The LZA2027 Tone Termination Panel Instruction and Programming Manual

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0300-30944-900 **Rev. 12-02**

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SPECIFICATIONS

Input Voltage	10.7 Vdc - 18 Vdc
Standby current @ 13.8 Vdc	75mA
Temperature range	0 to +70 deg C
Relative humidity	90% at 50 deg C
Line impedance	600 ohms
Line control	2 or 4 wire audio
Receive to line audio output level	50mV rms. - 2.8V rms. into 600 ohms
Receive to line S/N ratio	> 50 dB (ref. -10 dBm in to +10 dBm out)
Receive to line distortion	< 3%
Receive to line frequency response through de-emphasis	+1, -3 dB (300 to 3000 Hz) +1, -3 dB at 6 dB/octave (300 to 3000 Hz)
Line to TX audio output level	30mV rms. - 1.3V rms. into 600 ohms
Line to TX S/N ratio	> 40 dB (ref. 0 dBm in to +2 dBm out)
Line to TX distortion	< 3%
Line to TX frequency response	+1, -3 dB (300 to 3000 Hz)
Outputs – open collector	100mA sink
Outputs – relay contacts	1 A Form C
Weight	1.3 lb.
Dimensions	4.25" x 6.5" x 1.5"

1 GENERAL DESCRIPTION

1.1 Description

The LZA2027 tone termination panel is designed to operate in conjunction with IDA Models 24-66 and 24-20 tone remote controllers, as well as other tone remotes currently marketed. The LZA2027 detects tones from a compatible controller to remotely control the GBH-01 base station.

The operational settings that the LZA2027 is to operate under can be selected and changed with the LAA0744 software program that operates on a standard personal computer. In multi-frequency applications, the LZA2027 can be configured for a number of frequency control schemes. When configuring the LZA2027 for operation, one of the eleven function tones can be selected to be associated with a particular function. The LZA2027 can also be configured for dual function tone signaling which allows a pair of function tones to be associated with each function.

As ordered from RELM Wireless, the LZA2027 is configured (programmed) for 2-wire mode, single tone assigned functions, and 8-channel operation in Group 1. In addition to the standard PTT and receive functions, the LZA2027 can be custom programmed to allow feature selections such as group and channel, channel scan, and group scan of the GBH-01 base station. The LZA2027 is programming can be changed to be used with a standard 99-channel remote. The programming software and cable for the LZA2027 from RELM under part number LAA2027PS.

The standard 6 pin modular jack, located at the rear of the base station, is used for the interconnecting the tone termination panel to the remote with the supplied modular cable. The connections should be standard for all remotes.

1.2 Capabilities and Features

- 2 wire or 4 wire operation
- Remote update
- 11 function tones 1050 - 2050 Hz
- Dual function tone capability allowing up to 99 channel selections
- PC programmable
- Non-volatile memory

1.3 Service Information

If you need service, contact your local BK Radio dealer equipped to service your radio. If you find it impractical to have service performed by your local dealer, contact BK Radio at the address below:

BK Radio
ATTN: Customer Service
7100 Technology Drive
West Melbourne, FL 32904
Voice (800) 422-6281
FAX (321) 953-7986

2 INSTALLATION AND SETUP

2.1 Inspection

The LZA2027 is a factory installed option for the GBH-01 base station. After being installed and before the GBH is shipped to the customer, the LZA2027 is thoroughly tested using an IDA tone remote, model 2466. However, should you feel the need to inspect it, it is located above the power supply board and secured by two screws within the GBH chassis.

2.2 Line Connection

The LZA2027 allows either 2-wire or 4-wire lines to be used when connecting the LZA2027 to a remote. The line connection should be made to the modular jack on the back of the GBH-01. For 2-wire lines, audio to and from the remote share the same two wires, pins 4 and 5 of the modular jack. For 4-wire lines, pins 4 and 5 of the modular jack are used for audio to the remote while pins 3 and 6 are used for audio from the remote.

2.3 Test Procedure

The LZA2027 has been aligned from the factory for optimum performance, and in most cases, it does not require additional adjustments. However, due to different remote cable lengths that can be used, tone levels of the remote terminal and LZA2027 within the base station may need to be re-adjusted for optimum performance. It is recommended to test the complete system on the bench with the actual remote cables before installing the system. Use only one remote at first. Additional remotes can be added later. See section 2.4 for disassembly and section 5.3 for audio adjustments.

1. Be sure to program the base station radio as required to user's specific frequencies and tones. Keypad programming can be accomplished by using the BK "Smart" Microphone, model LAA0290. An IBM or compatible PC can be used to program the base station radio when using the LAA0725 programming cable and LAA0742CD Windows based editor software; or the radio can be cloned by a GPH or EPH series portable using the LAA0700 or G/ECC cloning cable. However, the radio system options must be programmed using the programming cable and PC editor software.

2. If custom programming is required, program the tones of the LZA2027 so that they match the remote. See section 3.0 for programming information.

3. Plug the remote into the RJ45, six pin, modular connector into the rear of the base station chassis. Plug the remote in its AC source. Plug the base station power supply into the AC source and switch the power supply and radio on. Connect the antenna jack of the base station to an antenna, service monitor, or proper 50-ohm load.

5. Receiver audio from the base station radio should be heard at the remote when a proper receive signal is present or when the radio's squelch is un-muted. If no audio is present or the audio is "sputtering", adjust the *RX Audio to Line Level* for the desired level to the line. Adjust the receive audio as follows:

    - While injecting a standard input signal from your RF generator (-60dBm RF, 3kHz wideband mode or 1.5 kHz narrowband mode deviation of 1kHz tone), adjust R92 until 0.24Vrms (–10dBm) is measured on the remote line.

6. Press the "PTT" button on the remote. If the base station radio does not transmit, it may be necessary to adjust the audio level coming from the remote. Verify that the " 2175 Hz hold tone" from the remote is approximately 0.08Vrms (-20dBm) on the remote line. If not, readjust the remote per the manufacturer's instructions. If the base station still does not transmit, the *Line Input Level* or the *2175 Hz Detect Level* may also need to be adjusted on the LZA2027. See section 5.3 Audio Adjustments for more details.

    Verify the 2175 Hz hold tone from the remote cannot be heard on compatible receiver channels. If the tone is heard, the *TX 2175 Hz Notch Filter* may need to be adjusted. See section 5.3 Audio Adjustments for more details.

7. Once the remote is able to key the base station radio reliably, verify the deviation levels are set properly. (Do not exceed 5 kHz for wideband systems and do not exceed 2.5 kHz for narrowband systems.) If necessary, adjust the *Line to TX Audio Level* for the desired transmitter deviation from the base station radio. See section 5.3 Audio Adjustments for more details.

    The remote should now be able to change channels on the base station radio. The LZA2027 should also be able to update the remote (if enabled with the programming software) when the channel or the group is changed from the base station radio. If not, check the *2175 Hz Encode Level* and the tone detect levels on the remote.

Perform steps 8 – 11 if additional remotes are added.

8. Program and re-adjust any additional remotes as required. They should be programmed and adjusted the same way as the first remote.

9. Connect additional remotes in parallel (daisy chain fashion) to the first remote. Make sure all additional remotes are set to high impedance and the first remote that is directly connected to the base station kept at the low impedance setting. See remote Manufacturer's instructions for changing this setting.

10. Adjust transmit and receive levels of each remote as required. Audio from all remotes should arrive at the LZA2027 with the same level. If a 4-wire line is being used, adjust the *4-Wire Intercom Level* for the desired level of intercom audio.

11. Verify that all desired functions of the base station radio are controlled by all of the remotes. Also, verify that all of the remotes are updated by the LZA2027 when a change is made from the base station radio.

2.4 Disassembly and Reassemble

WARNING

To prevent AC shock or product damage, the base station should be unplugged from the AC source. The ON/OFF switch on the power supply and on the radio should be left switched "ON". This will drain any residual DC voltage from the power supply and the radio to prevent damage to the LZA2027, power supply, or radio in the event of accidental shorting.

Disassembly of the base station will be required if tone level adjustments or programming of the LZA2027 is necessary. This is accomplished by removing the seven black Philips head screws from both sides of the base station chassis. Carefully lift and remove the black outer metal case and set it aside. A Torx-9 driver is needed to remove the 15 screws holding down the top lid. Once all of the screws are removed, carefully pull up the top galvanized lid and set it aside. All tuning potentiometers and programming jumpers can be accessed without further disassembly. Since the printed circuit board contains sensitive circuitry, be sure to take the necessary precautions against electrostatic discharge.

