



GAI-TRONICS® CORPORATION
A HUBBELL COMPANY

IDR1000A DC Remote Desk Set User and Installation Manual



CONFIDENTIALITY NOTICE

This manual is provided solely as an operational, installation, and maintenance guide and contains sensitive business and technical information which is confidential and proprietary to GAI-Tronics. GAI-Tronics retains all intellectual property and other rights in or to the information contained herein, and such information may only be used in connection with the operation of your GAI-Tronics product or system. This manual may not be disclosed in any form, in whole or in part, directly or indirectly, to any third party.

COMPUTER SOFTWARE COPYRIGHTS

This product contains copyrighted computer programs stored in semiconductor memory. These programs are copyrighted by GAI-Tronics Corporation and may not be reproduced in any form without express written permission from GAI-Tronics.

WARRANTY

GAI-Tronics warrants for a period of one (1) year from the date of shipment, that any GAI-Tronics equipment supplied hereunder shall be free of defects in material and workmanship, shall comply with the then-current product specifications and product literature, and if applicable, shall be fit for the purpose specified in the agreed-upon quotation or proposal document. If (a) Seller's goods prove to be defective in workmanship and/or material under normal and proper usage, or unfit for the purpose specified and agreed upon, and (b) Buyer's claim is made within the warranty period set forth above, Buyer may return such goods to GAI-Tronics' nearest depot repair facility, freight prepaid, at which time they will be repaired or replaced, at Seller's option, without charge to Buyer. Repair or replacement shall be Buyer's sole and exclusive remedy, and the warranty period on any repaired or replacement equipment shall be one (1) year from the date the original equipment was shipped. In no event shall GAI-Tronics' warranty obligations with respect to equipment exceed 100% of the total cost of the equipment supplied hereunder. The applicability of any such third-party warranty will be determined solely by GAI-Tronics.

Services. Any services GAI-Tronics provides hereunder, whether directly or through subcontractors, shall be performed in accordance with the standard of care with which such services are normally provided in the industry. If the services fail to meet the applicable industry standard, GAI-Tronics will, for a period of one (1) year from the date of completion, re-perform such services at no cost to the Buyer. Re-performance of services shall be Buyer's sole and exclusive remedy, and in no event shall GAI-Tronics' warranty obligations with respect to services exceed 100% of the total cost of services provided hereunder.

Limitations/Exclusions. The warranty on any equipment supplied hereunder is subject to Customer's use in compliance with applicable FCC regulations and manufacturer specifications. The warranties herein shall not apply to, and GAI-Tronics shall not be responsible for, any damage to the goods or failure of the services supplied hereunder, to the extent caused by accident, misuse, abuse, neglect, system design, product modification, failure to follow instructions contained in the product manual, repair, or attempted repair by anyone not authorized by GAI-Tronics, improper installation, installation of parts that do not conform to the quality or specifications of the original parts or accessories, damage or loss occurred during shipment, or any unit which is not new when sold or upon which the serial number has been defaced, modified or removed. The warranty does not extend to damage incurred by natural causes including Force Majeure. The warranty does not cover microprocessors if failure is due to static damage or application of improper voltage. **THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES AND REMEDIES, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

Operational and Maintenance Procedures. Buyer acknowledges that any improper use, maintenance, or modification of the equipment provided hereunder, or use of unqualified maintenance or service technicians will severely impair the operational effectiveness of the entire communication system. Buyer hereby agrees to indemnify, defend and hold GAI-Tronics harmless from and against any and all third party claims arising, in any manner, out of: (a) Buyer's neglect of the equipment; (b) Buyer's use of technicians not authorized by GAI-Tronics to service the equipment; or (c) Buyer's improper use or modification of the equipment or failure to follow the operational and maintenance procedures provided with the equipment.

Limitation of Liability/Damages. In no event (even should circumstances cause the exclusive warranties and remedies set forth in the Warranty section to fail of their essential purpose) shall either party be liable for any indirect, incidental, special or consequential damages (including, but not limited to, loss of use, loss of anticipated profits, or damages arising from delay) whether such claims are alleged to have arisen out of breach of warranty, breach of contract, strict or absolute liability in tort, or other act, error or omission, or from any other cause whatsoever, or any combination of the foregoing.

Table of Contents

FOREWORD	1
SCOPE OF MANUAL	1
NOMENCLATURE	1
ORDERING REPLACEMENT PARTS	1
SERVICE AND REPAIR	1
FEATURES AND BENEFITS OF THE IDR1000A DC REMOTE DESK SET	2
FCC INTERFERENCE WARNING	2
SAFE HANDLING OF CMOS INTEGRATED CIRCUIT DEVICES	3
PERFORMANCE SPECIFICATIONS	4
DESCRIPTION.....	5
PHYSICAL DESCRIPTION	5
DESK SET BUTTON PANEL	5
<i>Frequency Buttons, F1 through F4.....</i>	<i>6</i>
<i>Volume Buttons.....</i>	<i>6</i>
<i>Control Button.....</i>	<i>6</i>
<i>Intercom Button.....</i>	<i>6</i>
<i>Monitor Button.....</i>	<i>6</i>
<i>Transmit Button and LED.....</i>	<i>6</i>
INTERNAL MICROPHONE	7
HANDSET	7
PROGRAMMING SWITCHES	7
<i>SWA Switch Settings.....</i>	<i>7</i>
ACCESSORIES	8
FIELD REPLACEMENT ITEMS	8
OPERATION.....	9
OPERATIONAL DESCRIPTION	9
FRONT PANEL BUTTON OPERATION	9
<i>Changing Base Station Frequencies.....</i>	<i>9</i>
<i>Speaker Volume Adjustment.....</i>	<i>9</i>
<i>Intercom.....</i>	<i>9</i>
<i>Monitor Mode.....</i>	<i>9</i>
<i>Transmit Mode.....</i>	<i>9</i>
<i>DCLOTL (DC Line Operated Transmit Light).....</i>	<i>10</i>
INITIATING CALLS	10
RECEIVING CALLS	10
HANDSET TRANSMIT	10
TRANSMIT FROM INTERNAL MICROPHONE.....	10
INSTALLATION.....	11
PLANNING THE INSTALLATION.....	11
MOUNTING.....	11
FCC INTERFERENCE WARNINGS	11
EQUIPMENT REQUIRED.....	12
<i>Test Equipment.....</i>	<i>12</i>
<i>Documentation.....</i>	<i>12</i>

CABLE INSTALLATION SAFETY CONSIDERATIONS.....	12
TELEPHONE LINE LIGHTNING AND OVER-VOLTAGE PROTECTION.....	12
POWER CONNECTIONS.....	13
LINE CONNECTIONS.....	13
<i>Line Considerations - Private Circuit</i>	13
<i>Circuit Conditioning</i>	14
SETTINGS AND ADJUSTMENTS.....	14
<i>Line Input Level Adjustment</i>	15
<i>Remote Adjustment</i>	15
<i>Line Output Adjustment</i>	15
<i>Handset Earpiece Volume Adjustment</i>	15
PROGRAMMING.....	16
<i>DC Current Magnitude Table</i>	17
PROGRAMMING MODE.....	18
DESK SET REASSEMBLY.....	18
THEORY OF OPERATION.....	19
DIGITAL CIRCUITS.....	19
<i>Analog-to-Digital Conversions</i>	19
<i>Serial Peripheral Interface</i>	19
DC CURRENT GENERATION.....	19
AUDIO CIRCUITS.....	20
SPEAKER VOLUME CONTROL.....	20
POWER SUPPLIES.....	20
TROUBLESHOOTING.....	21
TROUBLESHOOTING THE IDR1000A DC REMOTE DESK SET.....	21
FUSE REPLACEMENT.....	22
MAIN CIRCUIT BOARD.....	23
SCHEMATICS.....	25
DEFINITIONS AND ACRONYMS.....	33

Scope of Manual

This manual offers descriptive data and service information for the IDR1000A DC Remote Desk Set. Service diagrams and printed circuit board details are a part of this service manual.

Nomenclature

The model number, located on the nameplate on the bottom, specifically identifies GAI-Tronics equipment. If additional options are ordered, the option will be identified on the circuit board.

Ordering Replacement Parts

When ordering replacement parts or requesting equipment information, please include the complete identification number. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part and sufficient description of the desired component to identify it. Order parts from:

Customer Service

GAI-Tronics Corporation

400 E. Wyomissing Ave.

Mohnton, PA 19540

US: 800-492-1212

Outside US: 610-777-1374

Service and Repair

Inoperative or malfunctioning equipment should be returned to the factory for repair. Please call **1-800-492-1212** to obtain a Return Authorization number, published repair prices, and shipping instructions.

NOTE: A purchase order or credit card number is required prior to processing non-warranty repairs.

