DIGITAL HYBRID I

Installation and Operations Manual

Digital Hybrid I Installation and Operations Manual

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This manual was written and designed by Renee Gibson.

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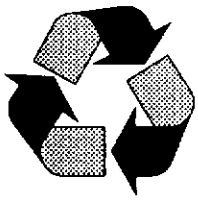

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This manual has been printed entirely on recycled paper.

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Introduction

Thank you for purchasing Gentner's Digital Hybrid I. When installed properly, according to the instructions contained in this manual, the system will provide very high quality audio performance.

The Digital Hybrid I has been developed to meet the needs of the budget-conscious, small to mid-size broadcast studio. The system contains the features most often required by this market segment.

The Gentner Digital Hybrid I is designed to digitally clarify incoming telephone calls that will be broadcast on the air. The system keeps connection noises from reaching your listening audience. Additionally, automatic nulling optimizes individual line conditions upon connection. Once the line is connected, the Digital Hybrid I continues to automatically adapt to telephone line conditions, providing the best possible telephone audio, call after call.

Using digital signal processing technology, the Digital Hybrid I also separates the send (announcer) and receive (caller) audio to eliminate distortion, weak signals and feedback. it continually filters low and high end frequency noises to provide the purest sound available in telephone audio. Unlike a speaker phone, the Digital Hybrid I allows the audio to be transmitted without clipping, or cutting out conversation. The result is clean, crisp audio on every call.

Its high quality digital audio processing and sturdy rack-mountable steel case, combined with Gentner's reputation and commitment to service, make the Digital Hybrid I an exceptional value.

The Digital Hybrid I is designed to be installed quickly and easily in any facility with virtually any telephone system. Should you need further assistance not addressed in this Installation and Operations Manual, please call our Technical Services personnel at the number listed below.

We welcome and encourage your comments so that we can continue to improve this product. Please forward all correspondence to the following location.

Gentner Communications Corporation
Professional Audio Products Division
1825 Research Way
Salt Lake City, Utah 84119
Telephone: (801) 975-7200
Facsimile: (801) 977-0087

Features and Benefits

- 100% Digital Hybrid. Sophisticated digital circuitry and Digital Signal Processing (DSP) techniques isolate the Send and Receive sides of a telephone conversation. This provides clean, consistent audio quality of telephone calls in broadcast applications. Feedback and discoloration of Send audio is also prevented.
- 16 Bit Digital Data Conversion Rate.
- 10 kHz Sampling Rate. The Digital Hybrid I adapts automatically and continuously to telephone line conditions and programming content.
- Analog anti-alias Filter. Carefully designed bandpass filters on both the Send and Caller circuits minimize hum, Central Office switching noise and telephone multiplex distortion. (<.4% Caller Distortion.)
- Automatic muting of Caller audio is standard.
- Caller control adjustment reduces Caller audio to permit the desired degree of announcer dominance.
- EPROM based memory for easy future updates.
- Sturdy, rack mountable unit (one rack unit high).
- Built-in power supply.
- Large, illuminated switches.
- Internal test tone generator.
- High quality, multi-feature, low cost digital hybrid.

Applications

Typical Broadcast Applications

A multi-line telephone is used to select a telephone line to be routed to the Digital Hybrid I. When the talent is ready to put the call on the air, the ON switch is pressed. The following then occurs:

a. The selected phone line is terminated and caller is muted.

b. A 300 millisecond burst of white noise is sent down the phone line.

c. The hybrid automatically nulls to the noise burst.

d. The output audio is unmuted and the Caller audio is routed to the input of the console.

The muting function is useful in broadcast applications because it masks the termination pops and clicks, making telephone connection clean and clear.

The mix-minus output of the console is routed to the MAIN SEND audio input of the Digital Hybrid I, and to the caller.

A typical broadcast station would use the Digital Hybrid I as shown in Figure 1.

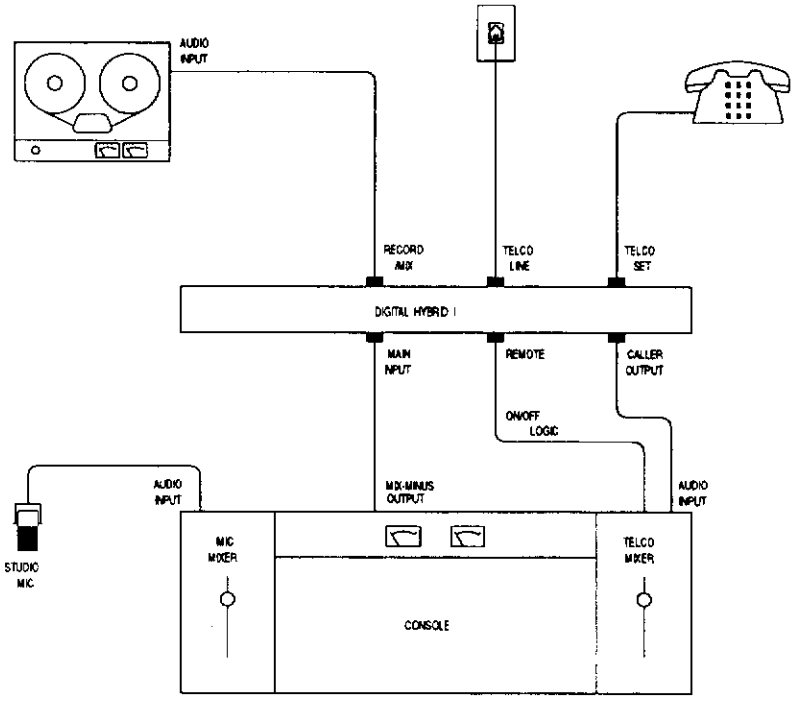


Figure 1

Typical Broadcast Installation

Conferencing Multiple Digital Hybrid I Units

Multiple Digital Hybrid I units can be conferenced for the airing of multiple callers.

Figure 2 shows two Digital Hybrid Is that could be connected to either a dedicated telephone line or to multi-line call directors.

When connected to multi-line call directors, maximum flexibility in placing two callers in a fully amplified conference is achieved.

In this configuration, both callers would hear the studio announcer and each other. Separate Caller Audio Outputs are available for application to the mixing console.

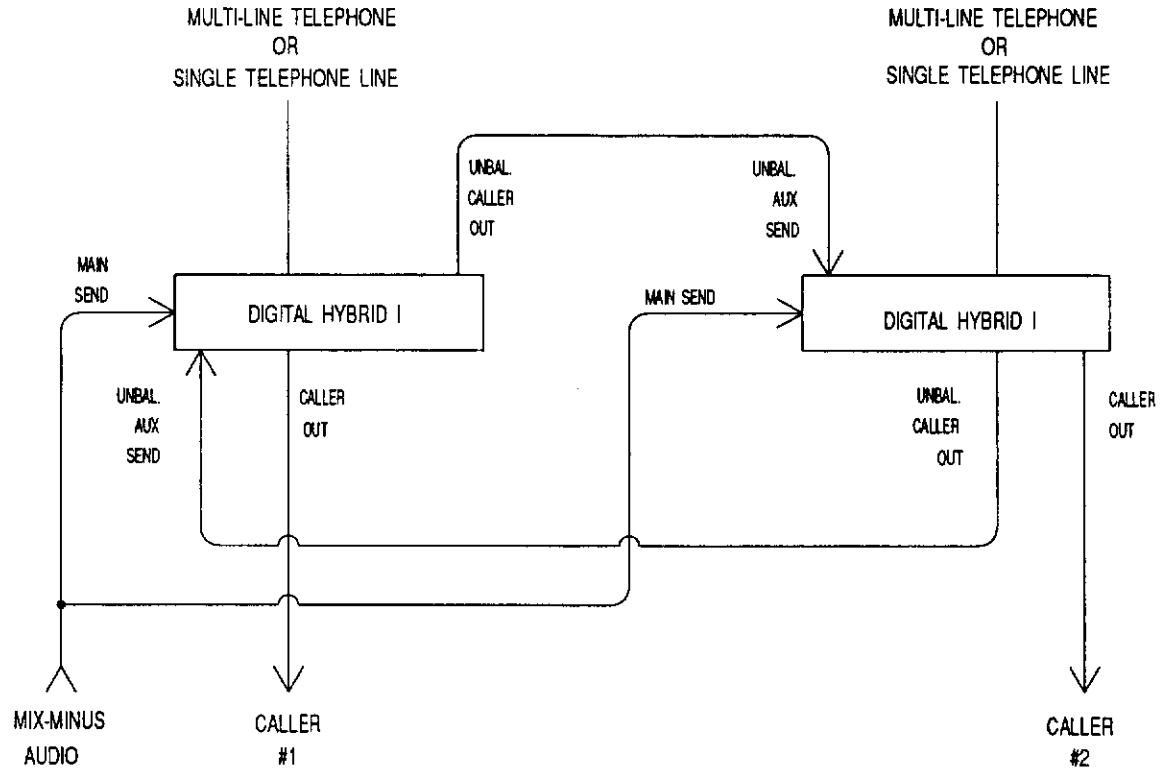


Figure 2

Dual Hybrids with Separate Audio Outputs

Product Description

Trim pots and DIP switches located behind the removable front access panel will be used and set during Installation and Calibration. After that, they will rarely need to be accessed. These controls, as well as the other front panel controls will be described below.