To reassemble the LZA2027, reinstall the top lid securing it with all of the Torx 9 screws, but take caution not to over-tighten them. Reinstall the black outer case and secure it with the seven black screws.

3 CUSTOM PROGRAMMING

3.1 General Information

The software and programming cable for the LZA2027 must be revision 1.10 or newer. The earlier version 1.01 runs in MSDOS mode and does not run on Windows 95, NT, and 98 platforms. To purchase the cable and latest programming software (P/N LAA2027PS), please contact: RELM Wireless Corporation at **(800) 422-6281**.

3.2 Computer Connection

A computer must be connected to the LZA2027 in order to customize the features and channel selections. To connect the computer to the LZA2027, the case of the GBH-01 will need to be opened as per instructed in section 2.4. Remove the short modular plug from the rear of the LZA2027 to the rear chassis. Install the modular plug end of the programming cable directly into the modular jack on the back of the LZA2027. The DB-9 end of the programming cable should be plugged into the serial port of the computer.

IMPORTANT

Before switching "ON" the GBH-01, remove jumpers JP15 and JP16 and relocate jumper JP1 from A-B to B-C on the LZA2027. After programming is complete reinstall jumpers JP15 and JP16 and relocate jumper JP1 from B-C to A-B. Switch the GBH-01 "OFF" and then back "ON" to reset the LZA2027, thus, placing it into the "user" mode.

3.3 Initial Set-Up

Plug the programming cable into the proper serial data communications port, normally located at the rear of the computer.

1. Start the program. When booted up, the computer window name should be "Tone Programmer". Note: Press <F1> at any time for help.

2. Select menu item [Tools] and [Comport].

3. Select the pull-down ▾ menu from the "Communications Port" field and select the Com-port that is being used, [COM1] or [COM2]. Select [OK].

4. Select main menu item [Panel], [Radio Type], and [RELM GMH].

NOTE

Before changing the default programming contents of the LZA2027, it is suggested to read the stock configuration from the panel first and then save it as a back up file. This file can be modified to the end user's requirements and be saved under a different file name. The stock configuration file then can be used as a back-up file in the event of catastrophic programming error.

3.4 Channel Programming

1. To edit the channel tones, select main menu item [Panel], [Edit Tone Functions].

2. Select the pull-down ▾ menu from the "Tone 1" field. Select the frequency that is to be assigned to the function desired. Make sure the panel frequency matches the remote frequency for the assigned function. When using a 99 channel remote that requires two tones to make a selection, select the pull-down ▾ menu from the "Tone 2" field. Again, select the frequency that is to be assigned to the function desired. Make sure the panel frequency matches the remote frequency for the assigned function.

3. Select the pull-down ▾ menu from the "Function" field. At the bottom of the list, select the [Goto Group/Channel].

4. Select the pull-down ▾ menu from the "Group" field. Select the group number that you want the radio to change to when the appropriate tone is selected.

5. Select the pull-down ▾ menu from the “Channel” field. Select the channel number that is within the group you selected (in step 4) that you want the radio to change to when the appropriate tone is selected.

6. To edit or program more channels, repeat steps 2 through 5. Select [Ok] when programming is complete.

The standard factory programming of the LZA2027 is for 8-channel configuration and the tone assignment is shown in Table 1. Examples of Single Tone and Dual Tone Channel Programming are shown in Tables 2 and 3 respectively.

Table 1 – Default Group & Channel Tone Assignment (Eight channels in the same Group)

Group	Channel	Tone
1	1	1950
1	2	1850
1	3	1750
1	4	1650
1	5	1550
1	6	1450
1	7	1350
1	8	1250

Table 2 - Example of Single Tone Channel Programming (Eight channels in the various Groups)

Eight Channels		
Group	Channel	Tone
1	1	1950
1	2	1850
1	3	1750
2	1	1650
3	1	1550
4	1	1450
5	1	1350
6	1	1250

Table 3 - Example of Dual Tone Channel Programming

32 of 99 Channels								
Group	Channel	Tone1	Tone 2		Group	Channel	Tone1	Tone 2
1	1	1050	1050		2	1	1150	1350
1	2	1050	1150		2	2	1150	1450
1	3	1050	1250		2	3	1150	1550
1	4	1050	1350		2	4	1150	1650
1	5	1050	1450		2	5	1150	1750
1	6	1050	1550		2	6	1150	1850
1	7	1050	1650		2	7	1150	1950
1	8	1050	1750		2	8	1150	2050
1	9	1050	1850		2	9	1250	1050
1	10	1050	1950		2	10	1250	1150
1	11	1050	2050		2	11	1250	1250
1	12	1050	1050		2	12	1250	1350
1	13	1150	1150		2	13	1250	1450
1	14	1150	1250		2	14	1250	1550
1	15	1150	1350		2	15	1250	1650
1	16	1150	1450		2	16	1250	1750

3.5 Radio Options

3.5.1 Group Scan

Some remotes have an auxiliary button that can be assigned to toggle the Group Scan function ON or OFF. For an explanation of this feature, see page 14 of the GBH-01 Base Station Owner's Manual.

The groups that are added or deleted in the Group Scan list must be made at the keypad of the radio or by using the LAA0290 Microphone. Adding or deleting of Groups in the scan list cannot be made by the remote. See page 8 of the Owner's Manual for instructions to add or delete groups in the scan list.

3.5.2 Channel Scan

Some remotes have an auxiliary button, or a designated Scan button, that can be assigned to toggle the Channel Scan feature ON and OFF. See page 9 of Owner's Manual for an explanation of the feature.

The channels that are added or deleted in the scan list must be made at the keypad of the radio by using the LAA0290 Microphone. Adding and deleting of channels in the scan list cannot be made by the remote. See page 6 of the GBH Owner's Manual for instructions to add or delete channels from the scan list.

3.5.3 Priority Scan

Some remotes have an auxiliary button that can be assigned to toggle the Priority Scan function ON and OFF. See page 11 of the GBH Owner's Manual for an explanation of this feature.

The Priority channel must be selected/changed at the keypad of the radio. It cannot be changed by the remote. See page 6 of the Owner's Manual for instructions to change the Priority channel.

3.5.4 Talk-around

Some remotes have an auxiliary button that can be assigned to turn the Talk Around function ON and OFF. See page 7 of the GBH Owner's Manual for an explanation of this feature. Since the "Talk Around" function is not a default assigned key on the front panel of the Base Station radio, it must be assigned. For re-assigning this button, use the GMH editor software LAA0742.

3.5.5 Monitor

Some remotes have an auxiliary button that can be assigned to toggle the Monitor function ON or OFF. See page 6 of the GBH-01 Owner's Manual for an explanation of this feature.

3.5.6 On/Off Hook

Some remotes have an auxiliary button that can be assigned to toggle the Hook function ON and OFF. It simulates a microphone at the radio of being "on" or "off hook". While on hook, the radio scans and is in the tone decode mode. Taking the radio "off hook" will take the radio out of scan and out of tone decode mode.

3.5.7 Home Channel

See page 7 of the GBH Owner's Manual for an explanation of this feature. Since the "Home" function is not a default assigned key on the front panel of the Base Station radio, it must be assigned. For re-assigning this button, use the GMH editor software LAA0742.

3.5.8 Next Channel

The "Next Channel" feature is used to select the next consecutive channel in the scan list (not scanning). It is recommended to only use this feature when one group of 16 or fewer channels is being used. This option should not be used when more than one group is being used.

3.6 Programming “Function” Options

1. To edit the “Function” Options, select main menu item [Panel] and [Edit Tone Functions].

2. Select the pull-down ▾ menu from the “Tone 1” field. Select the frequency that is to be assigned to the function desired. Make sure the panel frequency matches the remote frequency for the assigned function. When using a 99 channel remote that requires two tones to make a selection, select the pull-down ▾ menu from the “Tone 2” field. Again, select the frequency that is to be assigned to the function desired. Make sure the panel frequency matches the remote frequency for the assigned function.

3. Select the pull-down ▾ menu from the “Function” field. Select the desired function to be programmed. Example: “Group Scan On.”

4. To edit or program more “Function” options, repeat steps 2 through 3. Select [Ok] when programming is complete.

3.7 Panel Options

To edit Panel Options, select main menu item [Panel] and [Edit Options].

- Selecting ✓ the box next to “4 wire” is for 4-wire operation and de-selecting ☐ the box is for 2-wire operation.
- Selecting ✓ the box next to “Single Tone” operation is for singe tone operation, and de-selecting ☐ the box is for dual tone operation.
- Selecting ✓ the box next to “Remote Update” toggles this feature ON, and de-selecting ☐ the box toggles this feature OFF. Remote update is a feature available in the IDA model 2466 remote. When one or more remotes are installed, this feature updates the remote/s when changes to the channel selector are made at the base station. Select [Ok] when programming is complete.

