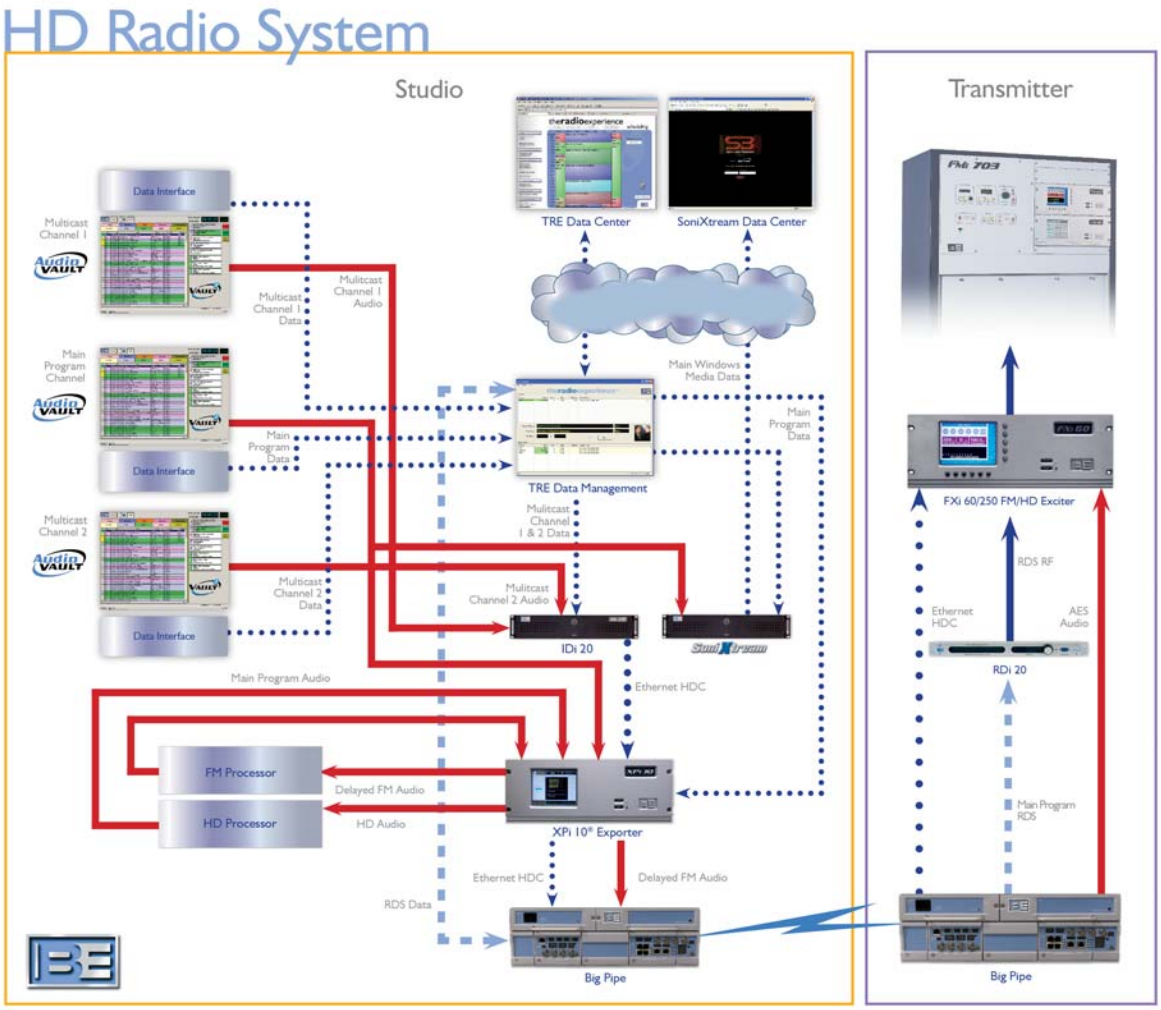


Figure 1 – Typical 2nd Generation HD Radio™ System with the RDi 20

2. Prepare the Installation of the RDi 20

2.1. Verify Contents of Shipment

- ☐ 808-9170, RDi 20 RDS Subcarrier Generator
- ☐ 597-9170, RDi 20 RDS Subcarrier Generator, Quick Install Guide (this document)
- ☐ 978-9170, RDi Installation Kit
  - ☐ 682-0001, AC Power Cord
  - ☐ 947-0020, Assy, Cable, BNC, Qty (2)
  - ☐ 417-0910, Kit Backshell for 9 Pin D-sub Connector, Qty (4)
  - ☐ 550-111, Connector D-sub 9 Pin Female, Qty (3)
  - ☐ 550-112, Connector D-sub 9 Pin Male, Qty (1)
  - ☐ 418-1550-008, Connector Plug, 8 Pin Terminal Block

2.2. Tools / Items Needed For Installation (not supplied)

- ☐ Small Flat Blade Screwdriver
- ☐ Wire Strippers
- ☐ Solder and Soldering Iron (if planning to use MPX IN - Serial Data Input port)
- ☐ Cable for 9 Pin Connectors (if planning to use MPX IN - Serial Data Input port)
- ☐ Heat Shrink for 9 Pin Cable (if planning to use MPX IN - Serial Data Input port)
- ☐ Standard Rack Mounting Hardware
- ☐ Appropriate Tool for Rack Hardware
- ☐ Standard Ethernet Cable to connect from RDi to STL
- ☐ Straight Thru Serial Cable (for Firmware Upgrades)
- ☐ Personal Computer (for Firmware Upgrades)

2.3. Mounting Considerations

The RDi 20 is designed to mount in a standard 19" E.I.A. rack or cabinet and is a 1 rack unit in height.

2.4. Estimated Time for Installation / Setup

Providing that you have the proper materials and tools listed above, the installation and setup of the RDi 20 will take approximately 1 hour.

3. RDi 20 Rear Panel Connections / Features

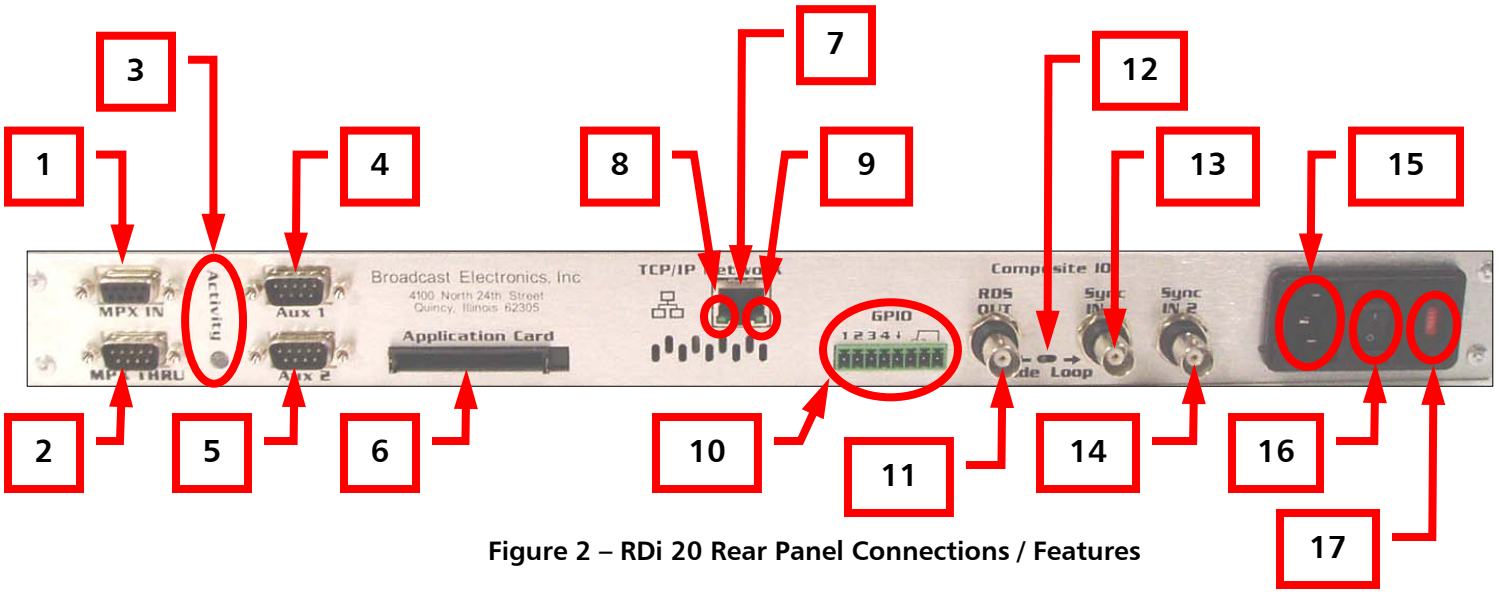


Figure 2 – RDi 20 Rear Panel Connections / Features

1) **MPX IN** – Serial data input from B.E.'s TRE or competing product. This input data may be multiplexed for feeding additional RDi's in the future. The "MPX In" is a D9F connector with "DCE" pin-out (see **Figures 5** and **5A**). Both the MPX IN and MPX THRU connectors have a passive bypass relay such that multiplex data will pass thru to the next device in the chain even if the RDi 20 is powered off.

2) **MPX THRU** – Used for connecting multiple RDi's together (cable connectors supplied). The "MPX Thru" is a D9M with "DTE" pin-out (see **Figures 5** and **5A**). Both the MPX IN and MPX THRU connectors have a passive bypass relay such that multiplex data will pass thru to the next device in the chain even if the RDi 20 is powered off.

3) **ACTIVITY LED** – The MPX Activity LED is lit green when the MPX input is active. The Activity LED will blink momentarily (green-off-green) to indicate an incoming data packet or switch momentarily red to indicate an error in the incoming data.

4) **AUX 1** – The "Aux 1" port has the same "DTE" pin-out as the "MPX Thru" (see **Figures 5** and **5A**). This connection will be used for future use.

5) **AUX 2** – The "Aux 2" port has the same "DTE" pin-out as the "MPX Thru" (see **Figures 5** and **5A**). This connection will be used for future use.

6) **APPLICATION CARD** – For future use.

7) **TCP / IP NETWORK** – RJ45 ethernet data input connection from B.E.'s TRE, Now Playing, or competing product via a Studio to Transmitter Link (STL).

8) **SPEED INDICATOR** – This is the ethernet speed indicator (lit for 100 base, extinguished for 10-base).

9) **LINK / ACTIVITY INDICATOR** – This is the ethernet activity indicator (will blink green-off -green during activity).

10) GPIO – General Purpose Input / Output Connections for future use.

11) RDS OUT – Subcarrier RF Output to be connected to the Exciter at the Transmitter Site (see **Section 5.6**).

12) SIDE CHAIN / LOOP THRU SWITCH – The Side/Loop switch selects the mode of operation for the Composite IO section.

In **"SIDE CHAIN"** operation the 19kHz pilot is applied to a sync input and only the RDS waveform appears at the RDS output. (The RDS waveform is locked in phase to the applied pilot reference.)

In **"LOOP THRU"** operation the complete composite signal (including audio and the 19kHz pilot) is applied to a sync input and a precision summing amplifier (internal to the RDi 20) adds the incoming composite signal to the internally generated RDS waveform and the sum of these signals is presented at the RDS output. Note that in "loop thru" operation a passive bypass relay is present to pass the composite signal if the RDi 20 is powered off.

13) SYNC IN 1 – 19 kHz Pilot Signal IN from Exciter (see **Section 5.6**).

14) SYNC IN 2 – 19 kHz Pilot Signal IN from Exciter (see **Section 5.6**).

15) AC POWER – AC Line cord connection.

16) ON / OFF – Main AC ON / OFF switch.

17) VOLTAGE – Voltage selection (115V or 230V) fuse block.

4. RDi 20 Front Panel Features

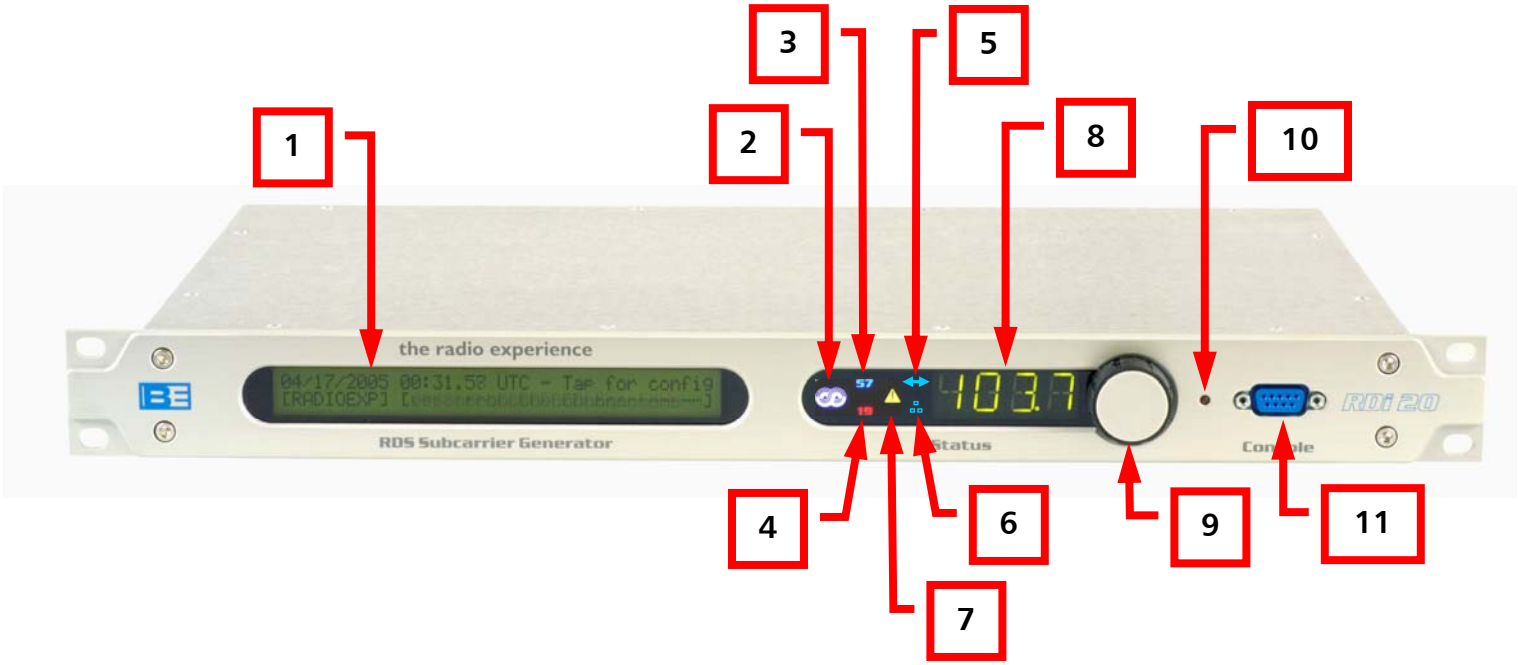


Figure 3 – RDi 20 Front Panel Features

1) **TEXT DISPLAY** – In normal operation the date and time (UTC) is displayed along with the selected sync input (upper right), the 8 character PS code (lower left) and current radio text (scrolling area, lower right).

   With release of the firmware v0.152 it is now possible to configure common features of the RDi 20 from the front panel using a combination of menus on the text display and the encoder (item 9).

2) **RDS LOGO** – This is the RDS Logo (not a status indicator).

3) **57 kHz (SUBCARRIER) STATUS INDICATOR** – Lit blue for normal operation, lit red if the unit is in the bypass state (XEBP=Enabled).

4) **19 kHz (STEREO PILOT) STATUS INDICATOR** – Lit blue when a 19 kHz reference (stereo pilot) is present at a sync input and the corresponding sync input is selected (XESS=Input 1 or XESS=Input 2). This is the normal state for a stereo broadcast with the RDS subcarrier phase locked to the stereo pilot. Lit red if a reference is not detected or if the unit is in the bypass state. Indicator is dark for monophonic broadcast with a "free running" subcarrier (XESS=Disabled).

5) **MPX ACTIVITY INDICATOR** – Lit blue for normal operation. Blinks momentarily (blue-off-blue) on reception and successful processing of new data on the MPX port. Blinks red momentarily to indicate reception of corrupt data on the MPX port.

6) **ETHERNET ACTIVITY INDICATOR** – Lit blue for normal operation. Blinks momentarily (blue-off-blue) on reception and successful processing of new data on the Ethernet port. Indicator is dark if no link detected (no Ethernet cable attached or other connectivity issue).

