Eclipse Series

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Keytone Decoder

This manual is produced by RF Technology Pty Ltd
10/8 Leighton Place, Hornsby, 2077 NSW Australia

General System Description

The Keytone Decoder (KTD) module 05/9140 is the base station end of a tone-based, remote-keying system for the Eclipse series. When used with a compatible encoder it provides the means of keying the transmitter over the same voice-frequency (300--3000hz) circuit that carries the transmitted audio.

The decoder also provides Automatic Gain Control to compensate for changes in the voice circuit gain.

The system uses a single tone frequency of 2970~Hz to key the transmitter. When it is detected, the decoder keys the transmitter via an active low PTT output.

The amplitude of the incoming tone is used as a level reference for the AGC system. The AGC circuitry automatically adjusts the gain of the channel to maintain a constant tone level. This also maintains the voice information at a constant level since it shares the channel.

The audio output for the transmitter has the keytone removed by notch filters.

Installation and Operation

The KTD module plugs into the Eclipse series sub-rack. All connections are via the 25 pin connector on the rear of the module. The unit is aligned at the factory and should not require realignment. The only field adjustments
required are the line input and output levels. These can be set from the front panel.

Module Connections (DB-25 Pinouts)

KTD Signal	KTD pin
600 ohm LINE IN [+]	6
600 ohm LINE IN [-]	20
600 ohm LINE OUT [+]	4
600 ohm LINE OUT [-]	17
PTT output	3
+12V	1, 14
GND	13, 25

System Adjustment

The following procedure may be used to set the line input and output levels.

1 The normal test signal consists of 1 kHz at -30 to 0 dBm and 2970 Hz at 8.5 dB below the 1 kHz level. The level used for system adjustment should be consistent with that provided from the control point through the VF circuit. Record the level used.

2 Apply the normal test signal to the module input pins 20,6. The test signal may be through the VF circuit from the control point or supplied locally.

3 Turn the front panel LINE IN adjustment fully clockwise until the mechanism clicks.

4 Connect an audio level meter between the LINE OUT pins 4,17 and adjust the front panel LINE OUT control to obtain –10 dBm.

5 Reduce the test signal input level by 20 dB. If the test signal is supplied from the remote control point, this may be done by either inserting a 20 dB attenuator in the circuit or by bridging the input terminals with a 33 ohm resistor.

6 Adjust the front panel LINE IN control counter-clockwise until the measured output level drops to –12 dBm.

7 Restore the test signal to the level recorded in step1

8 Adjust the front panel LINE OUT control to obtain the desired level. This is normally -10 to –6 dBm when connected to an Eclipse transmitter line input.

Circuit Description

Line Input

The composite voice plus keytone is input to the module through line transformer T1. This provides a compatible input for 600 ohm VF circuits.

The line input can be configured to provide a 600 ohm termination or a high impedance load by setting jumper JP2.

The input level is adjusted by the front panel control RV1. A high pass filter consisting of U1A and associated components is provided to reduce any 50 Hz hum which may be present. The hum filter can be by-passed by setting JP3.

AGC

The composite audio is applied to the input of a variable gain amplifier consisting of U2 and U3. U2A, an operational transconductance amplifier, is the variable gain element. U3A and U3B are used as inverting and non-inverting output buffers.

The gain of the amplifier is controlled by either of two level detectors. One is driven by the audio (voice plus keytone). U3A and U3B connect to Q1 and Q3 and act as a full wave AGC detector. The output from this detector is a negative going dc voltage. It is applied to the base of Q2 which in turn increases the current into pin 8 of U2 and reduces its gain.

This threshold of the audio signal detector is set at approximately 6 dB above the normal audio level. Therefore this detector only controls the gain when the audio level exceeds normal levels.

The keytone output from U5A drives the tone AGC detector Q5. The output from this detector controls the gain of U2 under normal operating conditions.

