SRK ELECTRONICS PTY LTD

(ACN 089 050 564 ABN 44 089 050 564)

8 Victoria Grove

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VIC 3123

Australia

STLRX Manual

Safety note

This equipment uses high voltages internally. Any servicing should be performed by competent individuals.

Prolonged exposure to high level RF radiation has been shown to pose a health risk. Whilst the equipment is intrinsically safe, its use in conjunction with an antenna system may generate large RF fields. Appropriate precautions should be taken by individuals that habitually work close to the transmitting antenna.

WARNING

THIS EQUIPMENT IS SUPPLIED WITH A MAINS LEAD INCORPORATING AN EARTH WIRE. IT IS IMPERATIVE THAT THIS EQUIPMENT IS CONNECTED TO A MAINS OUTLET THAT HAS AN EARTH. IN COUNTRIES WHERE EARTHED OUTLETS ARE NOT MANDATORY, IT IS THE CUSTOMER'S RESPONSIBILITY TO ENSURE THAT THIS EQUIPMENT IS APPROPRIATELY EARTHED.

1 GENERAL DESCRIPTION

The STLRX is a high quality receiver intended for the receiver section of aural studio to transmitter links.

Its features include:

- Frequency agile.
- High sensitivity.
- Wide bandwidth.
- Rugged design.
- Conservatively rated.
- Excellent audio quality
- Comprehensive telemetry.
- Flexible configuration.

The STLRX is designed and built in Australia.

2 UNPACKING

This section details the way in which the STLRX should be unpacked upon receipt by the customer.

The STLRX should be removed from its packing, and the packing stored and used should it be necessary to return the STLRX to the manufacturer.

Along with the receiver, the following items should also be present:

- This manual
- Mains lead
- Spare fuse

The customer should ensure that all items are present and then store them in a safe place.

3 INSTALLATION

3.1 General

This section describes the installation and infrastructure requirements for the STLRX Departure from the instructions contained herein may void any warranty provided by SRK.

The STLRX has been designed to be mounted in a standard 19” rack frame, where it will occupy 2 rack units.

However, the receiver may also be used in a free standing situation, so long as all other requirements are met as below.

3.2 Environmental

The receiver is intended for indoor use. The receiver should be protected from rainfall and direct sunlight, extremes of temperature and humidity and from conditions of high dust levels. The receiver shall not be operated at altitudes in excess of 3500m above sea level. The receiver must be installed on a flat, stable surface. The receiver must be installed in the upright position. The receiver must be installed in a location free from vermin and the ingress of other animals. The receiver shall not be installed in locations prone to flooding. All ventilation orifices must be clear to allow adequate air flow.

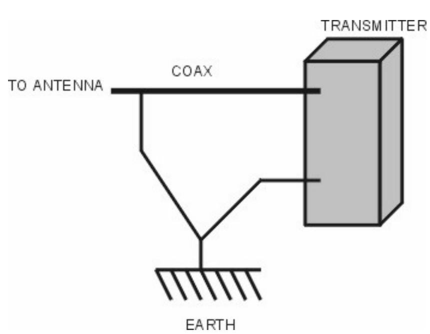
3.3 Electrical supply

The electrical supply to the receiver must be of the voltage, form and frequency described in the specifications. All electrical wiring must be carried out in accordance with local laws, standards and regulations. If power supply voltages regularly fall outside specifications then a voltage regulator must be installed between the supply inlet and the receiver.

3.4 Earthing

Adequate earthing of the receiver is vital to ensure long term reliability and user safety. The electrical supply must be earthed, via the earthing pin of the IEC connector. In countries where power outlet earthing is merely optional, an earthed outlet **must** be used. See safety notice at the front of this manual. A separate, independent, earth is required for the receiver/antenna system and must be connected to the earthing point indicated on the rear of the receiver. The cable used to connect the earth should be as thick as possible, with 8 AWG being the smallest size acceptable. Where possible, broad earthing band should be used.

In addition to the earth connection to the receiver, the outer conductor of the coax feed to the antenna should be connected to the earth, as indicated below.



The earth itself must be of high quality buried copper, at least 1.5m deep and preferably in ground that is habitually humid (eg, the base of a gutter down pipe).

3.5 Antenna

The antenna load connected to the receiver should present a DC short to ensure lighting protection.

3.6 Audio feed

In situations where the audio output of the receiver is over any form of land line, suitable protection must be included external to the receiver to ensure voltage transients do not enter the receiver. These may be in the form of high power zener diodes and/or gas discharge tubes.

Where the receiver is co-sited with an AM installation, suitable filtering must be included in the audio feed to ensure that excessive RF voltages do not enter the receiver.

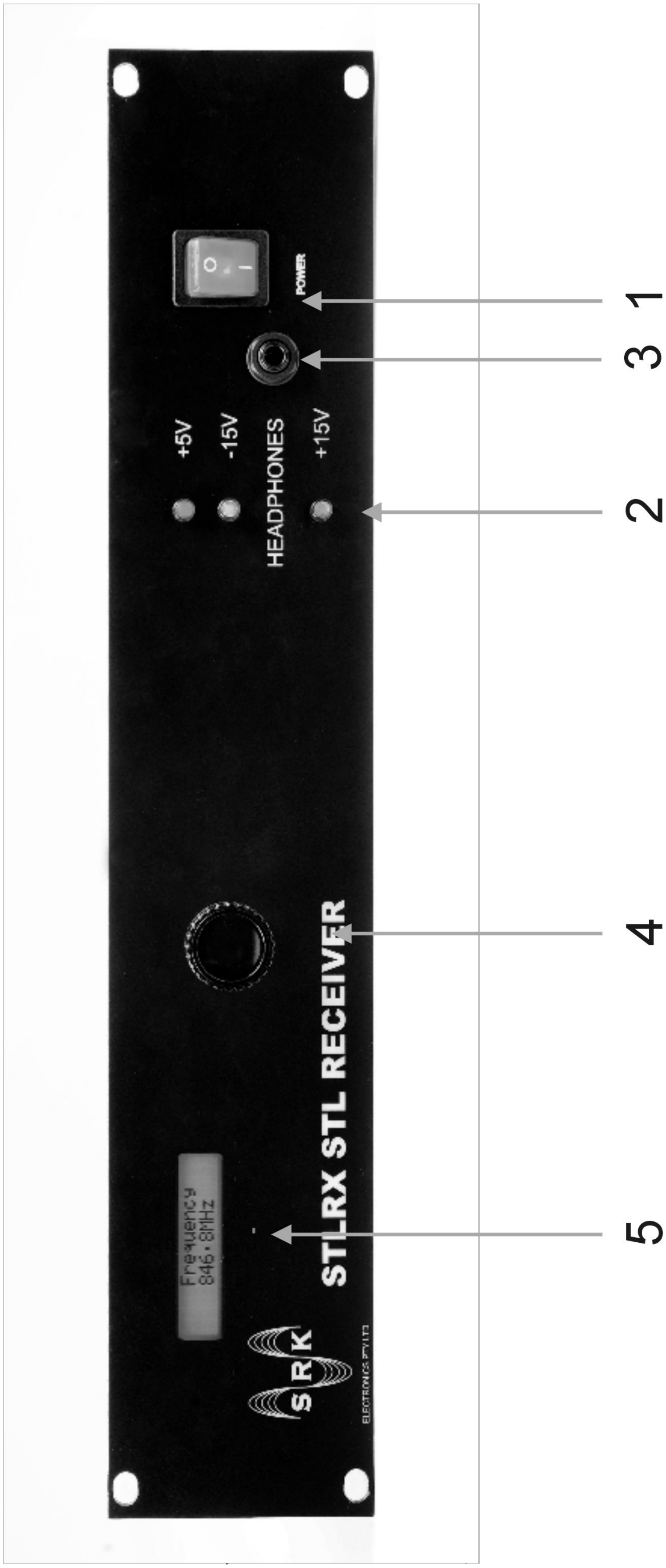


Fig 4.1 Front View

Fig 4.2 REAR VIEW

4 OPERATION

4.1 Front Panel

Please refer to figure 4.1. The numbers of the following paragraphs refer to the controls shown in figure 4.1.

1 Power Switch
Switches the receiver on and off.

2 Power Supply LEDs
Lights green to indicate the presence of internal power supply voltages

3 Headphone output
Allows the output audio to be monitored on headphones.

4 Control knob
This allows all parameters to be read or modified.

5 LCD
Displays current parameter value and any error messages.

4.2 Rear panel.

Please refer to figure 4.2. The numbers of the following paragraphs refer to the controls shown in figure 4.2.

6 Remote connector

Remote operation is performed by making connection to this DB9 socket. Please refer to section 4.11 for details

7 Audio output

This is a balanced audio output. Pin designation is as follows:

1	GND (screen)
2	+ve audio
3	-ve audio

The mating connector should be a female XLR (cannon) type.

Note that should it be desired to use this output as un-balanced, pin1 should be used as ground and either pin 2 or pin 3 as signal.

8 Remote relay contact

This is a normally open relay contact which closes once the signal strength exceeds the squelch threshold by more than 3dB. This can be used to control the main transmitter or switch in standby audio sources.

The relay contact is isolated from the rest of the receiver circuitry and is rated 1A @ 30V.

9 Earth stud

This is an M6 stud for connecting an earth. This is recommended for superior lightning protection.

10 Mains input

This is the mains input, 240V AC unless specified by the customer. Mating connector is IEC female. Any connection made to this socket must incorporate a safety earth.

11 RF in

This is the connection for the antenna. Mating connector is N type male, 50Ω.

12 Fuse

This is the primary mains fuse and is rated 2A slow blow. Use only ceramic cased replacements.

4.3 Switching on and off

The STLRX is switched on by depressing the power switch (1) to the down position.

If mains voltage is present then the switch should illuminate. The LCD display will initially show:

SRK ELECTRONICS

When self diagnostics have completed successfully the display will show the current operating frequency. For example:

Frequency
851.6MHz

The STLRX is now in operative mode. The user may set the unit's parameters by either the front panel or remote control.

The STLRX may be switched off at any time by depressing the power switch to the up position.

4.4 Setting squelch level

The level at which the squelch operates is set by rotating the knob until "Squelch level" is shown. This is the level, in dBm, at the antenna input that will cause the audio output to un-mute and the squelch relay to close.

Pressing the knob momentarily will make the “Squelch level” characters flash. Whilst they are flashing, rotating the knob clockwise will decrease the level. Rotating the knob anticlockwise will increase the level.

When finished adjusting the level, press the knob again momentarily. The “Squelch level” characters will stop flashing and the selected level will remain set.

The STLRX is unique in giving an actual signal strength figure in dBm, accurate to within a couple of dB. This allows the user to accurately determine the power margin under actual operating conditions without the need for a spectrum analyzer.