3.8 Panel Outputs

This feature is to be used to assign the “active “ relay outputs of the LZA2027 when interfaced with an accessory.

1. To edit Panel Outputs, select main menu item [Panel] and [Edit Output Defaults].

2. Select the pull-down ▾ menu from the “Active State” field and select the active state for the respective output to be assigned.

3. Select the pull-down ▾ menu from the “Time” field and select the duration for that state.

4. To edit or program more Panel Outputs, repeat steps 2 through 3. Select [Ok] when programming is complete.

IMPORTANT

When programming is complete, reinstall jumpers JP15 and JP16, and relocate jumper JP1 from B-C to A-B. Switch the GBH-01 “OFF” and then back “ON” to reset the LZA2027, thus, placing it into the “user” mode.

4 OPERATION

4.1 Update Sequences

Update sequences are sent from the remote to the LZA2027 and can also be sent from the LZA2027 to the remote. These update sequences allow the remote to control the different base station radio functions, such as current channel and scan status. The update sequence also keeps the primary remote and any parallel remotes updated to the current base station radio status. Figure 1 shows the different components of the update sequence. It is important to note that levels as well as tone frequencies define the update sequence. Line loss needs to be taken into consideration and will probably be a factor during installation. The levels shown in Figure 1 will most likely be less when they arrive at either the LZA2027 or the remote, but in the same proportion. The LZA2027 is setup for the correct tones and levels from a 600-ohm source with no line loss. However, due to loading of paralleled remotes on the same line, as well as line loss, some audio levels may need to be increased. With parallel remote installations, all remotes tones should arrive at the LZA2027 with the same levels.

The guard tone is defined as 2175 Hz at +10 dBm and is the first tone in an update sequence. The guard tone is used to signal the start of an update sequence. If the guard tone is not detected properly, the rest of the update sequence will be ignored. Following the guard tone in the update sequence is the function tone (or tones) at a level of 0 dBm. (Updates sent by the LZA2027 to the remote do not include function tones.) The function tone is decoded to determine the action required by the update sequence. When the update sequence is sent by a remote, the function tone may be followed by the hold tone. The hold tone is defined as 2175 Hz at -20 dBm and indicates that the remote's PTT is being pressed. When the LZA2027 detects the hold tone, it will key the base station radio and pass audio from the remote to the base station radio. The audio from the remote rides on top of the hold tone. The LZA2027 will keep the base station radio keyed until the hold tone is no longer detected.

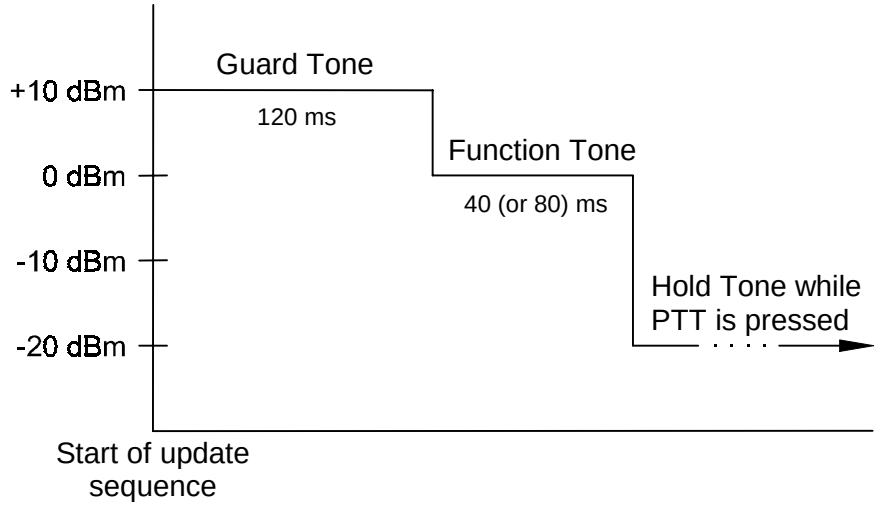


Figure 1 – Tone Levels

4.2 Outputs

The LZA2027 contains 10 open collector outputs. Four of these outputs, outputs 1, 2, 9, and 10, can also be switched to relay outputs. The outputs are available as general-purpose outputs and can be programmed as active high or active low and also as timed outputs. The outputs are controlled by the remote that can enable or disable any number of outputs with a single update sequence.

5 ADJUSTMENT PROCEDURES

IMPORTANT

The alignment procedures listed below must be followed in order to ensure proper performance of the tone termination panels when used with one or more remotes. It may be necessary to re-align the remote(s) being used for proper signal levels to include transmit and receive audio, and guard tone. Consult the remote manufacturer's instruction manual for details.

5.1 Audio Measurements

The common term that is used to express audio power levels in a communications system is the decibel referenced to 1mW of power (dBm). Another term, which is often misused, is the decibel (dB). It is important the correct term, or unit of measurement, be used as determined by its application.

dB - Power or Voltage Ratio

The decibel or dB is a ratio and is defined as a measure such that:

$$dB\ (power) = 10\log\ (Pa/Pb)$$

or

$$dB\ (voltage) = 20\ \log\ (E1/E2)$$

where Pa and Pb are two values of power, E1 and E2 are two values of voltage. Note that since dB is a ratio, it has no unit value such volts, amps, or watts.

dBm - Decibel referenced to 1mW

The symbol dBm indicates a power level with respect to 1mW of power (0dBm is equal to 1mW). Although this definition does not imply a 600-ohm impedance, most AC voltmeters are calibrated in terms of dBm across 600 ohms. In this case using the formula:

$$E^2 = PR$$

gives

$$E = 0.77Vrms \text{ or } 2.2Vpp$$

with P = 1mW and R = 600 ohms. Therefore, 0 dBm is equal to 0.77Vrms. It can also be shown that +10dBm is equal to 2.45Vrms and -20dBm is equal to .08Vrms.

5.2 Adjustment Potentiometers

The functions of the adjustment potentiometers are described below. Refer to section **5.3 Audio Adjustments** for detailed instructions on adjusting these pots. Refer to the adjustment locator diagram in the back of this manual for the location of the adjustment potentiometers. An asterisk (*) indicates the potentiometer has been factory set and should not need adjusting. Potentiometers without an asterisk may need to be adjusted for the best audio quality and performance on a particular system. See Table 4 for Audio Adjustment Designators.

Table 4 – Audio Adjustment Designators

R11*	2175 Hz Encode Level
R25	Local Mic to TX Audio Level
R32*	2175 Hz Detect Level
R34*	2175 Hz Band pass Adjust
R50*, R51*	RX 2175 Hz Notch Filter Adjust
R52*, R53*	TX 2175 Hz Notch Filter Adjust
R90	Line to TX Audio Level
R91	4-Wire Intercom Level
R92	RX Audio to Line Level
R93*	Line Input Level

5.3 Audio Adjustments

2175 Hz Encode Level - This is level of the 2175 Hz tone sent to the line by the LZA2027. Potentiometer R11 has been factory adjusted to provide +10 dBm of encoded 2175 Hz tone into a 600-ohm load across pins 4 and 5 of the line connector J3. R11 can be adjusted if a level other than +10 dBm is desired.

Local Mic to TX Audio Level - This is the level of local microphone audio that is sent by the LZA2027 to the base station radio for transmission. Potentiometer R25 should be adjusted to provide the desired transmitter deviation when transmitting from the local microphone. Do not turn **R25** up too high since this will cause distortion and clipping. **Typically not used.**

2175 Hz Detect Level - This is the level of audio sent into the guard and hold tone detectors. Potentiometer R32 has been factory adjusted so that U9 pin 1 just goes high with a 2175 Hz tone at 8 dBm applied across pins 4 and 5 (2-wire) or pins 3 and 6 (4-wire) of the line connector J3. Adjust **R32** only if the guard and hold tones are not being detected reliably and only after the *2175 Hz Band pass Adjust* and the *Line Input Level* have been set.

2175 Hz Band pass Adjust - This adjustment sets the center frequency of the 2175 Hz band pass filter. Potentiometer R34 has been factory adjusted for a maximum level at U10 pin 1 with a 2175 Hz tone applied across pins 4 and 5 (2-wire) or pins 3 and 6 (4-wire) of the line connector J3. Adjust **R34** only if the guard and hold tones are not being detected reliably.