Band-Pass / Reject Filter

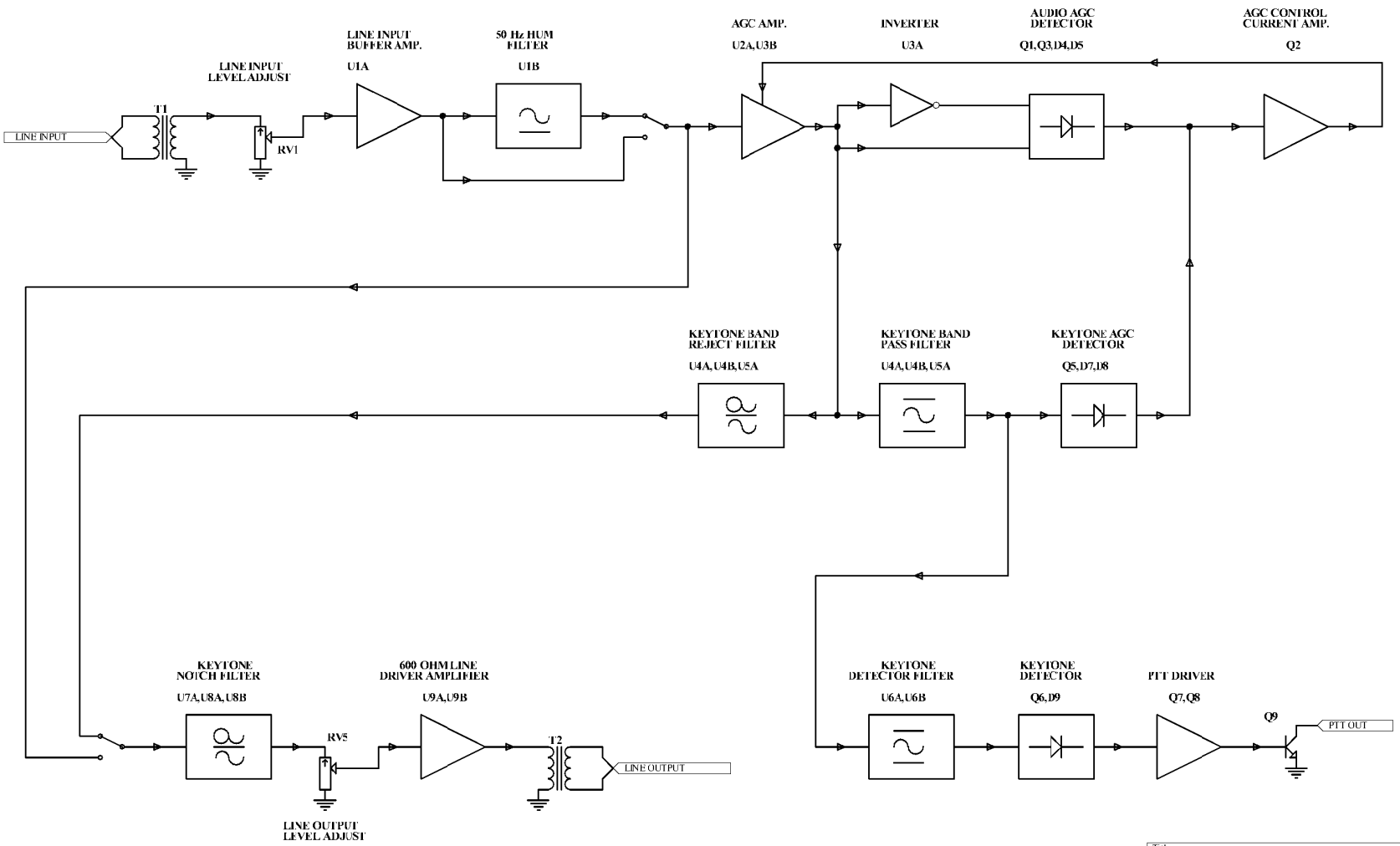
U4A, U4B and U5A are used in a filter circuit which has band pass and band reject outputs. The band reject output is used to remove the keytone from the audio supplied to the line output. The band pass output is used to separate the keytone from the lower audio frequencies. This signal is then fed to the tone ACG detector and to the keytone filter.

Keytone Filter and Detector

The keytone filter U6A, U6B and associated components provides the additional selectivity necessary to separate the keytone from the other audio frequency components. The filter output from U6B is applied to the base of Q6. Q6 is turned ON when the key tone is present and produces a negative going voltage which causes Q7, Q8 and Q9 to turn ON. The PTT output is taken from the collector of Q9.

Notch Filter and Line Output

U7A, U8A and U8B are the active elements of a notch filter. This filter is used to further reduce the residual keytone. The output level is adjusted by RV5. The output amplifiers U9A and U9B drive the 600 ohm line output through transformer T2.