Features and Benefits of the IDR1000A DC Remote Desk Set

Feature	Benefit
Programmable 4-frequency function control	Each frequency/function key can be programmed for one of 56 dc currents.
Intercom	Desk set users can communicate with each other without tying up valuable frequency time.
Parallel transmit audio	User can hear audio transmitted by another desk set.
Selectable DCTOTL	Indicates transmit by a parallel user, preventing interruptions.
Selectable off-hook local speaker	User can choose continuous local speaker when handset is off-hook.
Front-mounted controls and adjustments	Provides easy-to-operate functions
Built-in internal microphone	Allows for handset-free communication.
Adjustable receive input sensitivity and transmit output level	Allows flexibility with different radio systems and user environments where radio output levels, line losses, and noise factors vary.
Receive and transmit compression	Automatically normalizes varying input and output levels caused by system factors.

FCC Interference Warning

The FCC requires that manuals pertaining to Class A and Class B computing devices must contain warnings about possible interference with local residential radio and TV reception. This warning reads as follows:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Safe Handling of CMOS Integrated Circuit Devices

Many of the integrated circuit devices used in communications equipment are of the Complementary Metal Oxide Semiconductor (CMOS) type. Because of their high open circuit impedance, CMOS integrated circuits are vulnerable to damage from static charges. Care must be taken handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS integrated circuit inputs, the protection is effective only against overvoltage in the hundreds of volts range such as is encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules, even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

1. Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal, earth-grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

NOTE: Wearing a conductive wrist strap will minimize static build-up during servicing.

2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.
3. Power down the unit before installing or removing the circuit module.
4. When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static build-up. Similarly, disconnect the test probe prior to removing the ground lead.
5. All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe.
6. If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through 100K of resistance.
7. When soldering, be sure the soldering iron is grounded, and has a grounded tip.
8. Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static build-up as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.
9. When replacing a CMOS integrated circuit device, leave the device in its conductive rail container or conductive foam until it is to be inserted into the printed circuit module.
10. All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.
11. Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). **Never use non-conductive material** for packaging these modules.

Performance Specifications

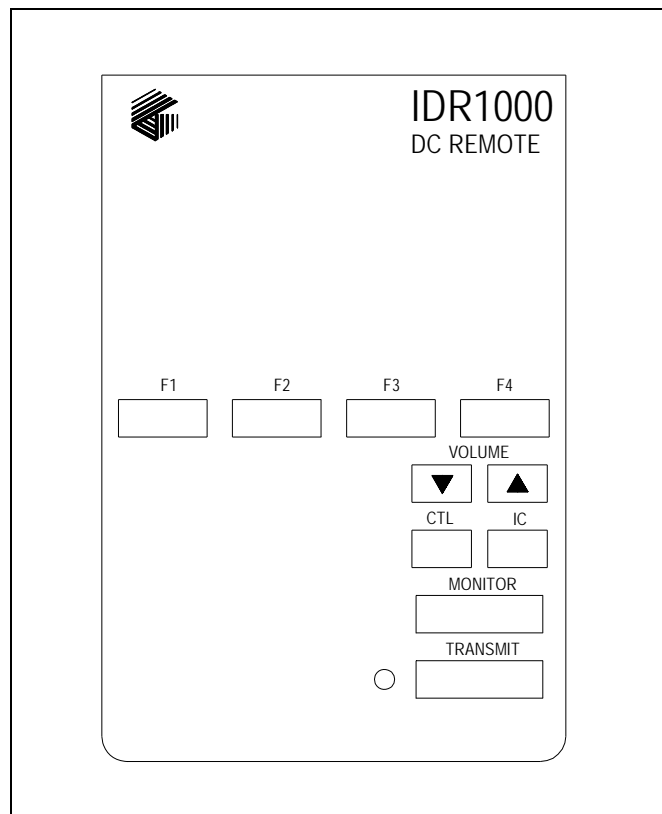
Color	Black
Physical size.....	7.6 W × 8.9 L × 4.7 H inches
Weight.....	2.4 lbs.
Temperature range.....	-35° C to +70° C
Humidity	95% at 50° C (non-condensing)
Line impedance.....	600 ohms nominal
Power input.....	10.5–16 V dc; 1.0 A maximum
Nominal input level	-10 dBm
Nominal output level	Range -25 to 0 dBm, -10 dB Range -15 to +5 dBm into 560 ohms
Frequency response.....	+/-3 dB from 300–3000 Hz
Hum and noise	Less than -45 dB below rated outputs
Audio output to speakers	1 watt minimum with level in compression range
Audio distortion	Less than 3% THD
Maximum number of remotes.....	Ten
DC current defaults	
F1.....	5.5 mA
F2.....	12.5 mA
F3.....	-5.5 mA
F4.....	-12.5 mA
Monitor (Programmable).....	-2.5 mA
NOTE: Each button listed above can be programmed from -14 to +14 mA in 0.5 mA increments.	
Safety	Class III SELV equipment Powered by UL-listed (E104603) and CSA certified (LR67888) ac adapter
Line Interface.....	FCC Part 68 Exempt (Category II Tariff #260 service for private/leased line application)

Physical Description

The IDR1000A, when used in conjunction with a dc remote adapter located at the radio site, provides remote dispatch and station control. For maximum range, the RF equipment is often located at a distant radio tower, tall building or hilltop location apart from the location where radio calls originate and are received. The desk set uses private leased telephone lines, or customer-owned metallic pairs that are capable of supporting dc control currents. The unit can be placed on a flat surface or wall-mounted. All connections are made inside the unit. The desk set is powered by a 10.5 to 16 V dc power source.

Desk Set Button Panel

Refer to the figure below for the locations of the buttons and LED on the desk set button panel.



Front View – IDR1000A Remote Desk Set Button Panel

Frequency Buttons, F1 through F4

The frequency buttons, labeled F1, F2, F3, and F4, are normally used to change channels on the radio, although the use and function of these buttons depend on the capabilities of the radio in use. A frequency button illuminates when pressed, and remains lit until a different frequency button is pressed.

Volume Buttons

Two buttons labeled VOLUME are imprinted with up and down arrows. They are used to increase and decrease the local speaker volume and as programming function keys.

Control Button

The CTL button is used in conjunction with the VOLUME Up or VOLUME Down buttons to mute and unmute the local speaker. It is also used during programming.

Intercom Button

The Intercom (IC) button allows communication between desk sets without transmission over the radio.

Monitor Button

The MONITOR button is used to place the radio in the monitor mode.

Transmit Button and LED

The TRANSMIT button is used to initiate voice transmissions. Pressing the TRANSMIT button places the desk set in the transmit mode. The TRANSMIT LED illuminates while transmitting.

Internal Microphone

This microphone is intended for use in low noise environments. The handset must be on-hook in order to use the microphone.

Handset

The desk set is equipped with a push-to-talk handset with a coil cord for receiving and transmitting.

Programming Switches

A set of programming switches is included on the main circuit board of the desk set. The switch setting functions are as follows:

SWA Switch Settings

NOTE: Power must be reset to unit before changes to SWA will take effect.

Switch	Determines:	On	Off
SWA-1	Not used.	N/A	N/A
SWA-2	Frequency change commands on PTT only	Pressing the frequency button does not immediately change the station frequency. It changes only after TX or handset PTT is pressed.	Pressing the frequency button immediately changes the station frequency.
SWA-3	Not used.	N/A	N/A
SWA-4	Operation with handset removed	Allows the use of the internal mic and local speaker without handset.	Handset must be present for proper operation.
SWA-5	Parallel audio	Parallel audio is disabled. (Requires that DCLOTL be enabled. See SWA-7)	Parallel TX audio is enabled.
SWA-6	Line termination enable or disable	Disabled	Enabled
SWA-7	DCLOTL	Enabled	Disabled
SWA-8	Front panel programming mode enable or disable	Disabled	Enabled

Accessories

Description	Part No.
DC Remote Adapter	IDA1000A
Audio Accessory Box	XAAB002A
Desk Microphone*	XDM004A
Footswitch*	XFS002A
Headset* (requires coiled cord)	XHS003C
Headset Coiled Cord	XCC004B

*These accessories require the use of the XAAB002A Audio Accessory Box.

Field Replacement Items

Description	Part No.
PTT Handset with Cord, Black	HANDSET BLACK
Replacement Power Supply, 120 V ac/12 V dc @ 1 amp	40419-014
Replacement PCBA	69307-002
Replacement Power Supply Adapter, European	40420-001
Replacement Power Supply Adapter, UK	40420-002
Replacement Power Supply Adapter, Australia	40420-003
Replacement Power Supply Adapter, Korea	40420-004
Speaker Assembly	61501-014

Operational Description

The IDR1000A DC Remote Desk Set provides radio system control from a remote location. Changes in dc current through a telephone line tell the remote adapter to control radio functions such as transmit, channel changes, and monitor. Receive audio from the system radio system is sent to the IDR1000A from the radio via the same telephone line connection. The IDR1000A must be connected to a dc remote adapter, such as an IDA1000, located at the radio site.