The drawing will show each control by number. The item will be referenced by that number in the descriptions.

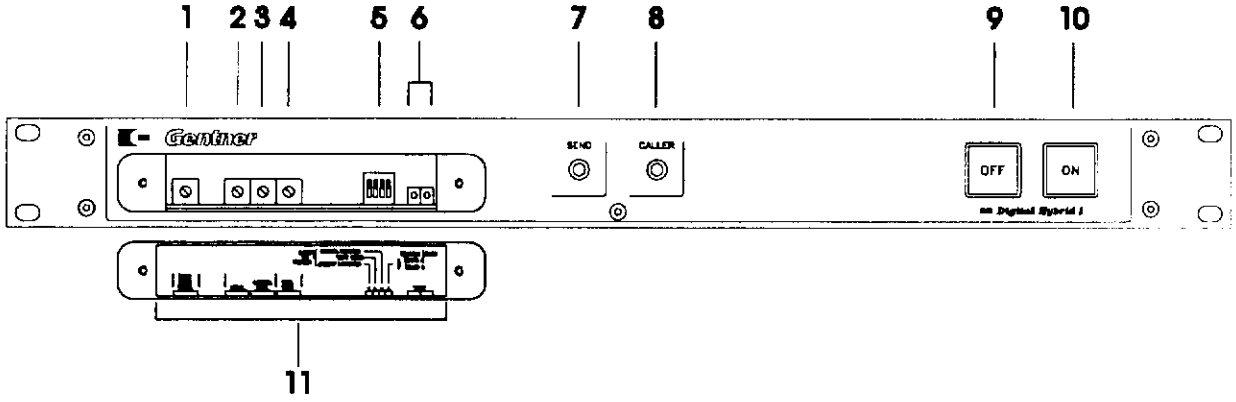


Figure 3

Front Panel Layout

Front Panel Controls and Indicators

1. MAIN SEND LEVEL. Use to adjust Main Send audio level into the hybrid. Monitor the Send level with the SEND LED (7).

2. CALLER LEVEL. Use to adjust the Caller audio level into the hybrid. Monitor the Caller level with the CALLER LED (8).

3. CALLER CONTROL. Use to adjust the talent's level of audio dominance over Caller audio. (Typically set at full counter-clockwise position.)

4. NULL TRIM. This Null trim pot is used to provide a coarse analog null. This is a one-time procedure during installation that will minimize voltage across the test jacks and allow maximum separation of the Send and Caller audio.

5. DIP Switches. Four DIP switches are provided to program your system to operate in the mode(s) required for your application. The four switches control ON/OFF latching, Test Tone, Digital Nulling and either A or B Nulling modes.

6. TEST. These test points will be used during setup procedure for analog null.

7. SEND LED. When the Digital Hybrid I is on line, the SEND LED will glow green when it senses that Send audio is present. The SEND LED will flash red to indicate that the Send level is 6 dB before clipping.

8. CALLER LED. This LED will glow green when the Digital Hybrid I senses Caller (receive) audio from the telephone line. The CALLER LED will flash red to indicate a level of 6 dB before clipping.

9. OFF Button. When the OFF button is pressed, the Digital Hybrid I disconnects from the telephone line and illuminates the OFF button indicator.

10. ON Button. When the ON button is pressed, the Digital Hybrid I closes its telephone line relay, connecting the hybrid circuitry to the telephone line. The ON button indicator will glow indicating an on-line status.

11. The label placed on the inside of the removable door lists the functions of the corresponding controls and DIP switches, for convenience during level setting and setup routines.

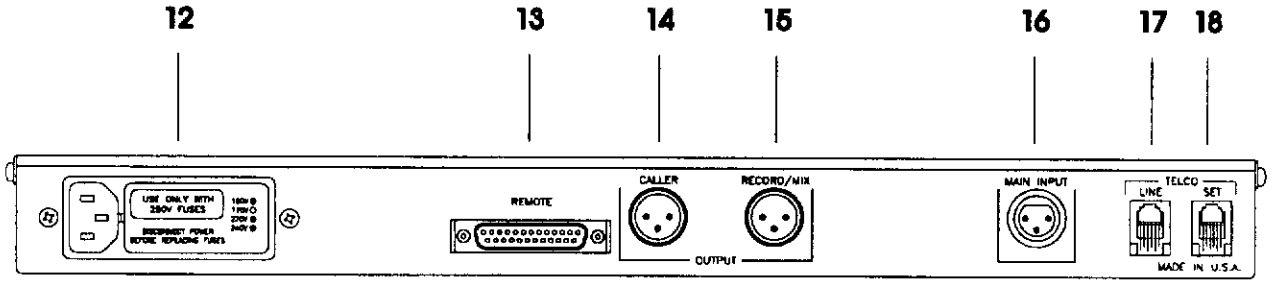


Figure 4

Back Panel Connections

Back Panel Connections

12. POWER MODULE. The power module can be set for voltage requirements of either 100, 120, 220 or 240, 50/60 Hz. It has been factory set at 120 VAC.

13. REMOTE. This 25-pin D-type connector is used to remotely control ON, OFF, AUX Send, Caller, REC/MIX and their indicators.

14. CALLER. The XLR connector is Caller audio output only. It is a balanced line level output.

15. RECORD/MIX. This XLR output connector provides a balanced line level sum of the Main Send and Caller audio. It is used to feed a tape recorder for recording telephone conversations.

16. MAIN (Send) INPUT. This XLR input is a balanced, bridging line level input connector containing your Send (program) audio.

17. LINE. This RJ-11C modular connector is used to connect your incoming telephone line to the hybrid.

18. SET. This RJ-11C modular plug connects your hybrid to a telephone set.

Getting Started

This manual will provide the information you need to properly use and maintain the Digital Hybrid I. Read this manual thoroughly before attempting to use your Digital Hybrid I for broadcast applications.

The "Telephone Basics" White Paper is a valuable primer on standard telephone systems. It is available from Gentner, if required for applications not covered in this manual. The publication also provides a good review for those already familiar with telephone interfacing requirements.

Please refer to this manual first if you have any questions or problems regarding the use of the Digital Hybrid I. If you cannot find an answer in the manual, please contact Gentner Technical Services at (801) 975-7200.

Checking Your Shipment

Please check your Digital Hybrid I shipment. Carefully unpack your shipment and check for any damage. If you notice any damage to the components, notify your shipping carrier immediately. Be sure to retain the original boxes and packing material for inspection by the carrier. Gentner is not responsible for product damage incurred during shipment. You must make claims directly with the carrier.

Next, check the contents of the shipping container to be certain that each item listed below is included. If any item is missing, notify Gentner immediately.

QTY.	ITEM	GENTNER P/N
1	Digital Hybrid I Unit Assembly	850-009-401
1	Operations Manual	800-009-401
1	Warranty Registration Card	432-600-000
4	Rack Screws	681-400-001
4	Rack Cups	684-400-001
1	Modular Telephone Cord	830-000-012
1	Molded Power Cord	699-150-006

Overview

The Digital Hybrid I utilizes highly sophisticated digital circuitry and digital signal processing techniques to optimize the isolation between the Send and Receive sides of a telephone conversation.

The performance advances provided by the Digital Hybrid I help reduce feedback, even when you have an open microphone in the same room with a loudspeaker.

The Digital Hybrid I provides a Caller Control circuit, allowing you to reduce the caller audio to the desired degree of announcer dominance.

Remote control functions of the unit can be accessed via a single rear panel REMOTE connector.

A removable metal panel on the front of the unit allows access to controls for MAIN SEND Level, CALLER LEVEL, and CALLER CONTROL. A coarse (analog) null adjustment is available, as well as a series of DIP switches for programming other functions and features of the Digital Hybrid I.

The unit has two LED indicators on the front panel. The SEND and CALLER LED's flash green to indicate the presence of respective audio, and flash red to indicate a level of 6 dB before clipping. This helps you prevent distortion due to excessive audio levels.

SEND input audio is mixed with CALLER audio and feeds both balanced and unbalanced audio outputs, which can then be used to feed both sides of the telephone conversation to a tape recorder.

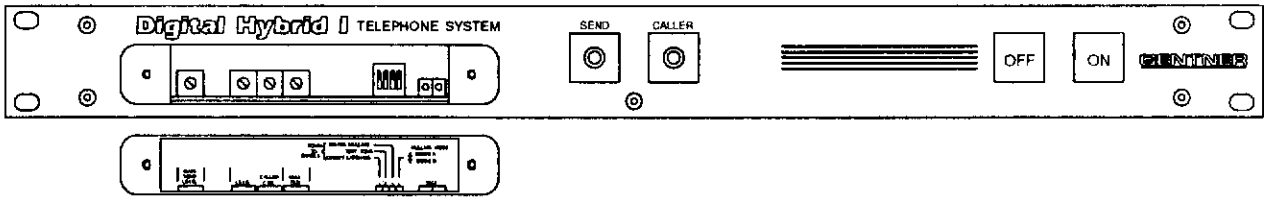


Figure 5

Front Panel with Control Door Open

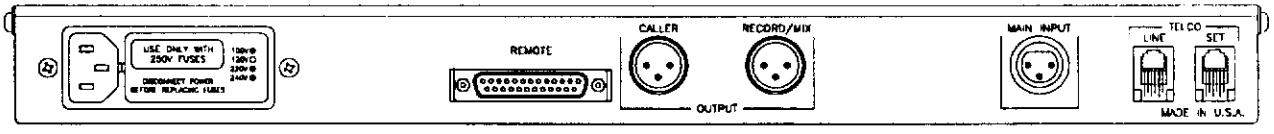


Figure 6

Back Panel

Installation

Mounting Your Digital Hybrid I

If desired, you can mount the Digital Hybrid I into a standard 19" equipment rack using the screws provided.