7) **FAULT INDICATOR** – Lit red for hardware fault. (Note that it is normal for this indicator to light red for several seconds on power up or CPU reset.) Future versions of the firmware may define additional states for this indicator.

8) **NUMERIC DISPLAY** – The numeric display cycles through a set of three device ID codes. This includes the PI code in hexidecimal and ASCII form as well as the station broadcast frequency.

9) **ENCODER** – With release of the firmware v0.152 it is now possible to configure common features of the RDi 20 from the front panel using menus (on the text display, item 1) and this control. The encoder is rotated left or right to scroll through menu items and pressed in (clicked) to make selections.

10) **HARDWARE RESET BUTTON** – This pushbutton triggers a hardware reset. (Note that the button is recessed into the panel and a small flat screwdriver or similar tool is required to actuate it.) This control is normally not used. It is part of a hardware interlock to force access to the CPU ROM monitor (press and hold encoder in while momentarily pressing the reset button).

11) **CONSOLE PORT** – A serial communications port used for initial device configuration using a terminal emulator as well as installation "uploading" of new firmware. This port is "DCE" wired and is always configured for 115200 baud, 8 bits, no parity, 1 stop bit.

5. Installation

5.1. AC Voltage Configuration

The RDi 20 can be quickly configured for either 115V (factory default) or 230V operation. On the rear of the RDi unit there is a fuse block the can be removed, rotated 180˚, and reinstalled to quickly change from 115V to 230V.

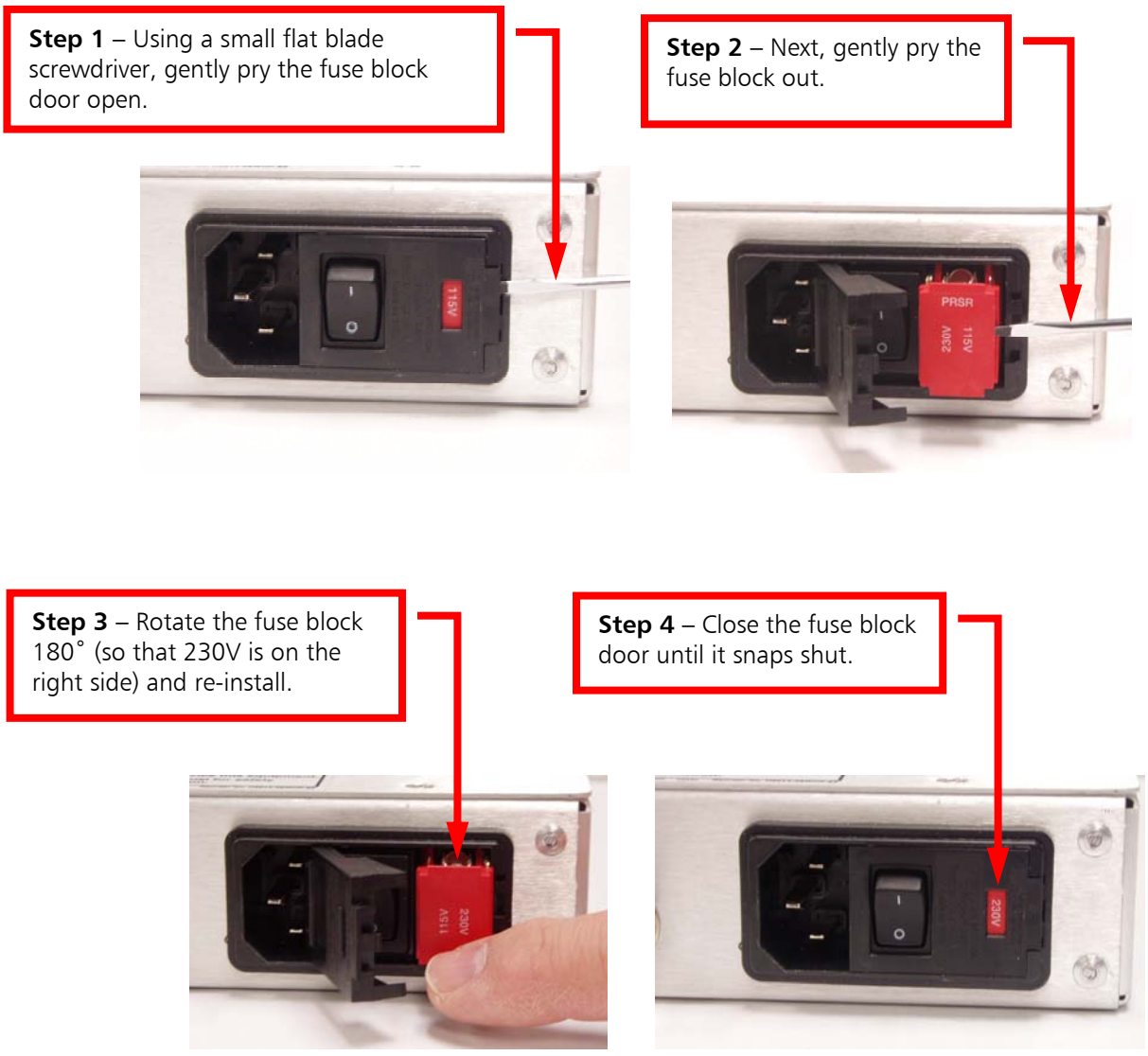


Figure 4 – RDi 20 AC Configuration (115V or 230V)

5.2. Install into Equipment Rack

Install the RDi 20 into a standard 19" E.I.A. equipment rack at the transmitter site.

5.3. Connect AC Power

Connect the AC Power Cord (supplied in kit) to the RDi 20.

5.4. Connect the Data Input Cable (Serial or Ethernet)

The RDi 20 will accept either serial data to the **MPX IN** port, or ethernet data via the **TCP / IP NETWORK** port. Most installations will connect a standard ethernet cable (not supplied) from the RDi 20 to the STL at the transmitter site.

NOTE: Communication across the **STL** may be either **UDP** or **TCP/IP** protocol.

If the serial data **MPX IN** port is going to be used, terminate the serial input cable with the appropriate connector from the kit. See the following section for pinout.

5.5. MPX and AUX Data Ports

The "**MPX**" and "**AUX**" data ports are capable of operating with RS232 or RS422 signaling. (The signal names change depending on the type of electrical signaling selected for the port.)

The "**MPX IN**" is the serial data input port and is a DB9F connector with "DCE" pin-out.

The "**MPX THRU**" is a DB9M with "DTE" pin-out and is used if connecting to another RDi 20.

The "**AUX 1**" and "**AUX 2**" ports are also DB9Ms and have the same "DTE" pin-out as the "**MPX THRU**."

MPX IN (DB9F)	RS232 (DCE)	RS422		**MPX THRU, AUX 1, AUX 2 (DB9M)**	RS232 (DTE)	RS422
1	DCD (out)			1		
2	RD (out)	TXD-		2	RD (in)	RXD-
3	TD (in)	RXD-		3	TD (out)	TXD-
4				4	DTR (out)	
5	Ground	Ground		5	Ground	Ground
6	DSR (out)			6		
7	RTS (in)	RXD+		7	RTS (out)	TXD+
8	CTS (out)	TXD+		8	CTS (in)	RXD+
9				9		

Figure 5 – MPX IN, MPX THRU, AUX 1, and AUX 2 Connector Pinouts

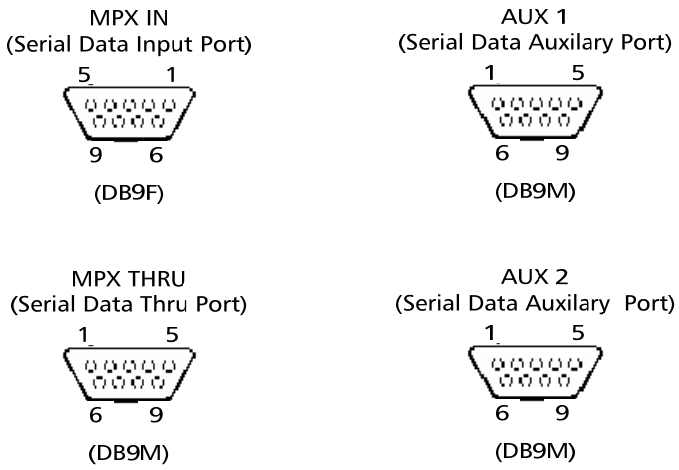


Figure 5A – MPX IN, MPX THRU, AUX 1, and AUX 2 Connector Pinouts

5.6. SYNC IN & RDS OUT Connections for "SIDE" & "LOOP" Modes

The RDi 20 subcarrier generator offers two methods for connection into the FM composite chain known as "**Side Chain**" and "**Loop Thru**".

"**Side Chain**" is normally the preferred method of connection. The mode switch must be set to the "**Side**" position for this connection method. The 19kHz pilot reference from the stereo generator is connected (via BNC Cable 947-0020 supplied in kit) to one of the sync inputs on the RDi 20. This allows the RDi 20 to phase lock the 57kHz RDS subcarrier to the 19kHz stereo pilot. The RDS output of the RDi 20 is then connected (via BNC Cable 947-0020 supplied in kit) to a Subcarrier (SCA) or Aux Input on the FM Exciter. In this mode of operation, only the RDS waveform is present at the RDi 20 RDS Output and this signal is mixed into the final composite by a summing amplifier within the Exciter.

"**Loop Thru**" is an alternate method of connection that is required in some composite chains. The mode switch must be set to the "**Loop**" position for this connection method. In "**Loop Thru**" operation the composite signal from the stereo generator (containing audio and the 19kHz pilot) is connected (via BNC Cable 947-0020 supplied in kit) to a Sync Input on the RDi 20. A precision summing amplifier (internal to the RDi 20) combines the incoming composite signal with the internally generated RDS waveform to produce the final output. The RDi 20 RDS Output (which is now the full composite signal including audio and the RDS subcarrier) is connected (via BNC Cable 947-0020 supplied in kit) to the main program input on the FM Exciter. In "**Loop Thru**" operation, a passive bypass relay internal to the RDi 20 allows the composite signal to pass thru to the Exciter should the RDi 20 be powered off.

In either case, it is necessary to adjust the RDS signal level to produce an appropriate (approximately 3%) final injection level. See the **RDS Output Level Settings** section of this manual for further information on adjusting signal levels.

6. RDi 20 Front Panel Programming

6.1. Overview

With firmware release v0.152, the RDi 20 has the capability of "Front Panel Setup" using the Encoder Wheel and the Display.

Figure 6 – RDi 20 Status Display

Once the RDi 20 comes up, depress the Encoder Wheel once to enter the programming menu set.

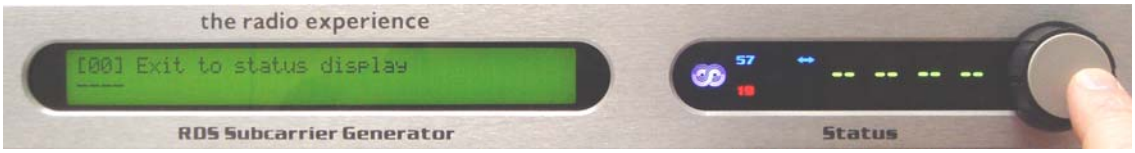


Figure 7 – RDi 20 Programming Menu Set

Next, rotate the Encoder Wheel (right or left) to go to the desired programming menu. There are 38 programming menus available for front panel setup that are numbered [00] through [37] . This number is displayed in the upper left corner of the display in the programming menus. Please note that the menu selections "wrap around" from item [37] to item [00] and vice versa.

Figure 8 – Rotate the RDi 20's Encoder Wheel to Scroll Through the Programming Menus

Once you are in the desired programming menu, depress the Encoder Wheel. The brackets will now move from the menu number in the upper left corner of the display to the first programmable selection. Next, rotate the Encoder Wheel (right or left) to make the desired entry. Depress the Encoder Wheel again, the brackets will go to either the next programmable selection or back to the menu number. Rotate the Encoder Wheel to go to next desired menu.

Once all changes are made, go to programming menu [01] and depress the Encoder Wheel to save all changes.

Next, go to menu [02] and depress the Encoder Wheel to reset the RDi 20.

6.2. RDi 20 Front Panel Programming Parameters

Please note that most of the RDi 20's system parameters may be programmed via the front panel. However, there are a few that may only be changed via a serial connection using Hyper Terminal (see **Sections 9** and **11**).

6.3. Exiting the Programming Menu Set Without Saving

If at anytime during the programming process you wish to exit without saving changes, navigate to the [00] programming menu and depress the encoder wheel. The RDi 20 will then return to the Status Display screen.

The front panel programming menu may also be used to view the current state of the RDi 20's system parameters. To exit the menu system after browsing the system parameters, select item [00] to return to the status display.

[00] Exit to status display

6.4. Saving Settings

Navigate to the [01] programming menu,

[01] Save parameters to NVRAM
XSAV

Next, depress the encoder wheel to save all settings to NVRAM.

6.5. Restarting the RDi 20 After Saving Settings

Certain system parameters (such as the TCP/IP configuration) only take effect when the RDi-20 CPU starts up. As such, use option [02] to restart the CPU after all desired changes have been made and saved to NVRAM."

Navigate to the [02] programming menu,

[02] Software restart
XRES

Next, depress the encoder wheel to restart the RDi 20 software.

7. Configure the RDi 20 via the Front Panel

7.1. Set the IP Address

[18] IP Address
XIPA = * . * . *. *

7.2. Set the Subnet Mask

[19] Subnet
XIPS = * . * . *. *

7.3. Set the Gateway (if applicable)

[20] Gateway
XIPG = * . * . *. *

7.4. Set DNS (if applicable)

[21] DNS
XIPD = * . * . *. *

7.5. Save the Settings

Navigate to the [01] programming menu,

[01] Save parameters to NVRAM
XSAV

Next, depress the encoder wheel to save all settings to NVRAM.

7.6. Frequency ID

[37] Frequency ID
XIDF = ???.?

7.7. Set UDP Input 1

It is necessary to set the UDP port that the RDi 20 listens to for incoming data. This value must also be set on the controlling software.

[22] UDP input 1
XIPP=n :n.n.n.n

Where the first "**n**" selects the UDP port number. The presence of the "**:**" and four additional numbers **n.n.n.n** sets a mask such that the RDi 20 will only listen to UDP packets from a specific address or range of addresses.

To listen to port **16550** from any address starting with "**192.168**" enter "**XIPP=16550:192.168.*.***" The "*****" is a "match any" wildcard.

The more digits specified, the more restricted the range. As such, "**XIPP=16550:192.168.1.137**" sets the RDi 20 to listen to port **16550** but only if the UDP packet originated at **192.168.1.137**

7.8. Save the Settings

Navigate to the [01] programming menu,

[01] Save parameters to NVRAM
XSAV

Next, depress the encoder wheel to save all settings to NVRAM.

7.9. Configure the MPX Port

[17] MPX port
XMCP = mpx : sig : baud : bits : par : stop

Where:
"**mpx**" = "**--**" for non-multiplexed data
- or -
"**mpx**" = "**00-99**" (a channel number) for multiplexed data

"**sig**" = "**RS232** or **RS422**" to select the type of electrical signaling

"**baud**" = "**300** to **115200**" to select the baud rate (typically "**9600**")

"**bits**" = "**5** to **8**" to select the number of data bits (typically "**8**")

"**par**" = "**N,O,E**" to select none, odd, or even parity (typically "**N**")

"**stop**" = "**1** or **2**" to select the number of stop bits (typically "**1**")

7.10. Save the Settings

[01] Save parameters to NVRAM
XSAV

7.11. Enabling RDS Group Generation

[07] Group generation
XENA = (setting may be Enabled or Disabled; will default to Enabled if using TRE)

When "XENA = Enabled" group generation is enabled and the actual RDS data appears at the output.

When "XENA = Disabled" group generation is disabled and an "all zero" modulation appears at the output. (That is to say, the subcarrier waveform is

present but no group data is being generated. The RDS /RBDS standards consider "all zero" modulation as the reference waveform for use when setting the RDS injection level.)

7.12. PS Group Type

[36] PS group type
XPSG = (setting may be Group OA or Group OB)

7.13. Enabling RDS Subcarrier Output

[03] Output bypass
XEBP = (Disabled or Enabled; default is Enabled which is to say that the output is bypassed / no signal present.)

7.14. Save the Settings

[01] Save parameters to NVRAM
XSAV

7.15. Configure Composite Sync

[06] Sync Select / PLL
XESS = (settings may be Disabled, Input 1, or Input 2; default is ????)