Front Panel Button Operation

Changing Base Station Frequencies

Press the F1, F2, F3, or F4 buttons to select among the four possible base station frequencies. Applicability and use of these buttons depend on your radio's capabilities. Whenever a frequency button is pressed, the button illuminates and remains on until a different frequency button is pressed.

Speaker Volume Adjustment

Press the VOLUME Up or Down buttons to adjust the local speaker volume.

Mute the local speaker by pressing the CTL and VOLUME Down buttons simultaneously. The selected frequency button flashes to indicate that the speaker is muted. Unmute the speaker by pressing either the VOLUME Up, VOLUME Down, or CTL and VOLUME Up buttons.

Press the CTL and VOLUME Up buttons to enable the local speaker while the handset is off-hook. When the handset is placed back on-hook, the local speaker again operates normally— that is, it is disabled whenever the handset is taken off-hook.

Intercom

Press the IC button to communicate between desk sets without transmitting over the radio. When the IC button is pressed and held, microphone audio is routed to the line without activating the radio transmitter. Other dc remote desk sets on the same line will hear the audio automatically.

Monitor Mode

Press the MONITOR button (RX CTCSS/CDCSS disable) to place the radio in the monitor mode. Press this button before making a call to verify a clear radio channel is available.

Transmit Mode

Press the TRANSMIT button to place the desk set in the transmit mode and initiate voice transmissions.

DCLOTL (DC Line Operated Transmit Light)

The DCLOTL indicates that a parallel-connected desk set is transmitting by illuminating the TRANSMIT LED. This indicates that the wire line to the base station is busy.

When dc voltage is detected on the wire lines connected to the desk set, the DCLOTL prevents simultaneous transmissions over the control lines. This feature is enabled/disabled by SWA-7. For more information, see the switch setting table on page 7.

Initiating Calls

Before initiating a call, press the MONITOR button to verify that the radio channel is clear. To initiate a call, press the TRANSMIT button or the handset push-to-talk (PTT) pressbar. The TRANSMIT LED illuminates when transmitting.

Always allow a short delay before speaking to allow time for the radio channel to be established. The TRANSMIT button or handset PTT bar must be held down while talking to the radio user and released to listen. When the transmission is completed, the TRANSMIT LED extinguishes and the desk set returns to the receive mode.

Receiving Calls

When power is first applied, the desk set is in the receive mode, allowing receive audio to be heard through the speaker or handset. The desk set is always in receive mode unless the user presses the TRANSMIT or IC buttons.

The desk set contains an internal or local speaker and a handset speaker, which operate as follows:

- When the handset is in the cradle, or on-hook, receive audio is heard on the local internal speaker.
- When the handset is off-hook, receive audio is routed to the handset.

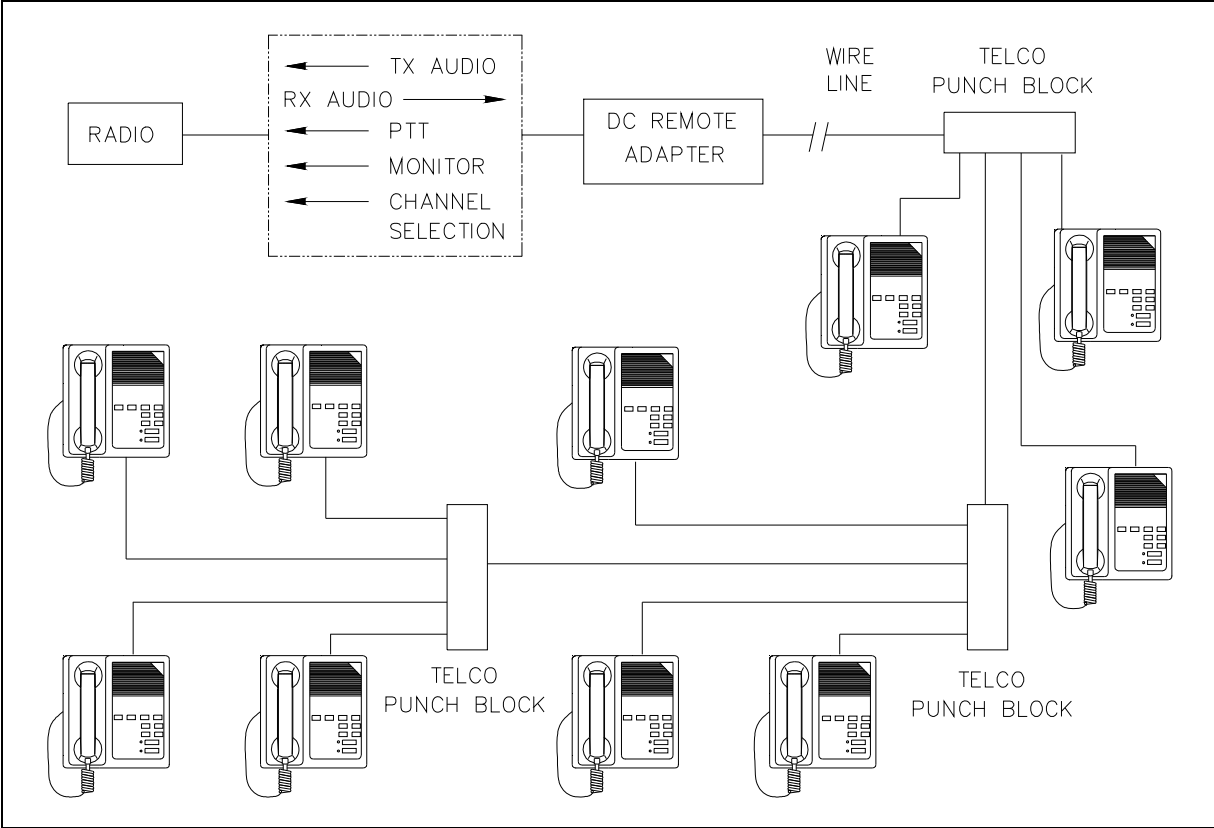
Handset Transmit

Using the handset is recommended when the desk set is located in noisy surroundings. Press the handset PTT bar or TRANSMIT button and speak into the handset microphone.

Transmit From Internal Microphone

Use the internal microphone only in low noise environments. The handset must be on-hook for the internal microphone to operate. Press the TRANSMIT button and speak in the direction of the internal microphone. For the best transmit audio quality, maintain a distance of about 12 to 18 inches from the microphone.

Planning the Installation



Sample IDR1000A Installation Diagram

Mounting

The desk set can be placed on a desk or mounted vertically on a wall. To wall mount the desk set, remove the four bottom screws from the base and then rotate the base 180°. Reinstall the four screws to the base and rotate the handset hook located on the front of the unit.

FCC Interference Warnings

The FCC requires that manuals pertaining to Class A and Class B computing devices contain warnings about possible interference with local and residential radio and TV reception. Please read these warnings and all safety information in the Foreword section of this manual.

Equipment Required

Test Equipment

- RF service monitor
- AC voltmeter with dB ranges for measuring audio levels
- #1 Phillips screwdriver
- 1/8-inch flat blade screwdriver

Documentation

- base station's tone remote adapter manual
- these installation instructions

Cable Installation Safety Considerations

Interconnecting, communications, and Class 2 dc power cables should be separated from electrical light or other Class 1 circuits by at least 2 inches. The exception is where Class 1 wiring or power circuits are run in a raceway, or are metal-sheathed or metal-clad, or are permanently separated from the conductors of the other circuitry by a continuous and firmly fixed nonconductor such as porcelain tubes or flexible tubing in addition to the insulation on the wire. Communications cables and in-building wiring should be listed and marked for the purpose according to NEC Article 800.

Telephone Line Lightning and Over-voltage Protection

For maximum surge and lightning protection, building primary (over-voltage) protectors should be installed at the point where the telephone lines enter the radio equipment building. Primary protectors are usually required by local codes and should be provided by your leased line provider.

The IDR1000A DC Remote Desk Set has an over-current phone line fuse (F2) which protects against occasional extreme fault conditions that may get past the primary protectors. An example of such a fault condition is a power line cross. If the fuse requires replacement, replace F2 with the same type Bussmann C515S-1.25 A fuse.