The Digital Hybrid I does not require an internal cooling fan. As long as the unit receives adequate ventilation, it will operate normally.

Gentner recommends an operating environment between 32 and 106° degrees F (0 and +50° C). Be careful not to block any of the ventilation holes in the unit's chassis. Always be sure that a free flow of air gets to the unit while it is operating.

NOTE: *You can also mount the Digital Hybrid I into a road case, making it easy to transport and protect from the elements and other environmental hazards. If you install your Digital Hybrid I into a road case, you should ensure that your Digital Hybrid I receives adequate ventilation.*

Setting Up the AC Power Input

CAUTION: Always be sure that the Digital Hybrid I is configured for the correct power source prior to operation.

Your Digital Hybrid I was shipped to you ready to use with a 120 VAC 50/60 Hz power source (unless otherwise marked.) You can easily alter the AC power input to accept 100, 220 or 240 VAC power input.

If your system requires a different voltage selection, refer to Figure 7 on the following page. (Otherwise, skip this step and proceed to "Connecting the Digital Hybrid I Directly to a Single Central Office Telephone Line", on page 12.)

Follow these instructions to change the system's voltage setting:

1. **DISCONNECT THE UNIT FROM AC POWER.** Unplug the electrical power cable from the rear panel.
2. Use a small screwdriver to remove the black access cover from the rear panel fuse/power assembly.
3. Use long-nosed pliers to pull on the nylon tab located near the right side of the assembly and remove the small square jumper board.
4. Manipulate the tab thrugh the channel until the imprinted voltage designation faces away from the nylon tab.
5. Reinsert the jumper board oriented so that the desired voltage imprint is away from you and the nylon tab is toward you.
6. Replace the fuse with the proper value as indicated below: For 100-120 VAC, the fuse should be 1/4 amp Slo-Blo. For 220-240 VAC, the fuse should be 1/8 amp Slo-Blo (customer provided).

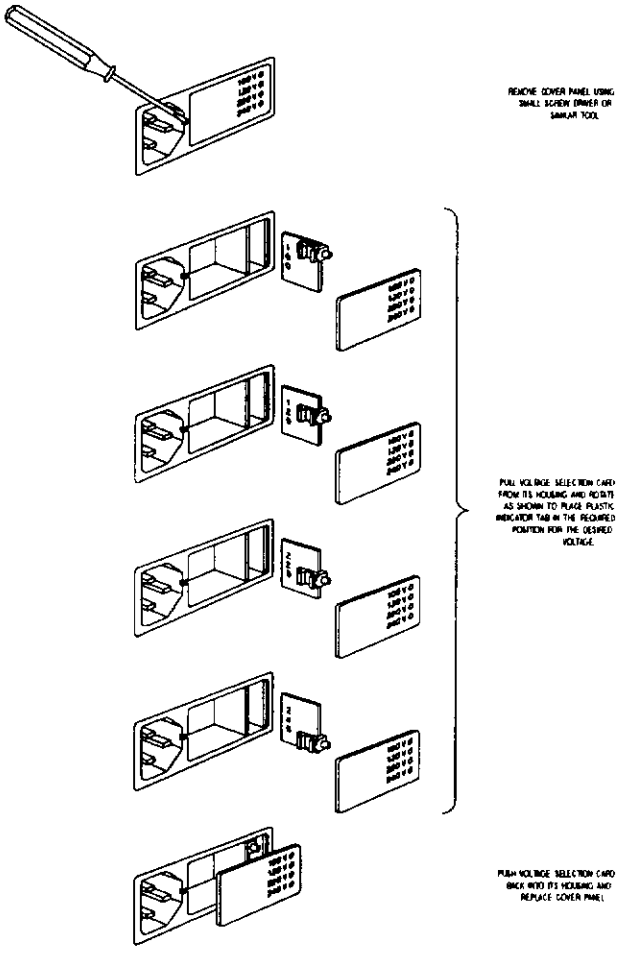


Figure 7

Changing the Power Voltage Setting

g. Replace the back access cover.

h. The tip of the nylon tab should indicate selected voltage as inscribed on the black access cover.

i. Replace the power cable and proceed with installation.

Connecting to a Single Central Office Telephone Line

Connect the incoming telephone line to the Digital Hybrid Is LINE jack with the appropriate modular telephone cable. Refer to Figure 8 for details.

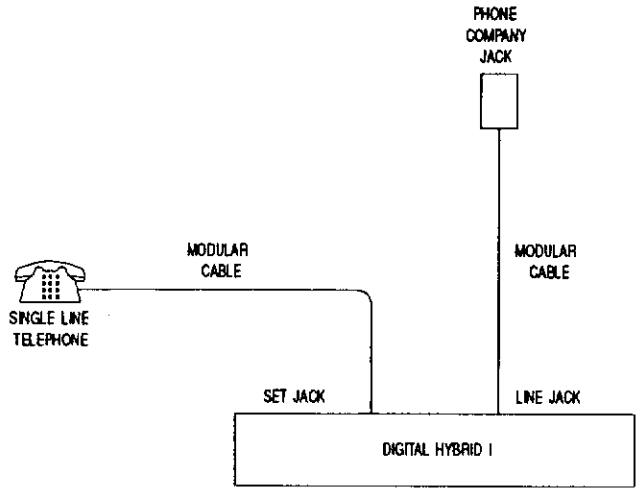


Figure 8

Connection to a Single Central Office Telephone

An optional telephone instrument can be connected to the SET jack. Telephone calls can be placed and received normally with the telephone instrument when the Digital Hybrid I is OFF.

Compatibility with Electronic KSU Telephone Sets

Many broadcast facilities and offices employ telephone equipment that uses microprocessor controlled key service units. Even though these systems are referred to as digital, the actual audio to the multi-line telephone instrument is often carried on an analog balanced pair.

Such systems can usually be satisfactorily interfaced to the Digital Hybrid I. It is recommended that you contact your interconnect company and inquire if they offer units (often called "jack sets" or "modem interface units" or "Tip and Ring equivalent jacks") that bring out the necessary connections for interfacing to the Digital Hybrid I.

A "FAX line", "modem line", or an "answering machine line" will usually solve any problems in getting the right connections for a Digital Hybrid I from an electronic key service system.

Other methods of interfacing to multi-line telephones are available. Contact your telephone system manufacturer or Gentner Technical Support if you need further assistance.

Connecting the Digital Hybrid I to Audio Equipment

The basic function of the Digital Hybrid I is to separate audio being sent to the caller (SEND audio) from audio being received from the caller (CALLER audio). Refer to Figure 9.

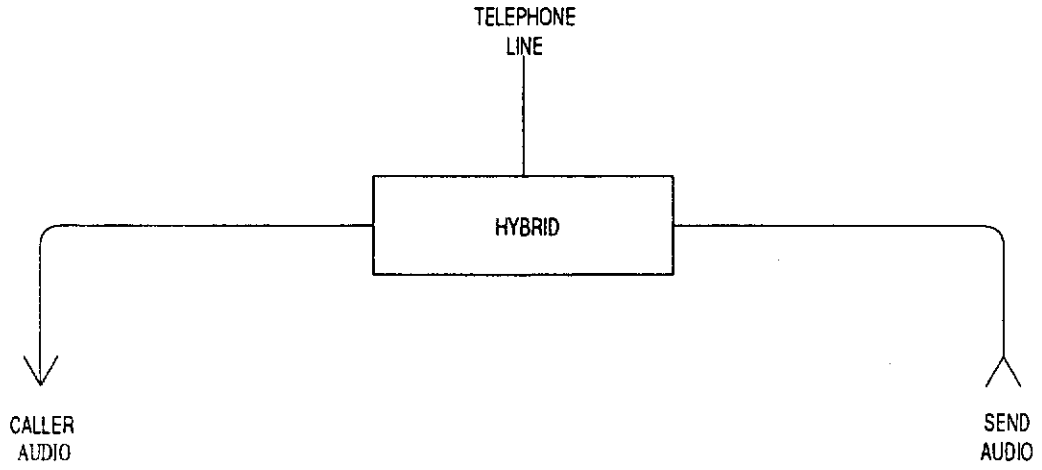


Figure 9

Function of a Telephone Hybrid

The primary audio connections for the Digital Hybrid I are made via XLR connectors and include MAIN SEND input, CALLER audio output and RECORD/MIX audio output. Refer to Figure 10.

The MAIN SEND input is a balanced, bridging line level input.

The RECORD/MIX audio output provides a balanced, line level sum of the MAIN SEND and CALLER audio.

The CALLER out is Caller audio only. It is a balanced line level output.

Additional unbalanced audio inputs and outputs are found on the DB-25 REMOTE connector.