RX 2175 Hz Notch Filter Adjust - This adjustment sets the notch frequency of the RX audio 2175 Hz notch filter. Potentiometers R50 and R51 have been factory adjusted for a minimum level at U13 pin 1 with a 2175 Hz tone applied to pin 1 of the radio connector P2. Adjust R50 and R51 only if 2175 Hz tones from the base station radio are not being filtered out. For best results, alternate between R50 and R51 while adjusting.

TX 2175 Hz Notch Filter Adjust - This adjustment sets the notch frequency of the TX audio 2175 Hz notch filter. Potentiometers R52 and R53 have been factory adjusted for a minimum level at U11 pin 1 with a 2175 Hz tone applied across pins 4 and 5 (2-wire) or pins 3 and 6 (4-wire) of the line connector J3. Adjust R52 and R53 only if 2175 Hz tones from the

line are not being filtered out. For best results, alternate between R52 and R53 while adjusting.

Line to TX Audio Level - This is the level of the audio received from the line that is sent by the LZA2027 to the base station radio for transmission. Potentiometer R90 should be adjusted to provide the desired transmitter deviation when transmitting from a remote. Do not turn R90 up too high since this will cause distortion and clipping. Adjust R90 only after the *Line Input Level* has been set.

4-Wire Intercom Level - This is the level of the audio sent from one remote to the other paralleled remotes when using a 4-wire line. Potentiometer R91 should be adjusted to provide the desired level of audio to the paralleled remotes when one of the remotes is transmitting. Do not turn R91 up too high since this will cause distortion and clipping.

RX Audio to Line Level - This is the level of the audio from the base station radio that is sent by the LZA2027 to the line. While the base station radio is receiving a transmission from another radio, adjust potentiometer R92 to provide the desired level of audio to the remote through the line taking into account any line loss. Do not turn R92 up too high since this will cause distortion and clipping.

Line Input Level - This is the level of audio received from the remote through the line by the LZA2027. Potentiometer R93 has been factory adjusted to provide +10 dBm at U14 pin 1 with a 2175 Hz tone at +10 dBm applied across pins 4 and 5 (2-wire) or pins 3 and 6 (4-wire) of the line connector J3. The guard tone from the remote may arrive at the LZA2027 with a level less than +10 dBm due to line loss between the remote and the LZA2027. If this is the case, adjust R93 to provide +10 dBm at U14 pin 1 when guard tone is being received from the remote.

6 CIRCUIT DESCRIPTION

6.1 Power Supply

The LZA2027 receives its supply voltage (13.8 Vdc) from the DB25 connector (P2) at pin 20 and pin 7 being ground. The 13.8vdc supply is fed into the voltage regulators U16 and U17 through D8 and F1. D8 prevents a reverse voltage from harming the LZA2027 and F1 is a 1Amp fuse that provides protection from excessive current draw. U16 is a 5vdc regulator that provides power for the digital circuits of the LZA2027. U17 is a 10 Vdc regulator that provides power for the analog circuits of the LZA2027. C60, C61, and C62 provide filtering for the power supplies. In addition, U13D is used to provide a 5vdc reference for the analog circuits of the LZA2027.

6.2 Transmit Audio

Audio appearing on the line enters the LZA2027 on pins 4 and 5 of J3 when using a 2-wire line and on pins 3 and 6 of J3 when using a 4-wire line. SG1 - SG4 are surge arresters that protect the LZA2027 from line transients. T1 (2-wire) or T2 (4-wire) couples line audio into the LZA2027. R86 (2-wire) and R99 (4-wire) are used to provide 600-ohm impedance to the line. Audio from T1 and T2 goes to JP4, which determines if a 2-wire or a 4-wire line is being used.

The audio then passes to U14A, which is an amplifier stage that is used to compensate for line loss. Potentiometer R93 controls the gain of this amplifier stage.

The audio then enters the automatic gain control (AGC) circuit. This circuit compensates for varying input levels by providing a constant output over an input range of 30 dB. The AGC circuit is comprised of U12B and U11C and their associated components. The audio signal on pin 13 of U12 is rectified internally and is used to control the gain of the internal gain cell connected between pins 9 and 11 of U12. The attack time of the AGC is determined by C33 and the recovery time is determined by C32. The AGC output is at pin 8 of U11.

The audio then enters the TX 2175 Hz notch filter through jumper JP5. JP5 determines if the transmit audio comes from the AGC output or if it bypasses the AGC through R78 and R88. The notch filter is comprised of U11A and U11B and their associated components. Potentiometers R52 and R53 are used to tune the notch filter to 2175 Hz. The notch filter removes the 2175 Hz hold tone from the transmit audio to prevent it from being heard.

The audio will then pass through the bilateral switch U8A when the control section enables this switch. The audio passes to U11D, which is a summing amplifier stage that is used to provide the proper level of audio to the base station radio. Potentiometer R90 controls the gain of the transmit audio through this stage. Jumper JP8 is used to set the “transmit audio” output as a high or low impedance. The audio then leads to pin 21 of P2 as the “Mic. Audio” output.

6.3 Receive Audio

Receive audio from the base station radio enters the LZA2027 on pin 1 of P2. The audio passes to U13C which is a buffer stage for the receive audio. Jumper JP3 determines if the receive audio is de-emphasized or not.

The audio then enters the RX 2175 Hz notch filter. The notch filter is comprised of U13A and U13B and their associated components. Potentiometers R50 and R51 are used to tune the notch filter to 2175 Hz. The notch filter removes any 2175 Hz component present in the receive audio to prevent falsing any 2175 Hz detectors in the remote.

The audio will then pass through the bilateral switch U8B when the control section enables this switch. The audio then passes to line driver U15 that drives the line-coupling transformer T1 when enabled by the control section. Potentiometer R92 controls the gain of the receive audio through the line driver. Audio coupled to the line by T1 appears across pins 4 and 5 of J3. Resistor R98 is used to provide 600-ohm impedance to the line when U15 is enabled.

6.4 Guard and Hold Tone Detect

Line audio from U14A is passed into the 2175 Hz band pass filter through potentiometer R32. R32 adjusts the level of audio into the band pass filter and therefore into the guard and hold tone detect circuits. The band pass filter is comprised of U10A, U10B, and U10C and their associated components. Potentiometer R34 is used to tune the band pass filter to 2175 Hz.

The 2175 Hz tones that come out of the band pass filter are passed into the guard and hold tone detect circuits. The guard tone detect circuit is comprised of U9A and its associated components. Diodes D3 and D4 pass only the positive transitions of the 2175 Hz tones to capacitor C16 which causes C16 to charge up. During negative transitions, resistor R27

discharges C16. The charge on C16 is passed to U9A, which is a comparator that compares the charge on C16 to a reference level. U9A outputs a high to the control section when the charge on C16 exceeds the reference level that indicates that guard tone is being detected.

The hold tone detect circuit is comprised of U10D and U9B and their associated components. U10D is an amplifier stage that provides approximately 30 dB of gain. Diodes D5 and D6 pass only the positive transitions of the 2175 Hz tones to capacitor C24 which causes C24 to charge up. During negative transitions, resistor R46 discharges C24. The charge on C24 is passed to U9B, which is a comparator that compares the charge on C24 to a reference level. U9B outputs a high to the control section when the charge on C24 exceeds the reference level that indicates that hold tone is being detected.

6.5 4-Wire Intercom

Line audio from U14A passes through the bilateral switch U8D when the control section enables this switch. The audio passes back to the line through the line driver U15. Potentiometer R91 controls the gain of the 4-wire intercom audio through the summing amplifier. The 4-wire intercom circuit allows audio from a remote that is transmitting to be received by paralleled remotes when using a 4-wire line.

6.6 Outputs

The LZA2027 provides 10 outputs on connector P2. Pins 11 - 16 of P2 are outputs 3 - 8 and are passed directly to the control board. Pins 4 - 6, 8 - 10, 17 - 19, and 22 - 24 of P2 are the common, normally closed, and normally open relay outputs for outputs 1, 2, 9, and 10 when jumpers JP6, JP11, JP9, and JP13 (respectively) are installed. If jumpers JP7, JP10, JP12, and JP14 are installed, pins 6, 10, 19, and 24 of P2 are outputs 1, 2, 9, and 10 (respectively) and are passed directly to the control board.

6.7 Control Board

The LZA2027 is controlled by U2, which is an 8-bit micro-controller. The micro-controller continuously executes instructions from the program code that is stored internally. Crystal X2 provides an 11.0592 MHz clock to the micro-controller. U7 is a voltage monitor that will reset the micro-controller on power-up and under low voltage conditions. The programmable operating characteristics of the LZA2027 are stored in U6, which is a serial EEPROM. The micro-controller reads data out of U6 as required.