Power Connections

Power is supplied to the desk set from a listed ac adapter. Make connections to the main circuit board according to the following table:

TS1 Pin #	Function
1	N/C
2	N/C
3	Line Signal Connection (-)
4	Line Signal Connection (+)
5	Ground and dc minus or (-)
6	Power (+)10.5 to 16 V dc (lead with white dashed line)

Line Connections

To make the required line connections, a cable with a tinned bare leads stripped to about 3/8-inch or pin terminal is necessary. With the housing opened, route the lines through the slot in the housing bottom. Using a small slotted screwdriver, connect the two-wire line to the terminal block position on the main circuit board labeled LINE 1. See the terminal block table above.

Several desk sets can be connected in parallel. The maximum loss between any two desk sets, or between a desk set and the station, should not exceed 20 dB. Desk sets are shipped with line termination enabled. With parallel units connected, only the most distant desk set unit should be terminated. Refer to the SWA Switch Settings Table on page 7.

Line Considerations - Private Circuit

If leased lines from your local telephone company are used between the remote desk sets and the IDA1000 or similar dc remote adapter, the line provider (Local Exchange Carrier) may request a Facility Interface Code (FIC) or Network Channel Interface Code (NCI code). End-to-end dc continuity is *required* on these private analog circuit lines. The private analog service lines described in the table below are subject to local availability.

Facility Interface Code

FIC	Description
02DC2	Two-wire dc at end-user premises; 600-ohm impedance (No option code)
Metallic	Two-wire metallic private line (commonly known as ‘hoot and holler’ circuits)

Within a plant, campus, or building, customer-supplied metallic pairs may be used.

NOTE: DC continuity is required on the lines between the dc desk sets and the remote base station equipment.

Circuit Conditioning

The desk set is designed to work with good quality analog speech band or leased private circuit. This was previously known as “basic” conditioning under Series 2000/3002 service. The line must be non-PSTN (no dial tone, talk-battery, or signaling). This equipment falls under the Category II, FCC Tariff #260 Service and is exempt from FCC Part 68 registration. (Ref. FCC Form 730 Application Guide pages 1-5.)

For two-wire operation, 2000 Series lines may be used with or without conditioning. C1 or C2 conditioning is available for these lines and relates to the envelope delay distortion and attenuation. A basic conditioned line may be used if it is the only type available. Overall system quality is limited by the quality of these lines.

Settings and Adjustments

The desk set housing must be open with the circuit board exposed. These procedures assume that the base station has been properly adjusted.



Voltages hazardous to life may be present at the exposed control line terminals under certain conditions during the following procedures. These voltages are also present on some component leads. Care should be taken to avoid shock during testing.

NOTE: In the following tests, a 2- μ F, 250-volt blocking capacitor should be used to protect any test equipment that could be damaged by dc voltages.

Line Input Level Adjustment

1. The line input level adjustment ensures that the compression amplifier circuitry of the dc desk set operates properly on signals received from the base station.
2. Adjust the base station level by applying an RF signal with a 1000 Hz tone at 60% system deviation to the station receiver.
3. Adjust the base station line output control for an output of 0 dBm to the audio control line.

Remote Adjustment

1. Connect an ac voltmeter to TPC1 test point.
2. Starting with the line input control (pot 3) rotated fully counter clockwise, adjust the line input control until the ac voltage level across the voltmeter just stops increasing.
3. Remove the RF signal from the base station.

Line Output Adjustment

The line output adjustment ensures that the correct audio signal level is output to the remote control line during transmission.

1. Disconnect the handset from the desk set.
2. Apply a 1000 Hz signal into the handset mic terminals (red - handset mic, black - ground).
3. Press the TRANSMIT button and adjust the line output level control (pot 4) until 0 dBm is output to the remote control line.



When the TRANSMIT button is pressed, a hazardous voltage is output on the remote control line. Care should be taken to avoid shock.

4. Remove the signal from the handset microphone terminals and reconnect the handset.

Handset Earpiece Volume Adjustment

This is factory set at a nominal level suitable for many applications. Adjustment should be made only after the receive audio level pot and the appropriate switch have properly set. The handset earpiece volume control (pot 5) is accessible through the lower slotted mounting hole without opening the unit.

1. Pot 5 is located on the main circuit board, but can be accessed through the adjustment hole located on the side of the unit near the handset jack without having to open the desk set. This pot is used to adjust earpiece volume in the handset.
2. Use a 1/8-inch slotted screwdriver to adjust pot 5 to a comfortable volume level.

Programming

Front panel programming and the diagnostic mode are accessed by key-press combinations entered within 3 seconds of power up. During this period, all of the LEDs light as an indication that programming changes may be made. Access to the programming and diagnostic functions can be disabled by SWA-8. This allows the installing technician to set parameters and then disable access to programming functions. When disabled, users can not accidentally change parameters.

F1 through F4 are set at the factory to the following currents:

F1 = 5.5 mA	F3 = -5.5 mA
F2 = 12.5 mA	F4 = -12.5 mA

To adjust and program the frequencies and currents, see the “Programming Mode” chart on page 18. Current adjustments are made in 0.5 mA increments. The tables below show the conditions of the LED in the respective frequency button. For example, for a dc current magnitude of 2.0 mA:

TX button LED is Off; F1 LED is Off; F2 LED is On; F3 LED is Off; and F4 LED is Off.

To exit a programming mode and return to normal operation, press the TRANSMIT button.

DC Current Magnitude Table

TX LED	F1	F2	F3	F4	Magnitude
Off	Off	Off	Off	Off	0 mA
Off	Off	Off	Off	On	0.5 mA
Off	Off	Off	On	Off	1.0 mA
Off	Off	Off	On	On	1.5 mA
Off	Off	On	Off	Off	2.0 mA
Off	Off	On	Off	On	2.5 mA
Off	Off	On	On	Off	3.0 mA
Off	Off	On	On	On	3.5 mA
Off	On	Off	Off	Off	4.0 mA
Off	On	Off	Off	On	4.5 mA
Off	On	Off	On	Off	5.0 mA
Off	On	Off	On	On	5.5 mA
Off	On	On	Off	Off	6.0 mA
Off	On	On	Off	On	6.5 mA
Off	On	On	On	Off	7.0 mA
Off	On	On	On	On	7.5 mA
On	Off	Off	Off	Off	8.0 mA
On	Off	Off	Off	On	8.5 mA
On	Off	Off	On	Off	9.0 mA
On	Off	Off	On	On	9.5 mA
On	Off	On	Off	Off	10.0 mA
On	Off	On	Off	On	10.5 mA
On	Off	On	On	Off	11.0 mA
On	Off	On	On	On	11.5 mA
On	On	Off	Off	Off	12.0 mA
On	On	Off	Off	On	12.5 mA
On	On	Off	On	Off	13.0 mA
On	On	Off	On	On	13.5 mA
On	On	On	Off	Off	14.0 mA

NOTE: If the LEDs are flashing, the current polarity is negative.

Programming Mode

Important: The initial key press must be made within 3 seconds of power up.

The desk set automatically exits the program mode and returns to normal operation after 5 minutes.

Programming Function (See DC Current Magnitude Table - page 17)	Key-press *Within 3 seconds of power up, press and release:
Program/adjust DCLOTL threshold:	*CTL+TRANSMIT
• Increase current magnitude.	then VOLUME Up
• Decrease current magnitude.	then VOLUME Down
• Toggle current polarity.	then IC
• Save as new DCTOTL threshold.	then MONITOR
Program/adjust MONITOR dc current:	*CTL+MONITOR
• Increase current magnitude.	then VOLUME Up
• Decrease current magnitude.	then VOLUME Down
• Toggle current polarity.	then IC
• Save current magnitude.	then TRANSMIT
Program/adjust F1, F2, F3, F4 dc current:	*CTL+F1 (or F2 or F3 or F4)
• Increase current magnitude.	then VOLUME Up
• Decrease current magnitude.	then VOLUME Down
• Toggle current polarity.	then IC
• Save current magnitude.	then TRANSMIT
Continuous current is placed on the wire line during this test. The LEDs indicate the selected current magnitude. See DC Magnitude Current Table. If the LEDs are flashing, the current polarity is negative.	
RAM Diagnostic:	*CTL+IC , then F3-F4-F2-F1 (within 15 seconds)
If the correct sequence is not entered within 15 seconds, the unit resets. If the correct sequence is entered, the RAM diagnostic runs, default parameters are reloaded and the unit resets. If the RAM diagnostic detects an error(s), the LEDs flash and the unit 'hangs' until the power is cycled.	

Desk Set Reassembly

1. After making the required connections, replace the top cover on the desk set and reattach the four screws in each corner of the back housing.
2. To wall mount, affix the desk set to the wall using the molded-in mounting holes.

Digital Circuits

On power-up, microcontroller U1 reads switch SWA through tri-state buffer U3. Switch readings determine certain operating characteristics of the desk set.