KEYTONE DECODER SIGNAL FLOW

Title	R F Technology Pty Ltd 17/8 Leighton Place, Hornsby, 2077, Australia		
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Date: 18-Aug-1998	Sheet 1 of 2		
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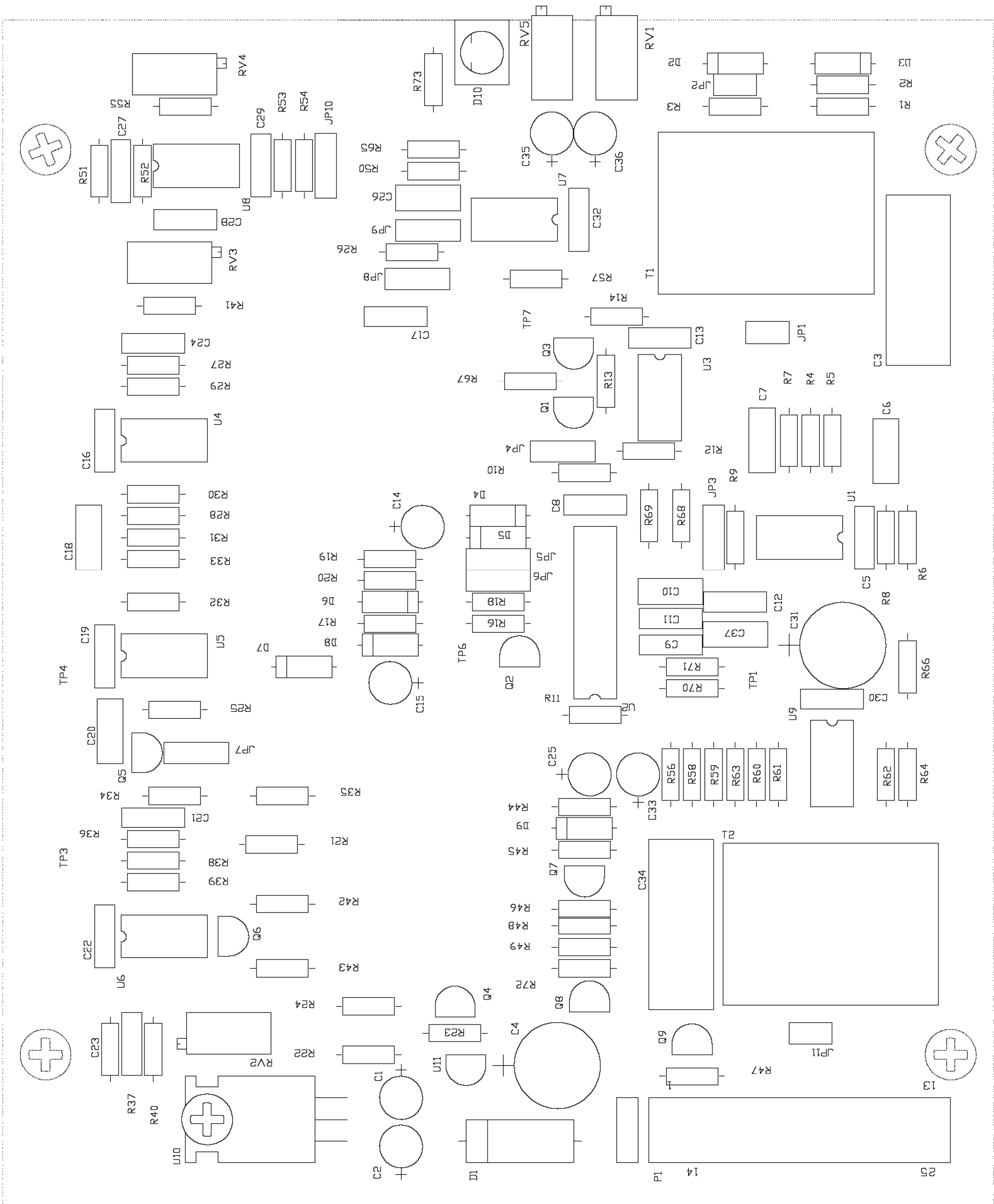
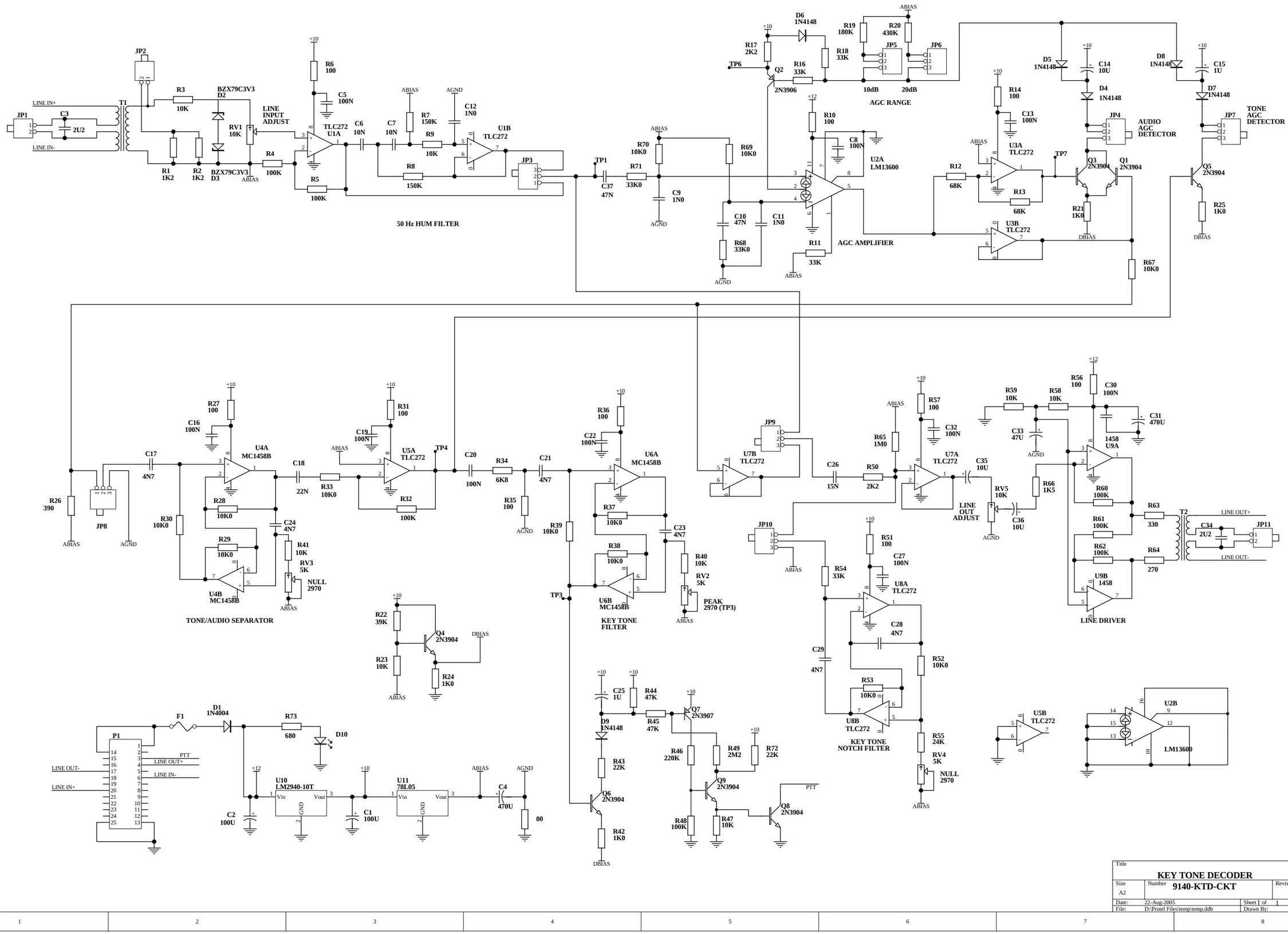