Furthermore, in situations where co-channel interference is a problem, setting the squelch level somewhere between the main and interfering signal levels can be achieved with great ease and confidence.

The level setting is recorded in non-volatile RAM, so it is not necessary to set the level each time the STLRX is switched on.

4.5 Setting Channel Frequency

The STLRX is fully frequency agile and may be set to any 200KHz channel in the range 845.2MHz to 851.8MHz. This is accomplished by rotating the knob until the display shows “Frequency”. The current frequency is shown on the second line of the display.

Pressing the knob momentarily will make the “Frequency” characters flash. Whilst they are flashing, rotating the knob clockwise will increase the frequency. Rotating the knob anticlockwise will decrease the frequency.

When finished adjusting the frequency, press the knob again momentarily. The “Frequency” characters will stop flashing and the selected frequency will be programmed into the PLL. The frequency will not change until the “Frequency” characters are not flashing.

The channel frequency is stored in non-volatile RAM, so it is not necessary to set the frequency each time the STLRX is switched on.

4.6 Setting audio gain

The audio output gain of the STLRX may be set between 0 and 100%, in 0.5% increments.

The peak deviation and audio gain can be measured by rotating the knob until the display shows “Gain/Deviation”.

Pressing the knob momentarily will make the “Gain/Deviation” characters flash. Whilst they are flashing, rotating the knob clockwise will increase the gain. Rotating the knob anticlockwise will decrease the gain.

When finished adjusting the gain, press the knob again momentarily. The “Gain/Deviation” characters will stop flashing and the selected gain will remain set.

Upon installation, the link should be driven with program audio and the gain set to an appropriate level to drive the broadcast transmitter.

The audio gain is stored in non-volatile RAM, so it is not necessary to set the gain each time the STLRX is switched on.

4.7 Selecting de-emphasis.

The STLRX allows the user to select either 75µS, 50µS or no de-emphasis.

To view the current de-emphasis setting, rotate the knob until the display shows "De-emphasis". The current de-emphasis setting is shown on the second line of the display.

Pressing the knob momentarily will make the "De-emphasis" characters flash. Whilst they are flashing, rotating the knob in either direction will sequence through the available de-emphasis time constants.

When finished adjusting the de-emphasis, press the knob again momentarily. The "De-emphasis" characters will stop flashing and the selected de-emphasis will remain set.

The pre-emphasis setting is stored in non-volatile RAM.

As a general rule, de-emphasis should only be used if the program content is mono or intended for an AM transmitter.

Regardless of which de-emphasis setting is used, it should match the pre-emphasis setting of the STL transmitter at the other end of the link.

4.8 Measuring received signal strength.

As mentioned in the section dealing with squelch level, the STLRX gives an accurate measure of signal strength in dBm, in the range -40 to -120dBm. Signal strengths above -40dBm will read as "+++" on the display. Signal strengths below -120dBm will read as "---" on the display.

An optimum signal strength is somewhere between -50 and -80dBm. This will give the best compromise in terms of inter-modulation immunity and signal to noise ratio.

Should the signal strength be too great then external attenuators can be fitted at the antenna input. This will ensure inter-modulation artifacts are reduced.

Signal strength can be measured by rotating the knob until "Signal strength" is displayed.

4.9 Setting the low pass filter.

The STLRX incorporates an audio low pass filter, with a cutoff of 15KHz, which may be switched on or off as desired.

To view the current LPF setting, rotate the knob until the display shows "15KHz LPF". The current filter setting is shown on the second line of the display.

Pressing the knob momentarily will make the "15KHz LPF" characters flash. Whilst they are flashing, rotating the knob clockwise will turn the filter on. Rotating the knob anticlockwise will turn the filter off.

When finished setting the filter, press the knob again momentarily. The "15KHz LPF" characters will stop flashing and the filter will remain off or on as selected.

4.10 Monitor headphone output.

The STLRX has a stereo ¼" jack on the front panel where headphones can be used to monitor the audio output of the receiver. Note that this output is taken from the signal path before the gain setting circuitry, so the gain setting will not affect the headphone volume. No additional filtering or de-emphasis is applied to the headphone output. So in systems where pre-emphasis/de-emphasis is applied external to the STL, the headphone output will sound “tinny”.

4.11 Remote operation.

The STLRX may be monitored and controlled remotely via the “TELEMETRY” connector on the rear of the unit. This is an RS232 standard connection with the following characteristics:

Baud rate:	9600
Data bits:	8
Parity:	NONE
Stop bits:	1
Flow control:	NONE

The pinout for the DB9 connector is as follows: pin 2, transmit data, pin 3, receive data, pin 5, common (0V). All other pins are not connected.

The STLRX responds to the following commands. <CR> indicates the ASCII character 0D hex. All letters are upper case, spaces (20 hex) are indicated by “_”. All commands must be terminated by <CR>. Note that a line feed (0A hex) must not be sent before or after <CR>. After a response is sent, a carriage return, line feed and “>” are sent.

RL?<CR>
Returns received signal strength (level) in the form -XXXdBm<LF><CR>>. For example:

RL?<CR> (command)
-_51dBm<LF><CR> (response from receiver)
>

Note that for signal strengths between -40 and -99dBm, the leading zero is replaced with a space

SL?<CR>
Returns squelch level in the form -XXXdBm<LF><CR>>. For example:

SL?<CR> (command)
-100dBm<LF><CR> (response from receiver)
>

Note that for squelch levels between -40 and -99dBm, the leading zero is replaced with a space

CF?<CR>
Returns channel frequency in the form XXX.XMHz<LF><CR>>. For example:

CF?<CR> (command)
848.6MHz<LF><CR> (response from receiver)
>

PD?<CR>
Returns the measured peak deviation in the form XXXKHz<LF><CR>>. For example:

PD?<CR> (command)
_45KHz<LF><CR> (response from receiver)
>

Note that any leading zeros are set to spaces, except for the special case of `0KHz`.

AG?<CR>
Returns the current audio gain in the form XXX%<LF><CR>>. For example:

AG?<CR>	(command)
_95%<LF><CR>	(response from receiver)
>	

DE?<CR>
Returns the current de-emphasis time constant in the form None<LF><CR>>, 75uS<CR><LF>> or 50uS<CR><LF>>. For example:

DE?<CR>	(command)
None<LF><CR>	(response from receiver)
>	

AF?<CR>
Returns the current status of the 15KHz low pass filter in the form Out<LF><CR>> or In<LF><CR>>. For example:

AF?<CR>	(command)
_In<LF><CR>	(response from receiver)
>	

PS?<CR>
Returns the current front panel status in the form Locked<CR><LF>> or Unlocked<CR><LF>>. For example:

PS?<CR>	(command)
Locked<CR><LF>	(response from receiver)
>	

SL=XXX<CR>
Allows the squelch level to be set to the value XXX. Valid range for XXX is 040 to 120. For example:

SL=075<CR>	(command, sets squelch level to -75dBm)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

CF=XXX.X<CR>
Allows the channel frequency to be set to the value XXX.X. Valid range for XXX.X is 845.2 to 851.8. For example:

CF=850.4<CR>	(command, sets channel frequency to 850.4MHz)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

AG=XX<CR>
Allows the audio gain to be set to the value XX. Valid range for XX is 00 to 99. For example:

AG=67<CR>	(command, sets audio gain to 67%)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

DE=NONE<CR>, DE=75US<CR>, DE=50US<CR>
Allows the de-emphasis to be set. For example:

DE=75US<CR>	(command, sets de-emphasis to 75µS)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

AF=IN<CR>, AF=OUT<CR>
Allows the audio low pass filter to be set. For example:

AF=IN<CR>	(command, sets filter to in)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

FE<CR>
Unlocks the front panel to allow parameters to be altered locally. For example:

FE<CR>	(command to enable the front panel)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

FD<CR>
Locks front panel. Parameters can be measured but not changed locally. For example:

FD<CR>	(command to disable front panel)
Ok<LF><CR>	(response from receiver indicating that command has been executed)
>	

HP?<CR>
Returns a summery of the above commands.

Any data received by the receiver, other than the commands listed above will generate the following error string:

Invalid_command.__Send_HP?(CR)_for_command_syntax.<LF><CR>
>

Any data outside the valid range for the parameter concerned will generate the following error string:

Incorrect_value_or_syntax.__Send HP?(CR)_for_help.<LF><CR>
>

Should it be necessary to make connection to the remote port using cables running external to the building housing the STLRX, it is recommended that external filtering and transient protection be installed on these lines.

5 MAINTENANCE

5.1 Recommended maintenance schedule

The STLRX will give many years of trouble free service with little or no attention

It is advisable to replace the fuse every 5 years. This will prevent un-expected failures due to fuse fatigue. Note that replacement fuses should be of the ceramic cased variety.

6 CIRCUIT DESCRIPTION

6.1 Equipment Overview

The STLRX consists of the following sub-assemblies:

- Band pass cavity filter
- Front end
- 2nd IF amplifier
- Demodulator
- Output board
- Front panel
- Power supply

These assemblies are interconnected as per “STLRX wiring diagram”.

Please refer to fig 6.1 for the physical location of each sub-assembly.

The band pass cavity filter acts as a pre-selector and ensures that the image rejection of the receiver is very high.

The front end amplifies the signal and mixes it down to 167MHz, the 1st IF.

The 2nd IF amplifier converts the 1st IF to 10.7MHz, the 2nd IF. This is then amplified and limited.

The demodulator takes the 2nd IF and generates audio.

The output board contains the gain control, audio low pass filter, de-emphasis circuits, headphone and line drivers.

The front panel contains a micro-controller which generates the control signals for the rest of the receiver. The MCU also drives the LCD and reads the rotary encoder to allow data entry by the user.

The power supply generates +15V, -15V and 5V from the incoming mains voltage.

6.2 Band Pass Cavity Filter.

The band pass filter has a bandwidth of 25MHz, centered at 848.5MHz. Insertion loss is about 0.7dB. Loss at the image frequency (516MHz) is >100dB.

6.3 Front end

Signal enters on J1. U1 contains a low noise amplifier which gives about 20dB of gain. The output is passed through Z1. This is a low pass filter which ensures that the second order response of the cavity filter does not allow spurious responses.

The signal is then passed to a transformer which provides a further 6dB of gain as well as generating a balanced drive for the first mixer.

The local oscillator frequency is such that the 1st IF is set to 166.22MHz. The active mixer within U1 generates a balanced signal which is converted to a single sided signal by T2 and output on J2 to be passed to the 2nd IF amplifier.

The local oscillator is generated by a phase locked loop (U4) driving a low noise VCO (U7). This is programmed by the microprocessor on the front panel to generate a frequency of between 678.98 to 685.58MHz.