Analog-to-Digital Conversions

Each keyboard button is associated with a particular voltage level at microcontroller inputs AN0 and AN1. These inputs are periodically scanned to determine whether a key is being pressed or released. The microcontroller determines whether the handset is on-hook, off-hook, or whether the handset PTT bar is being pressed by reading the voltage level at input AN2.

Serial Peripheral Interface

The microcontroller uses a synchronous serial interface to control LEDs, provide audio control logic, and to interface non-volatile memory U2. LEDs are turned on or off by the outputs of serial-to-parallel latch U6. The microcontroller manages audio circuits through the outputs of serial-to-parallel latch U4. Operating parameters such as control current magnitudes and polarities, etc. are stored in serial NVRAM U2.

DC Current Generation

B+ is stepped up to a relatively high ac value by T2 and rectified by D21, D23 and filtered by C86 to the level required for the line current into the wire line connected to the desk set. Q19, a power MOSFET, is driven by U22, a pulse width modulation regulator operating at approximately 50 kHz. U22 controls the drive to Q19 according to the feedback received from U21b, which effectively bridges the line, forming a servo. U22 is switched by the HVON signal when control currents are demanded by the microcontroller.

When dc current is sensed on the line, the BUSY signal (output of U19c) is sensed by the microcontroller at input AN3. Normally, when this signal is sensed and the desk set is not generating current, the microcontroller inhibits operation of keys which would interfere with parallel transmissions.

POT2 is used to calibrate the dc control currents, its supply being referenced by zener diode D28.

The microcontroller demands specific current polarity by the DIR output of serial-to-parallel latch U20. This signal controls an opto-isolated H-bridge (consisting of U23 and U24) which forces the required polarity. The microcontroller selects specific current magnitudes via 6 output lines of U20.

The regulated dc current is fed to split-winding line transformer T1. C87 ensures a low impedance audio path.

Audio Circuits

Audio from the wire line is scaled through amplifier U12a and fed through the line audio adjustment, POT3. Then, it is high-pass filtered through U12b to remove wire line hum. The resulting signal is gated to the compressor circuit consisting of U11a, U11b, U11c, Q8, and associated components. Audio at TPC1 is then gated to amplifier U13b where it is summed with any required tones (such as volume beeps) from oscillator U11d. At the output of U13a, audio is fed to speaker amplifier U15. Also, the signal can be gated to the handset earpiece. Earpiece volume is adjusted through POT 5.

The microcontroller selects the active microphone based on the state of the hookswitch. Microphone audio is scaled through U12d and gated to the compressor circuit. Microphone audio at TPC1, the compressor output, is gated to amplifier U12c. POT 4 adjusts the line output level. The output of U12c is gated to line driver U14 and transmitted over the wire line.

Speaker Volume Control

The actual speaker output level adjustment is done internally within power amp U15. The control circuit for this provides a precise control voltage connected to pin 5 of U15. The microcontroller examines the VOLUME Up and VOLUME Down button presses and provides control pulses to electronic pot U9. U9 provides a variable reference voltage into the divider resistors (R156, R157, R158, R159) connected to U13 pin 12.

Speaker muting voltage is also connected to this divider through R154. If the dc volume control voltage at U15 pin 5 is below 0.3 V dc, the speaker amplifier switches to the mute mode. A dc volume control voltage greater than 1.6 V dc results in maximum gain of the amplifier U15.

Power Supplies

The power supplies for the desk set operate in the linear series-pass mode. Programmable zener U7 serves as reference for the 5 V digital and analog power supplies. The reference voltage is 5.00 V dc +/-0.1 V dc measured at U7 pin 1. Op-amp U8a controls the series pass element Q12 to provide 5 V dc at the 5 VD source point at C60, C61. The 5 VA supply is low-current and is fully implemented by U8b.

The VOS power supply, used to power the op-amp rails, is regulated to be approximately 11.2 V dc. The voltage level of the VOS supply is approximately 1.2 V above the 10 V (nominal) CMOS switch power supply. The reference for VOS is the 5 VD output. The divided output sample (through R178, R179, and R180) is compared to the reference at Q14 which serves as the control element for the series pass transistor Q13.

Troubleshooting the IDR1000A DC Remote Desk Set

The following is a list of potential problems you may encounter and possible solutions.

Problem	Possible Solution
General problems.	Ensure that there is a valid circuit line path from the desk set to the dc remote adapter.
	Ensure that the private circuit is balanced by making sure neither side of the telephone line is grounded.
	Check for a blown fuse and ensure that the desk set is connected to a dc power source.
The desk set will not cause the dc remote adapter to key the radio.	Ensure that the proper dc current magnitude for the dc adapter to key the radio is programmed into the desk set. Refer to the dc adapter service manual.
	Ensure that the desk set's output level is set properly, and that the DCLOTL is set in a range of 5 mA to 14 mA into the telephone line.
RX audio is low or distorted.	Ensure that the dc adapter is wired correctly, including the RX audio pair. Audio quality is limited by the quality of the private radio circuit or leased lines between the station radio equipment and the remote dispatch point(s). In some cases, equalization of the lines or line conditioning may be required to ensure a reasonably flat line.
	Correct the desk set's receive audio pot 3 setting: <ul style="list-style-type: none"> • Too high sensitivity overdrives the unit and results in distorted receive audio. • A setting that is too low results in low speaker or handset audio.
	If the internal speaker audio is adequate and only the earpiece is low, check the handset level pot 5 setting. See the "Settings and Adjustments" section in the "Operations" section of this manual.

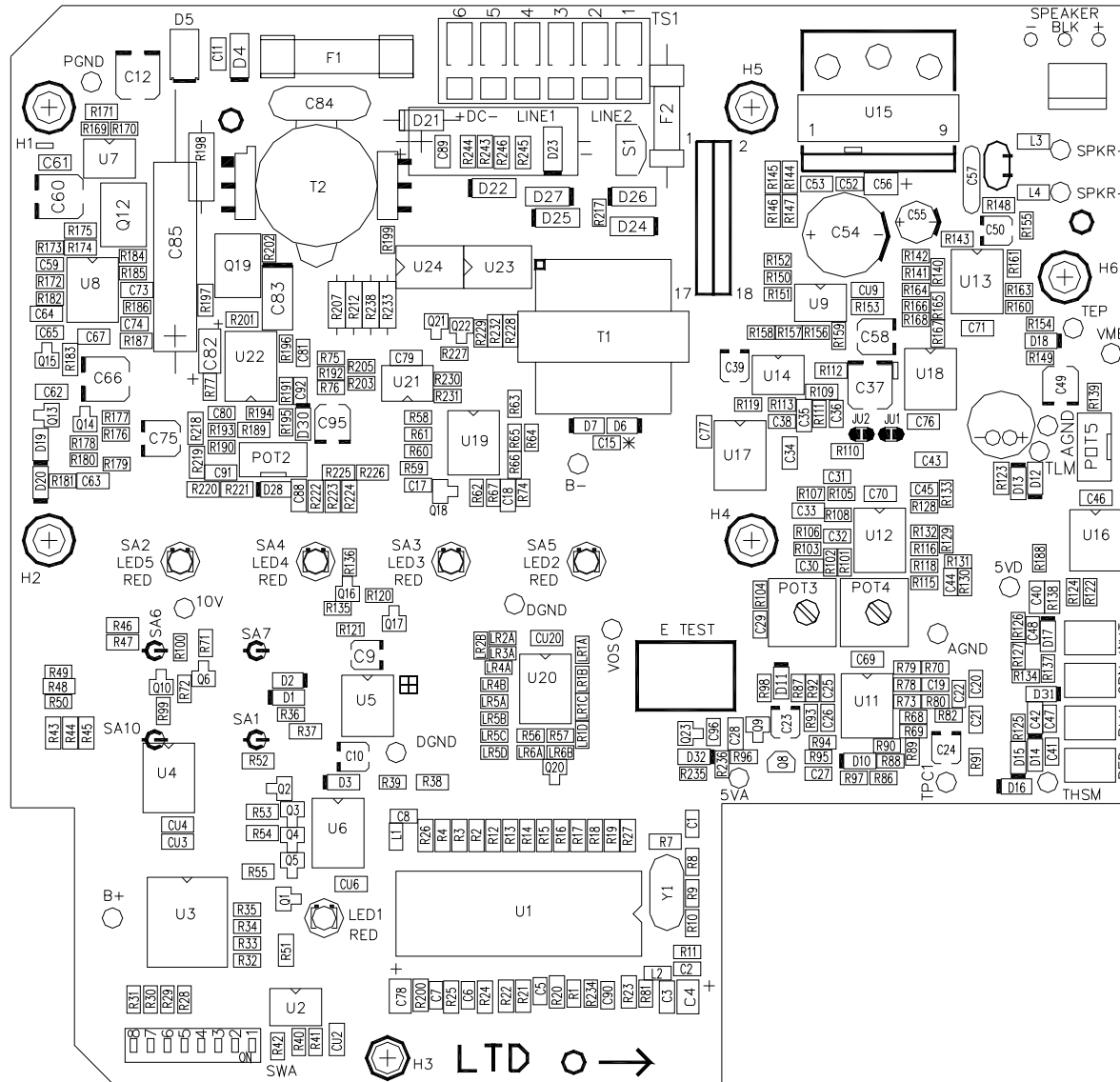
Problem	Possible Solution
There is continuous noise in the receive audio.	<p>The dc remote adapter must be connected to a muted and de-emphasized receive point in the station receiver.</p> <p>If receiver audio is derived from a detector or discriminator, continuous noise is heard unless the dc remote adapter has an internal squelch circuit.</p> <p>Refer to the station and dc remote adapter manuals for more information.</p>
No receive audio on local speaker or handset.	Ensure that the dc remote adapter is supplying audio onto the private circuit.
	Ensure that the desk set's local speaker is not muted. Muting is indicated by a flashing frequency button.
There is no TX audio.	Check to be sure that station transmitter is keyed when PTT is applied from the desk set. If it is not, refer to the dc remote adapter or station manual.
Low TX audio.	Verify that the desk set's transmit output level is properly set and ensure that there is no more than 20 dB loss in the private or leased line, which can cause degradation of the audio signal.
	If a leased line is being used and excessive losses are measured, contact your local exchange carrier. Check the pot 4 setting.
Distorted TX audio.	Verify that the dc remote adapter's transmit audio output level is properly set to match the station's rated transmit sensitivity. Refer to the station and dc remote adapter manuals for proper setup procedures.
No audio on local speaker.	Ensure that the volume is not turned down all the way, and the handset is on-hook. If receive audio is not switched to the local speaker when the handset is on-hook, the handset may be defective or have a defective magnetic reed switch.
	The local speaker is muted. (Indicated by a flashing frequency button.)