If a mixing console is used to feed the MAIN SEND inputs of the Digital Hybrid I, the audio going down the line must not contain any CALLER audio. There are several ways to accomplish this:

1. Creation of a separate mix channel. If the console has an extra mixing output channel, use this channel to mix all the audio you want to send to the Digital Hybrid I, *except* the channel that will be connected to Caller audio.

2. Internal mix-minus bus. Mix-minus refers to a sum of all the audio sources in the console *minus* the Caller audio. Many console manufacturers provide this feature.

c. "Build Your Own" mix-minus by summing all audio sources to be sent to the caller.

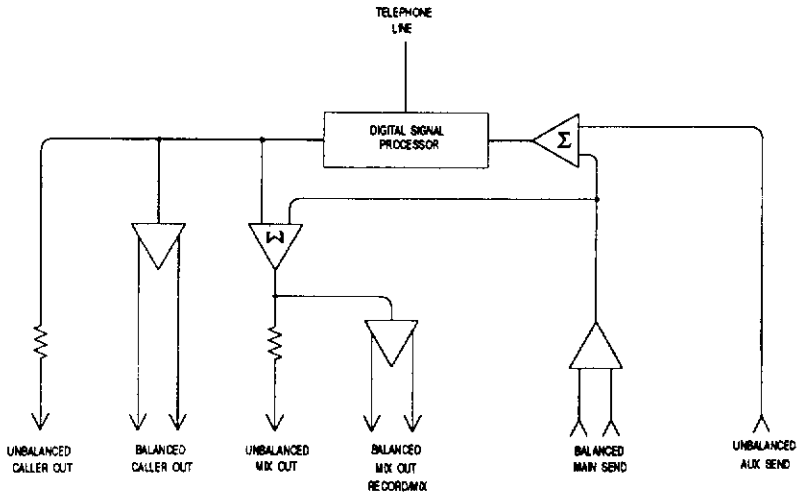


Figure 10

Digital Hybrid I Audio Connections

d. Discrete Microphone Mixer. If only microphone audio will be sent down the line, a separate microphone mixer may be utilized. This audio can then be sent to the Main Send input of the Digital Hybrid I as well as the input of the console.

e. One Channel Send. If a single source of audio will be sent to the caller (such as a microphone), simply use the line-level output of the microphone preamplifier.

The CALLER output XLR must be connected to a separate channel of an audio console or the input of an audio amplifier. This will allow monitoring of Caller audio.

The RECORD/MIX output XLR contains a sum of both Send and Caller audio. This audio combination is useful for recording both sides of telephone conversations.

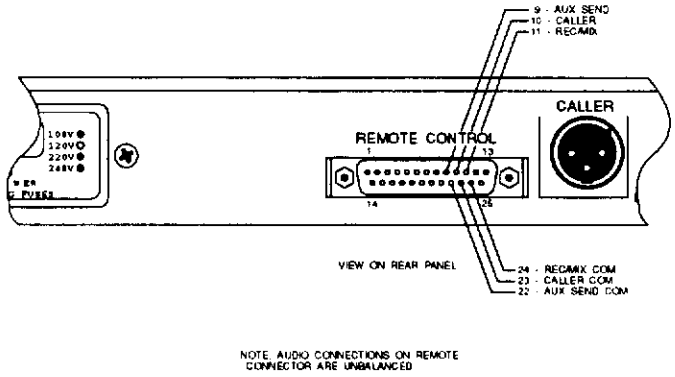
The REMOTE Connector

The REMOTE connector is a 25-pin D-type connector located on the rear panel of the Digital Hybrid I. The following is a pin-out of the remote control functions and audio connections that appear on the remote connector:

1. Remote ON
2. Remote OFF
3. Not used
4. Not used
5. Switch Common (b)
6. Not used
7. Not used
8. Not used
9. Unbalanced AUX Send
10. Unbalanced Caller
11. Unbalanced REC/MIX Audio Output
12. Not used
13. Not used
14. Remote ON Indicator (a)
15. Remote OFF Indicator (a)
16. Not used
17. Not used
18. Indicator Common (b)
19. Send Presence Remote Indicator (a)
20. Caller Presence Remote Indicator (a)
21. Indicator Common (b)
22. AUX Send Audio Common (c)
23. Unbalanced Caller Audio Common (c)
24. REC/MIX Audio Common (c)
25. Not used

(a) Open Collector Output
(b) Digital Ground
(c) Analog Ground

When looking at the REMOTE connector on the rear panel of the Digital Hybrid I, Pins #1 through #13 appear left to right on the top row of pins. Pins #14 through #25 appear left to right on the bottom row of pins. See Figure 11.



NOTE: AUDIO CONNECTIONS ON REMOTE CONNECTOR ARE UNBALANCED

Figure 11

Remote Connector Audio Pin Outs

Functions of the pins on the 25-DB REMOTE connector are as follows:

Pin #1: Remote ON
Pin #5: Switch Common

These connections are used to remotely turn the Digital Hybrid I on. The switching action can be either momentary or latching, as selected by front panel DIP switch 1. The Digital Hybrid I is shipped with DIP switch 1 in the UP position. In this position, a momentary closure between REMOTE connector pins #1 and #5 will turn on the Digital Hybrid I.

NOTE: If you choose to use the remote ON/OFF switching in the latching mode, the Digital Hybrid I front panel ON/OFF switches will not function normally.

Pin #2: Remote OFF
Pin #5: Switch Common

A momentary closure between these pins turns off the Digital Hybrid I. When DIP switch 1 (latching) is in the down position, the Remote OFF pin is not needed. The DH I will turn off when the latching ON closure is removed from Pin 1.

Pin #9: Unbalanced AUXILIARY Send
Pin #22: AUXILIARY Send Audio Common (Ground)

This is an unbalanced AUXILIARY SEND audio input. These connections will be used when conferencing multiple Digital Hybrid Is.

NOTE: Do not connect the minus (-) audio signal from actively balanced source to Pin #22, as this would place a direct short circuit across the minus half of the source amplifier. Connection of the plus (+) audio signal is all that is necessary. A single ground-return path is suggested.

Pin #10: Unbalanced Caller
Pin #23: Unbalanced Caller Audio Common (Ground)

This is an unbalanced CALLER audio output. It can be used for applications requiring an additional unbalanced CALLER output.

Pin #11: Unbalanced RECORD/MIX Audio Output
Pin #24: RECORD/MIX Audio Common (Ground)

This provides an unbalanced RECORD/MIX audio output which may be used for a wide range of applications. For example, this output may be used to feed a tape recorder for recording telephone conversations.

Pin #14: Remote ON Indicator
Pin #15: Remote OFF Indicator

These pins are used to remote the ON, OFF, indicators. Pins #14, and #15 provide open collector outputs capable of sinking 100 mA at 40 VDC. An external voltage supply must be used to power the remote indicators. The voltage must be referenced to Pin #18 and must not exceed 40 VDC. Also the current into each of these pins must not exceed 100 milliamps.

Pin #18: Indicator Common(Ground)

Use this pin as the negative (ground) reference for the external power supply used to drive remote indicator lamps or LEDs. See Pins #14, 15, above.

Pin #19: Send Presence Remote Indicator
Pin #20: Caller Presence Remote Indicator

These pins are used to provide remote indication of the front panel Send Presence and Caller Presence LEDs. They provide open collector outputs capable of sinking 100 mA at 40 VDC. An external voltage supply must be used to power the remote indicators. This supply can be referenced to Pin #21 and must not exceed 40 VDC. Also, the total current into each of these pins must not exceed 100 milliamps.

These outputs will be active (low) whenever the front panel indicators are illuminated with green. They are inactive (high) when the front panel indicators are extinguished or illuminated red.

Pin #21: Indicator Common (Ground)

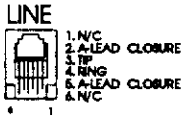
Use this pin as the negative (ground) reference for the external power supply used to drive remote indicator lamps or LEDs. See Pins #19 and #20 above.

The LINE and SET Connectors

LINE Connector

This modular RJ-11C connector allows direct connection to the telephone line or an associated call director.

Pin designations are, right to left (as viewed from the rear of the Digital Hybrid I):



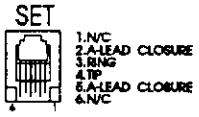
LINE CONNECTOR PIN OUTS	
1	To pin 6 of SET RJ-11C
2	To pin 5 of SET
3	Tip
4	Ringer
5	To pin 2 of SET
6	To pin 1 of SET RJ-11C

SET Connector

This modular RJ-11C connector provides connection for a single line telephone instrument.

When the Digital Hybrid I is in the OFF mode, the telephone line (connected to the LINE RJ-11C connector) is routed to this jack. When the Hybrid is in the ON mode, this jack is disabled.

Pin designations are, right to left (as viewed from the rear of the Digital Hybrid I):



SET CONNECTOR PIN OUTS	
1	To pin 6 of LINE RJ-11C
2	To Pin 5 of LINE
3	Ring
4	Tip
5	To pin 2 of LINE
6	To pin 1 of LINE RJ-11C

Calibration

Overview

After the Digital Hybrid I has been installed, the controls behind the removable front panel must be adjusted.