Port 0 on the micro-controller (pins 36 - 43) is used for controlling outputs 1 - 8. Resistor network R1 provides pull-up resistors for the port 0 pins that are connected to the driver inputs of U1, which contains 8 open collector drivers. The driver outputs of U1 are passed to the base board through connector J1. Port 2 on the micro-controller (pins 24 - 31) is used for controlling outputs 9 and 10, the bilateral switches, and the line driver. Resistor network R3 provides pull-up resistors for the port 2 pins that are connected to the driver inputs of U4, which contains 8 open collector drivers. The driver outputs of U4 are passed to the base board through connector J1.

Port 1 on the micro-controller (pins 2 - 9) is used for reading the state of various inputs and for communicating with U3. The micro-controller will take specific actions based upon the state the inputs. U3 is an audio signal processor that is used for decoding the tones in the update sequences that are received from the remote and for generating the tones in the update

sequences that are sent to the remote. The micro-controller reads data from U3 to determine which tones are being decoded and writes data to U3 to cause U3 to generate the tones required for each update sequence sent. Potentiometer R11 is used to adjust the level of the update sequence tones sent to the line.

Pins 11 and 13 on the micro-controller are used to send and receive serial data. Pins 18 and 19 on the micro-controller are used to read the settings of jumpers JP1 and JP2.

7 ILLUSTRATIONS, PARTS LISTS, AND SCHEMATICS

7.1 Remote Cable Pin-out and Location

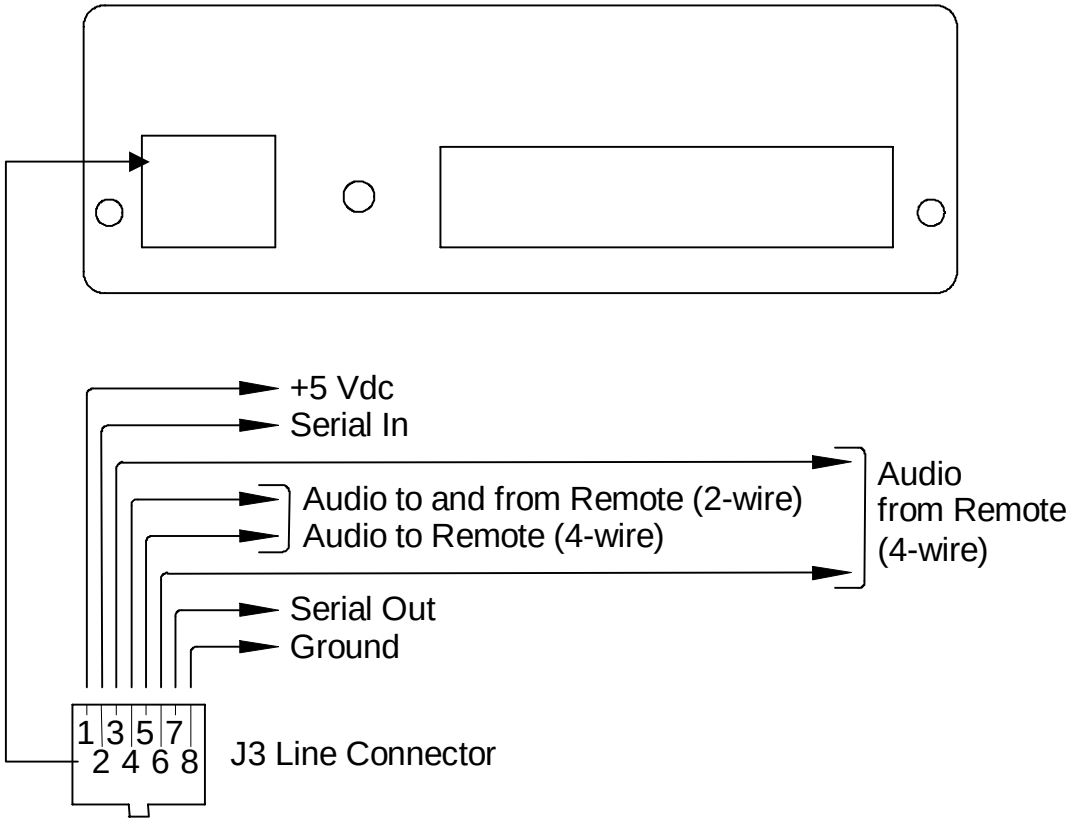


Figure – 2 Rear view of the LZA2027 and Connector Pin-out

7.2 Parts List, Parts Placement, and Schematics

Table 5 – LZA2027 Parts List (101-0242)

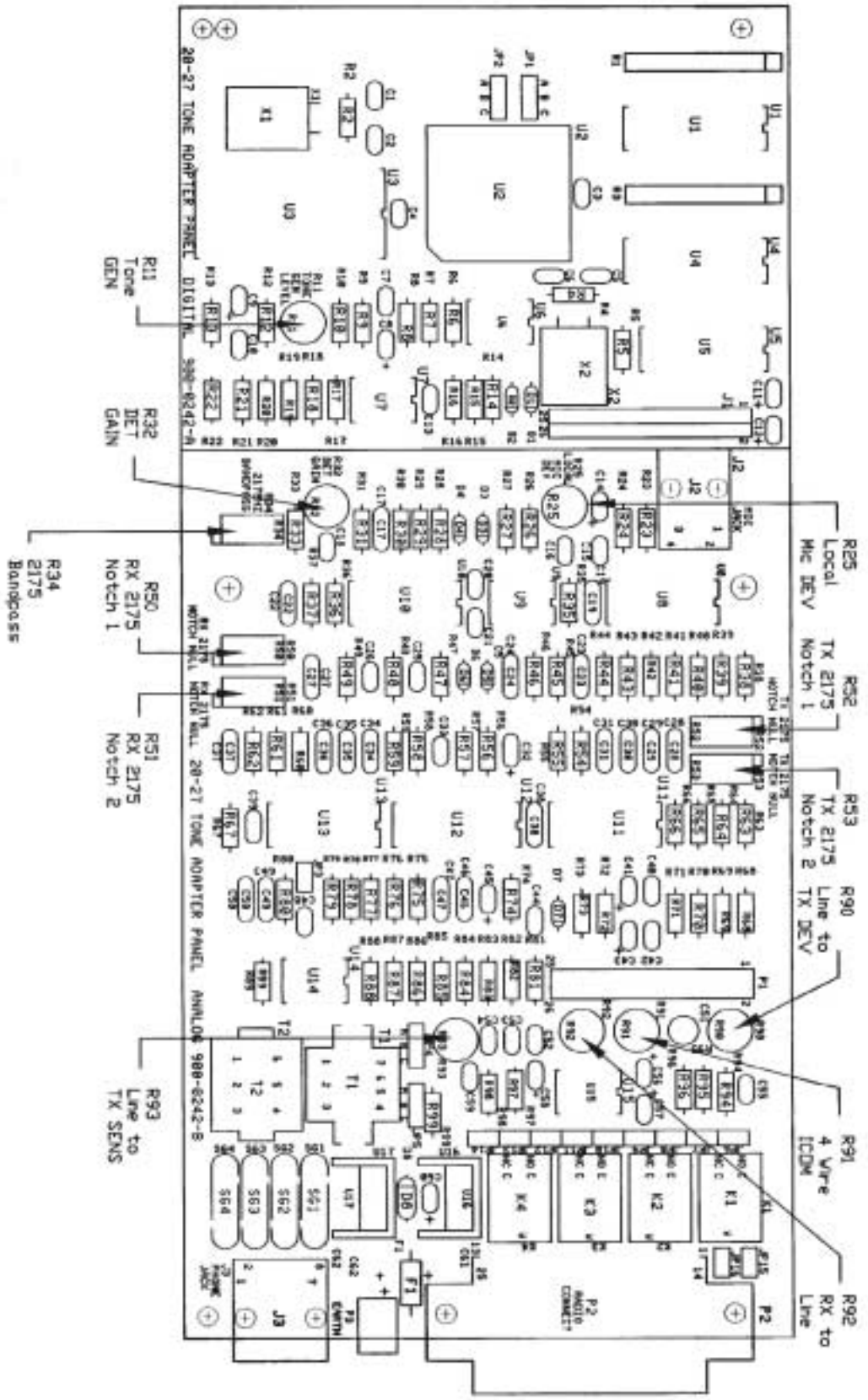
Item	Reference	Description	Qty.
1	C1,2,5,6	18pF 100V MONO CAP	4
2	C3,4,10,13,15,16,18, 20,21,25,33,40,44,48, 52,54,55,59	.1uF MONO CAP	18
3	C7,26,42	100pF MONO CAP	3
4	C8,41	2.2uF 35V TANT CAP	2
5	C9,43,45,58	1uF 35V TANT CAP	4
6	C11,12,14,57,60	10uF 16V TANT CAP	5
7	C17,22,27,28,29,30, 31,34,35,36	.01uF ULTRA MONO CAP	10
8	C19,23,49	.22uF 50V MONO CAP	3
9	C24,37,38,46,47,50	.47uF MONO CAP	6
10	C32	33uF 16V TANT CAP	1
11	C39	330pF MONO CAP	1
12	C51	2.2uF NP ELEC CAP	1
13	C53	.01uF MONO CAP	1
14	C56	4.7uF 35V TANT CAP	1
15	C61	10uF/50V ELEC CAP	1
16	C62	220uF/16V ELEC CAP	1
17	D1,2	ZENER 6.8V 1N5235	2
18	D3,4,5,6	DIODE 1N914/1N4148	4
19	D7	ZENER 3.3V 1N5226/4728	1
20	D8	DIODE 1N4003	1
21	F1	1 AMP FUSE PCB MOUNT	1
22	J1	13 PIN POST .1"	2
23	J2	JACK 4 POS MODULAR	1
24	J3	JACK 8 IN 6 MODULAR	1
25	JP1,2,4,5	JUMPER POST 3 PIN	4
26	JP3,6,7,8,9,10,11,12, 13,14,15,16	JUMPER POST 2 PIN	12
27	JP1,2,4,5,6,8,9,11,13 , 15,16	SHORTING PLUG	11
28	K1,2,3,4	RELAY SPDT MINI	4
29	P1	26 POS POST .1 X .1	1
30	P2	DB25 RIGHT ANGLE	1
31	P2	4-40 X 3/8 SCREW	2
32	P2	4-40 HEX NUT	2
33	P3	BRACKET GROUNDING	1
34	P3	4-40 X 1/4 SCREW	1
35	P3	#4 STAR WASHER	1
36	R1,3	3.3K 9 EL RES NETWORK	2
37	R2,4	1M 5% 1/4 W RES	2