RV4
R55
C27
R51
R52
C29
R53
R54
JP10
U8
C28
RV3
R41
C24
R27
R29
U4
C16
R30
R28
R31
R33
C18
R32
C19
U5
TP4
R25
C20
JP7
Q5
R34
R35
C21
R36
TP3
R21
R38
R39
R42
Q6
C22
U6
R43
R24
R22
RV2
C23
R37
R40
U10
C1
C2
R73
D10
RV5
RV1
D2
JP2
R3
D3
R2
R1
C35
C36
U7
R65
R50
C26
JP9
R26
JP8
C32
R57
T1
R14
TP7
C17
C13
JP1
C3
Q3
R13
U3
R67
Q1
R7
R4
R5
C7
C6
JP4
R12
R10
D4
C14
C8
R69
R68
JP3
R9
U1
D5
JP5
JP6
R19
R20
D6
R17
D8
D7
C15
R18
R16
TP6
Q2
C5
R6
R8
C10
C12
C11
C37
C31
C9
R66
R71
R70
TP1
R11
U2
C30
U9
C25
C33
R56
R58
R59
R63
R60
R61
R62
R64
R44
D9
R45
T2
C34
Q7
R46
R48
R49
R72
Q8
Q4
R23
C4
U11
Q9
JP11
R47
1
13
D1
P1
14
25