These controls consist of:

a. Three audio control trim-pots

b. One coarse (Analog) null adjustment

c. Four option switches

These controls are illustrated in Figure 12.

The functions of these controls are conveniently summarized by the reference label attached to the reverse side of the removable front panel.

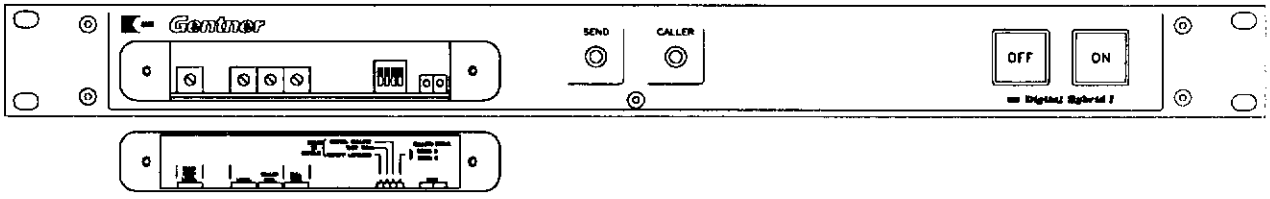


Figure 12

Front Panel with Removable Front Panel in Open Position

Analog Null Setup Procedure

The exceptional performance of the Digital Hybrid I begins with analog hybrid separation of Send and Caller (receive) audio.

The Digital Hybrid I relies on a standard analog hybrid to provide a coarse null. It then uses digital signal processing to optimize the null. Therefore, it is important to optimize the coarse analog null to enable the digital processing to maximize the fine nulling.

Adjustment of the analog null is a one-time setup operation. Refer to Figure 3-1 for assistance in locating the null adjustment trim pot, and the null test points. To setup the coarse null for this unit, please follow these steps:

1. Press the front panel OFF Switch.

2. Use a telephone instrument connected to the SET jack of the Digital Hybrid I to dial an outside telephone line. This will provide a connection through the telephone company's Central Office.

The line must be a quiet line to successfully complete this coarse null procedure. A quiet line can be obtained by either asking the party you have called to cover the mouthpiece of their telephone, or to disconnect the handset.

3. Connect an AC Voltmeter to the test jacks that are located at the right inside front panel access door.

4. Press the Digital Hybrid Is ON Switch.

***NOTE:** If a monitor speaker is being used, turn down the level before proceeding.*

5. Place DIP Switch 2 in the DOWN position. This enables a 625 Hz null test tone.

6. Place DIP Switch 3 in the UP position. This disables the digital nulling.

7. Adjust Null Trim Pot for minimum voltage across the test jacks.

8. Place DIP Switch 3 in the DOWN position. This will re-enable the digital nulling.

9. Place DIP Switch 2 in the UP position. This will disable the 625 Hz test tone.

10. Press the Digital Hybrid Is OFF Switch

This completes the procedure for adjusting the coarse null of the Digital Hybrid I. This procedure is only required on initial installation.

Adjusting the MAIN SEND Input Level

To adjust the MAIN SEND level, follow the procedure outlined below:

1. Press the front panel OFF Switch.

2. Use a telephone instrument connected to the SET jack of the Digital Hybrid I to dial an outside telephone line. (It is not necessary for the line to be a quiet line.)

3. Press the ON Switch of the Digital Hybrid I.

4. Apply program audio material at a normal operating level to the MAIN INPUT XLR connector on the rear panel of the Digital Hybrid I.

5. Locate the MAIN SEND trimmer potentiometer. It is the left-most trim-pot seen when looking at the front panel. See Figure 12.

6. Adjust the MAIN SEND LEVEL trim-pot so that the front panel SEND LED glows green most of the time and flashes red occasionally on the peaks. Red indicates a level of 6 dB before input clipping.

7. Press the front panel OFF control.

This completes adjustment of the MAIN SEND level.

NOTE: *It may be desirable to vary the setting from this point, depending on your own evaluation.*

Generally speaking, you will want to avoid sending too much audio level down the telephone line. By sending a minimum audio level, the hybrid leakage into the Caller (receive) output is reduced, improving the effective performance of the hybrid.

Also, sending a minimum audio level has a beneficial side-effect which causes the caller to speak louder, thereby improving the signal to noise ratio on the telephone line.

Adjusting the CALLER Level and CALLER Control Trimmers

Locate the CALLER LEVEL trimmer potentiometer. It is the second trim-pot from the left as viewed from the front of the Digital Hybrid I. (See Figure 12.)

Make certain that the Digital Hybrid I is OFF, then initiate a telephone call using a telephone connected to the SET jack on the Digital Hybrid I.

1. Press the Digital Hybrid Is ON Switch.

2. While the party on the other end of the call is speaking, adjust the CALLER LEVEL trim-pot to provide the proper output level for your audio equipment.

3. Locate the CALLER CONTROL trimmer potentiometer. It is the third trim-pot from the left, as viewed from the front of the Digital Hybrid I.

4. The CALLER CONTROL feature of the Digital Hybrid I automatically reduces (dims) the level of the Caller audio when Send audio is present (when the Talent is talking).

5. The purpose of this control is to allow the talent to dominate the conversation while speaking normally.

6. The amount of this Caller level reduction (dimming) is determined by the Caller Control trim-pot.

7. When the CALLER CONTROL trim-pot is fully counter clockwise, there is no Caller Control action. This is equal to 0 dB of Caller level reduction or dimming.

8. With the CALLER CONTROL trim-pot fully clockwise, approximately 40 dB of Caller level reduction (dimming) will occur whenever the talent is speaking (Send audio is present). This much

Caller Control causes the unit to act much like a speakerphone and is not recommended for most applications.

The CALLER CONTROL trimmer may be set for any amount of Caller level reduction (dimming) desired within the 0 dB to 40 dB range.

For most applications, 8 dB of Caller level reduction (dimming) allows the talent to always dominate the telephone conversation by controlling the audio level. The 8 dB setting allows the caller to still be heard clearly in a double-talk situation.

Setting the DIP Switches

There are four switches contained in a single DIP package location behind the removable front panel of the Digital Hybrid I. These switches are numbered 1 through 4, left to right, as viewed from the front of the unit. Refer to Figure 12.

A summary of the functions of the DIP switches is given in the following table:

DIP SWITCH SETTINGS	
Switch No.	**Function**
1	ON/OFF Latching
2	Test Tone
3	Digital Nulling
4	Nulling Mode

In all cases, if the DIP switch is in the DOWN position, the function is enabled.

A summary of the DIP switch functions is also illustrated on the label attached to the back of the removable front panel cover of the Digital Hybrid I.

A description of the function of each switch is shown below:

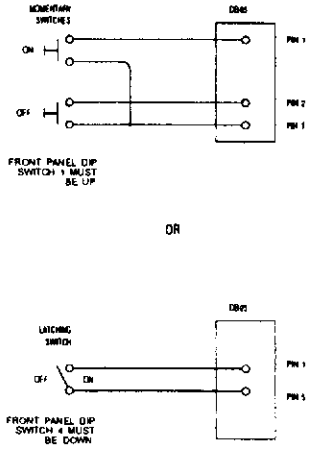


Figure 13

Remote ON/OFF Control

Switch 1: ON/OFF Latching

When this DIP switch is in the UP position, the Digital Hybrid Is On/Off functions can be controlled by the two momentary front panel ON and OFF switches, or two remote momentary switches connected to the DB-25 REMOTE connector on the rear panel of the unit. UP is the normal position for this DIP switch since it enables the front panel ON and OFF Switches.

If this switch is in the DOWN position, On/Off switching can only be controlled by a single remote latching ON/OFF switch. Because the front panel ON and OFF Switches are momentary, they do not function normally when this DIP switch is DOWN.

Refer to "The REMOTE Connector" on page 15 for REMOTE connector pin-out information regarding the remote ON and OFF control functions.

If your equipment provides a latching closure output which will be used to control the Digital Hybrid I, front panel Switch 1 should be placed in the DOWN position.

With Switch 1 in the down position, a latching closure across the REMOTE connector's ON pins (#1 and #5) will cause the Digital Hybrid I to go through its normal routine of nulling and then unmuting the Caller audio output. When the closure is reopened, the hybrid will mute and return to the off-line state.

NOTE: *When using the latching ON/OFF switching, no remote OFF Switch is to be used. Also, the front-panel ON and OFF Switches of the Digital Hybrid I will not function normally.*

Figure 13 shows two examples of connection for remote ON/OFF control.

Switch 2: Test Tone

With this switch in the DOWN position, the test tone generator is enabled.

This provides you with a signal source for use in checking audio and in setting up the Analog Null. (See "Analog Null Setup Procedure" on page 19.) This DIP switch is normally in the UP position so that the test tone is disabled.

Switch 3: Digital Nulling

The Digital Hybrid I uses analog nulling techniques to achieve a coarse null and digital nulling techniques to fine tune the null.

The normal operating position of this DIP switch is the DOWN position. Placing Switch 3 in the UP position disables the digital nulling portion of the hybrid to allow the coarse null setup procedure to be accomplished (as outlined in "Analog Null Setup Procedure" on page 19).

Switch 4: Mode A / Mode B Nulling Modes

For normal operation, the Digital Hybrid I should be powered up with the DIP Switch in the UP position (Mode A).