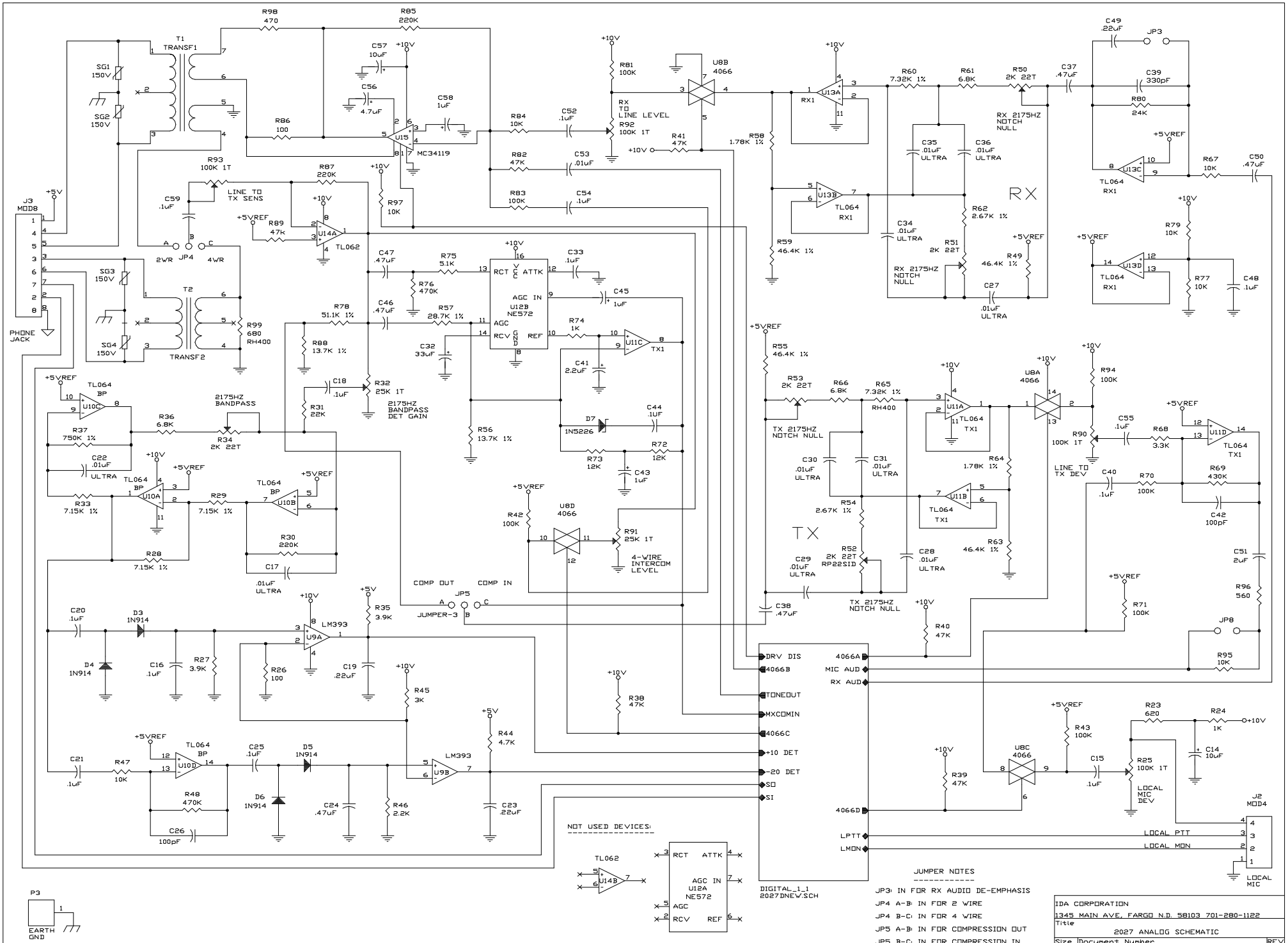
Item	Reference	Description	Qty.
38	R5,44	4.7K 5% 1/4 W RES	2
39	R6,7,16,18,19,22,47, 67,77,79,84,95,97	10K 5% 1/4 W RES	13
40	R8,38,39,40,41,82,89	47K 5% 1/4 W RES	7
41	R9	40.2K 1% 1/4 W RES	1
42	R10	374K 1% 1/4 W RES	1
43	R11,32,91	25K 1 TURN MINI POT	3
44	R12	11.8K 1% 1/4 W RES	1
45	R13,30,85,87	220K 5% 1/4 W RES	4
46	R14,15,26,86	100 OHM 5% 1/4 W RES	4
47	R17	17.8K 1% 1/4 W RES	1
48	R20	232K 1% 1/4 W RES	1
49	R21	93.1K 1% 1/4 W RES	1
50	R23	620 OHM 5% 1/4 W RES	1
51	R24,74	1K 5% 1/4 W RES	2
52	R25,90,92,93	100K 1 TURN MINI POT	4
53	R27,35	3.9K 5% 1/4 W RES	2
54	R28,29,33	7.15K 1% 1/1 W RES	3
55	R31	22K 5% 1/4 W RES	1
56	R34,50,51,52,53	2K 22T SIDE ADJ POT	5
57	R36,61,66	6.8K 5% 1/4 W RES	3
58	R37	750K 1% 1/4 W RES	1
59	R42,43,70,71,81,83,94	100K 5% 1/4 W RES	7
60	R45	3K 5% 1/4 W RES	1
61	R46	2.2K 5% 1/4 W RES	1
62	R48,76	470K 5% 1/4 W RES	2
63	R49,55,59,63	46.4K 1% 1/4 W RES	4
64	R54,62	2.67K 1% 1/4 W RES	2
65	R56,88	13.7K 1% 1/4 W RES	2
66	R57	28.7K 1% 1/4 W RES	1
67	R58,64	1.78K 1% 1/4 W RES	2
68	R60,65	7.32K 1% 1/4 W RES	2
69	R68	3.3K 5% 1/4 W RES	1
70	R69	430K 5% 1/4 W RES	1
71	R72,73	12K 1% 1/4 W RES	2
72	R75	5.1K 5% 1/4 W RES	1
73	R78	51.1K 1% 1/4 W RES	1
74	R80	24K 5% 1/4 W RES	1
75	R96	560 OHM 5% 1/4 W RES	1
76	R98	470 OHM 5% 1/4 W RES	1
77	R99	680 OHM 5% 1/4 W RES	1
78	SG1,2,3,4	VARISTOR 150V UL	4
79	T1	2-COIL TRANSFORMER	1
80	T2	AUDIO TRANSFORMER	1
81	U1,4	ULN2803 IC	2
82	U2	N83C51 IC	1