The active sync input is selected using the "**XESS**" command. "**XESS=Input 1**" selects sync input 1, "**XESS=Input 2**" selects sync input 2. A third case "**XESS=Disabled**" is provided for monophonic broadcast (no stereo pilot.) When "**XESS=Disabled**" the RDi 20 phase lock loop is disabled and the RDS subcarrier is generated using an accurate free running oscillator. If there is no sync signal applied to the RDi 20 set "**XESS=Disabled**". With the appropriate sync input selected, the "19" indicator on the front panel is lit blue to indicate detection of the 19kHz pilot reference. If "19" is lit red no sync signal is present or the incorrect sync input is selected.

7.16. Configure Composite Phase

[05] Output Phase
XEPH = n deg (setting range 0 - 359 deg; default is 0 deg)

The angle of phase lock between the pilot (sync) input and the RDS subcarrier output is set using the "**XEPH = n**" command. The full 360 degree range is allowed. This value is normally set to "0" (in phase operation) or sometimes "90" (quadrature operation).

7.17. RDS Output Level Settings

[04] Output attenuation
XEDB = ?.? dB (setting range is 0 to 60 dB in 0.5 dB steps; default is 33.0 dB)

The RDS output level is adjusted using the "**XEDB**" command. This command sets the amount of attenuation (in 0.5 dB steps) applied to the RDS waveform. The maximum output level of ~4.096 Vpp is achieved with zero attenuation: "**XEDB=0.0**" The larger the attenuation value the lower the resulting output level. The output defaults to a relatively low level of ~100mVpp achieved at "**XEDB=33.0**" (33dB attenuation). The output level is normally adjusted to achieve a 3% injection level for the RDS subcarrier.

7.18. Save the Settings

[01] Save parameters to NVRAM
XSAV

7.19. Set the Stations PI, PTY, PS, and DI Codes

7.19.1 Set the PI Code (Call letters)

Set the station PI code (Program Identification) using either "**XPIC=xxxx**" to enter the 4 digit hexdecimal representation or "**XPIT=text**" to have the RDi 20 generate the hexdecimal representation using the station call sign (for US / RBDS standard).

[10] PI code (by hexidecimal equivalent of call letters)
XPIC = ????
- or -
[11] PI code (by call letters)
XPIT = ????

7.19.2 Set the PTY Code

Set the PTY code (Programming Type) using the program types for RBDS (US standard).

[13] Program Type (PTY)
XPTY = ?? (see chart below; will default to 5 if using TRE)

1 = News	12 = Soft	23 = College
2 = Information	13 = Nostalgia	24 = Unassigned
3 = Sports	14 = Jazz	25 = Unassigned
4 = Talk	15 = Classical	26 = Unassigned
5 = Rock	16 = Rhythm and Blues	27 = Unassigned
6 = Classic Rock	17 = Soft R&B	28 = Unassigned
7 = Adult Hits	18 = Foreign Language	29 = Weather
8 = Soft Rock	19 = Religious Music	30 = Emergency Test
9 = Top 40	20 = Religious Talk	31 = Emergency
10 = Country	21 = Personality	
11 = Oldies	22 = Public	

Figure 9 – PTY Codes

7.19.3 Set the PS Code

Set the static PS code (Program Service) limited to 8 characters. Generally set as a station's slogan or other simple identifier.

[12] Program Service (PS)
XPSS = ???? (typically a station's slogan or other simple identifier; may use up to 8 characters)

7.19.4 Set Decoder Identification (DI) Flags

Set the "DI" flags (Decoder Identification). "**XFDI = Stereo**" for stereo broadcasts or "**XFDI = Mono**" otherwise. (See RBDS standard for the description of additional flag.)

[14] Decoder Identification (DI) flags
XFDI = (Stereo or Mono) AH: (0 or 1) CMP: (0 or 1) (Static PTY or Dynamic PTY)

XFDI = Stereo AH:0 CMP:0 Static PTY (Defaults if using TRE)

7.20. Save the Settings

Navigate to the [01] programming menu,

[01] Save parameters to NVRAM
XSAV

Next, depress the encoder wheel to save all settings to NVRAM.

7.21. Set Date and Time (UTC)

[08] Set date and time (UTC)
XUTC = mm/dd/yyyy hh:mm.ss

7.22. Set Local Offset from UTC

[09] Set local offset from UTC
XOFS = ?.? hours

7.23. Set Music/Speech (MS) Flag

[15] Music/Speech (MS) flag
XFMS = Music (or Speech)

7.24. Set the Traffic Program (TP) Flag

[16] Program Type (TP) flag
XFTP = (settings may be Disabled or Enabled)

7.25. Enable MPX Back-Channel

[24] MPX back-channel
XFBC = (setting may be Disabled or Enabled)

7.26. Broadcast Time of Day

[25] Broadcast Time of Day
XFBT = (setting may be Disabled or Enabled; default is disabled)

7.27. Save the Settings

Navigate to the [01] programming menu,

[01] Save parameters to NVRAM
XSAV

Next, depress the encoder wheel to save all settings to NVRAM.

7.28. Software Restart

After all desired programming changes have been made and saved to NVRAM.

Navigate to the [02] programming menu,

[02] Software restart
XRES

Next, depress the encoder wheel to restart the RDi 20 software.

8. Using TRE in Conjunction with the RDi 20

If you are using TRE (The Radio Experience) in conjunction with the RDi 20, certain RDi 20 parameters will automatically be set by TRE upon initial power up. These default parameters are listed in this section. If it desired, any of these parameters may also be changed.

8.1. DPS White Space

[26] DPS white space
XFPW = (setting may be Disabled or Enabled; will default to Enabled if using TRE)

8.2. Short Radiotext

[27] Short radiotext
XFST = (setting may be Disabled or Enabled; will default to Disabled if using TRE)

8.3. Radiotext Normal Blocks

[28] Radiotext normal blocks
XTNB = (setting may be 0 – 8; will default to 1 if using TRE)

8.4. Radiotext Burst Blocks

[29] Radiotext burst blocks
XTBB = (setting may be 0 – 8; will default to 8 if using TRE)

8.5. Radiotext Burst Cycles

[30] Radiotext burst cycles
XTBC = (setting may be 1 – 4; will default to 2 if using TRE)

8.6. PS Normal Blocks

[31] PS normal blocks
XPSN = (setting may be 1 – 16; will default to 4 if using TRE)

8.7. PS Blanking Cycles

[32] PS blanking cycles
XPSB = (setting may be 0 – 8; will default to 0 if using TRE)

8.8. DPS Scroll Advance

[33] DPS scroll advance
XPSA = (setting may be 0 – 8; will default to 8 if using TRE)

8.9. DPS Scroll Cycles

[34] DPS scroll cycles
XPSC = (setting may be 1 – 99; will default to 4 if using TRE)

8.10. DPS Scroll Delay

[35] DPS scroll delay
XPST = (setting may be 0 – 99; will default to 4 if using TRE)

9. Configure the RDi 20 using a Serial Connection

You may also set RDi 20 system parameters via a serial connection using Hyper Terminal if so desired.

9.1. Turn AC Power ON

Turn the AC Power Switch **ON** (located on the rear of the unit).

9.2. Connect a Personal Computer to the RDi 20

Step 1 - Connect a serial cable (not supplied) to the RDi 20 front panel Console port and then to the serial port on a personal computer.

Step 2 – Launch Hyper Terminal by going to **START -> ALL PROGRAMS -> ACCESSORIES -> COMMUNICATIONS -> HYPERTERMINAL.**

Step 3 – The default telnet questions box will appear. Select **Yes** if you want Hyper Terminal to be your default telnet program. Select **No** if you do not want it to be.

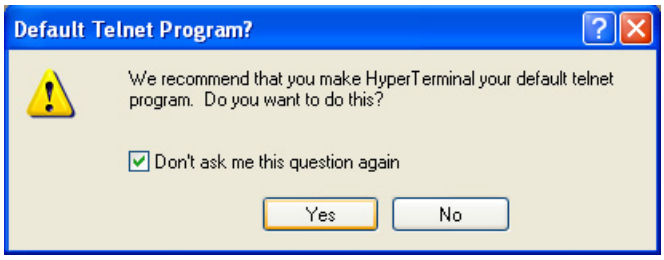


Figure 10 – Default Telnet Program Menu

Step 4 – Name the Connection, choose the Desktop Icon, then select **OK**.

Figure 11 – Connection Description Menu

Step 5 – Select the appropriate connection port (COM1 is the most common) from the pull down.

Figure 12 – Connect To Menu

Step 6 – Configure the port setting as shown below, select **Apply**, then **OK**.

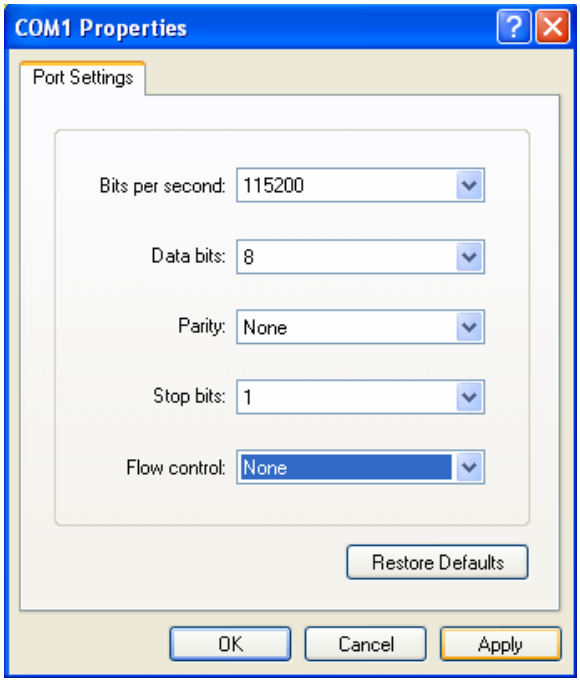


Figure 13 – Port Settings Menu

Step 7 – The Hyper Terminal window will appear. Next, select **FILE -> PROPERTIES.**

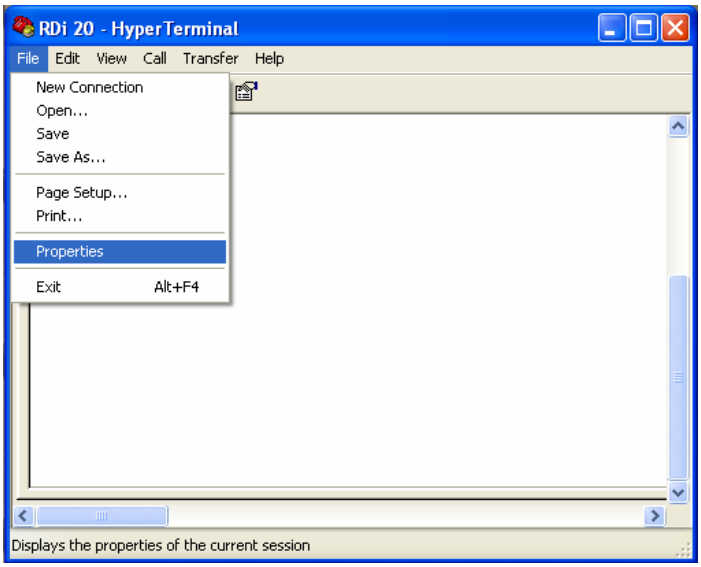


Figure 14 – Hyper Terminal Command Screen

Step 8 – The Connection Properties Menu will now appear. Select the settings tab.

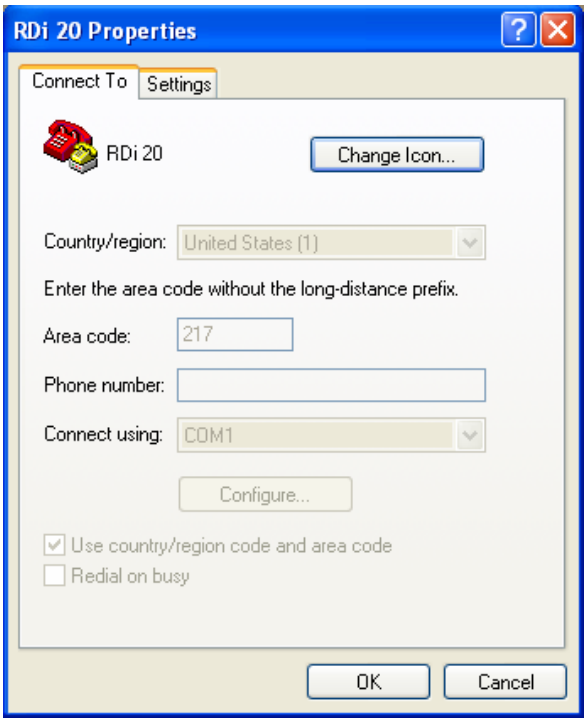


Figure 15 – Properties Menu

Step 9 – The Settings Menu will now appear. Next, select **ASCII Setup** and then select **OK**.

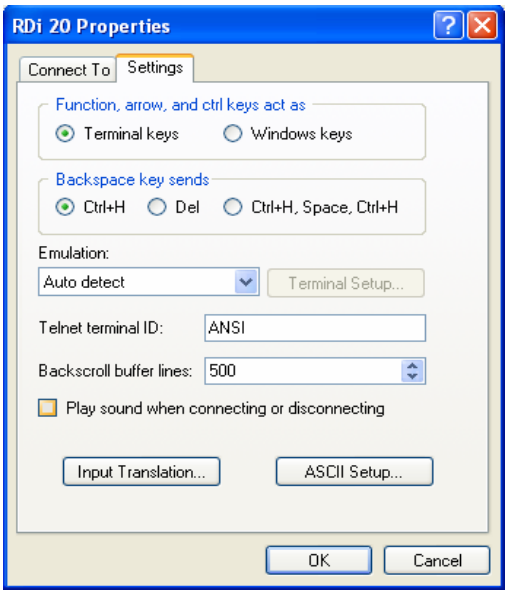


Figure 16 – Setting Menu

The Hyper Terminal is now ready to send commands to the RDi 20.

9.3. Setting the I.P. Address of the RDi 20

From the Hyper Terminal Screen, the command for entering the I.P. Address of the RDi 20 is **XIPA=**

Example: An I.P. Address of **193.168.0.3**, would be entered as

XIPA=193.168.0.3 <return>

Note: If the I.P. Address is accepted, a "**+**" will then appear on the next line.
If the I.P. Address is NOT accepted, a "**!**" will appear on the next line.

To query the I.P. Address of the RDi 20 from Hyper Terminal, enter

XIPA? <return>

9.4. Setting the Subnet Mask of the RDi 20

From the Hyper Terminal Screen, the command for entering the I.P. Address of the RDi 20 is **XIPS=**

Example: A Subnet Mask of **255.255.255.0**, would be entered as

XIPS=255.255.255.0 <return>

Note: If the Subnet Mask is accepted, a "**+**" will then appear on the next line.
If the Subnet Mask is NOT accepted, a "**!**" will appear on the next line.

To query the Subnet Mask of the RDi 20 from Hyper Terminal, enter

XIPS? <return>

9.5. Setting the Gateway of the RDi 20

If using a Gateway, from the Hyper Terminal Screen, the command for entering the Gateway Address of the RDi 20 is **XIPG=**

Example: A Gateway Address of **10.10.10.2**, would be entered as

XIPG=10.10.10.2 <return>

Note: If the Gateway Address is accepted, a "**+**" will then appear on the next line. If the Gateway Address is NOT accepted, a "**!**" will appear on the next line.

To query the Gateway Address of the RDi 20 from Hyper Terminal, enter

XIPG? <return>

9.6. Save the Settings

To save the settings made to the RDi, from the Hyper Terminal Screen enter

XSAV <return>

9.7. Set the UDP Port

It is necessary to set the UDP port that the RDi 20 listens to for incoming data. This value must also be set on the controlling software.

The command form is as follows:

XIPP=n(:n.n.n.n)

Where the first "**n**" selects the UDP port number. The presence of the "**:**" and four additional numbers **n.n.n.n** sets a mask such that the RDi 20 will only listen to UDP packets from a specific address or range of addresses.

To listen to port **16550** from any address starting with "**192.168**" enter "**XIPP=16550:192.168.*.***" The "*****" is a "match any" wildcard.

The more digits specified, the more restricted the range. As such, "**XIPP=16550:192.168.1.137**" sets the RDi 20 to listen to port **16550** but only if the UDP packet originated at **192.168.1.137**

9.8. Save the Settings

To save the settings made to the RDi, from the Hyper Terminal Screen enter

XSAV <return>

9.9. MPX IN and MPX THRU Port Configuration

For installations where the RDi 20 will receive PAD as serial data at the **MPX IN** port, it is necessary to configure the MPX port (using the **XMCP** command) to match the configuration (baud rate, data bits, etc) of the STL or other source of serial data.