U5 is an extremely stable 10MHz oscillator which is used to generate the reference for the PLL.

6.4 2nd IF amplifier

The first IF, at 166.22MHz, enters on J2 and filtered by Z1. This is a helical resonator with a centre frequency of 167MHz and a bandwidth of 2.5MHz.

This signal is passed to U1. This is an integrated mixer and IF amplifier. Impedance matching is performed by C1, C2 and L1.

The signal is passed to the mixer input. The second local oscillator is injected into the LO input of the mixer. This is at 155.52MHz and generated by U2, an ECL oscillator.

The 2nd IF (at 10.7MHz) is available at the output of the mixer. This is filtered by ceramic resonator X1 before being passed to the IF amplifier. The output of the IF amplifier is filtered by another resonator (X2) and passed to the limiting amplifier.

The output of the limiting amplifier would normally be passed to a quadrature frequency detector to recover the audio and U1 has this circuitry internally. However, for this application a normal quadrature detector will not provide sufficient quality. Therefore the output of the limiter is buffered by Q1 and passed out to the demodulator circuit on connector J1.

U1 also generates a DC voltage roughly proportional to the logarithm of the received signal strength. This is available on pin 7 and passed on to the microprocessor so that the signal strength can be measured and compared to the squelch level.

6.5 Demodulator

The demodulator is of a “pulse counting” type. 10.7MHz 2nd IF enters on J2. U2 is a band pass filter to remove any harmonics.

U1 is an oscillator/mixer that converts the 10.7MHz to 700KHz by mixing with 10MHz. This is generated by X1 and the internal oscillator of U1.

The output of the mixer contains both sum and difference signals at 20.7MHz and 700KHz respectively.

R1, R2, C5 and C6 filter out the sum product and Q1 amplifies the 700KHz component sufficiently to ensure an adequate voltage swing for the inverter, U3A.

The output of U3A is a 5V p-p square wave of average frequency 700KHz, but frequency modulated exactly as the input RF at 850MHz.

C23, R3, D1, U3B and U3C form a monostable of approximately 330nS time constant. Thus the output of U3C is a pulse-position modulated series of 330nS pulses. This is filtered by U5 and U6 to recover the base band audio. In fact, U5 and U6 form half of a four stage bessel filter. The last two stages are on the output board.

U7 simply adds gain to improve the signal to noise ratio.

6.6 Output board

The output board takes partially filtered audio from the demodulator and completes the filtering process using U2A and U2B. Combined with U5 and U6 of the demodulator, this forms a Bessel filter with a cutoff frequency of 100KHz.

R17, C10, C11, U3C and U3D allow de-emphasis to be applied if commanded by the microprocessor on the front panel.

U1 forms a low pass filter of 15KHz cutoff which can be switched into the signal path by U3B. Alternatively, the filter can be switched out by U3A. U2D provides an equivalent amount of gain as the active filter, but without the roll off.

U6 is a four quadrant digital to analogue converter which provides a means for the microprocessor to control the output level.

U8 latches in the serial data from the microprocessor and generates 8 bits of parallel data. U7 is a level shifter.

The output of U5B is fully processed and demodulated audio, of an amplitude determined by the gain setting of the microprocessor.

U4 is a differential line driver, with output protection provided by D1-D4, R29 and R30.

The output of U5B is also fed to a headphone driver, U11. This then provides the signal to the front panel headphone jack.

The un-processed audio is peak detected by U9 and U12 which generates a DC voltage proportional to the peak deviation of the incoming RF. This voltage is passed to the microprocessor the allow peak deviation to be measured.

Q2 drives the squelch relay, under microprocessor control.

Power and control signals are distributed to the other subassemblies by the output board.

6.7 Power supply

The power supply generates +15V, -15V and +5V from the 18V AC of the transformer.

AC enters on J1 and is rectified by D1-D4. Filtering is provided by R1, C6, R2 and C7. D5 and D6 provide transient protection.

The unregulated DC is regulated by U1, U2 and U3. The output voltages are passed to the rest of the receiver on J2.

6.8 Front Panel

The front panel allows the user to set and measure all of the parameters of the STLRX. Please refer to the appropriate schematic.

The heart of the front panel is U1, an MCU. This device generates all of the control signals and provides all of the metering for the STLRX, as well as the telemetry functions. It runs at a clock frequency of 7.37MHz, determined by X1. U1 performs the following functions:

The analogue signals on pins 39 and 40 (signal strength and peak deviation) are digitised and processed so that these parameters can be read on the LCD or via telemetry.

The status of the digital line on pins 38,21, 20, 19 and 16 are monitored to allow the status of the various parts of the receiver to be displayed on the LCD or via telemetry.

The LCD is controlled by the lines on pins 24, 26 and 27. The data bus for the LCD is on pins 1 to 8.

As there are more signals required than available pins on the MCU, an external latch is used to give extra outputs., U3.

This device generates the signals to program the PLL, audio gain, de-emphasis and low pass filter status.

Telemetry is provided by the internal USART of U1, and brought to RS232 levels by U2.

All parameters may be set manually using the rotary encoder, S1. The three lines from S1 are monitored by U1.

Power supply status is shown by the appropriate LEDs.

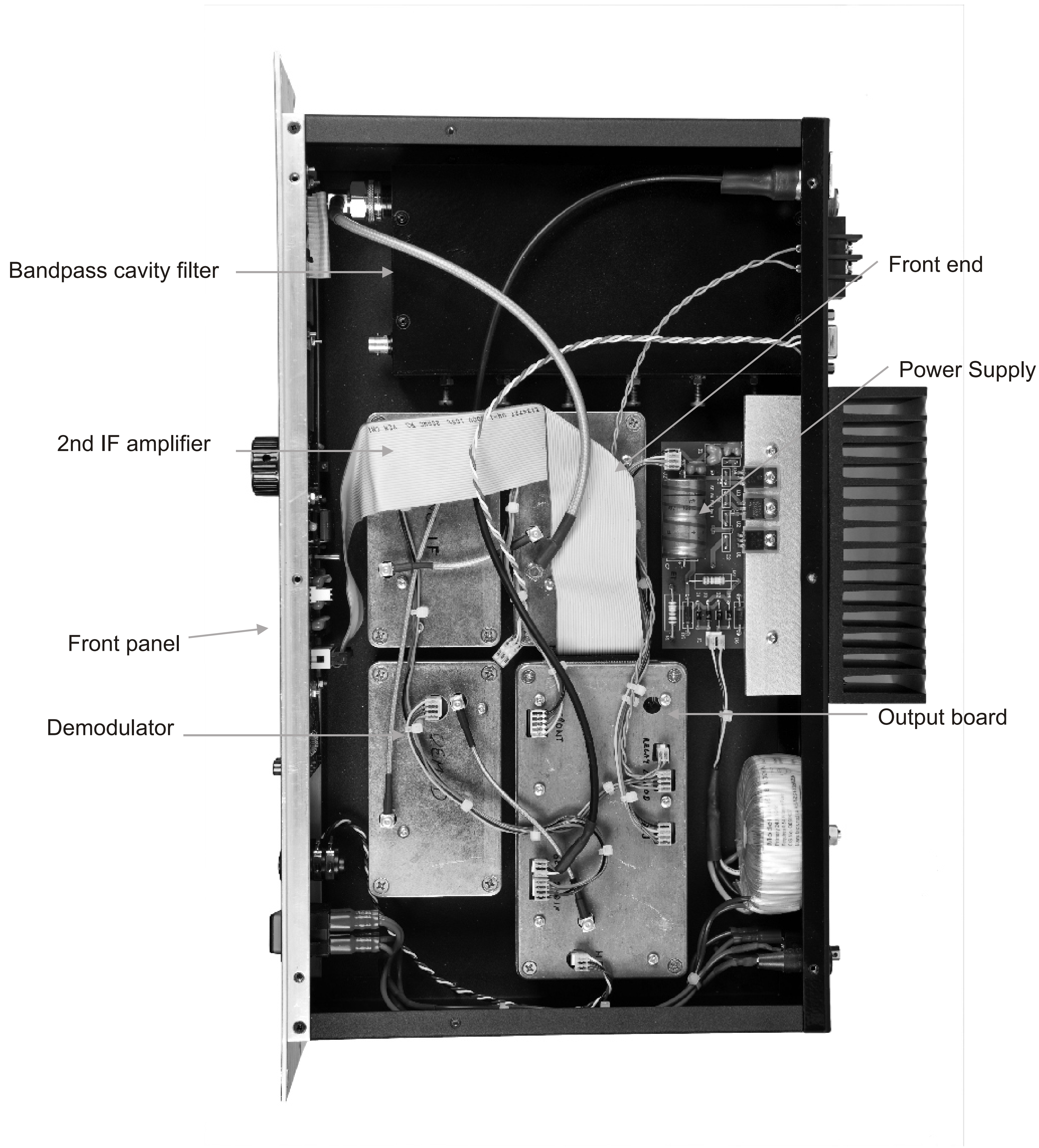
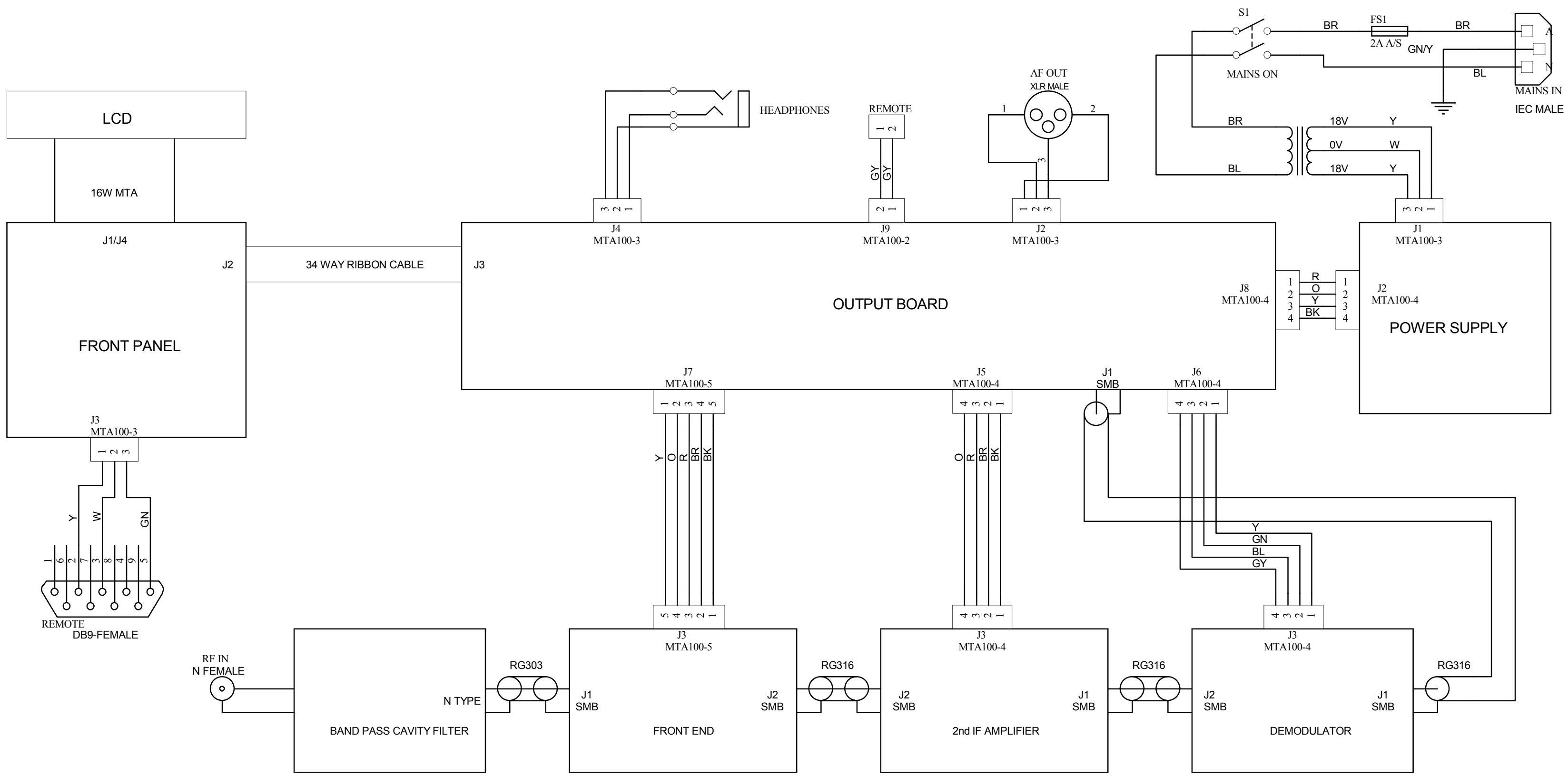