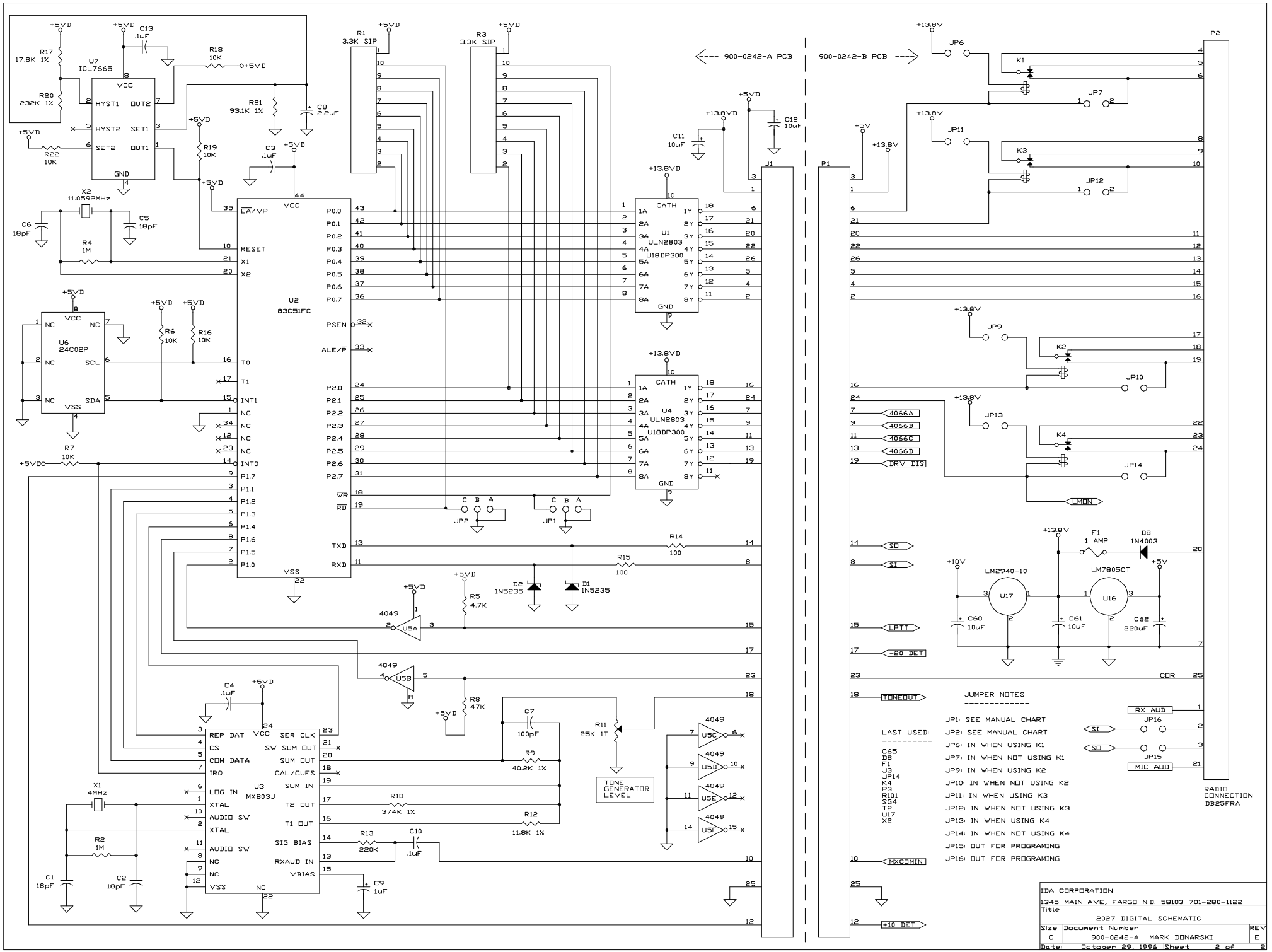
Item	Reference	Description	Qty.
83	U3	MX803J IC	1
84	U5	CD4048 IC	1
85	U6	24LC16 IC	1
86	U7	7665 IC	1
87	U8	4066 IC	1
88	U9	LM393 IC	1
89	U10,11,13	TLO64 IC	3
90	U12	NE572 IC	1
91	U14	TLO62CP IC	1
92	U15	MC34119 IC	1
93	U16	UA7805 TO-220 IC	1
94	U17	LM2940-10 TO-220 IC	1
95	U1,4	18 PIN DIP SOCKET	2
96	U2	44 PIN PLCC SOCKET	1
97	U3	24 PIN DIP SOCKET	1
98	U5,12	16 PIN DIP SOCKET	2
99	U6,7,9,14,15	8 PIN DIP SOCKET	5
100	U8,10,11,13	14 PIN DIP SOCKET	4
101	U16,17	HEAT SINK, TO-220	2
102	U16,17	INSULATOR, TO-220	2
103	X1	4 MHZ CRYSTAL	1
104	X2	11.0592 MHZ CRYSTAL	1
105	X1,2	1/8" PORON	2
106		4-40 X 1/4 SCREW	2
107		4-40 X 1/2 SPACER	2
108		S/N LABEL	1
109		LZA2027 PC BOARD	1

Table 6 - 10-Foot Telephone Cable Assembly Option Parts List (800-2016)

Item	Description	Qtv
1	6 POS 6 COND MOD PLUG	2
2	6 COND. TELEPHONE	10'


R11
Tone
GEN
R32
DET
GAIN
R34
2175
Bandpass
R50
RX 2175
Notch 1
R51
RX 2175
Notch 2
R93
Line to
TX SENS
R25
Local
Mic DEV
R52
TX 2175
Notch 1
R53
TX 2175
Notch 2
R90
Line to
TX DEV
R91
4 Wire
ICOM
R92
RX to
Line