This command simultaneously configures the **MPX IN** and **MPX THRU** ports. The command also allows a variable number of parameters to be specified. That is to say, if only the first 3 parameters (mpx:sig,baud) are specified, only those 3 parameters will be altered. Any unspecified parameters remain in their previous state.

XMCP=(mpx:sig,baud,bits,par,stop)

Where:

"**mpx**" = "**-**" for non-multiplexed data

OR

"**mpx**" = "**0-99**" (a channel number) for multiplexed data

"**sig**" = "**232** or **422**" to select the type of electrical signaling

"**baud**" = "**300** to **115200**" to select the baud rate (typically "**9600**")

"**bits**" = "**5** to **8**" to select the number of data bits (typically "**8**")

"**par**" = "**N,O,E**" to select none, odd, or even parity (typically "**N**")

"**stop**" = "**1** or **2**" to select the number of stop bits (typically "**1**")

9.10. Save the Settings

To save the settings made to the RDi, from the Hyper Terminal Screen enter

XSAV <return>

9.11. Enabling RDS Group Generation

From the Hyper Terminal Screen, the command to enable group generation from the RDI 20 is **XENA= n** <enter> (where "**n**" is either 1 or 0; see below for explanation)

When "**XENA=1**" group generation is enabled and the actual RDS data appears at the output.

When "**XENA=0**" group generation is disabled and an "all zero" modulation appears at the output. (That is to say, the subcarrier waveform is present but no

group data is being generated. The RDS /RBDS standards consider "all zero" modulation as the reference waveform for use when setting the RDS injection level.)

Note: If the command is accepted, a "**+**" will then appear on the next line.
If the command is NOT accepted, a "**!**" will appear on the next line.

To query the RDS Group Generation setting, enter

XENA? <return>

9.12. Enabling RDS Subcarrier Output

The "**XEBP**" command defaults to the "**1**" state. (That is to say that by default the output is bypassed / no signal is present.)

To enable the RDS subcarrier output, set "**XEBP=0**" The "57" indicator on the front panel is lit blue when the RDS output is active.

Once this setting is made and the "XSAV" (save) command is issued, the unit now defaults to the output enabled state.

If it is desired to fully disable the RDS subcarrier output of the RDi 20, set "**XEBP=1**" The "57" indicator on the front panel is lit red in the bypass (output disabled) state.

9.13. Save the Settings

To save the settings made to the RDi, from the Hyper Terminal Screen enter

XSAV <return>

9.14. Configure Composite Sync

The active sync input is selected using the "**XESS**" command. "**XESS=1**" selects sync input 1, "**XESS=2**" selects sync input 2. A third case "**XESS=0**" is provided for monophonic broadcast (no stereo pilot.) When "**XESS=0**" the RDi 20 phase lock loop is disabled and the RDS subcarrier is generated using an accurate free running oscillator. If there is no sync signal applied to the RDi 20 set "**XESS=0**". With the appropriate sync input selected, the "19" indicator on the front panel is lit blue to indicate detection of the 19kHz pilot reference. If "19" is lit red no sync signal is present or the incorrect sync input is selected.

9.15. Configure Composite Phase

The angle of phase lock between the pilot (sync) input and the RDS subcarrier output is set using the "**XEPH=n**" command. The full 360 degree range is allowed. This value is normally set to "0" (in phase operation) or sometimes "90" (quadrature operation).

9.16. RDS Output Level Settings

The RDS output level is adjusted using the "**XEDB**" command. This command sets the amount of attenuation (in 0.5 dB steps) applied to the RDS waveform. The maximum output level of ~4.096 Vpp is achieved with zero attenuation: "**XEDB=0.0**" The larger the attenuation value the lower the resulting output level. The output defaults to a relatively low level of ~100mVpp achieved at "**XEDB=33.0**" (33dB attenuation). The output level is normally adjusted to achieve a 3% injection level for the RDS subcarrier.

9.17. Save the Settings

To save the settings made to the RDi, from the Hyper Terminal Screen enter

XSAV <return>

9.18. Set the Station's PI, PTY, PS, and DI Codes

Step 1 – Set the station PI code (Program Identification) using either "**XPIC=xxxx**" to enter the 4 digit hexdecimal representation or "**XPIT=text**" to have the RDi 20 generate the hexdecimal representation using the station call sign (for US / RBDS standard).

Step 2 – Set the PTY code (Programming Type) using "**XPTY=n**" The program types for RBDS (US standard) are as follows:

1 = News	12 = Soft	23 = College
2 = Information	13 = Nostalgia	24 = Unassigned
3 = Sports	14 = Jazz	25 = Unassigned
4 = Talk	15 = Classical	26 = Unassigned
5 = Rock	16 = Rhythm and Blues	27 = Unassigned
6 = Classic Rock	17 = Soft R&B	28 = Unassigned
7 = Adult Hits	18 = Foreign Language	29 = Weather
8 = Soft Rock	19 = Religious Music	30 = Emergency Test
9 = Top 40	20 = Religious Talk	31 = Emergency
10 = Country	21 = Personality	
11 = Oldies	22 = Public	

Figure 17 – Program Identification (PTY) Codes

Step 3 – Set the static PS code (Program Service) using "**XPSS=text**" (Limited to 8 characters. Generally set as a station's slogan or other simple identifier.)

Step 4 – Set a default radiotext message using "**XTXT=text**"

Step 5 – Set the "DI" flags (Decoder Identification) using the "**XFDI=n**" command. Normally, "**XFDI=1**" for stereo broadcasts or "**XFDI=0**" otherwise. (See RBDS standard for additional flag values.)

9.19. Save the Settings

To save the settings made to the RDi, from the Hyper Terminal Screen enter

XSAV <return>

9.20. Restart the RDi

After completing the initial configuration and saving your changes, issue the "**XRES**" command to restart the RDi 20 CPU. Certain settings (such as the TCP/IP configuration) only take effect when the RDi 20 CPU starts up. As such, issuing the "**XRES**" command will make these changes active.

From the Hyper Terminal screen, enter

XRES <return>

9.21. Point the Device Providing RDS Data to the RDi 20

Configure the device (B.E.'s TRE or Now Playing are examples) that is going to be providing RDS data with the I.P. Address of the RDi 20.

9.22. Configure the Device Providing RDS Data to the RDi 20

The device providing data (B.E.'s TRE or Now Playing are examples) to the RDi 20 must be configured in order to send the desired text strings. See the instruction manual of your device for this configuration.

10. A Note on System Settings

All of the system parameters are stored in a battery backed NVRAM. The Lithium battery that holds these parameters has a life of about 10 years. The battery is replaceable and the RDi 20 will enter a warning/fault state at power up if the backup battery needs replacement. In this state, the system parameters are considered unreadable and the unit must "fail safe". The default configuration is therefore to bypass (disable) the RDS output. (In addition to the low battery signal, a CRC is also used to verify the NVRAM contents and thereby prevent the RDi 20 from reading potentially corrupt system parameters.)

11. RDi 20 Hyper Terminal Commands

XVER? (See RDi-20 Firmware versions)

Xnnn=value (to set a parameter)

Xnnn? (to query a parameter)

XCMD (List Commands)

XVER (display firmware version)

XRES (reset CPU)

XSAV (save parameters to NVRAM)

XENA=(0 or 1) enable data output

XEBP=(0 or 1) enable output bypass

XESS=(0 to 2) sync select (0=Disabled; 1=Input 1; 2=Input 2)

XEPH=(n) output phase, 1 degree step

XEDB=(n) output attenuation, 0.5dB step

XMCP=(mpx:sig,baud,bits,par,stop)
Where:
"**mpx**" = "**-**" for non-multiplexed data
- or -
"**mpx**" = "**0-99**" (a channel number) for multiplexed data
"**sig**" = "**232** or **422**" to select the type of electrical signaling
"**baud**" = "**300** to **115200**" to select the baud rate (typically "**9600**")
"**bits**" = "**5** to **8**" to select the number of data bits (typically "**8**")
"**par**" = "**N,O,E**" to select none, odd, or even parity (typically "**N**")
"**stop**" = "**1** or **2**" to select the number of stop bits (typically "**1**")

XUTC=(yyyymmdd-hhmmss) set time as UTC

XOFS=(n.n) set local offset in hours

XIPA=(n.n.n.n) set IP address

XIPS=(n.n.n.n) set subnet mask

XIPG=(n.n.n.n) set gateway

XIPD=(n.n.n.n) set DNS server

XIPC=(n) set Telnet port

XIPH=(n) set HTTP port

XFDI=(0 - 15) set DI flags

XIPP=n(:n.n.n.n) whereas the first "**n**" selects the UDP Input 1 port number. The presence of the "**:**" and four additional numbers **n.n.n.n** sets a mask such that the RDi 20 will only listen to UDP packets from a specific address or range of addresses.

XIPX=n(:n.n.n.n) whereas the first "**n**" selects the UDP Input 2 port number. The presence of the "**:**" and four additional numbers **n.n.n.n** sets a mask such that the RDi 20 will only listen to UDP packets from a specific address or range of addresses.

XFMS=(0 or 1) set speech/music

XFTP=(0 or 1) set traffic program

XFBT=(0 or 1) enable time of day group

XFPW=(0 or 1) enable DPS white space

XFTA=(0 or 1) set traffic announcement

XPIC=(xxxx) set PI code (hexdecimal)

XPIT=(text) set PI code by call sign

XPTY=(0 - 31) set program type

XTXT=(text) set radiotext

XTNB=(0 - 8) set RT normal blocks

XTBB=(0 - 16) set RT burst blocks

XTBC=(1 - 4) set RT burst cycles

XITD=(ch.xxxx.yyyy) insert transparent

XFST=(0 or 1) enable short RT groups

XPSS=(text) set 8 character static PS

XPSD=(text) set dynamic PS text

XPSN=(1 - 16) set PS normal blocks

XPSB=(0 - 8) set PS blanking cycles

XPSA=(0 - 8) set DPS scroll advance

XPSC=(1 - 99) set DPS scroll cycles

XPST=(0 - 99) set DPS scroll delay

12. Firmware Upgrades

Step 1 – Locate the Upgrade CD or download the upgrade files from the B.E. website. Copy the files to the hard drive "C:\" of the PC you will be using to perform the upgrade.

Step 2 – Turn the **AC Power Switch** on the rear panel of the **RDi 20** to **OFF**.

Step 3 – Next, establish communication via Hyper Terminal. Connect a straight thru serial cable (not supplied) to the RDi 20 front panel Console port and then to the serial port on a personal computer.

Step 4 – Launch Hyper Terminal by going to **START -> ALL PROGRAMS ->ACCESSORIES -> COMMUNICATIONS -> HYPERTERMINAL.**

Step 5 – The default telnet question box may appear. Select **Yes** if you want Hyper Terminal to be your default telnet program. Select **No** if you do not want it to be.

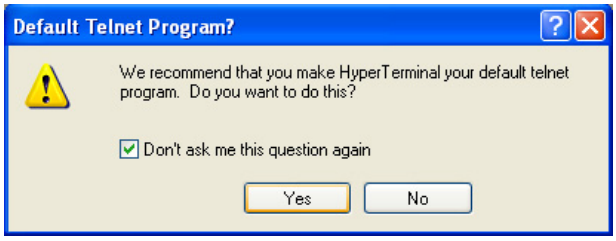


Figure 18 – Default Telnet Program Menu

Step 6 – Name the Connection, choose the Desktop Icon, then select **OK**.

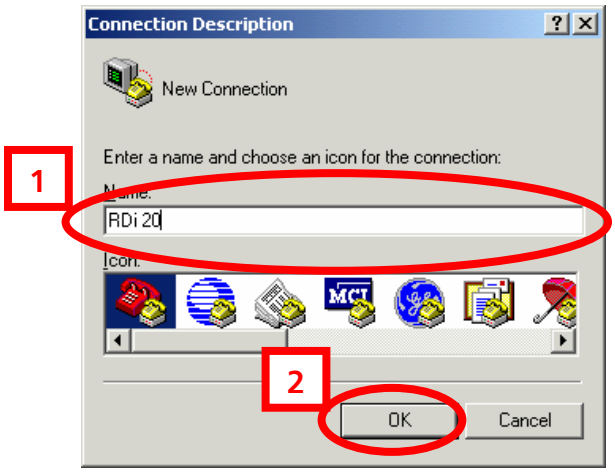


Figure 19 – Connection Description Menu

Step 7 – Select the appropriate connection port (**COM1** is the most common) from the pull down, then select **OK**.

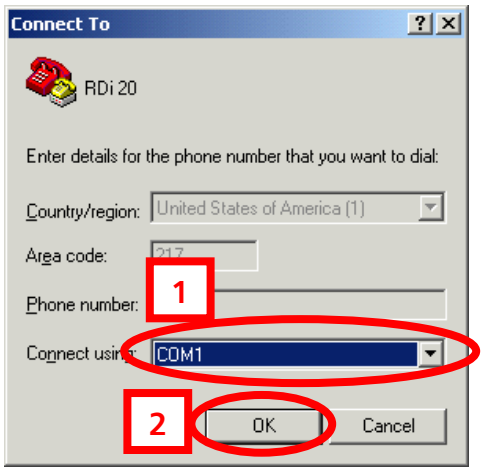


Figure 20 – Connect To Menu

Step 8 – Configure the **Port Settings** as shown below, then select **OK**.

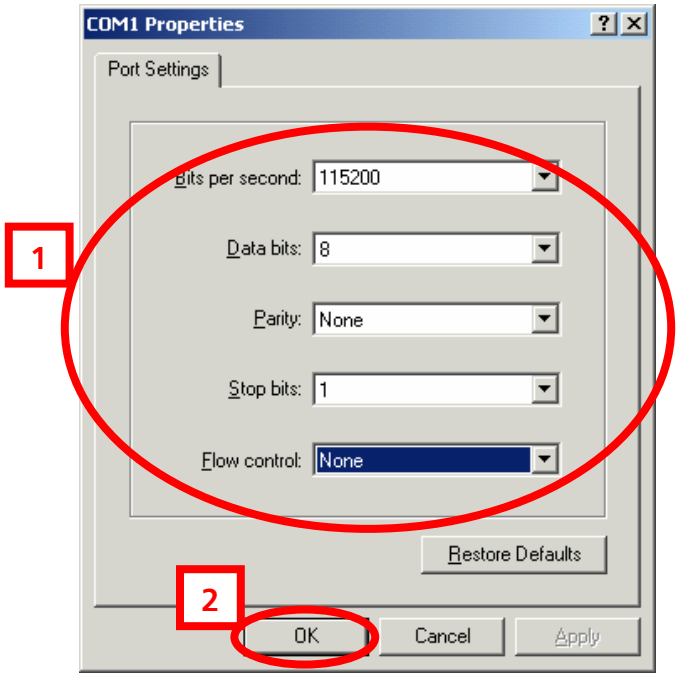


Figure 21 – Port Settings Menu

Step 9 – Next, turn the **AC Power Switch** on the rear panel of the **RDi 20** to **ON**. As the RDi 20 comes up, the Hyper Terminal window will fill in as shown below.

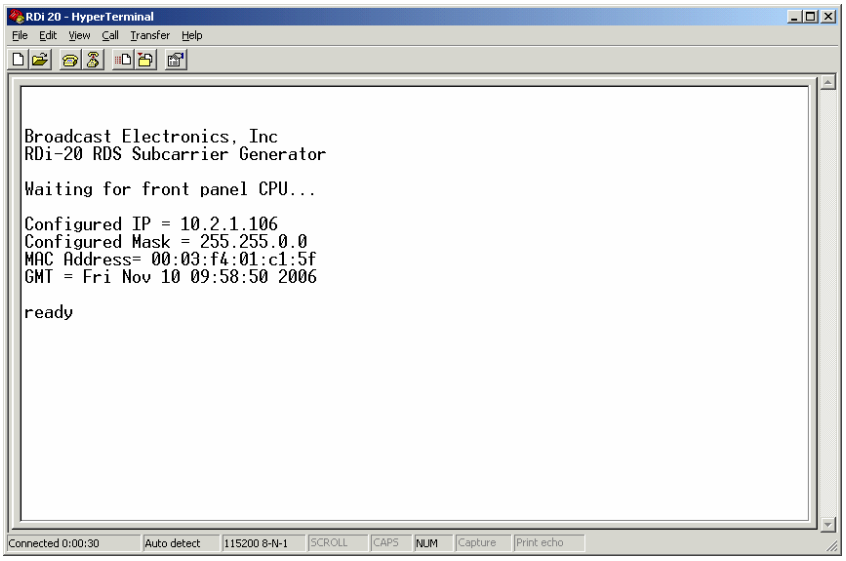


Figure 22 – Hyper Terminal Screen after RDi 20 Power UP.