Bandpass cavity filter
Front end
Power Supply
2nd IF amplifier
Front panel
Demodulator
Output board

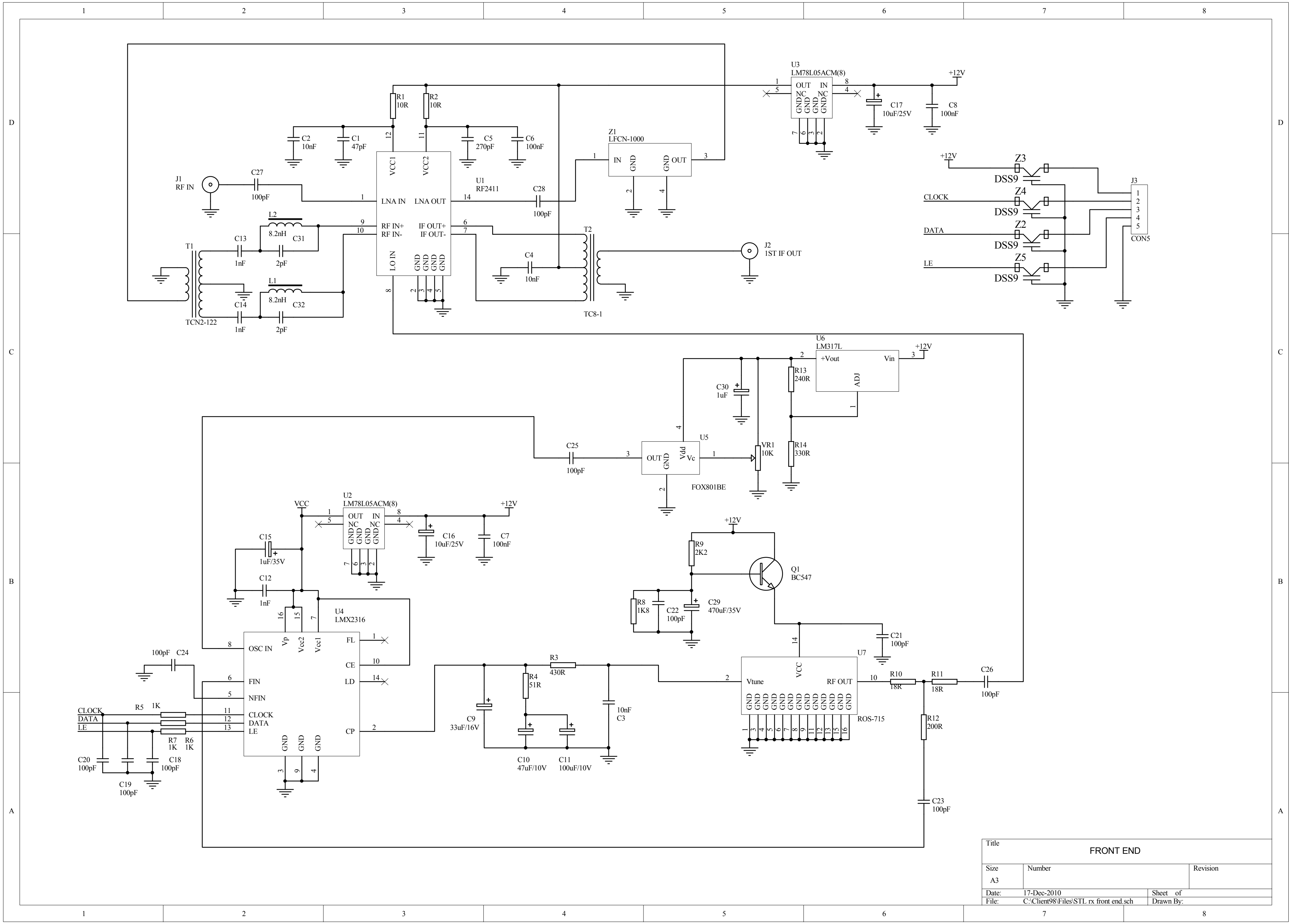
Fig 6.1



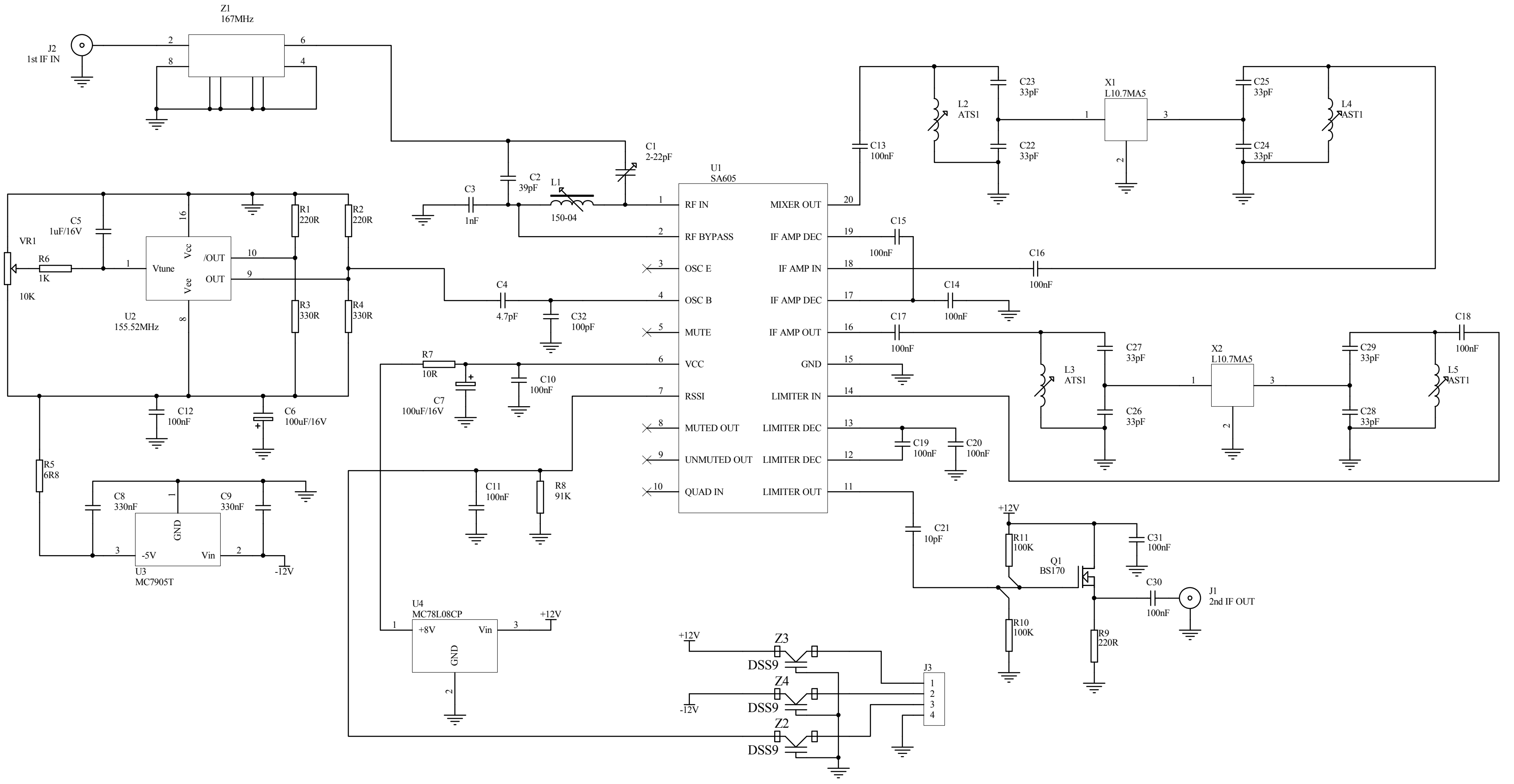
CABLE COLOUR DESIGNATION

BK BLACK
BR BROWN
R RED
O ORANGE
Y YELLOW
GN GREEN
BL BLUE
V VIOLET
GY GREY
W WHITE
P PINK
BK/R BLACK/RED
GN/Y GREEN/YELLOW

Title	STLRX Wiring Diagram		
Size: A3	Number	Revision: 1	
Date:	17-Dec-2010	Sheet of	
File:	C:\Client98\Files\STLRX.sch	Drawn By:	