If the line quality is compromised due to excessive external circumstances, Mode B may be enabled to intensify the nulling ability. Move the DIP Switch to the DOWN position (Mode B). If you have any question about the best operating mode for your line conditions, test the line in both modes.

NOTE: *If the position of DIP Switch 4 is changed, the Digital Hybrid I must be powered down then powered back up before the new position is recognized.*

Operation

The operation of the Digital Hybrid I is very easy when installed and set up properly. The following controls will operate as follows:

ON When the ON Switch is pressed, the Digital Hybrid I closes its telephone line relay, connecting the hybrid circuitry to the telephone line. The ON switch indicator will glow indicating an on-line status.

The hybrid mutes Caller audio, waits for the telephone loop current to become stable, and then applies a 300 millisecond burst of white noise to the telephone line. This noise is used by the Digital Signal Processor (DSP) to adjust its filter coefficients to maximize the hybrid null.

After the white noise has been removed, the hybrid removes the mute from the Caller amplifier, allowing telephone line audio to appear at the appropriate output connections on the rear panel.

If the ON Switch is pressed again during the course of a call, the filter coefficients are re-initialized and the nulling and muting process repeats itself without disconnecting the telephone line.

OFF When the OFF Switch is pressed, the Digital Hybrid I disconnects from the telephone line and illuminates the OFF switch indictor.

SEND LED When the Digital Hybrid I is on-line, the SEND LED will glow green when it senses that Send audio is present. The SEND LED will flash red to indicate that the Send level is 6 dB before clipping.

CALLER LED This LED will glow green when the Digital Hybrid I senses Caller (receive) audio from the telephone line. The CALLER LED will flash red to indicate a level of 6 dB before clipping.

Technical Information

The Digital Hybrid I is based on Digital Signal Processing (DSP) technology, which maximizes separation between the Send and Caller sides of a telephone conversation.

When the ON switch is pressed, the Digital Hybrid I activates a relay that connects the hybrid circuitry to the telephone line.

The internal microprocessor mutes Caller audio, waits for the telephone loop current to become stable and then applies a 300 millisecond burst of white noise to the telephone line. The microprocessor analyzes the noise and adapts the digital hybrid to maximize the null.

After the white noise burst is completed, the microprocessor removes the mute from the Caller audio amplifier, allowing Caller audio to appear at the Caller XLR connector on the rear panel of the unit.

While the Digital Hybrid I is on-line, the null is constantly optimized to adjust for changing telephone line and program audio conditions.

If the ON switch is pressed during the course of a telephone call, the ON switch is illuminated and the nulling and muting process repeats itself without disconnecting the telephone line. When the unit is in the latching mode, this process does not apply.

When the OFF switch is pressed, the Digital Hybrid mutes Caller output, disconnects the telephone line and illuminates the OFF switch indicator.

Specifications

The Digital Hybrid is enclosed in a rugged metal case, which may be mounted in a standard 19" equipment rack.

Physical Specifications

Height	1.75" / 4.45 cm
Width	19" / 48.26 cm
Depth	12" / 30.48 cm
Weight	10 lbs. / 4.53 kg.
Shipping Weight	13.4 lbs. / 5.9 kg.

Electrical Specifications

Power Requirements	100-120 / 220-240 VAC 50/60 Hz; 5 Watts maximum
Temperature Range	32 to 106° F (0 to +50° C)

Telephone Specifications

Line Connection	Modular RJ-11C
External Set	Modular RJ-11C (LINE connected to SET when the unit is off)
Hybrid	Standard Hybrid transformer coupled with Digital Signal Processor (DSP) leakage suppression.
Key Service Compatibility	Any key system providing true tip and ring compatibility to telephone instruments.
Tip/Ring Switching	Magnetically latching, DPDT relay.

Telephone Transmit

All measurements are referenced to a +4 dBu input and a -15 dBm level put on the telephone line.

Send Distortion	<.4% THD, 270 to 3000 Hz (Nulling Mode A)
Send SNR	>60 dB
Send Filter	+/- 2 dB from 270 to 3000 Hz -30 dB @ 6300 Hz

Telephone Receive

All measurements are referenced to a -15 dBm telephone input and a +4 dBm output level.

Receive Distortion	0.4% THD, 270 to 3300 Hz (Nulling Mode A)
Receive SNR	>60 dB
Receive Filter	+/-1 dB @ 270 and 3300 Hz -30 dB @ 100 Hz and 6300 Hz

Audio Interface

MAIN SEND Input	Active balanced, 20 K ohm, XLR bridging input, +4 dBu nominal. Level is adjustable via front access panel trim pot.
AUXILIARY SEND Input	Unbalanced, 20 K ohm +4 dBu fixed gain. Pin 9 of Remote connector. The AUXILIARY SEND audio does *not* appear at the MIX OUTPUT.
CALLER Output	Active balanced, 600 ohm nominal output impedance. Nominal output level +4 dBm, clip level +20 dBm. Also 600 ohm unbalanced CALLER output at Remote connector.
MIX Output	Active balanced, 600 ohm nominal output impedance: 4 dBm nominal fixed output level. Also 600 ohm unbalanced MIX output at Remote connector.

Remote Connector

REMOTE	25-pin D-type connector.

LINE and SET Telephone Connectors

LINE	RJ-11C modular connector
SET	RJ-11C modular connector

Digital Hybrid I Firmware License

The Digital Hybrid I is a microprocessor-based system. All firmware for the unit was developed by Gentner Communications Corporation.

By purchasing the Digital Hybrid I, you accept the terms of the Gentner Firmware License Agreement stated below. This License Agreement becomes effective as of the date of purchase of the Digital Hybrid I.

Gentner Firmware License Agreement

Gentner Communications Corporation, (hereinafter referred to as Gentner), is sole owner of the Digital Hybrid I firmware. The Digital Hybrid I firmware is defined as all software stored in the memory device supplied with this license. Gentner grants to the purchaser and/or the end-user of the Gentner Digital Hybrid I unit a non-exclusive license to use the firmware under the following terms and conditions.

This firmware is:

a. For use only on the Digital Hybrid I which has been purchased and properly registered by serial number with Gentner.

b. Not to be copied or duplicated in any way, and not to be transferred or delivered to any other person or entity without the written consent of Gentner.

c. Protected by all applicable copyright and patent laws. Any copyrights and patents assigned to Gentner for the Digital Hybrid I remain the sole property of Gentner.

This license does not assign or transfer ownership of the firmware. Included in this license is all information contained in the instruction manuals, schematic diagrams, and related materials. This license shall remain in effect for the life of your Digital Hybrid I. You may terminate the license by returning the Digital Hybrid I to Gentner in its original container. This license is automatically terminated if you violate any of the terms and conditions of this license. Upon such termination, the Digital Hybrid I must be returned to Gentner.

This license agreement is granted solely to the original purchaser of the Digital Hybrid I. If the Digital Hybrid I, and thus the firmware and this license, is to be passed to another person or entity in any way, the original purchaser must advise Gentner in writing of this transfer. The new holder of the Digital Hybrid I must acknowledge in writing acceptance of the terms and conditions of this license. The license be deemed terminated if such written acceptance is not presented to Gentner.

Product Line Updates

Gentner Broadcast Systems will offer, from time to time, new products, options, and firmware updates for its product line. As a registered owner of a Gentner product, you will automatically be notified of updates when them become available.

You must return a completed Warranty Card in order to be notified of updates to the product line.

If the card is lost, you may notify us by letter. Your letter must include the following information:

a. The Digital Hybrid I Serial Number.

b. Your Name

c. The name of your organization.

d. Your address

e. Date of purchase

f. The name of the company from whom you purchased your Digital Hybrid I.

Mail your Warranty Registration Card to:

Gentner Communications Corporation
Professional Audio Products Division
1825 Research Way
Salt Lake City, Utah 84119

All control functions of the Digital Hybrid I are contained in an EPROM (Erasable Programmable Read Only Memory) chip. This means that by simply changing the firmware EPROM, future updates of the Digital Hybrid I can be implemented.

The replacement of one EPROM, designated U33, will be all that is required for the majority of future upgrades. For upgrades involving a firmware EPROM change, field installation is possible. Procedures for performing future upgrades will be sent with upgrade kits.

If you prefer to send the unit to the factory, Gentner Technical Support will be able to install future upgrades into your Digital Hybrid I.

Warranty Agreement

GENTNER COMMUNICATIONS CORPORATION (Manufacturer) warrants that this product is free of defects in both materials and workmanship. Should any part of this equipment be defective, Manufacturer agrees, at its option, to:

A. Repair or replace any defective part free of charge (except transportation charges) for a period of one year from the date of the original purchase, provided the owner returns the equipment to the Manufacturer at the address set forth below. No charge will be made for parts or labor during this period;

B. Furnish replacement for any defective parts in the equipment for a period of one year from the date of original purchase. Replacement parts shall be furnished without charge, except labor and transportation.

This Warranty excludes assembled products not manufactured by Manufacturer whether or not they are incorporated in a Manufacturer product or sold under a Manufacturer part or model number.