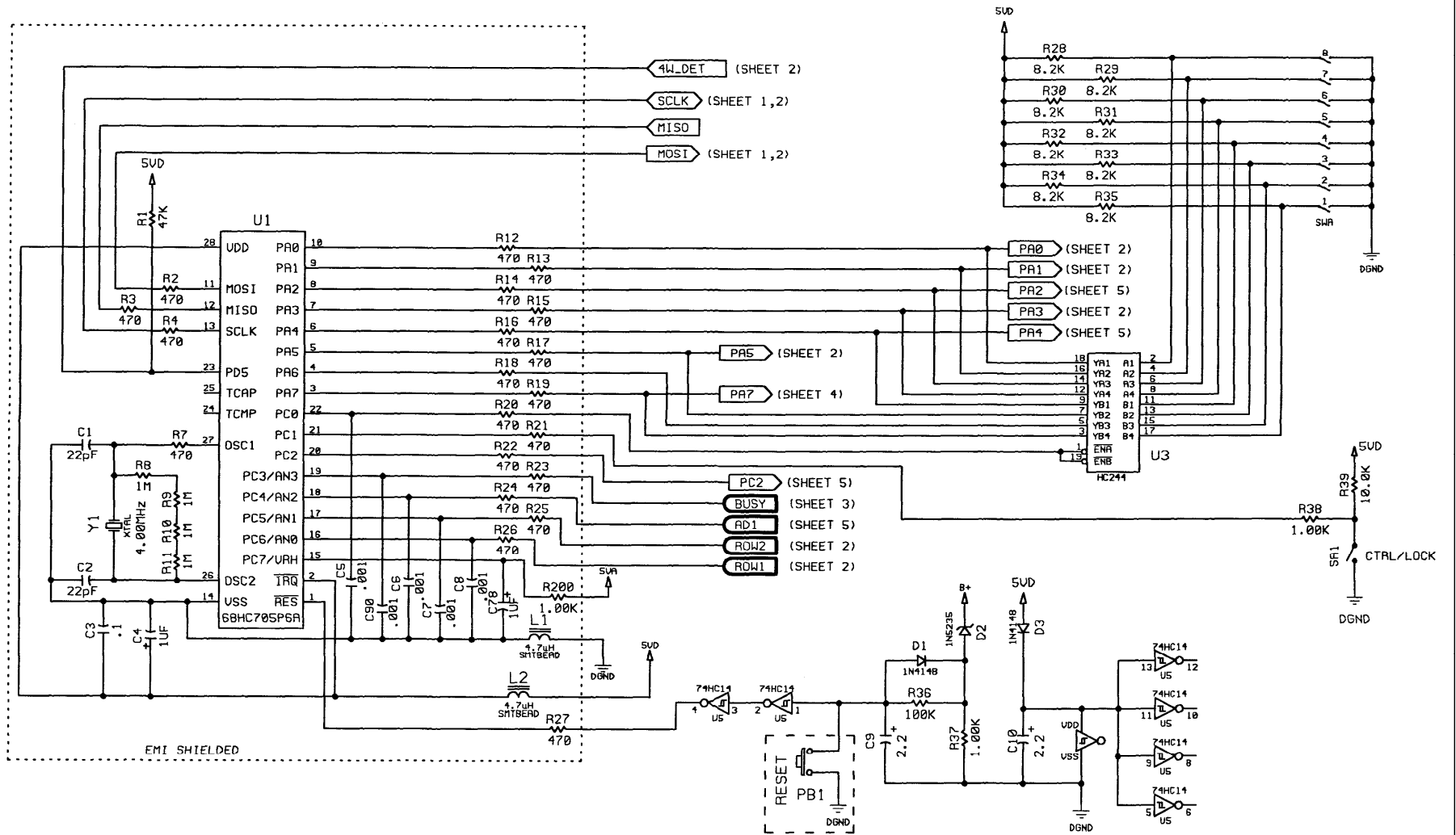
Fuse Replacement



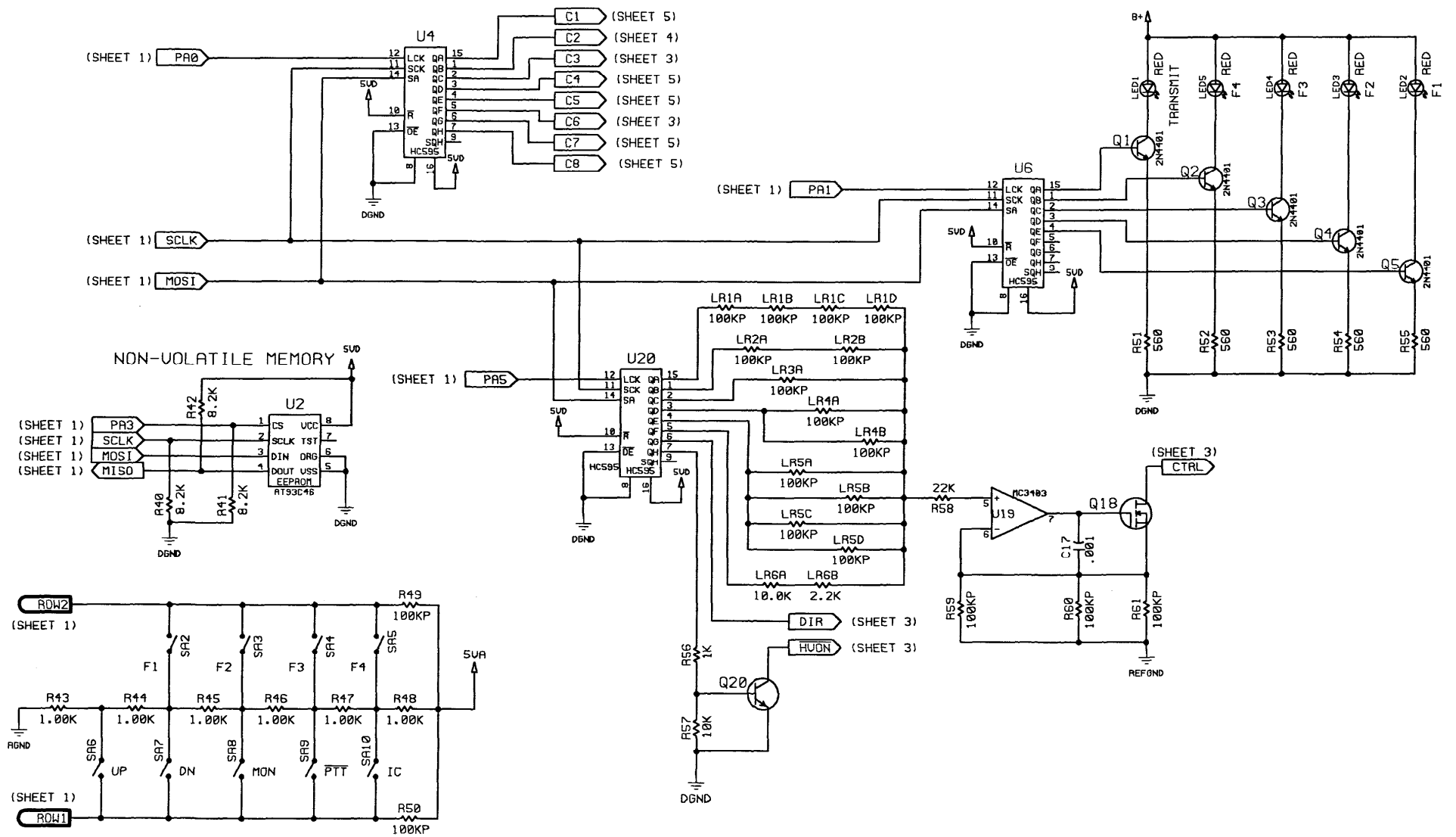
For continued safe operation, replace fuses with the same type:

- **F1 is a Bussmann GMA 750 mA FB fuse.**
- **F2 is a Bussmann C515S 1.25A SB 2AG SB fuse.**

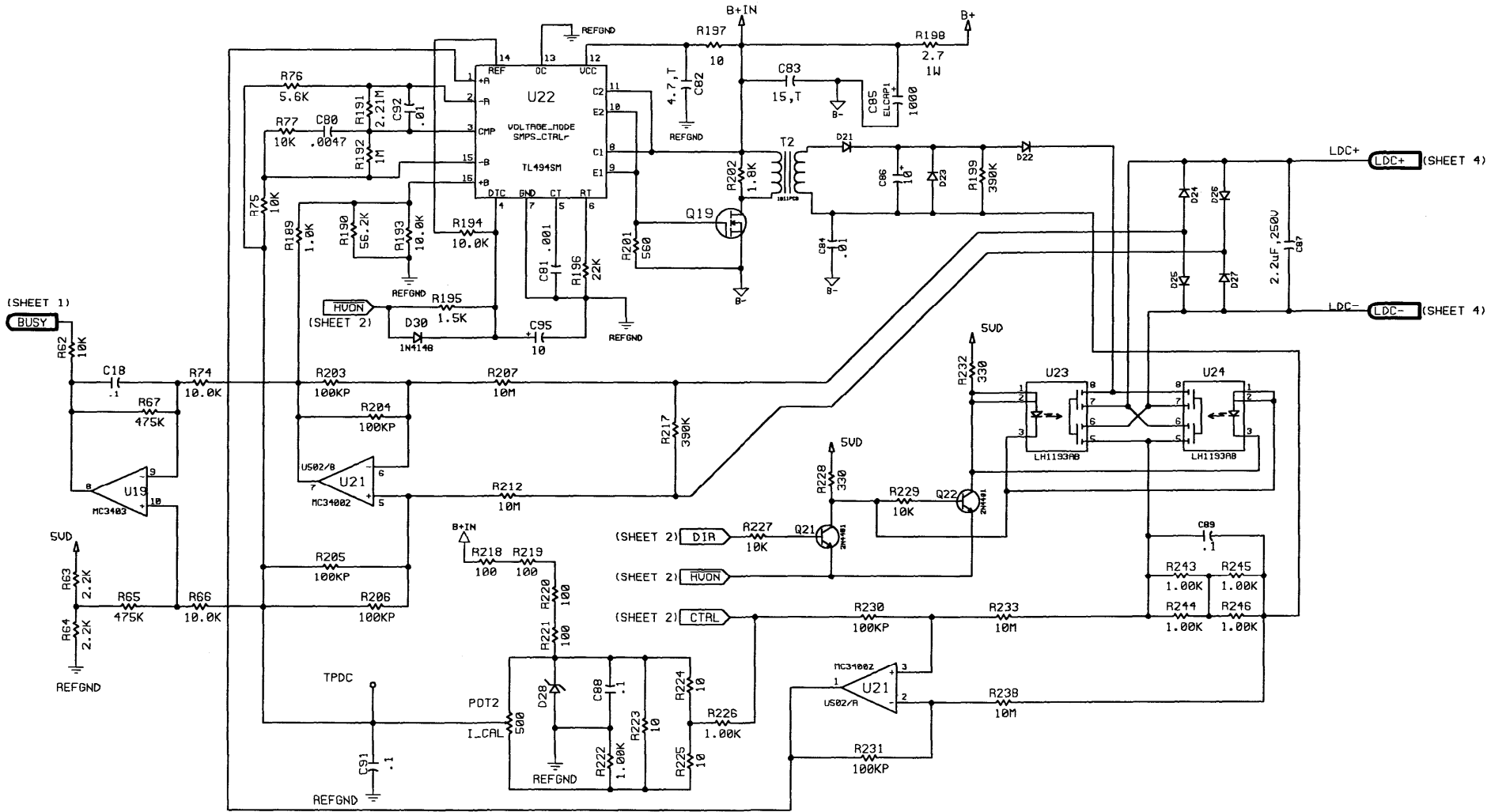




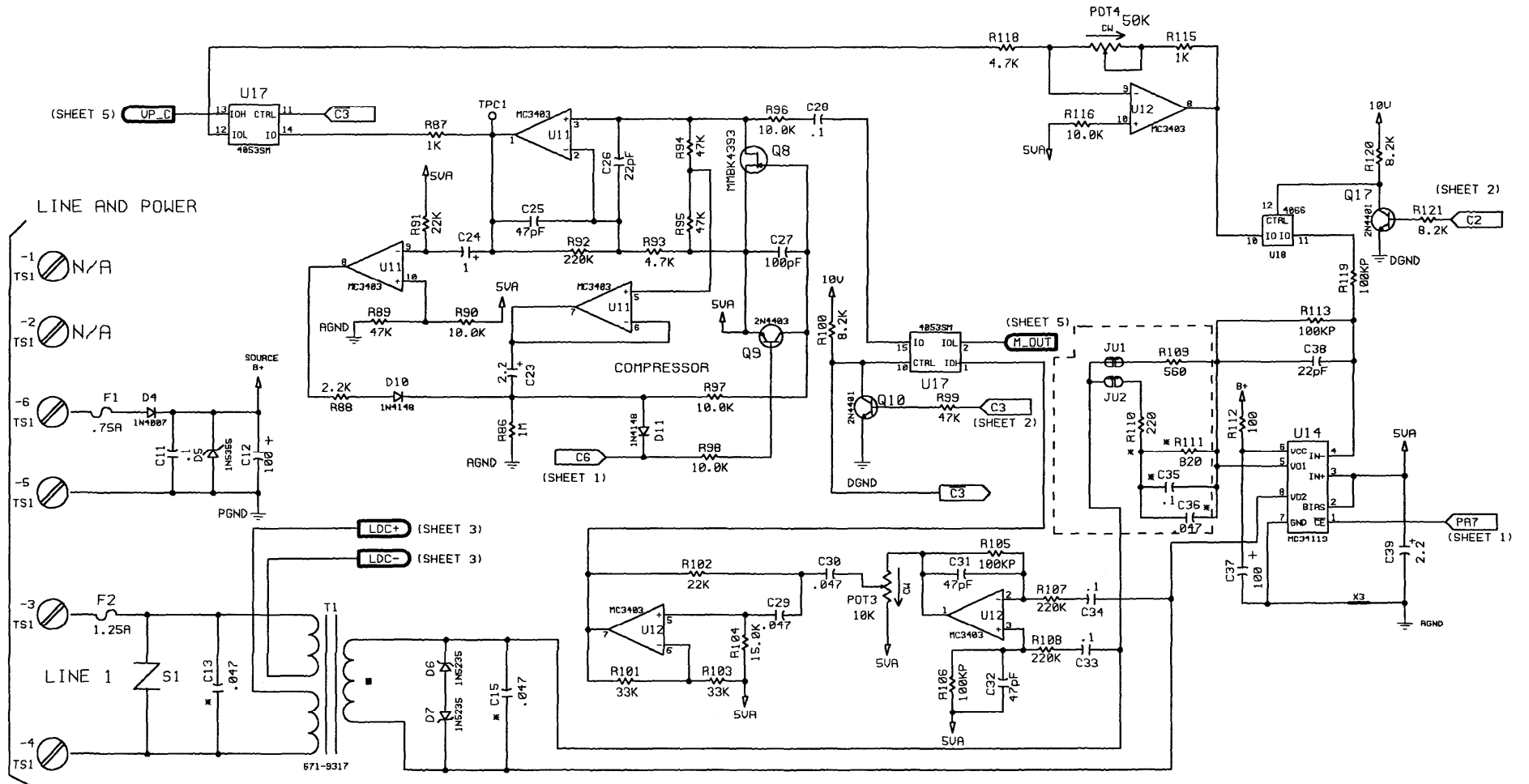
IDR1000A Microprocessor Section Schematic – Sheet 1