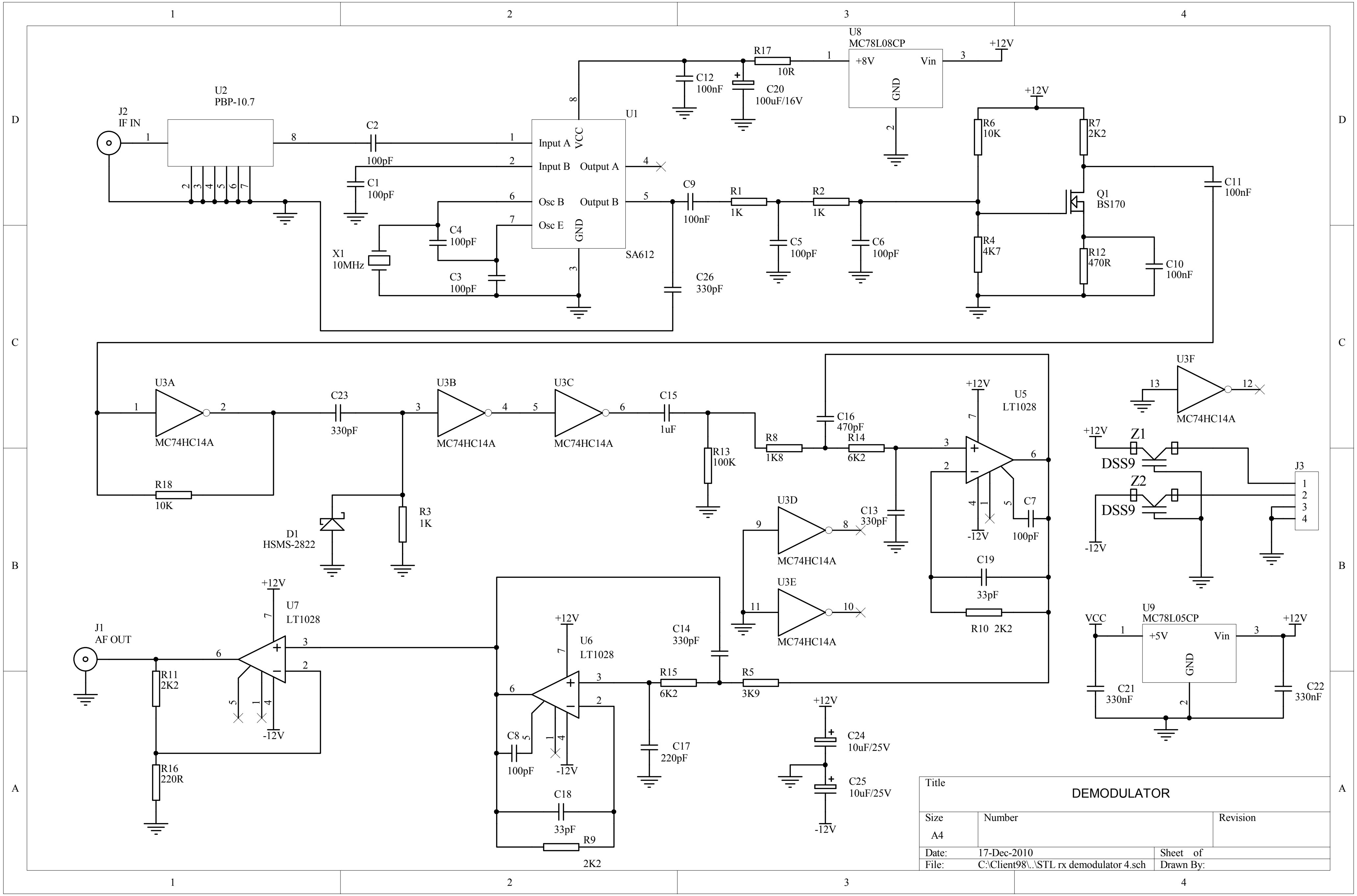
U3
LM78L05ACM(8)
OUT IN
NC NC
GND GND GND GND
+12V
C17
10uF/25V
C8
100nF
R1
10R
R2
10R
C2
10nF
C1
47pF
C5
270pF
C6
100nF
Z1
LFCN-1000
IN GND GND OUT
J1
RF IN
C27
100pF
U1
RF2411
VCC1 VCC2
LNA IN LNA OUT
RF IN+ IF OUT+
RF IN- IF OUT-
LO IN
GND GND GND GND
C28
100pF
L2
8.2nH
C31
2pF
C13
1nF
L1
8.2nH
C32
2pF
C14
1nF
T1
TCN2-122
C4
10nF
T2
TC8-1
J2
1ST IF OUT
Z3
DSS9
Z4
DSS9
Z2
DSS9
Z5
DSS9
CLOCK
DATA
LE
J3
CON5
U6
LM317L
+Vout Vin
ADJ
R13
240R
R14
330R
C30
1uF
VR1
10K
U5
OUT GND Vdd Vc
FOX801BE
C25
100pF
U2
LM78L05ACM(8)
VCC
C15
1uF/35V
C12
1nF
C16
10uF/25V
C7
100nF
R9
2K2
Q1
BC547
R8
1K8
C22
100pF
C29
470uF/35V
C21
100pF
U4
LMX2316
OSC IN
FIN
NFIN
CLOCK
DATA
LE
Vp Vcc2 Vcc1
FL
CE
LD
CP
GND GND GND
100pF C24
R5 1K
R7 1K
R6 1K
C20
100pF
C19
100pF
C18
100pF
R3
430R
R4
51R
C9
33uF/16V
C10
47uF/10V
C11
100uF/10V
10nF
C3
U7
ROS-715
Vtune
VCC
RF OUT
R10
18R
R11
18R
C26
100pF
R12
200R
C23
100pF
Title
FRONT END
Size
A3
Number
Revision
Date: 17-Dec-2010
Sheet of
File: C:\Client98\Files\STL rx front end.sch
Drawn By:



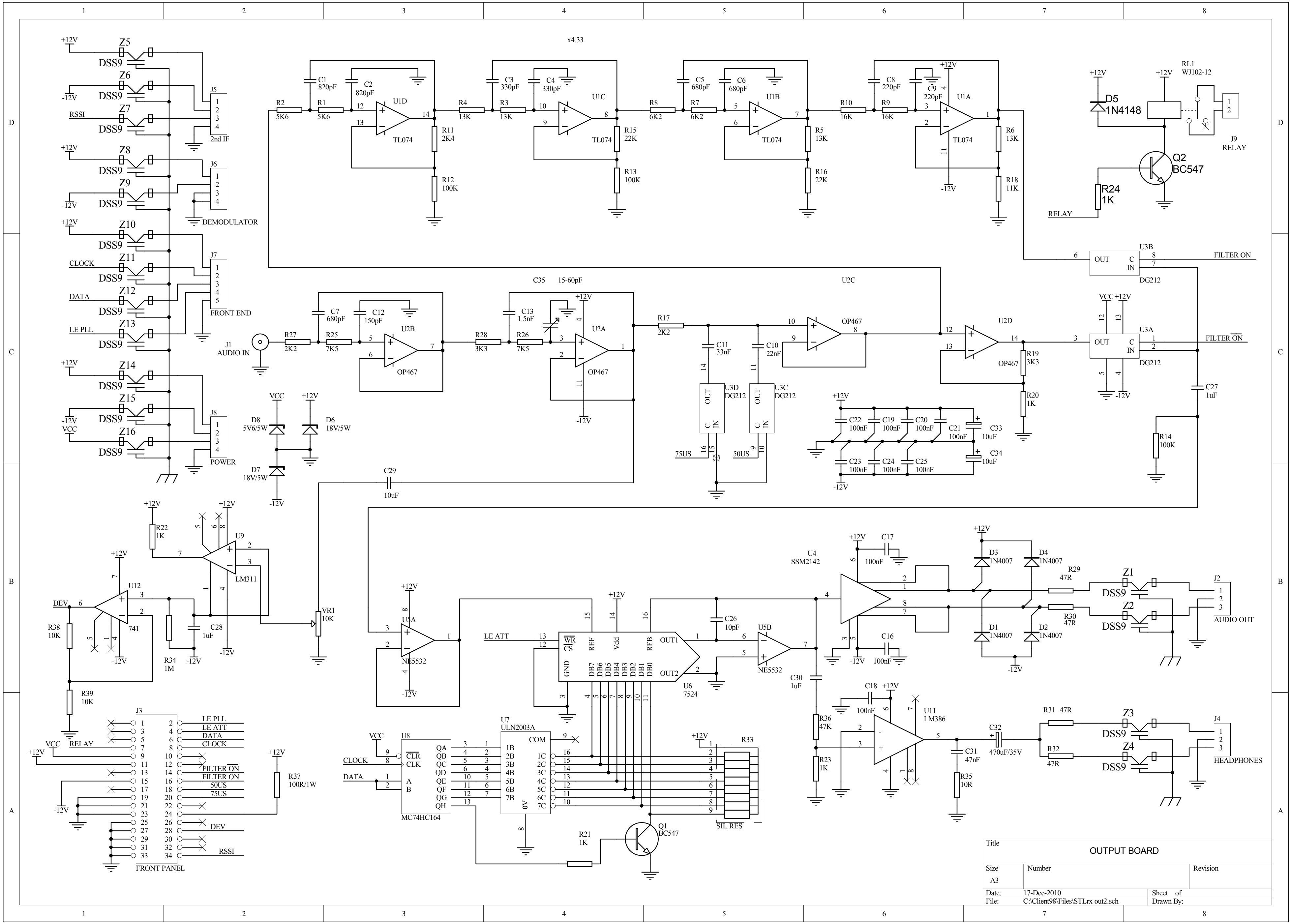
Title: 2nd IF AMPLIFIER

Size	Number	Revision
A3		

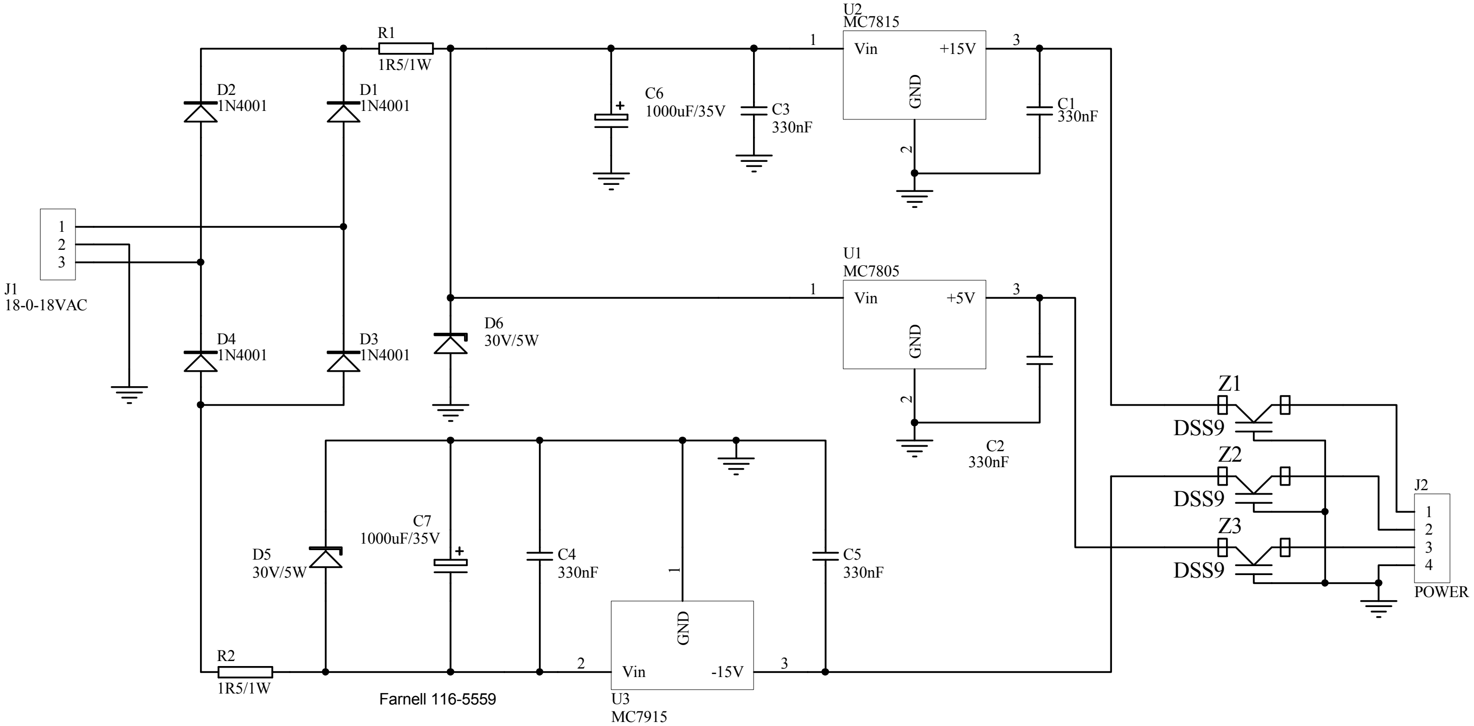
Date: 17-Dec-2010 | Sheet of
File: C:\Client98\Files\STL RX 2nd IF 2.sch | Drawn By:



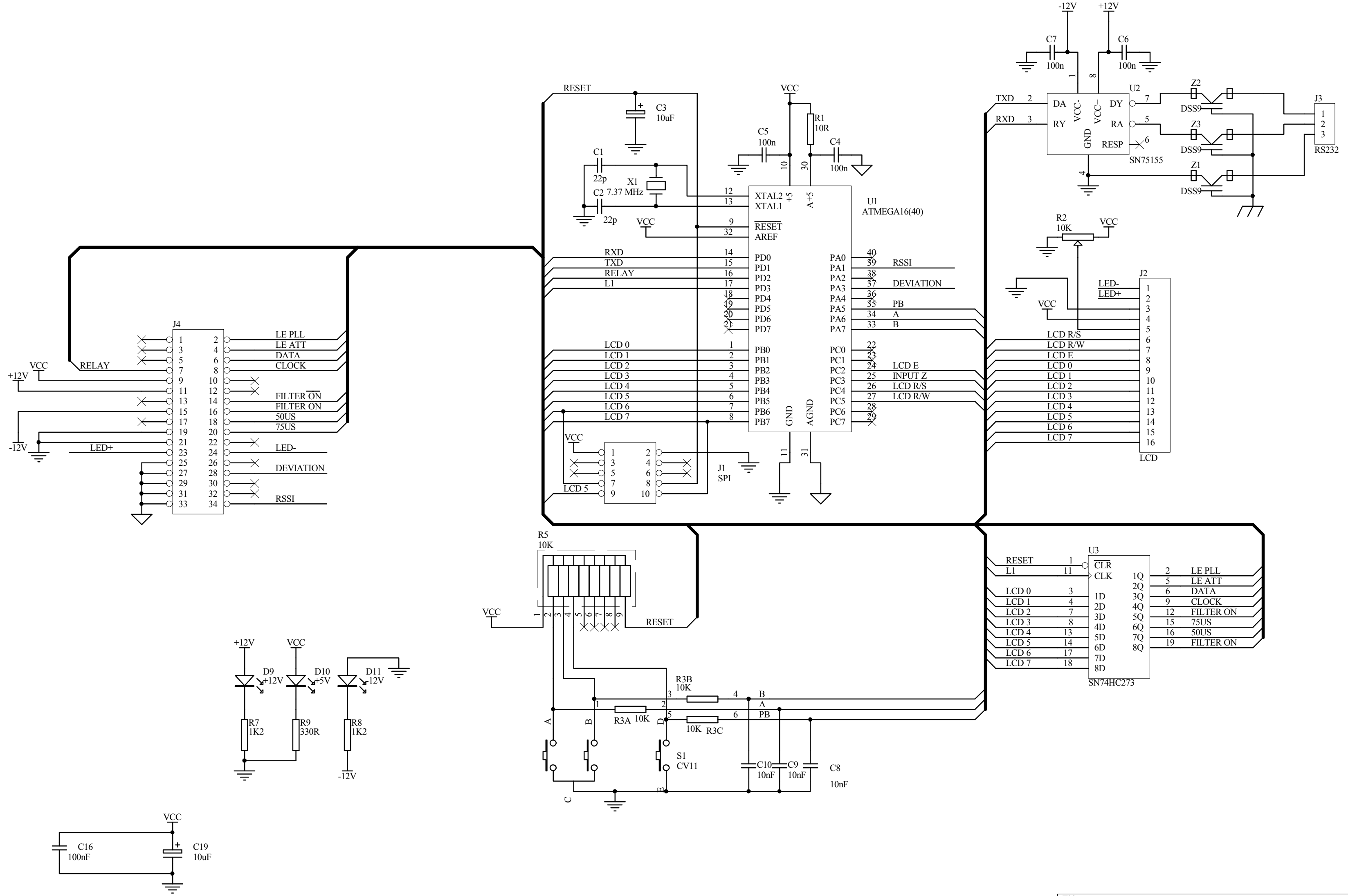
DEMODULATOR
J2 IF IN
U2 PBP-10.7
U1 SA612
Input A
Input B
Osc B
Osc E
Output A
Output B
VCC
GND
U8 MC78L08CP
+8V
Vin
GND
+12V
R17 10R
C12 100nF
C20 100uF/16V
C2 100pF
C1 100pF
C4 100pF
C3 100pF
X1 10MHz
C9 100nF
R1 1K
R2 1K
C5 100pF
C6 100pF
C26 330pF
R6 10K
R7 2K2
R4 4K7
R12 470R
Q1 BS170
C10 100nF
C11 100nF
U3A MC74HC14A
U3B MC74HC14A
U3C MC74HC14A
U3D MC74HC14A
U3E MC74HC14A
U3F MC74HC14A
R18 10K
C23 330pF
D1 HSMS-2822
R3 1K
C15 1uF
R13 100K
R8 1K8
R14 6K2
C16 470pF
C13 330pF
U5 LT1028
C7 100pF
C19 33pF
R10 2K2
-12V
Z1 DSS9
Z2 DSS9
J3
J1 AF OUT
U7 LT1028
R11 2K2
R16 220R
U6 LT1028
C14 330pF
R15 6K2
R5 3K9
C17 220pF
C8 100pF
C18 33pF
R9 2K2
C24 10uF/25V
C25 10uF/25V
U9 MC78L05CP
+5V
VCC
C21 330nF
C22 330nF
Title
Size A4
Number
Revision
Date: 17-Dec-2010
Sheet of
File: C:\Client98\..\STL rx demodulator 4.sch
Drawn By:



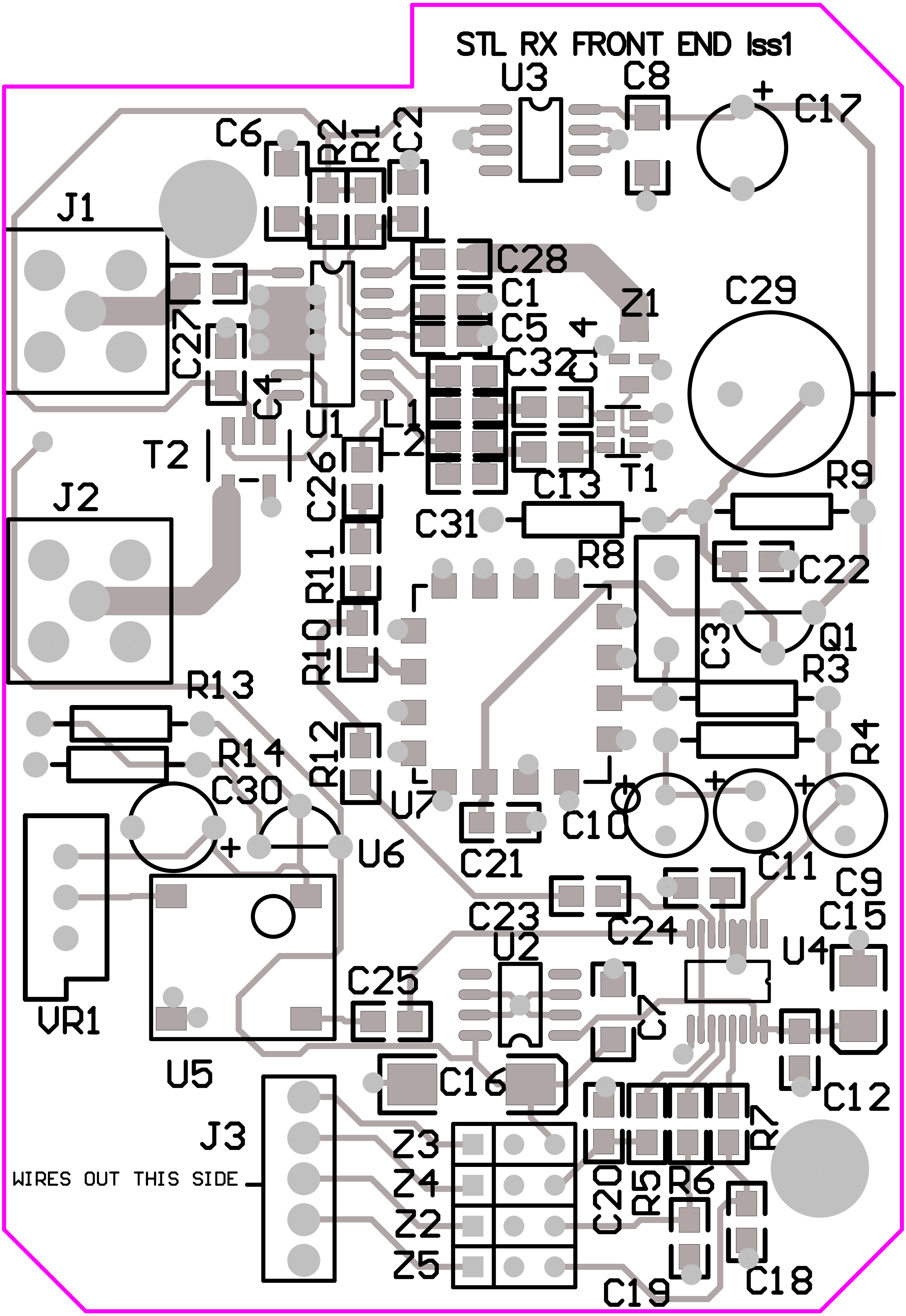
OUTPUT BOARD
Size A3
Number
Revision
Date: 17-Dec-2010
Sheet of
File: C:\Client98\Files\STLrx out2.sch
Drawn By:
x4.33
U1D TL074
U1C TL074
U1B TL074
U1A TL074
U2A OP467
U2B OP467
U2C OP467
U2D OP467
U3A DG212
U3B DG212
U3C DG212
U3D DG212
J1 AUDIO IN
J2 AUDIO OUT
J4 HEADPHONES
J3 FRONT PANEL
J5 2nd IF
J6 DEMODULATOR
J7 FRONT END
J8 POWER
J9 RELAY
RL1 WJ102-12
Q1 BC547
Q2 BC547
D5 1N4148
U4 SSM2142
U5A NE5532
U5B NE5532
U6 7524
U7 ULN2003A
U8 MC74HC164
U9 LM311
U11 LM386
U12 741
FILTER ON
75US
50US
LE ATT
LE PLL
CLOCK
DATA
RSSI
DEV
RELAY
SIL RES