THIS WARRANTY IS VOID IF:

A. The equipment has been damaged by negligence, accident, act-of-God or mishandling, or has not been operated in accordance with the procedures described in the operating and technical instructions; or,

B. The equipment has been altered or repaired by other than Manufacturer or an authorized service representative of Manufacturer; or,

C. Adaptations or accessories other than those manufactured or provided by Manufacturer have been made or attached to the equipment which, in the determination of Manufacturer, shall have affected the performance, safety or reliability of the equipment; or,

D. The equipment's original serial number has been modified or removed.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE, APPLIES TO THE EQUIPMENT, nor is any person or company authorized to assume any warranty for Manufacturer or any other liability in connection with the sale of Manufacturer's products.

Manufacturer does not assume any responsibility for consequential damages, expenses or loss of revenue or property, inconvenience or interruption in operation experienced by the customer due to a malfunction in the purchased equipment. No warranty service performed on any product shall extend the applicable warranty period.

In case of unsatisfactory operation, the purchaser shall promptly notify Manufacturer at the address set forth below in writing, giving full particulars as to the defects or unsatisfactory operation. Upon receipt of such notice, Manufacturer will give instructions respecting the shipment of the equipment, or such other matters as it elects to honor this warranty as above provided. This warranty does not cover damage to the equipment during shipping and Manufacturer assumes no responsibility for such damage. All shipping costs shall be paid by customer.

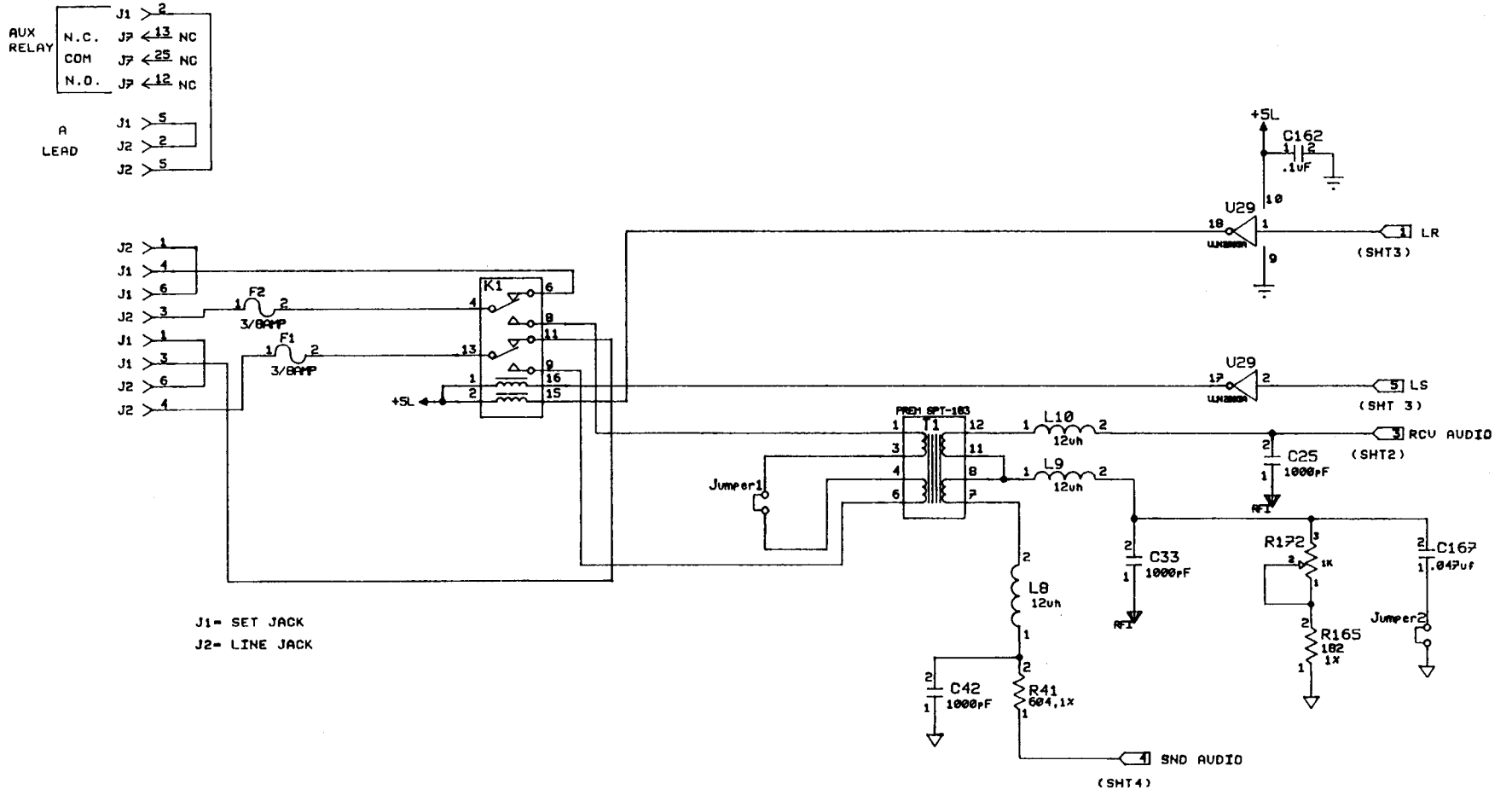
This warranty extends only to the original purchaser and is not assignable or transferable.

Gentner Communications Corporation • 1825 Research Way • Salt Lake City, Utah 84119

Schematics

Schematics for the Digital Hybrid I are on the following pages.

REVISIONS				
ZONE	LTR.	DESCRIPTION	DATE	APPROVED
ALL	A1	PRODUCTION RELEASE	3/93	
ALL	A2	VALUE CHANGE: R84 TO 84.5K	10/93	



J1= SET JACK
J2= LINE JACK

TELEPHONE INTERFACE

NOTES: UNLESS OTHERWISE SPECIFIED:

1. RESISTANCE VALUES ARE EXPRESSED IN OHMS, "K" DENOTES 1000 OHMS. CAPACITANCE VALUES ARE EXPRESSED IN MICRO FARADS, (UF). INDUCTOR VALUES ARE EXPRESSED IN MICRO HENRIES, (UH).