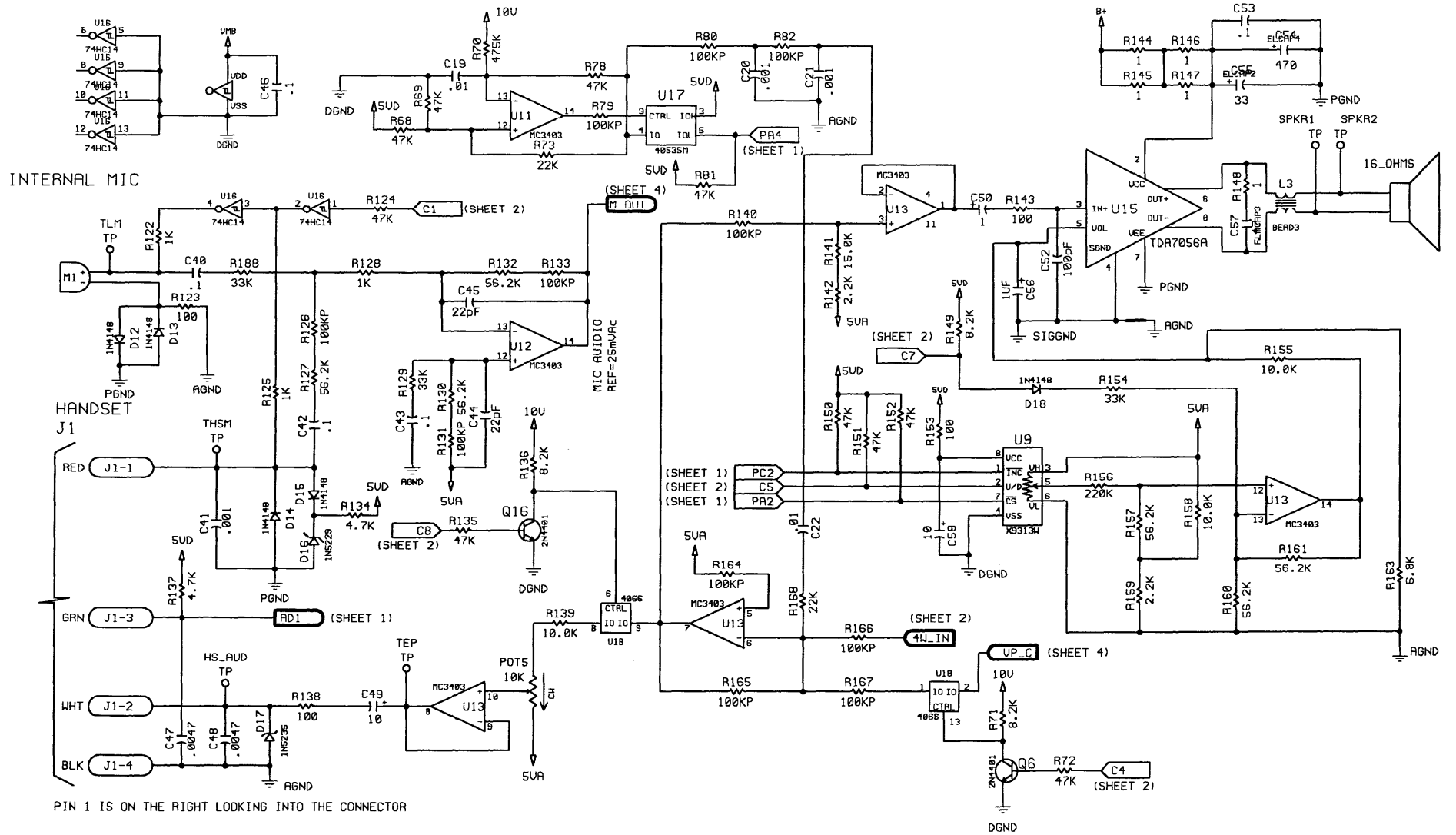
IDR1000A I/O Section Schematic – Sheet 2



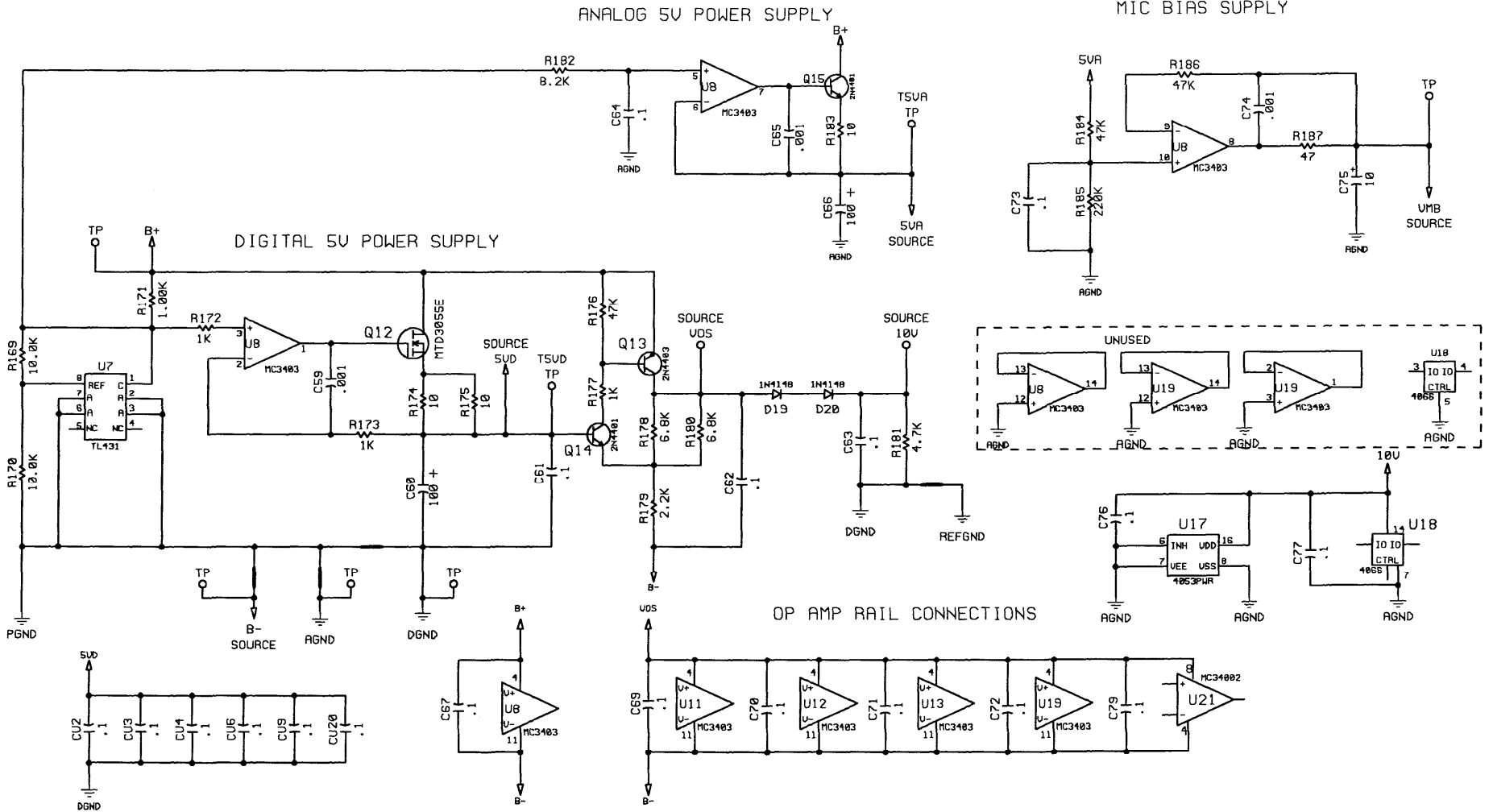
IDR1000A DC Control Schematic Diagram – Sheet 3



IDR1000A Audio Section Schematic Diagram (1 of 2) – Sheet 4



IDR1000A Audio Section Schematic Diagram (2 of 2) – Sheet 5



IDR1000A Power Supply Schematic – Sheet 6

Notes:

Definitions and Acronyms

Term	Definition
CSQ	Carrier squelch
CTCSS	A means of grouping users of a common radio channel. Subaudible tones are transmitted with audio; a particular radio's speaker (or the speakers of a group of radios) will unmute to broadcast a transmission only if the associated subaudible tone identifies it as belonging to the radio's user group.
CDCSS	A system analogous to CTCSS but using low speed digital signaling instead of subaudible tones.
HLGT	High level guard tone
LLGT	Low level guard tone
PTT	Push-to-talk