R98 470
R85 220K
T1 TRANSF1
SG1 150V
SG2 150V
C57 10uF
C56 4.7uF
C58 1uF
R86 100
U15 MC34119
R84 10K
C52 .1uF
R82 47K
C53 .01uF
R83 100K
C54 .1uF
R81 100K
RX TO LINE LEVEL
R92 100K 1T
R41 47K
U8B 4066
R58 1.78K 1%
R59 46.4K 1%
U13A RX1
R60 7.32K 1%
R61 6.8K
R50 2K 22T
RX 2175HZ NOTCH NULL
C37 .47uF
C49 .22uF
JP3
C39 330pF
R80 24K
U13C TL064 RX1
R67 10K
C50 .47uF
U13B TL064 RX1
C35 .01uF ULTRA
C36 .01uF ULTRA
C34 .01uF ULTRA
R62 2.67K 1%
R51 2K 22T
RX 2175HZ NOTCH NULL
R49 46.4K 1%
C27 .01uF ULTRA
RX
R93 100K 1T
LINE TO TX SENS
C59 .1uF
R87 220K
R89 47K
U14A TL062
R97 10K
J3 MOD8
PHONE JACK
JP4 2WR 4WR
SG3 150V
SG4 150V
T2 TRANSF2
R99 680 RH400
C47 .47uF
R75 5.1K
R76 470K
C46 .47uF
R78 51.1K 1%
R57 28.7K 1%
R88 13.7K 1%
C32 33uF
U12B NE572
RCT VCC ATTK AGC IN AGC RCV REF GND
C33 .1uF
C45 1uF
R74 1K
U11C TX1
C41 2.2uF
D7 1N5226
C44 .1UF
R72 12K
R73 12K
C43 1uF
R56 13.7K 1%
C18 .1uF
R32 25K 1T 2175HZ BANDPASS DET GAIN
R31 22K
TL064 BP U10C
2175HZ BANDPASS
R36 6.8K
R34 2K 22T
R37 750K 1%
C22 .01uF ULTRA
TL064 BP U10A
R33 7.15K 1%
R29 7.15K 1%
TL064 BP U10B
R30 220K
C17 .01uF ULTRA
R28 7.15K 1%
R55 46.4K 1%
R53 2K 22T
TX 2175HZ NOTCH NULL
R66 6.8K
R65 7.32K 1%
RH400
U11A TL064 TX1
U8A 4066
R94 100K
R90 100K 1T
LINE TO TX DEV
C55 .1uF
R68 3.3K
U11D TL064 TX1
C40 .1uF
R70 100K
R69 430K
C42 100pF
C30 .01uF ULTRA
C31 .01uF ULTRA
R64 1.78K 1%
U11B TL064 TX1
R54 2.67K 1%
TX
R52 2K 22T RP22SID
C28 .01uF ULTRA
R63 46.4K 1%
C29 .01uF ULTRA
TX 2175HZ NOTCH NULL
C38 .47uF
R40 47K
C51 2uF
R96 560
R71 100K
JP8
R95 10K
U8D 4066
R42 100K
R91 25K 1T 4-WIRE INTERCOM LEVEL
COMP OUT
COMP IN
JP5 JUMPER-3
C20 .1uF
D3 1N914
D4 1N914
C16 .1uF
R27 3.9K
U9A LM393
R26 100
C19 .22uF
R35 3.9K
R45 3K
R38 47K
R44 4.7K
C21 .1uF
R47 10K
U10D TL064 BP
R48 470K
C26 100pF
C25 .1uF
D5 1N914
D6 1N914
C24 .47uF
R46 2.2K
U9B LM393
C23 .22uF
DRV DIS
4066B
TONEOUT
MXCOMIN
4066C
+10 DET
-20 DET
SO
SI
4066A
MIC AUD
RX AUD
4066D
LPTT
LMON
U8C 4066
R43 100K
R39 47K
C15 .1uF
R23 620
R24 1K
C14 10uF
R25 100K 1T LOCAL MIC DEV
J2 MOD4
LOCAL PTT
LOCAL MON
LOCAL MIC
NOT USED DEVICES:
TL062 U14B
RCT ATTK AGC IN U12A NE572 AGC RCV REF
DIGITAL_1_1 2027DNEW.SCH
JUMPER NOTES
JP3: IN FOR RX AUDIO DE-EMPHASIS
JP4 A-B: IN FOR 2 WIRE
JP4 B-C: IN FOR 4 WIRE
JP5 A-B: IN FOR COMPRESSION OUT
JP5 B-C: IN FOR COMPRESSION IN
JP8: IN FOR 600 OHM IMP MIC AUDIO
P3 EARTH GND
IDA CORPORATION
1345 MAIN AVE, FARGO N.D. 58103 701-280-1122
Title
2027 ANALOG SCHEMATIC
Size C
Document Number 900-0242-B MARK DONARSKI
REV E
Date: November 14, 1996
Sheet 1 of 2


900-0242-A PCB
900-0242-B PCB
U7 ICL7665
U2 83C51FC
U6 24C02P
U3 MX803J
U1 ULN2803 U18DP300
U4 ULN2803 U18DP300
U5A 4049
U5B 4049
U5C 4049
U5D 4049
U5E 4049
U5F 4049
U16 LM7805CT
U17 LM2940-10
X1 4MHz
X2 11.0592MHz
R1 3.3K SIP
R3 3.3K SIP
R2 1M
R4 1M
R5 4.7K
R6 10K
R7 10K
R8 47K
R9 40.2K 1%
R10 374K 1%
R11 25K 1T
R12 11.8K 1%
R13 220K
R14 100
R15 100
R16 10K
R17 17.8K 1%
R18 10K
R19 10K
R20 232K 1%
R21 93.1K 1%
R22 10K
C1 18pF
C2 18pF
C3 .1uF
C4 .1uF
C5 18pF
C6 18pF
C7 100pF
C8 2.2uF
C9 1uF
C10 .1uF
C11 10uF
C12 10uF
C13 .1uF
C60 10uF
C61 10uF
C62 220uF
D1 1N5235
D2 1N5235
D8 1N4003
F1 1 AMP
J1
P1
P2
JP1
JP2
JP6
JP7
JP9
JP10
JP11
JP12
JP13
JP14
JP15
JP16
K1
K2
K3
K4
4066A
4066B
4066C
4066D
DRV DIS
LMON
SO
SI
LPTT
-20 DET
TONEOUT
MXCOMIN
+10 DET
COR
RX AUD
MIC AUD
TONE GENERATOR LEVEL
RADIO CONNECTION DB25FRA
JUMPER NOTES
JP1: SEE MANUAL CHART
JP2: SEE MANUAL CHART
JP6: IN WHEN USING K1
JP7: IN WHEN NOT USING K1
JP9: IN WHEN USING K2
JP10: IN WHEN NOT USING K2
JP11: IN WHEN USING K3
JP12: IN WHEN NOT USING K3
JP13: IN WHEN USING K4
JP14: IN WHEN NOT USING K4
JP15: OUT FOR PROGRAMING
JP16: OUT FOR PROGRAMING
LAST USED:
C65
D8
F1
J3
JP14
K4
P3
R101
SG4
T2
U17
X2
IDA CORPORATION
1345 MAIN AVE, FARGO N.D. 58103 701-280-1122
Title
2027 DIGITAL SCHEMATIC
Size C
Document Number 900-0242-A MARK DONARSKI
REV E
Date: October 29, 1996 Sheet 2 of 2

APPENDIX A – JUMPER SETTINGS

The LZA2027 has a number of jumpers that control the operation of the LZA2027. The functions and settings of these jumpers are described below.

JP1 - This jumper determines the operating mode of the LZA2027. JP1 should be set to A-B for Internal EEPROM mode and set to B-C for programming mode. In the Internal EEPROM mode, the operating characteristics of the LZA2027 are stored in an internal EEPROM. This EEPROM is programmed using the programming software.

The Programming mode allows the LZA2027 to be programmed by the programming software. Programming of the LZA2027 is accomplished by using a PC linked serially to the modular connector on the back of the LZA2027 with the programming cable. The programming information is stored by the LZA2027 in an internal EEPROM.

IMPORTANT

Before connecting the LZA2027 to a computer with the programming cable, be sure to remove jumpers JP15 and JP16.

JP2 - This jumper should be set to A-B (default).

JP3 - This jumper determines if the audio received from the base station radio is de-emphasized. If JP3 is shorted, the audio is de-emphasized. If JP3 is not shorted (default), the audio is not de-emphasized.

JP4 should be set to A-B (default) for 2-wire operation and set to B-C for 4-wire operation.

JP5 - The setting of this jumper determines if the line audio passes through the automatic gain control circuit before being sent to the base station radio to be transmitted. JP5 should be set to A-B (default) to bypass the AGC and to B-C to use the AGC.

JP6, JP7 - These jumpers determine if output 1 is an open collector output or a relay output. If JP6 is shorted (default), output 1 will be a relay output. If JP7 is shorted, output 1 will be an open collector output. Only one of JP6 and JP7 should be shorted at any time.

JP8 - This jumper determines the transmit audio output impedance. When JP8 is shorted, the impedance is 600 ohms. When JP8 is not shorted (default), the impedance is approximately 10k ohms.

JP9, JP10 - These jumpers determine if output 9 is an open collector output or a relay output. If JP9 is shorted (default), output 9 will be a relay output. If JP10 is shorted, output 9 will be an open collector output. Only one of JP9 and JP10 should be shorted at any time.

JP11, JP12 - These jumpers determine if output 2 is an open collector output or a relay output. If JP11 is shorted (default), output 2 will be a relay output. If JP12 is shorted, output 2 will be an open collector output. Only one of JP11 and JP12 should be shorted at any time.

JP13, JP14 - These jumpers determine if output 10 is an open collector output or a relay output. If JP13 is shorted (default), output 10 will be a relay output. If JP14 is shorted, output 10 will be an open collector output. Only one of JP13 and JP14 should be shorted at any time.

JP15 - This jumper is used to enable serial data out to the base station radio. JP15 should be removed when the LZA2027 is being programmed. If the LZA2027 is not being programmed, JP15 should be shorted (default).

JP16 - This jumper is used to enable serial data in from the base station radio. JP16 should be removed when the LZA2027 is being programmed. If the LZA2027 is not being programmed, JP16 should be shorted (default).

APPENDIX B - GBH-01 INTERFACE

Figure B-1 - GBH-01 Interface Cable

Table 7 – Interface Cable Parts List (106-27RLMGMH)

Item	Description	Qty
1	4-40 X 1/2 SCREW	2
2	DB25 CONNECTOR MALE	1
3	SCREW/CLIP KIT	2
4	DB25 COVER ASSEMBLY	1
5	DB15HD COVER	1
6	DB15HD CONNECTOR	1
7	6 CONDUCTOR CABLE	1.3’