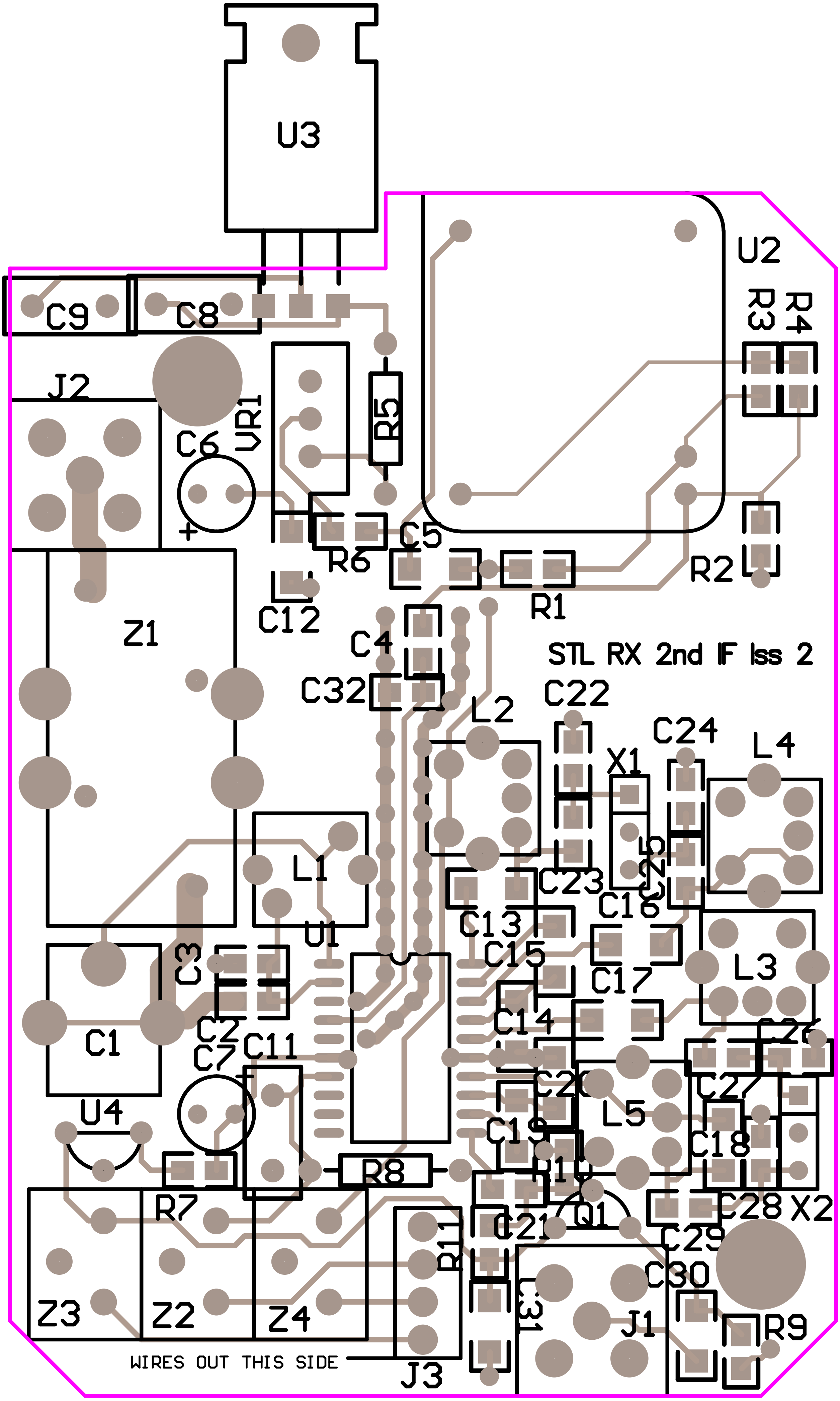
Title	POWER SUPPLY		
Size A4	Number		Revision
Date:	17-Dec-2010	Sheet of	
File:	C:\Client98\Files\STL rx psu.sch	Drawn By:	