Step 10 – Type **XRES** <enter>, then type **A** <enter> (within 2 seconds) to go to into programming mode (all typed commands must be **UPPER** case). The **nb>** prompt will appear as shown below.

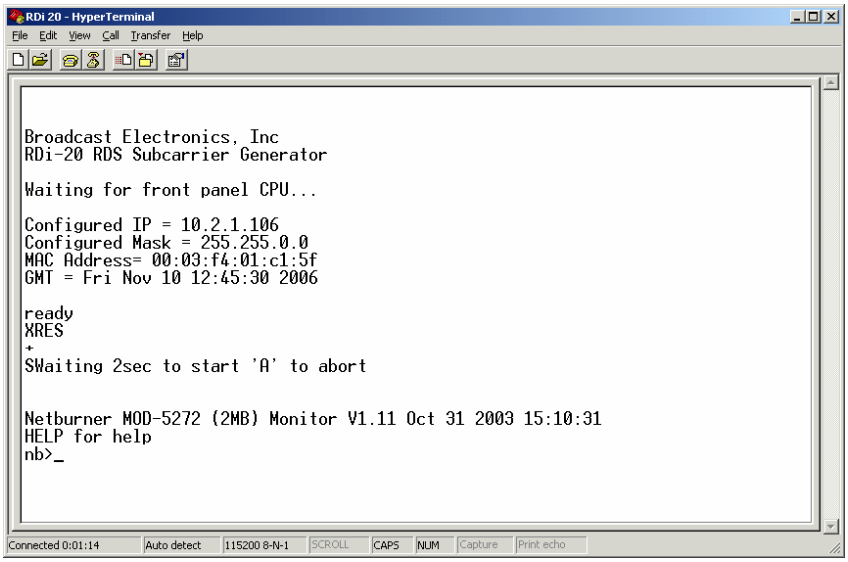


Figure 23 – nb> Prompt

Step 11 – Next, at the **nb>** prompt, type **FLA** <enter> (to go the flash mode).

Step 12 – Select **Transfer -> Send Text File** from the pull down menu.

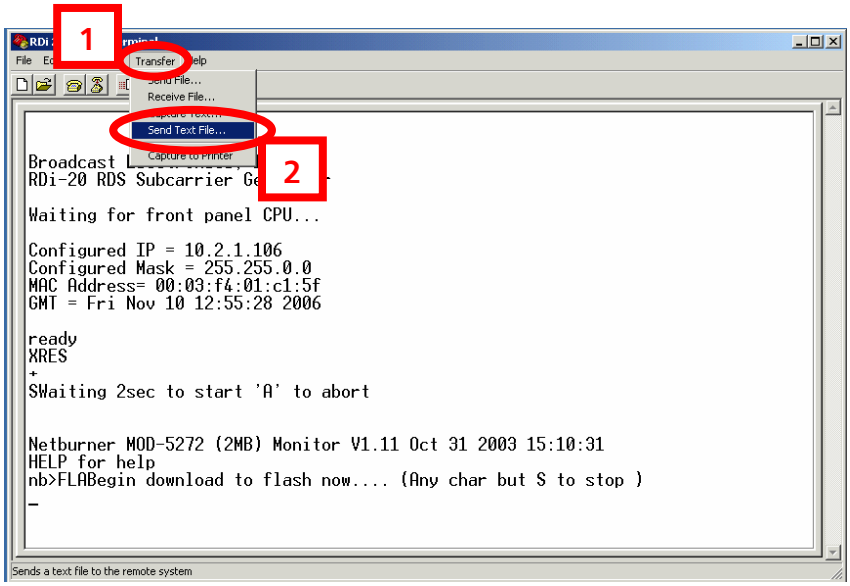


Figure 24 – Send Text File from Hyper Terminal

Step 13 – Browse to the directory where you copied the upgrade file, set file type filter to **All files (*.*),** select the upgrade (**.s19**) file, then select **Open.**

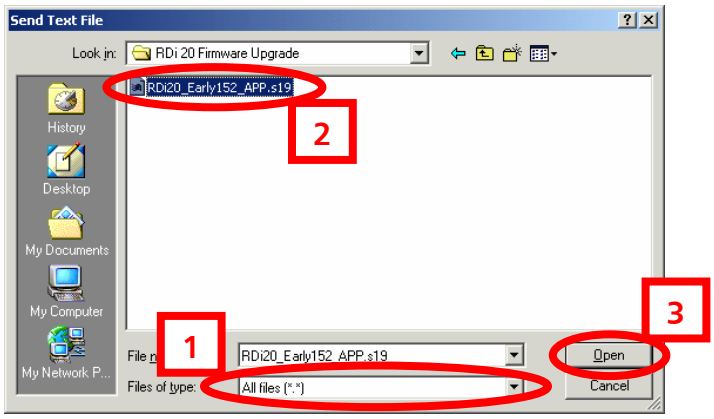


Figure 25 – Browse to the Upgrade File

Step 14 – The upgrade file will now be downloaded to the RDi 20. The Hyper Terminal screen should now look as shown on the next page in **Figure 26**. Characters will scroll across the screen indicating download progress. Please note that the download may take several minutes.

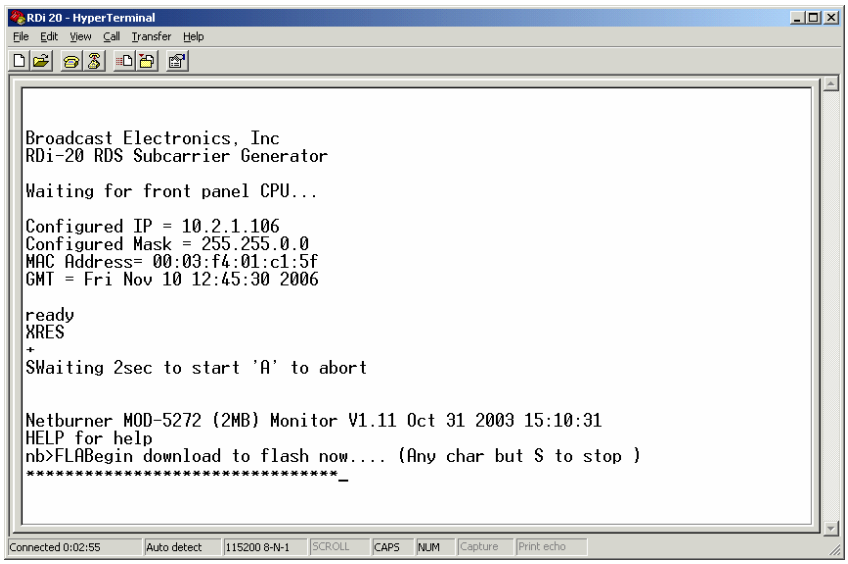


Figure 26 – Download Started

Step 15 – When the upgrade is complete, the RDi 20 will automatically reset. After the RDi 20 resets, the Hyper Terminal screen will look as shown below.

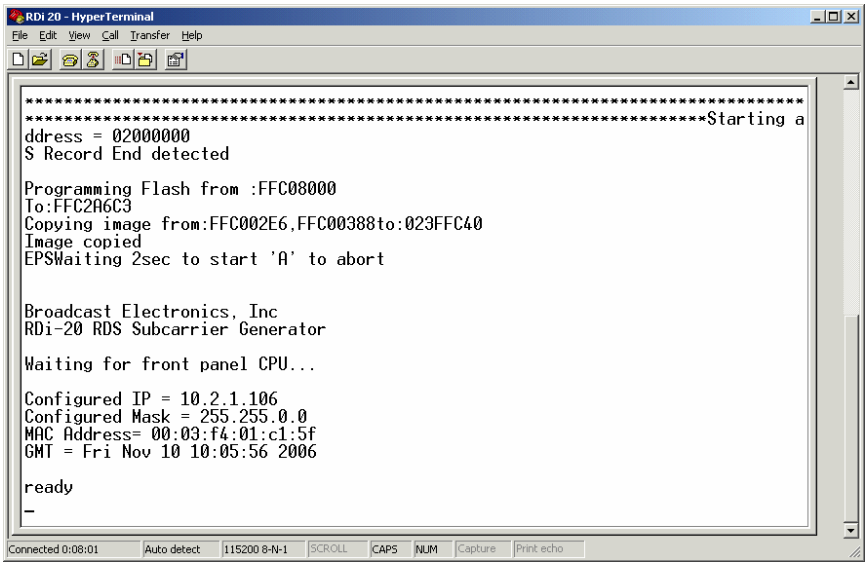


Figure 27 – Firmware Upgrade Complete

Step 16 – Type **XVER** <enter>, as shown in **Figure 28** on the next page, to verify that the firmware was in fact upgraded.

In the example shown, the RDi 20 was upgraded to v0.152.

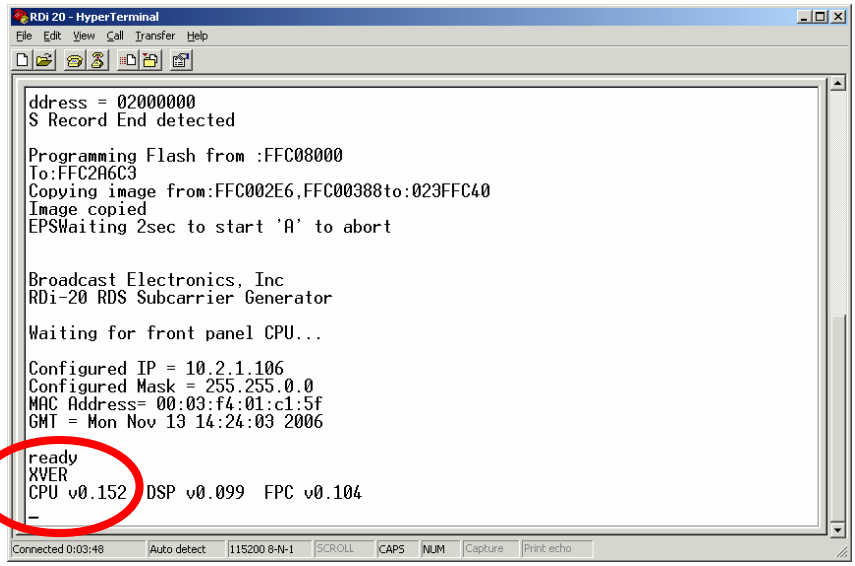


Figure 28 – Firmware Upgrade Complete

Step 17 – Disconnect the serial cable from the RDi 20.

13. RF Customer Service Contact Information

RF Customer Service -

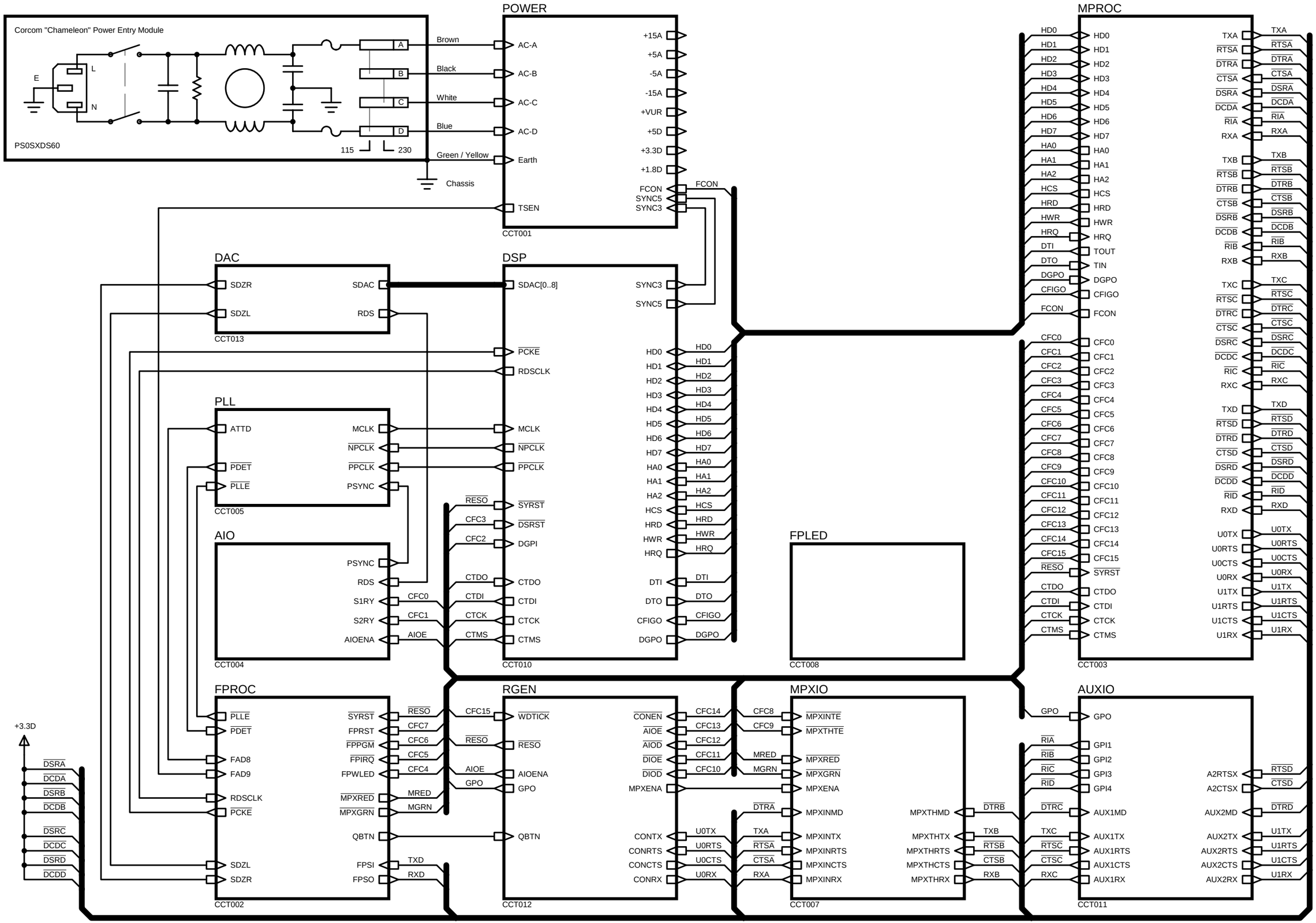
Telephone: **(217) 224-9617**
E-Mail: **rfservice@bdcast.com**
Fax: **(217) 224-9607**

14. Terms and Definitions

AAS	Advanced Application Services
AES/EBU	Audio Engineers Society/European Broadcast Union
AM	Amplitude Modulation
CRC	Cyclic Redunancy Code
DI	Decoder Identification Setting
DPS	Dynamic Program Service
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
NVRAM	Non Volatile Random Access Memory
PS	Program Service
PAD	Program Associated Data
PTY	Program Type
PTYN	Program Type Name
PI	Program Identification
QoS	Quality of Service
SIS	Station Information Service
SPS	Supplemental Program Service
UTC	Coordinated Universal Time
VHF	Very High Frequency
WAN	Wide Area Network
LAN	Local Area Network
CM	Connection Manager
LP	Logistics Processor
RDi	Broadcast Electronics' RDS Subcarrier Generator
RDS	Radio Data System (European Standard)
RBDS	Radio Broadcast Data System (U.S. Standard)
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 29 - Terms and Definitions