JP1
JP2
C3
2U2
LINE IN+
LINE IN-
T1
R3
10K
BZX79C3V3
D2
RV1
10K
LINE
INPUT
ADJUST
R1
1K2
R2
1K2
BZX79C3V3
D3
ABIAS
R4
100K
R5
100K
+10
R6
100
C5
100N
TLC272
U1A
C6
10N
C7
10N
R7
150K
R9
10K
R8
150K
AGND
C12
1N0
U1B
TLC272
JP3
50 Hz HUM FILTER
TP1
C37
47N
R71
33K0
R70
10K0
C9
1N0
R69
10K0
C10
47N
C11
1N0
R68
33K0
AGC AMPLIFIER
R10
100
C8
100N
U2A
LM13600
R11
33K
+12
D6
1N4148
R17
2K2
R16
33K
R18
33K
TP6
Q2
2N3906
R19
180K
R20
430K
JP5
JP6
10dB
20dB
AGC RANGE
D5
1N4148
D8
1N4148
C14
10U
C15
1U
D4
1N4148
D7
1N4148
R14
100
C13
100N
U3A
TLC272
R12
68K
R13
68K
TP7
JP4
AUDIO
AGC
DETECTOR
Q3
2N3904
Q1
2N3904
R21
1K0
DBIAS
U3B
TLC272
R67
10K0
JP7
TONE
AGC
DETECTOR
Q5
2N3904
R25
1K0
R27
100
C16
100N
U4A
MC1458B
C17
4N7
C18
22N
R33
10K0
R28
10K0
R30
10K0
C24
4N7
R29
10K0
R41
10K
RV3
5K
NULL
2970
U4B
MC1458B
R26
390
JP8
TONE/AUDIO SEPARATOR
R31
100
C19
100N
U5A
TLC272
TP4
R32
100K
C20
100N
R34
6K8
R35
100
C21
4N7
R36
100
C22
100N
U6A
MC1458B
R37
10K0
R38
10K0
R39
10K0
C23
4N7
R40
10K
RV2
5K
PEAK
2970 (TP3)
U6B
MC1458B
TP3
KEY TONE
FILTER
JP9
U7B
TLC272
R65
1M0
R57
100
C32
100N
U7A
TLC272
C26
15N
R50
2K2
C35
10U
RV5
10K
C36
10U
LINE
OUT
ADJUST
R59
10K
R58
10K
C33
47U
R56
100
C30
100N
C31
470U
1458
U9A
R66
1K5
R60
100K
R61
100K
R62
100K
R63
330
R64
270
T2
LINE OUT+
LINE OUT-
C34
2U2
JP11
U9B
1458
LINE DRIVER
JP10
R51
100
C27
100N
U8A
TLC272
R54
33K
C28
4N7
C29
4N7
R53
10K0
U8B
TLC272
R52
10K0
R55
24K
RV4
5K
NULL
2970
KEY TONE
NOTCH FILTER
U5B
TLC272
U2B
LM13600
R22
39K
Q4
2N3904
R23
10K
R24
1K0
C25
1U
R44
47K
R45
47K
Q7
2N3907
D9
1N4148
R43
22K
Q6
2N3904
R42
1K0
R46
220K
R49
2M2
R72
22K
Q9
2N3904
R48
100K
R47
10K
Q8
2N3904
PTT
P1
PTT
LINE OUT+
LINE OUT-
LINE IN-
LINE IN+
F1
D1
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C1
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C4
470U
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