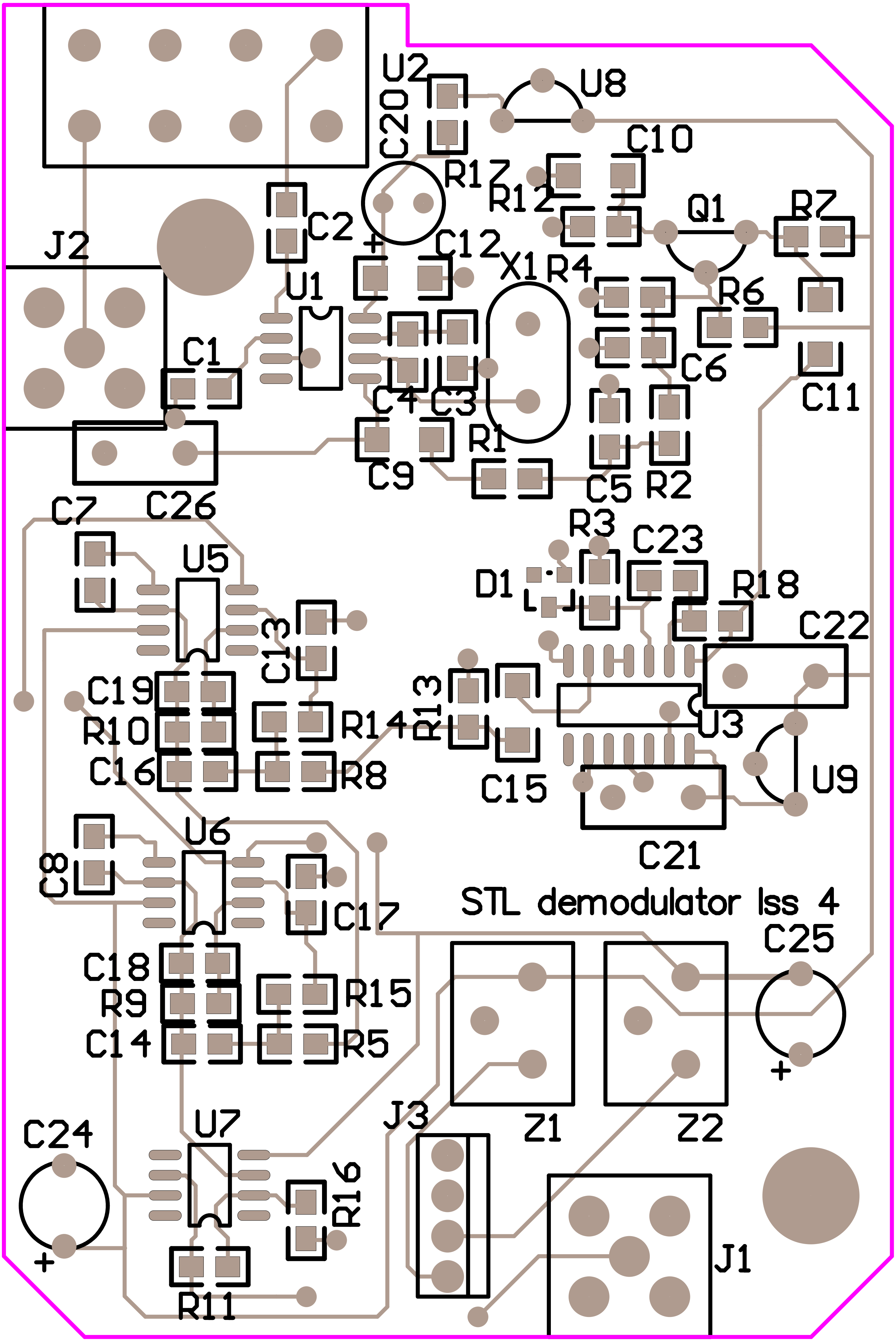


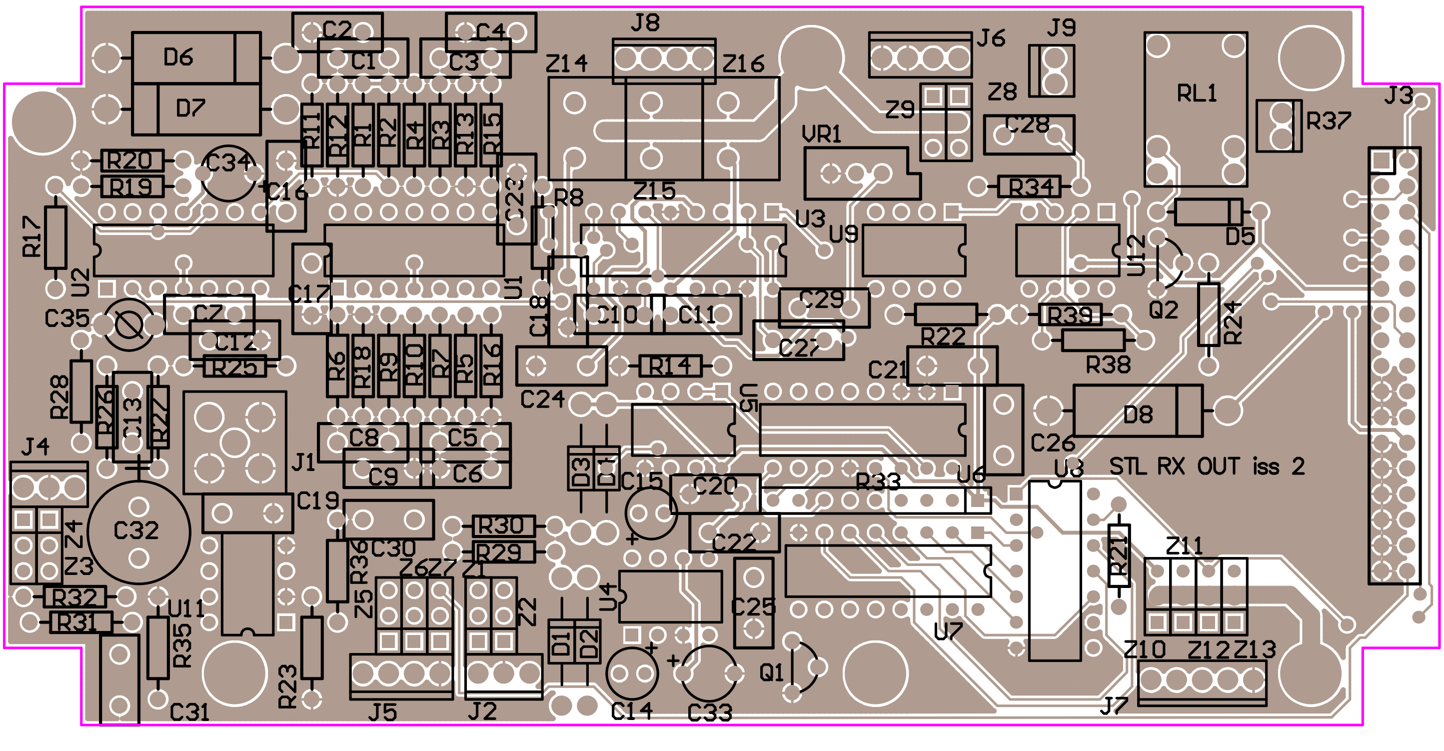
Title	STLRX front panel		
Size A3	Number		Revision 1
Date:	17-Dec-2010	Sheet of	
File:	C:\Client98\Files\STL rx front.sch	Drawn By:	

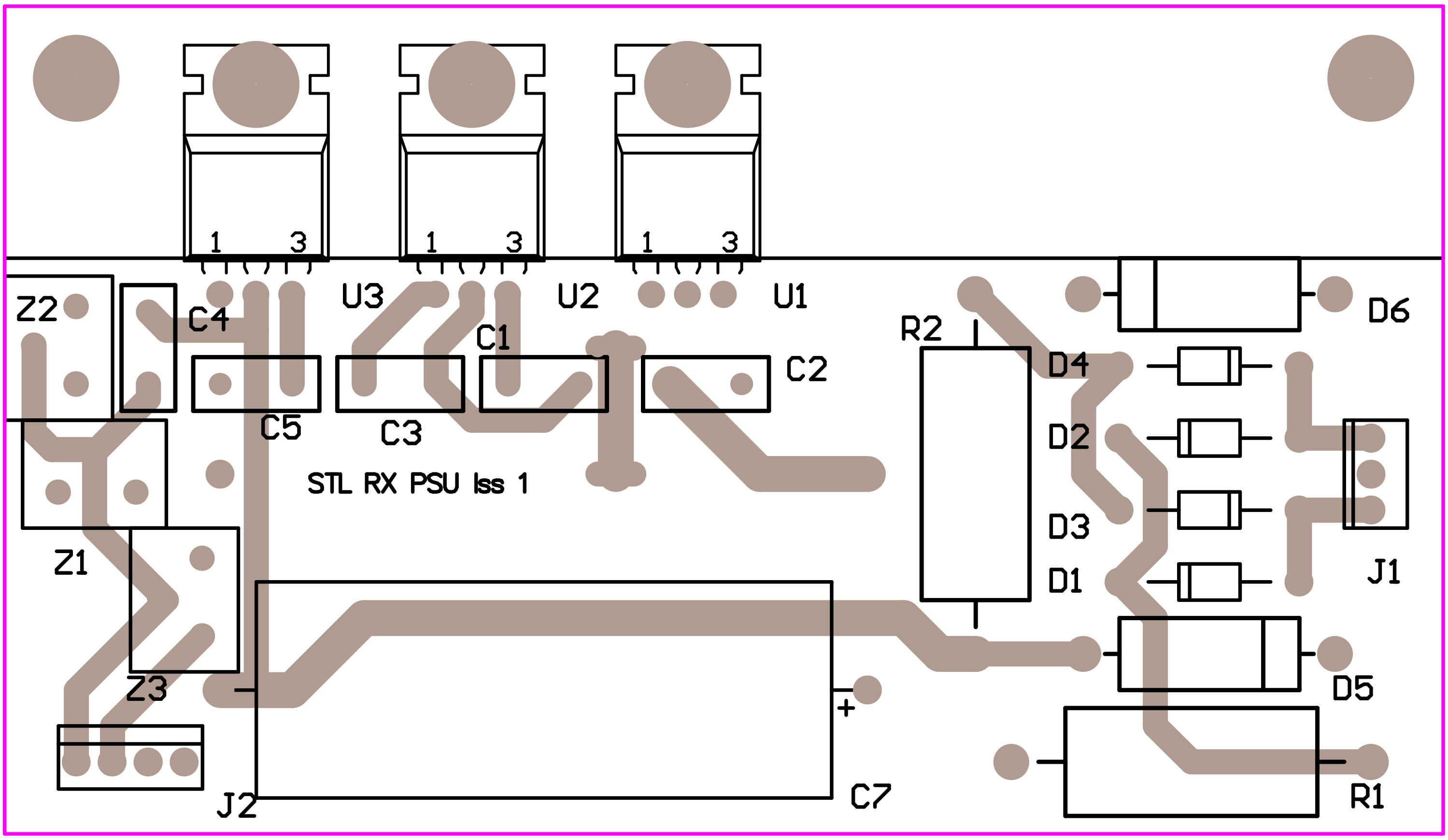


STL RX FRONT END Iss1
U3
C8
C17
C6
R2
R1
C2
J1
C28
C1
C5
Z1
C29
C27
C4
C14
C32
U1
L1
T2
C26
C13
T1
R9
J2
C31
R8
C22
R11
Q1
C3
R10
R3
R13
R12
R4
R14
C30
U7
C10
U6
C21
C11
VR1
C9
C23
C24
C15
U2
U4
C25
C7
U5
C16
C12
J3
Z3
R7
Z4
WIRES OUT THIS SIDE
Z2
C20
R5
R6
Z5
C19
C18

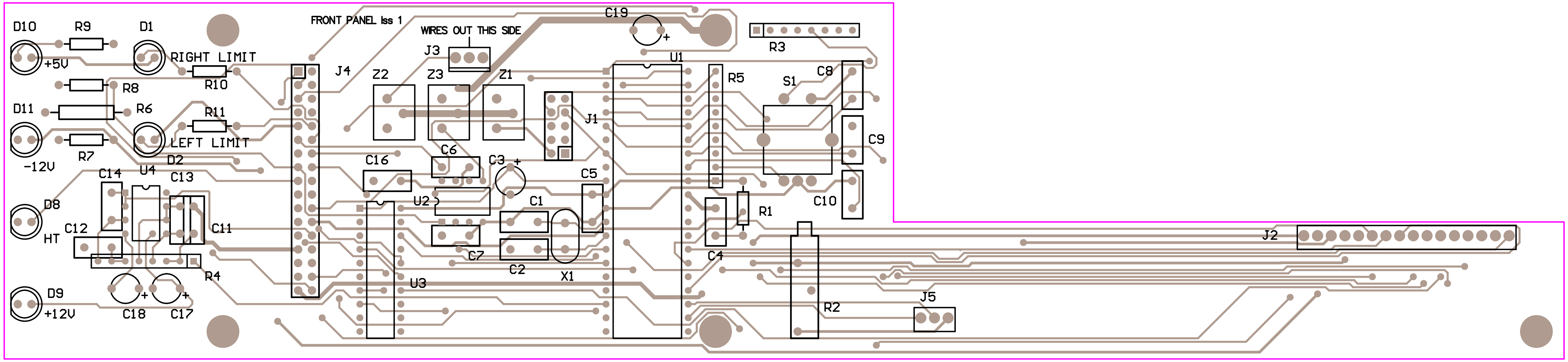

STL RX 2nd IF Iss 2
U3
U2
R3
R4
C9
C8
J2
C6
VR1
R5
R6
C5
R2
R1
C12
Z1
C4
C32
L2
C22
X1
C24
L4
L1
C23
C25
C16
U1
C13
C15
C3
C17
L3
C2
C14
C26
C1
C7
C11
C20
L5
C27
U4
C19
C18
R8
R10
R7
C21
Q1
C28
X2
R11
C29
C30
C31
J1
R9
Z3
Z2
Z4
WIRES OUT THIS SIDE
J3


STL demodulator Iss 4
U2
C20
U8
C10
R17
R12
Q1
R7
C2
C12
X1
R4
R6
J2
U1
C1
C4
C3
C6
C11
C9
R1
C5
R2
C7
C26
R3
C23
U5
D1
R18
C22
C13
C19
R10
C16
R14
R8
R13
C15
U3
U9
C21
C8
U6
C17
C25
C18
R9
C14
R15
R5
J3
Z1
Z2
C24
U7
R16
J1
R11


STL RX OUT iss 2



Z2
C4
U3
U2
U1
C1
C2
R2
D4
D6
C5
C3
D2
STL RX PSU Iss 1
D3
Z1
D1
J1
Z3
D5
J2
C7
R1



FRONT PANEL Iss 1
WIRES OUT THIS SIDE
D10
R9
D1
+5V
RIGHT LIMIT
R10
R8
D11
R6
R11
LEFT LIMIT
R7
-12V
D2
C14
U4
C13
D8
HT
C12
C11
R4
D9
+12V
C18
C17
J4
J3
Z2
Z3
Z1
C16
C6
C3
U2
C1
C7
C2
X1
U3
J1
C5
C19
U1
R5
S1
C8
C9
C10
R3
R1
C4
R2
J5
J2