15. Schematics



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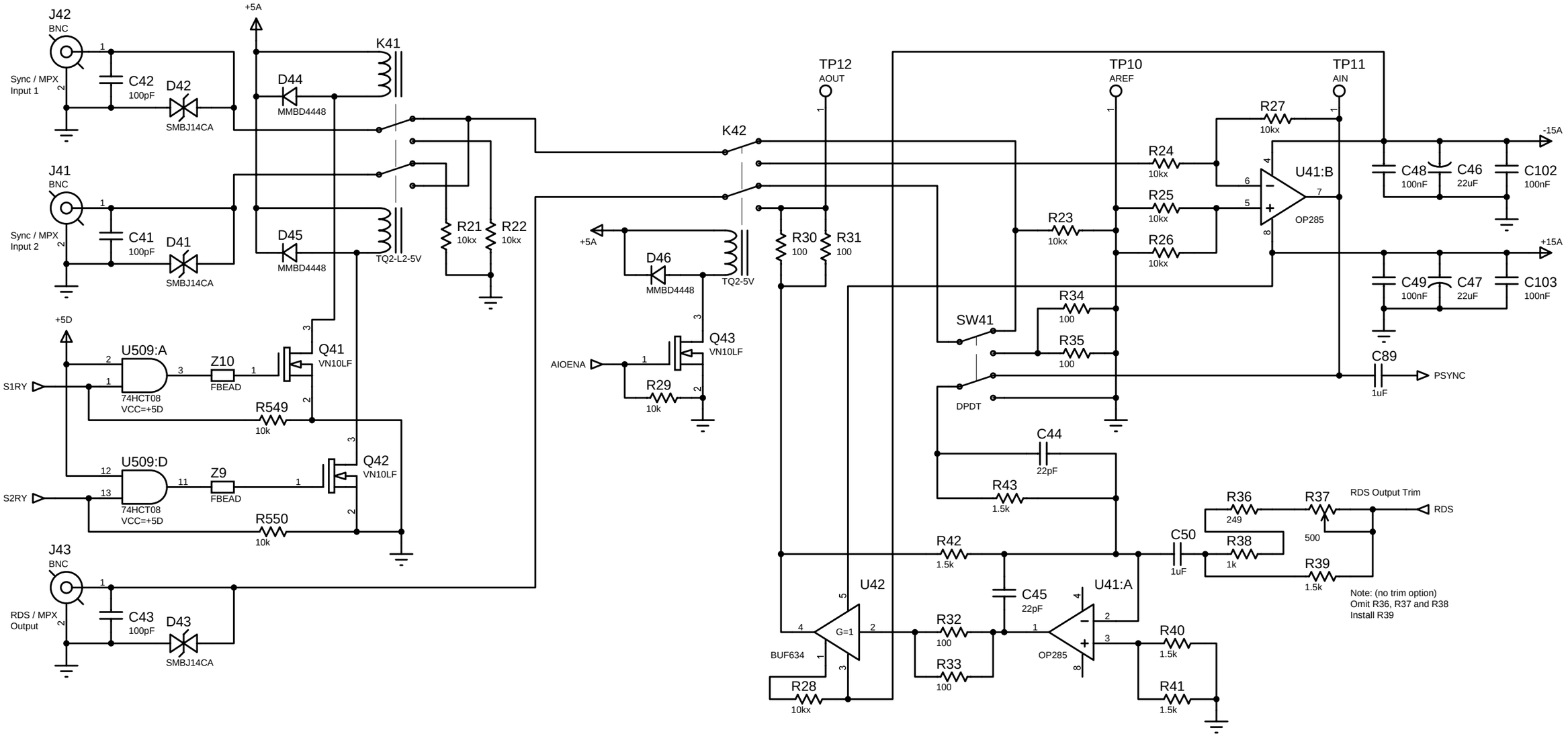
Size 11 x 17 | Scale 1.000 | Page 1 of 14

Author Seth Stroh

Modified 10/25/2005 | Created 11/22/2004

the radio experience
15810 SE 13th Street, Bellevue WA 98008

Design RDS Subcarrier Generator 5756 | Sheet Block Diagram | Assy 919-9170 | Revision 1.0



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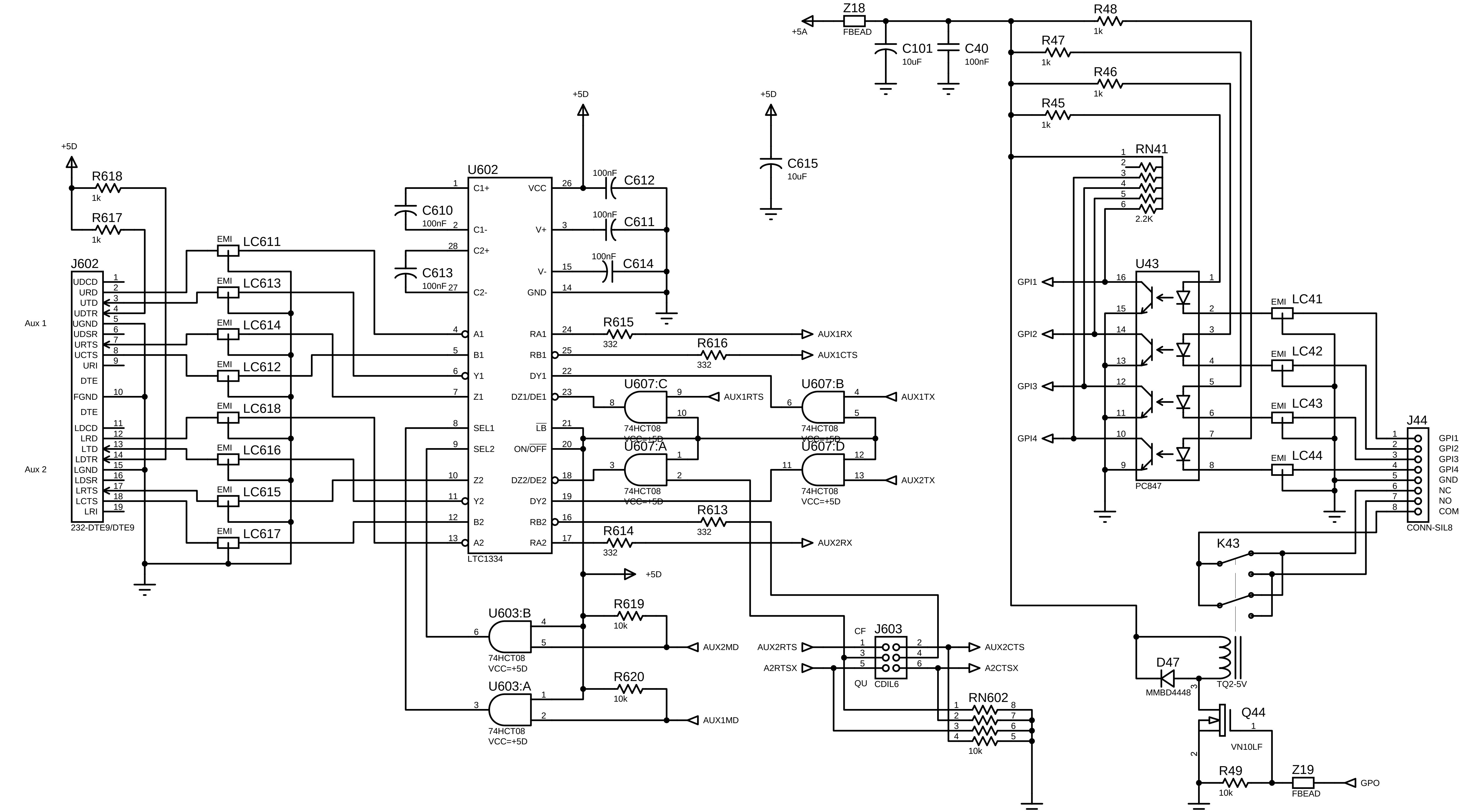
Size: 11 x 17
Scale: 1.000
Page: 2 of 14
Modified: 10/25/2005
Created: 11/22/2004
Revision: 1.0
Assy: 919-9170
Sheet: Analog IO
Design: RDS Subcarrier Generator 5756



Size 11 x 17

Scale 1.000

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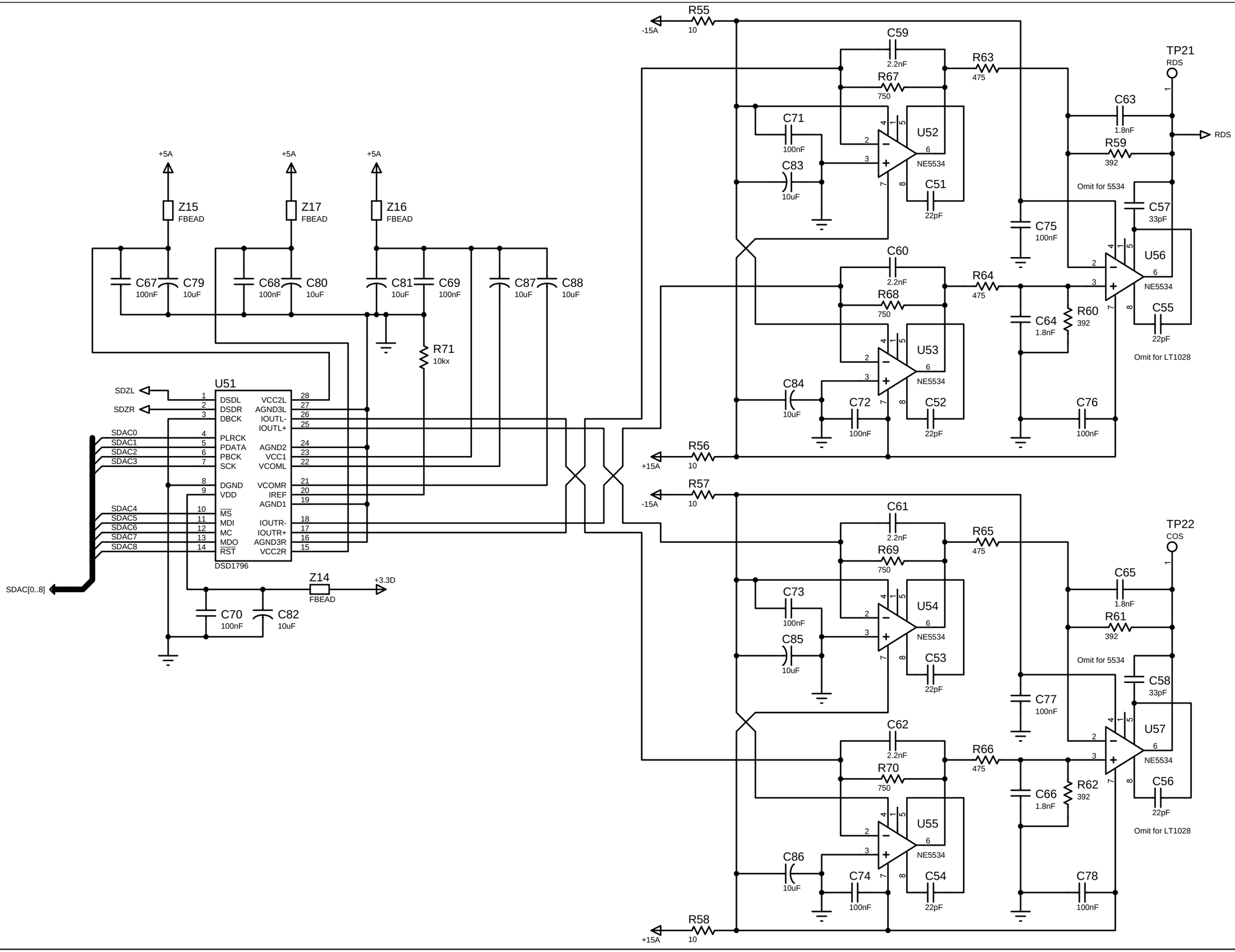
Design RDS Subcarrier Generator 5756

Sheet Auxiliary Serial IO and GPIO

Revision 1.0

Assy 919-9170



Size	11 x 17
Scale	1.000
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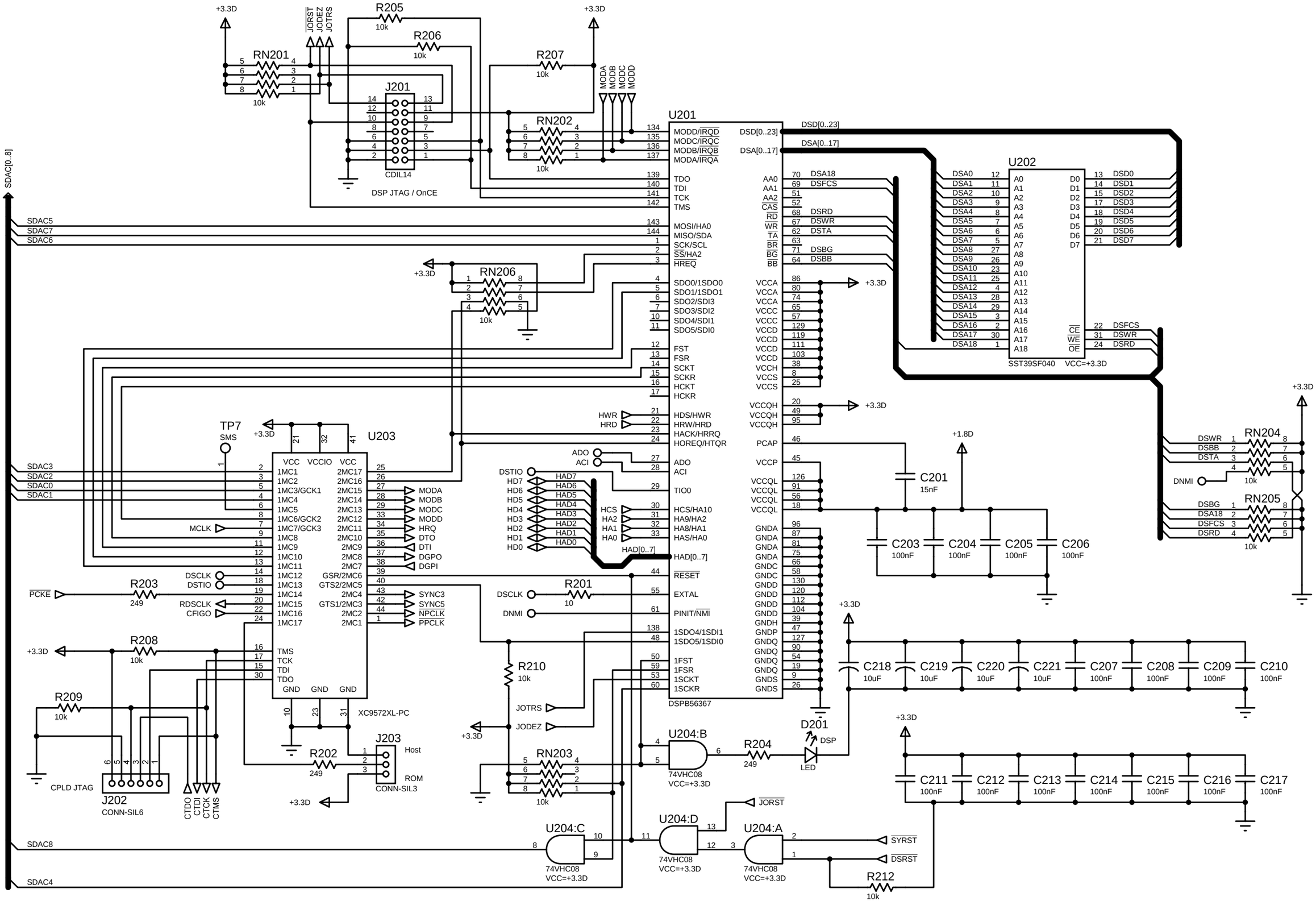
Modified	10/25/2005
Created	11/22/2004
Revision	1.0
Assy	919-9170
Sheet	Waveform DAC
Design	RDS Subcarrier Generator 5756



Size	11 x 17
Scale	1.000
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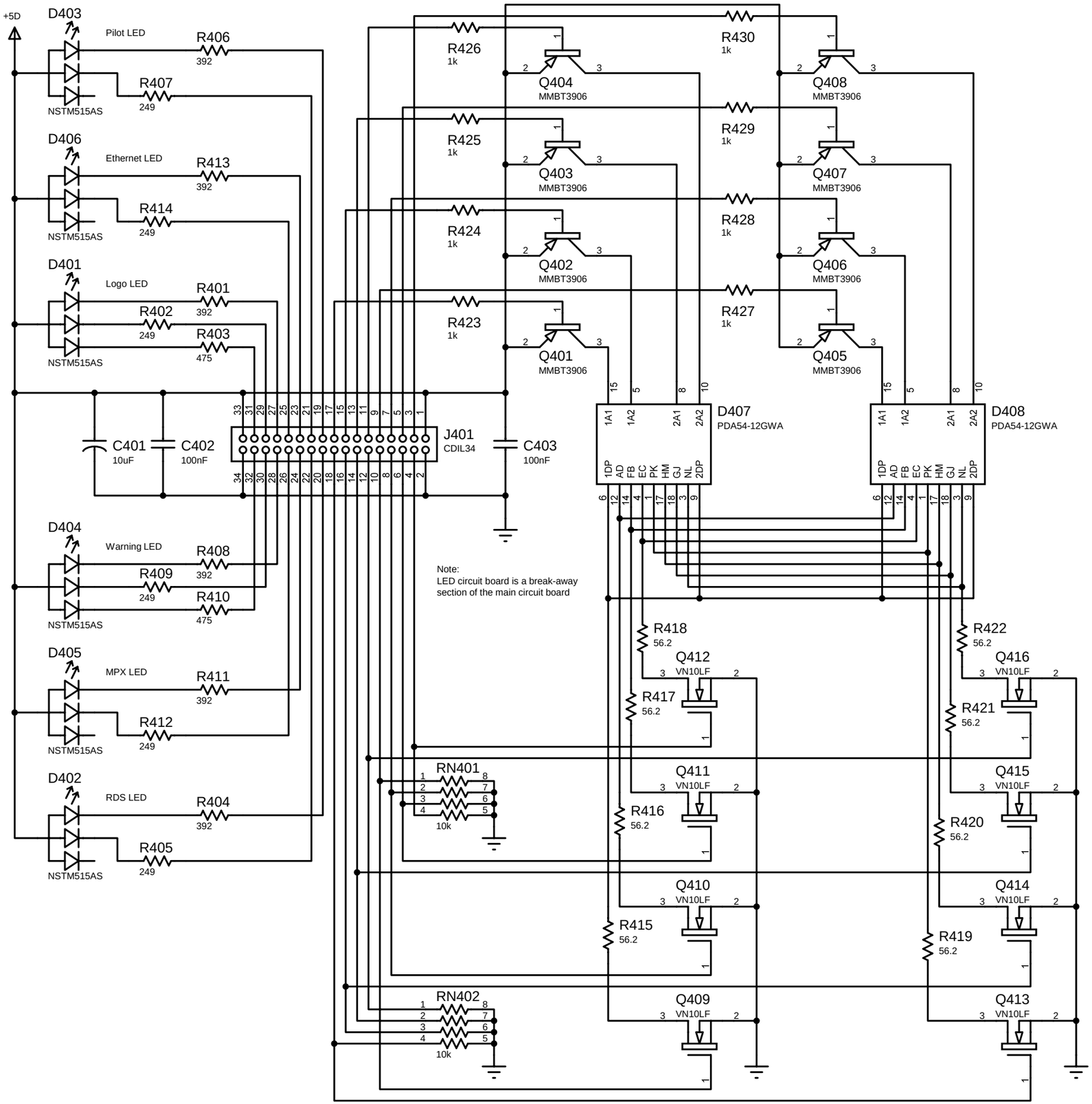
Created	11/22/2004
Revision	1.0
Assy	919-9170
Sheet	DSP and Clock Divider
Design	RDS Subcarrier Generator 5756



Size	11 x 17
Scale	1.000
Page	6 of 14

Author	Seth Stroh

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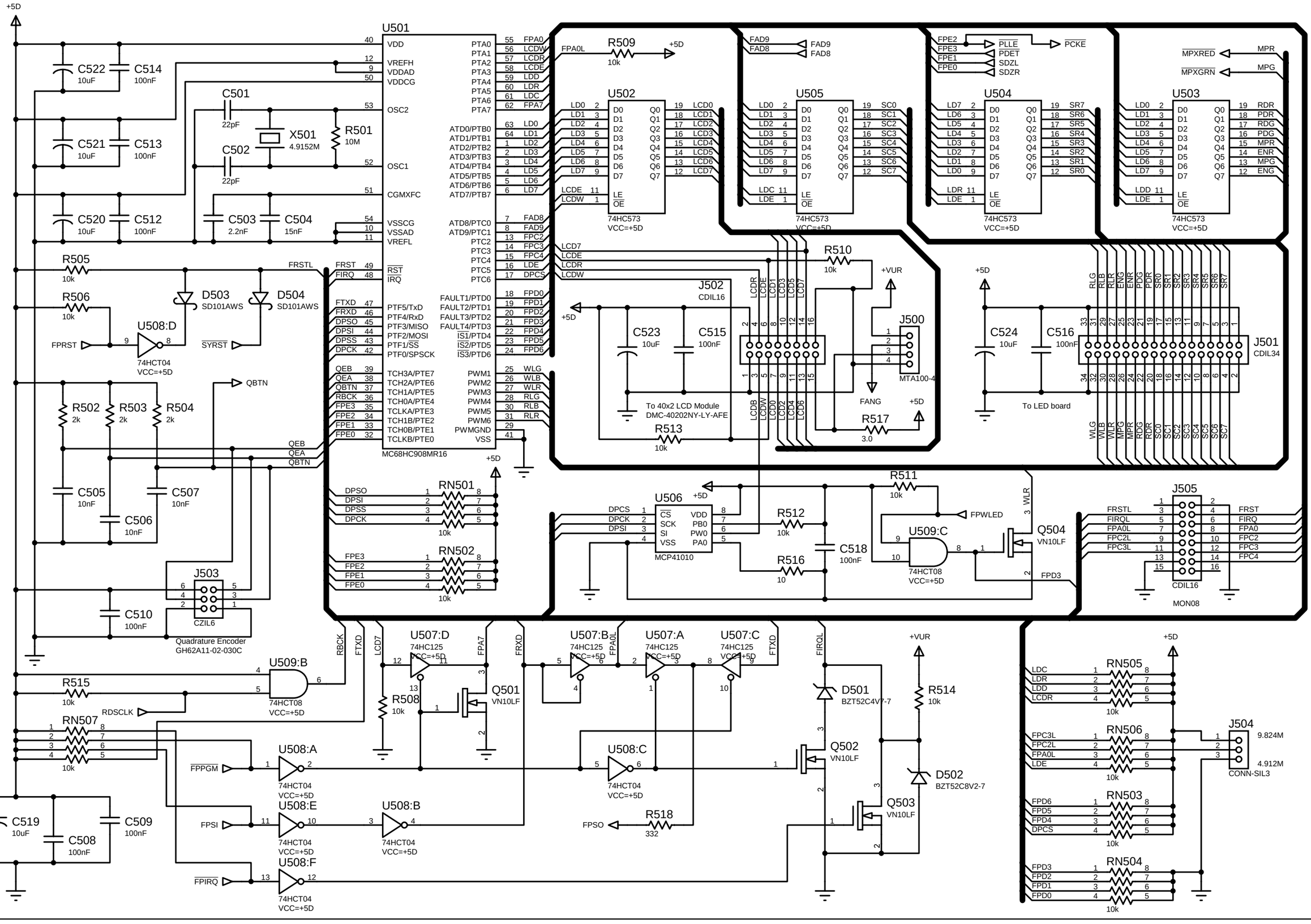
Created	11/22/2004
Modified	10/25/2005

Design	RDS Subcarrier Generator 5756
Sheet	Front Panel LEDs
Revision	1.0
Assy	919-9170


U501
MC68HC908MR16
U502
U505
U504
U503
74HC573
VCC=+5D
J502
CDIL16
To 40x2 LCD Module
DMC-40202NY-LY-AFE
J500
MTA100-4
J501
CDIL34
To LED board
U506
MCP41010
J505
CDIL16
MON08
J503
CZIL6
Quadrature Encoder
GH62A11-02-030C
U509:B
U509:C
74HCT08
VCC=+5D
U508:D
U508:A
U508:E
U508:B
U508:F
74HCT04
VCC=+5D
U507:D
U507:B
U507:A
U507:C
74HC125
VCC=+5D
RN501
RN502
RN503
RN504
RN505
RN506
RN507
J504
CONN-SIL3
9.824M
4.912M
X501
4.9152M
D501
BZT52C4V7-7
D502
BZT52C8V2-7
Q501
Q502
Q503
Q504
VN10LF
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RDS Subcarrier Generator 5756
Front Panel CPU
Size 11 x 17
Scale 1.000
Page 7 of 14
Author Seth Stroh
Created 11/22/2004
Modified 10/25/2005
Revision 1.0
Assy 919-9170
Sheet
Design

C319 10uF, C301 100nF, C302 100nF, C320 10uF

U301 MOD5272

U302 SN74ALVCH16373

U303 SN74ALVCH16245

U304 M48T35AV

U305 TL16C554

U307 XC9572XL-PC

U308 74AC541 VCC=+3.3D

U309 14.7456M

J301 CFCARD

J302 Xpansion CDIL40

D301 SD101AWS

D302 SL22

R303 10k, R304 10k, R301 10, R302 10

RN301 10k, RN302 10k, RN303 10k, RN304 10k, RN305 10k, RN306 10k, RN307 10k, RN308 10k

C303 100nF, C304 100nF, C305 100nF, C306 100nF, C307 100nF, C308 100nF, C309 100nF, C310 100nF, C311 100nF, C312 100nF, C313 100nF, C322 10uF, C323 10uF, C324 10uF, C314 100nF, C325 10uF, C315 100nF, C316 100nF, C317 100nF

+3.3D, SYRST, ALE, HRQ, FRES, URES, CFIGO

CFC[0..15], CFA[0..15], CFD[16..31]

U0RX, U0TX, U1RX, U1TX, QCLK, QDO, QDI, QCS0, QCS1, DGPO, U1RTS, FCON, TOUT, TIN, U0CTS, U0RTS, U1CTS

QSPICLK, QSPIDO, QSPIDI, QSPICS0, QSPICS1, QSPICS2, QSPICS3, PWM1, PWM2, USBD-, USBD+, TOUT0, TIN1, PB2/TIN2, PB3/TIN3, PB4/TIN0, PA0, PA1, PA5, IRQ6/PA15

RSTI, RSTO, TA, OE, BS2, BS3, R/W, CLK, TIP, CS1, CS2, CS3, IRQ1, IRQ3, IRQ5

CFRO, CFTA, CFOE, CFBS2, CFBS3, CFRW, CFCLK, CFTIP, CFCS1, CFCS2, CFCS3, CFIR1, CFIR3, CFIR6

CFA15 … CFA0, CFD31 … CFD16, CFRW, CFTIP

QCS1, QCS0, QCLK, +5D, QDO, QDI, CFIR3, XPCS, CFRO, XIOW, XIOR, A15 … A0, D31 … D16

A0 … A10, FCE1, FCE2, XIOW, XIOR, FREG, FRES, RESET, INPACK, IORD, IOWR, READY, WAIT, GND, CE1, CE2, WE, OE, REG, WP, CD1, CD2, CSEL, VS1, VS2, BVD1, BVD2, D0 … D31

RTCE, XIOW, XIOR, HCS, HRD, HWR, XRCS, FCE1, FCE2, RTCE, XPCS, HCS, UCSA, UCSB, UCSC, UCSD, FCD1, FCD2, FVS1, FWAI, FRDY, HA0, HA1, HA2, HD0 … HD7, UINTA, UINTB, UINTC, UINTD, FRDY

CFCLK, CTMS, CTCK, CTDI, CTDO, TMS, TCK, TDI, TDO, VCCIO, 1MC1 … 1MC17, 2MC1 … 2MC17, GSR/2MC6, GTS2/2MC5, GTS1/2MC3, 2MC4

UCSA, UCSB, UCSC, UCSD, URES, UINTA, UINTB, UINTC, UINTD, INTN, XTAL1, XTAL2, TXA, TXB, TXC, TXD, RTSA, RTSB, RTSC, RTSD, DTRA, DTRB, DTRC, DTRD, CTSA, CTSB, CTSC, CTSD, DSRA, DSRB, DSRC, DSRD, DCDA, DCDB, DCDC, DCDD, RIA, RIB, RIC, RID, RXA, RXB, RXC, RXD, IOR, IOW, TXRDY, RXRDY, CSA, CSB, CSC, CSD

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Assy 919-9170

Sheet Master CPU

Design RDS Subcarrier Generator 5756

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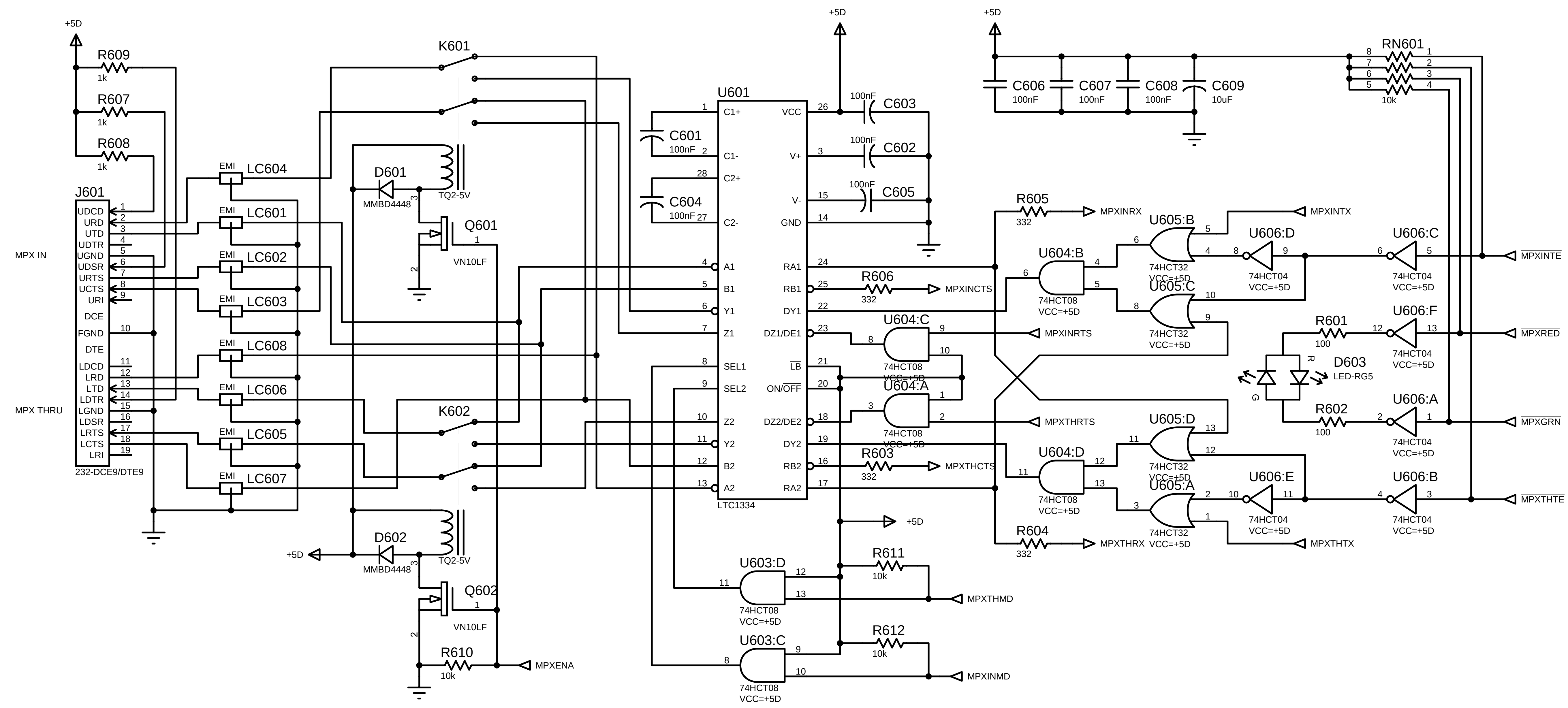

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Size	11 x 17
Scale	1.000
Page	9 of 14
Author	Seth Stroh
Modified	10/25/2005
Created	11/22/2004
Revision	1.0
Assy	919-9170
Design	RDS Subcarrier Generator 5756
Sheet	Multiplex Serial IO

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TP123
APLL
C127
5.6nF
R146
10kx
R133
2k
R134
2k
R147
10kx
R132
2k
C128
5.6nF
U121:B
TL074
R148
10kx
R149
10kx
R125
500
PLL Phase Trim
TP126
NP
TP127
PP
D121
D122
BZT52C4V7-7
D123
D124
BZT52C4V7-7
U122
74HC4053
VCC=+5A
VEE=-5A
VSS=GND
C124
100pF
R151
10kx
C123
100pF
R150
10kx
U123:C
TL074
D125
D126
BZT52C13-7
C129
5.6nF
R177
182k
R135
2k
R136
2k
R152
10kx
U123:D
TL074
R153
10kx
R154
10kx
C141
1uF
C142
1uF
R158
10kx
R157
10kx
R159
10kx
R156
10kx
R155
10kx
U123:B
TL074
-15A
C135
100nF
+15A
C136
100nF
R161
10kx
R164
10kx
R163
10kx
R162
10kx
R160
10kx
Z11
FBEAD
NPCLK
U126:C
74HCT08
VCC=+5A
+5A
Z12
FBEAD
PPCLK
U126:B
74HCT08
VCC=+5A
RN121
10k
U126:A
74HCT08
VCC=+5A
R143
1k
R144
1k
TP128
PLLE
Z6
FBEAD
PLLE
R137
2k
VCXO Trim
R126
500
R138
2k
Z5
FBEAD
U125
BV1525AEM-21.888
C131
1nF
Z13
FBEAD
C146
100nF
C140
100nF
C144
10uF
C147
100nF
R121
10
MCLK
C121
22pF
TP121
ASYNC
Note:
Install R171, R172 if AGC
circuit is not populated
R171
68.1k
R172
68.1k
R173
68.1k
R174
68.1k
AGC
CCT006
PSYNC
VIN
IOUT
VFB
LOUT
U121:C
TL074
R175
68.1k
C125
5.6nF
R124
500
R123
249
R130
1k
C126
5.6nF
Detector Phase Trim
+15A
C133
100nF
U121:D
TL074
R131
1.5k
U121:A
TL074
TP122
ALEV
R145
10kx
Z3
FBEAD
ATTD
TP124
ADET
C134
100nF
-15A
R139
10kx
R140
10kx
R141
10kx
R142
10kx
TDET
CCT009
SIGNAL
LOCK
LOCK
R128
1k
R129
1k
Z4
FBEAD
PDET
+5A

Size	11 x 17
Scale	1.000
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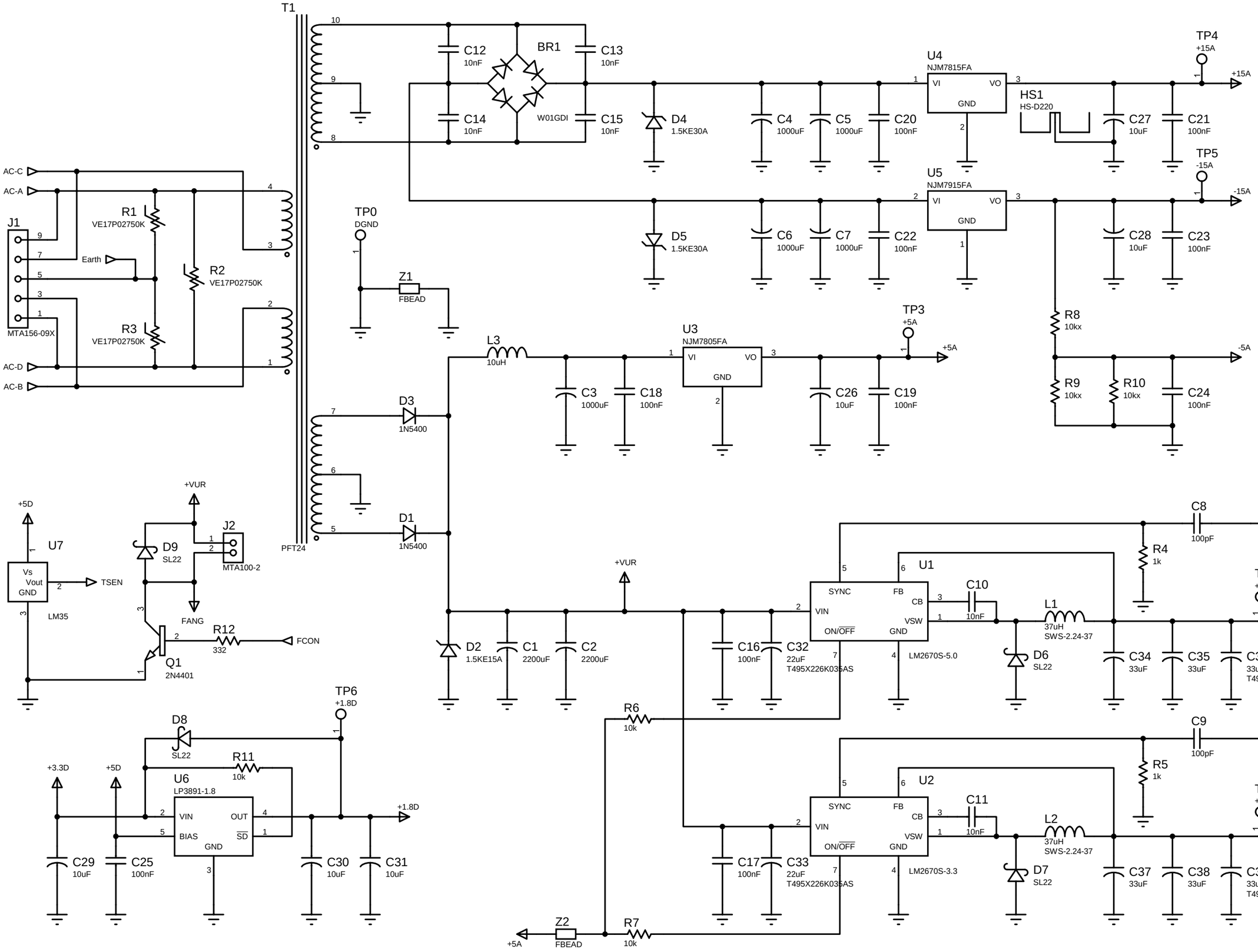
Modified	10/25/2005
Created	11/22/2004

Design: RDS Subcarrier Generator 5756
Sheet: Pilot Detector and Master PLL
Revision: 1.0
Assy: 919-9170



Size 11 x 17 | Scale 1.000 | Page 11 of 14

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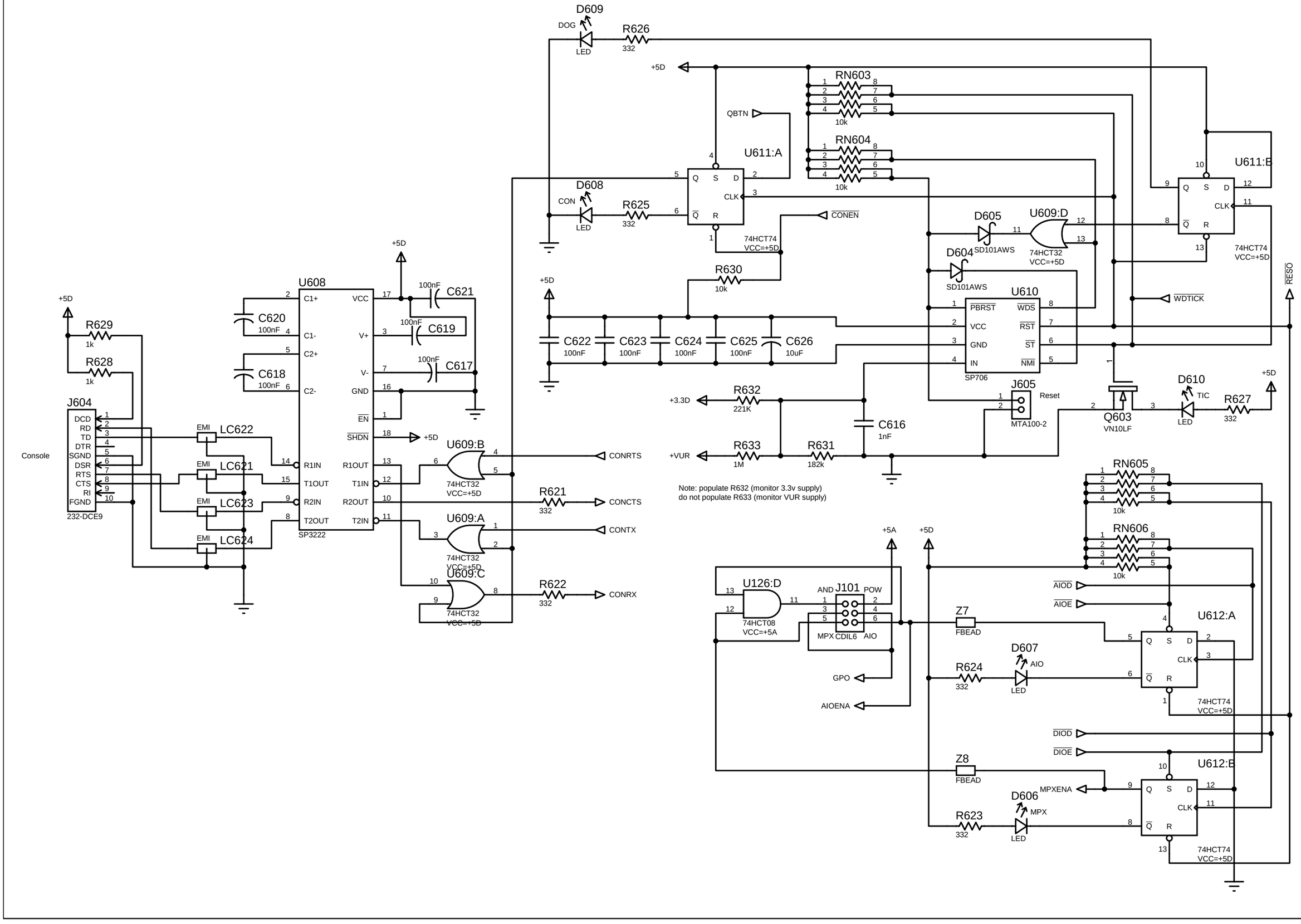
Design RDS Subcarrier Generator 5756
Sheet Power Supply
Revision 1.0
Assy 919-9170



Size	11 x 17
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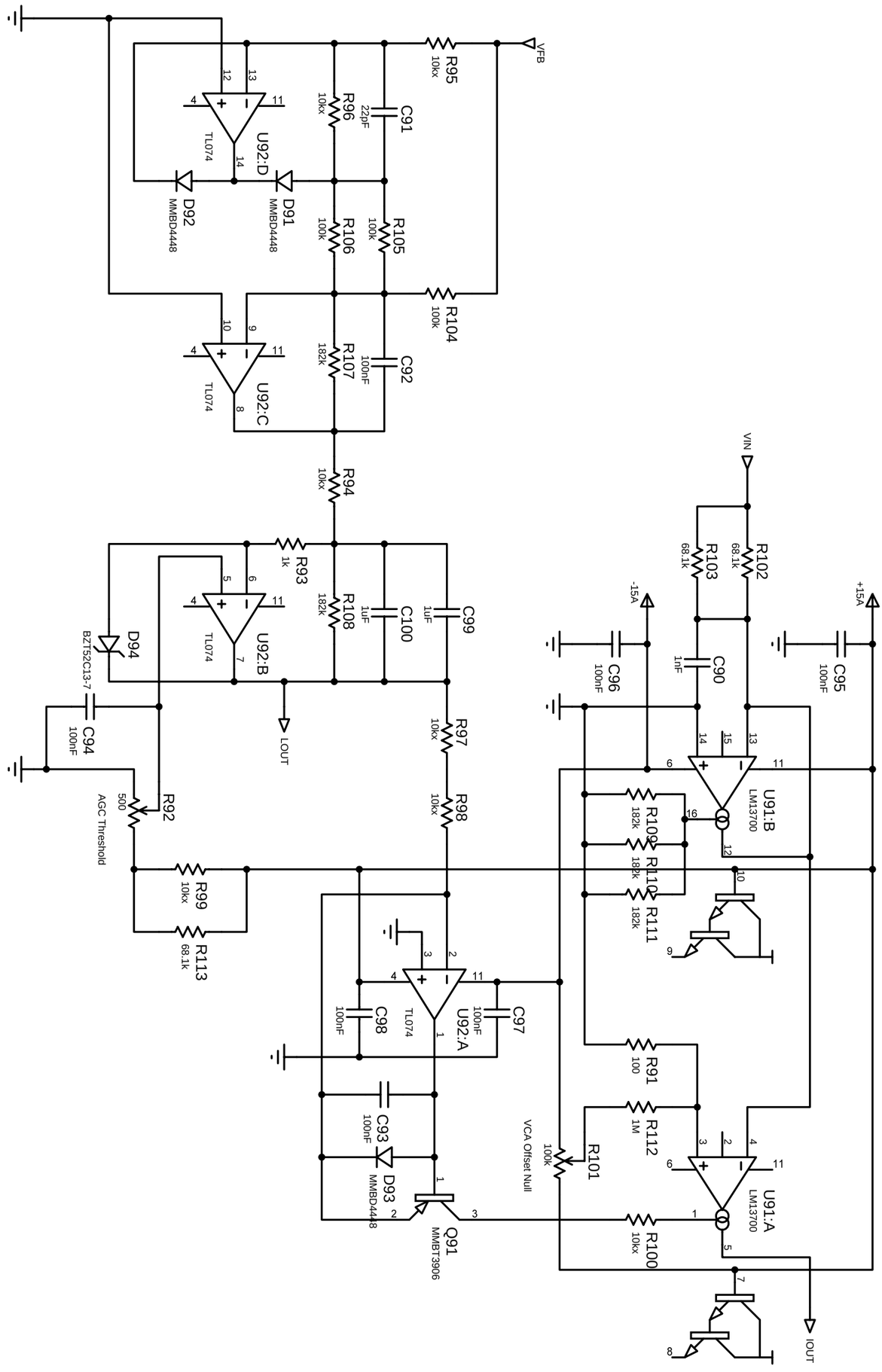
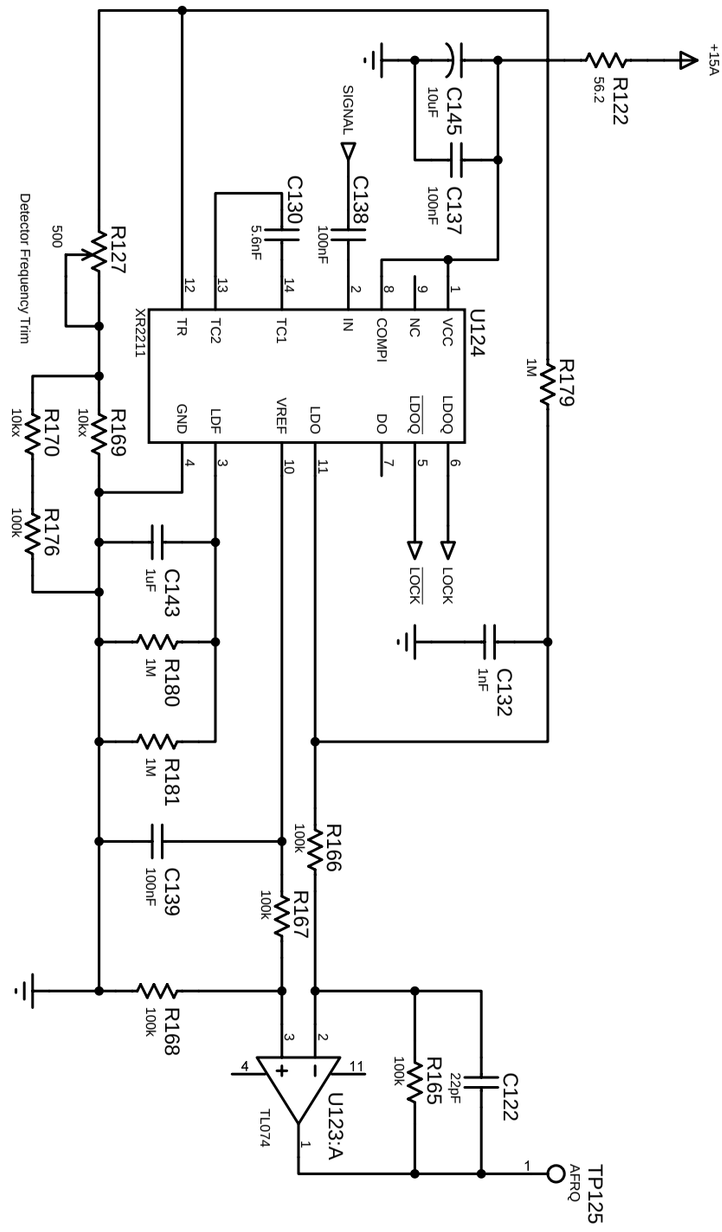
Modified	10/25/2005
Created	11/22/2004
Revision	1.0
Assy	919-9170
Sheet	Watchdog Reset and Console IO
Design	RDS Subcarrier Generator 5756



Design	RDS Subcarrier Generator 5756		**the radio experience**		PROPRIETARY RIGHTS	Size	11 x 17
	Sheet: Pilot AGC		15810 SE 13th Street, Bellevue WA 98008		This drawing is confidential and proprietary. Disclosure to unauthorized persons is strictly prohibited.	Scale	1.000
	Assy: 919-9170	Revision: 1.0	Created: 11/22/2004	Modified: 10/25/2005	Author: Seth Stroh	Page	13 of 14



Design	RDS Subcarrier Generator 5756		**the radio experience**		PROPRIETARY RIGHTS	Size	11 x 17
	Sheet: 19 kHz Tone Detector		15810 SE 13th Street, Bellevue WA 98008		This drawing is confidential and proprietary. Disclosure to unauthorized persons is strictly prohibited.	Scale	1.000
	Assy: 919-9170	Revision: 1.0	Created: 11/22/2004	Modified: 10/25/2005	Author: Seth Stroh	Page	14 of 14