2. STANDARD GROUND SYMBOLS :

DIGITAL GND
ANALOG GND
R.F.I. GND
SPECIAL GND A

DIMENSIONS IN INCHES
DO NOT SCALE

TOLERANCES
.XX = ±.02 | .XXX = ±.010 | ∠ = ±1°

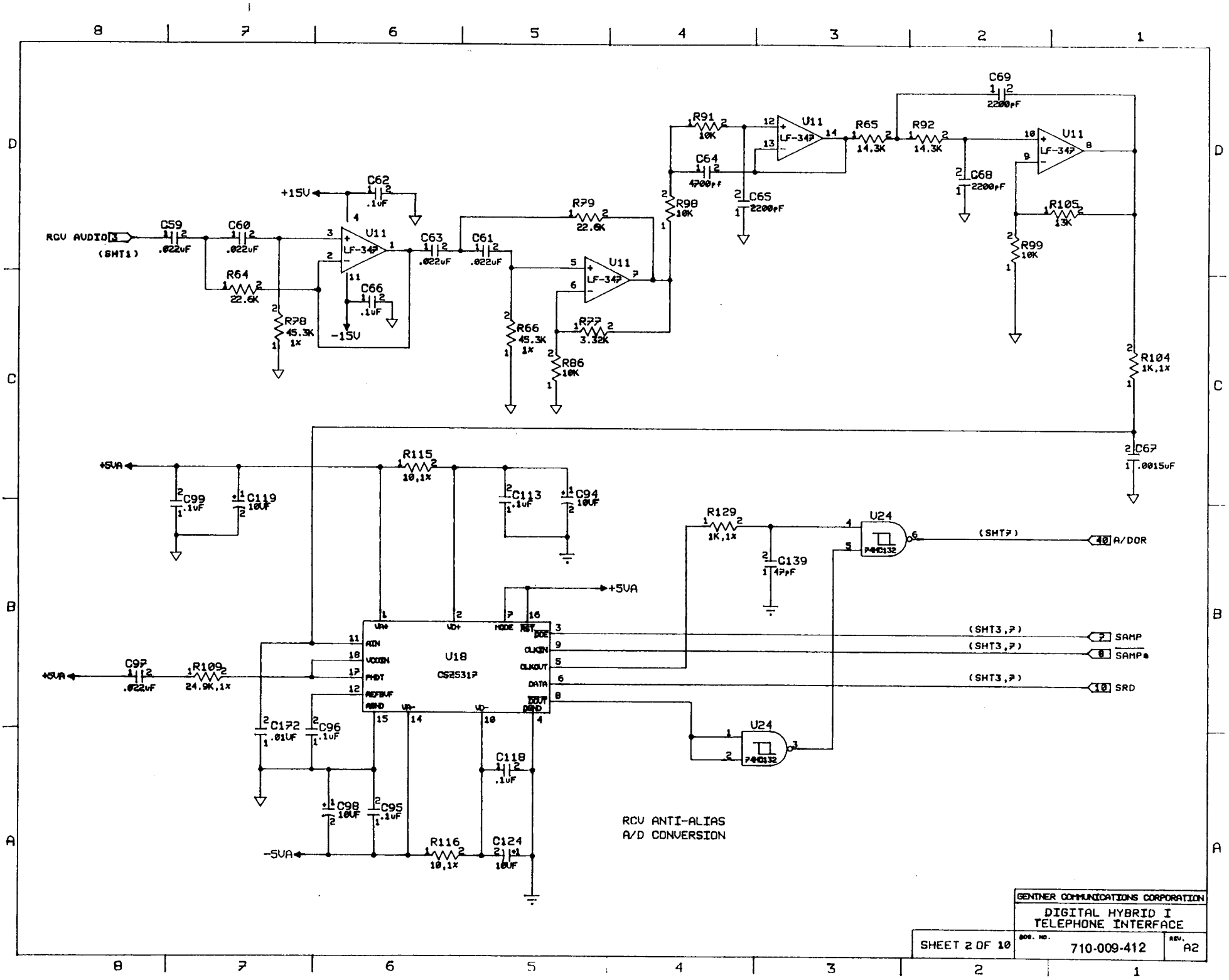
DRAWN S.P.M. DATE 10/92
CHECKED DATE
APPROVED DATE
PROJECTION

SHEET 1 OF 10

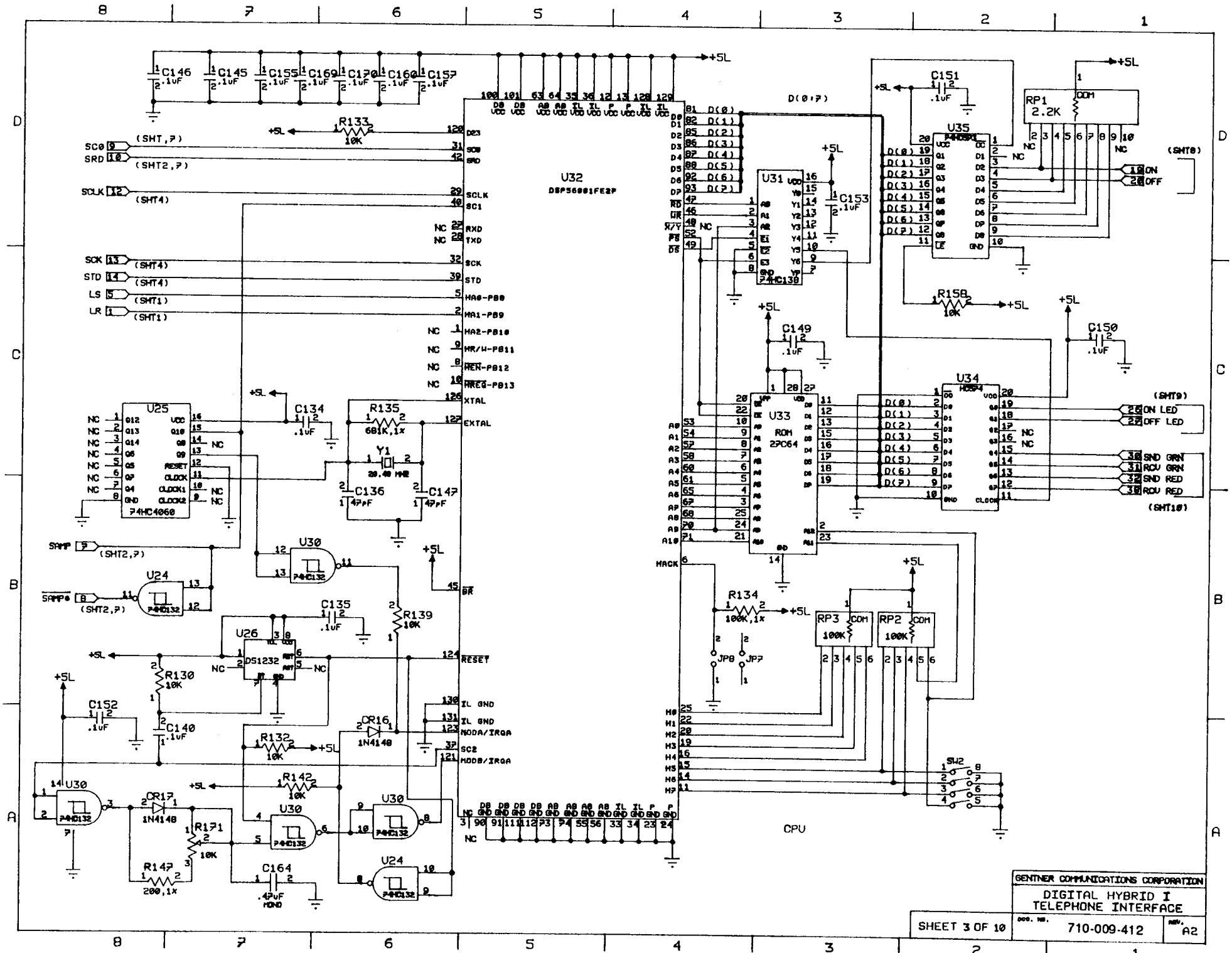
GENTNER
1825 Research Way, SLC, UT. 84119

TITLE
DIGITAL HYBRID I
TELEPHONE INTERFACE
ELECTRICAL SCHEMATIC

DOC. NO. 710-009-412
REV. A2



GENTNER COMMUNICATIONS CORPORATION	
DIGITAL HYBRID I TELEPHONE INTERFACE	
SHEET 2 OF 10	DOC. NO. 710-009-412 REV. A2


GENTNER COMMUNICATIONS CORPORATION
DIGITAL HYBRID I
TELEPHONE INTERFACE
SHEET 3 OF 10
DOC. NO. 710-009-412
REV. A2
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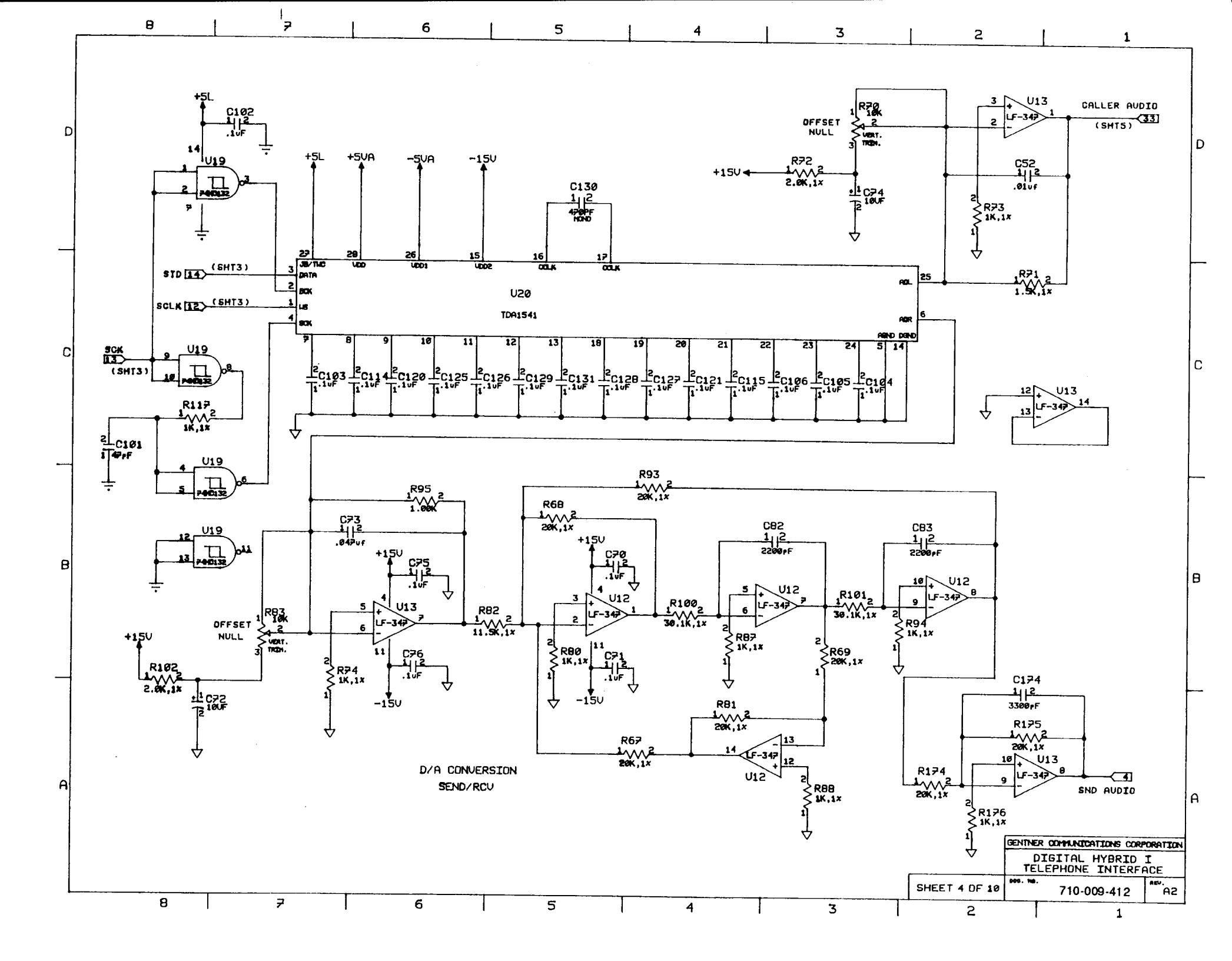
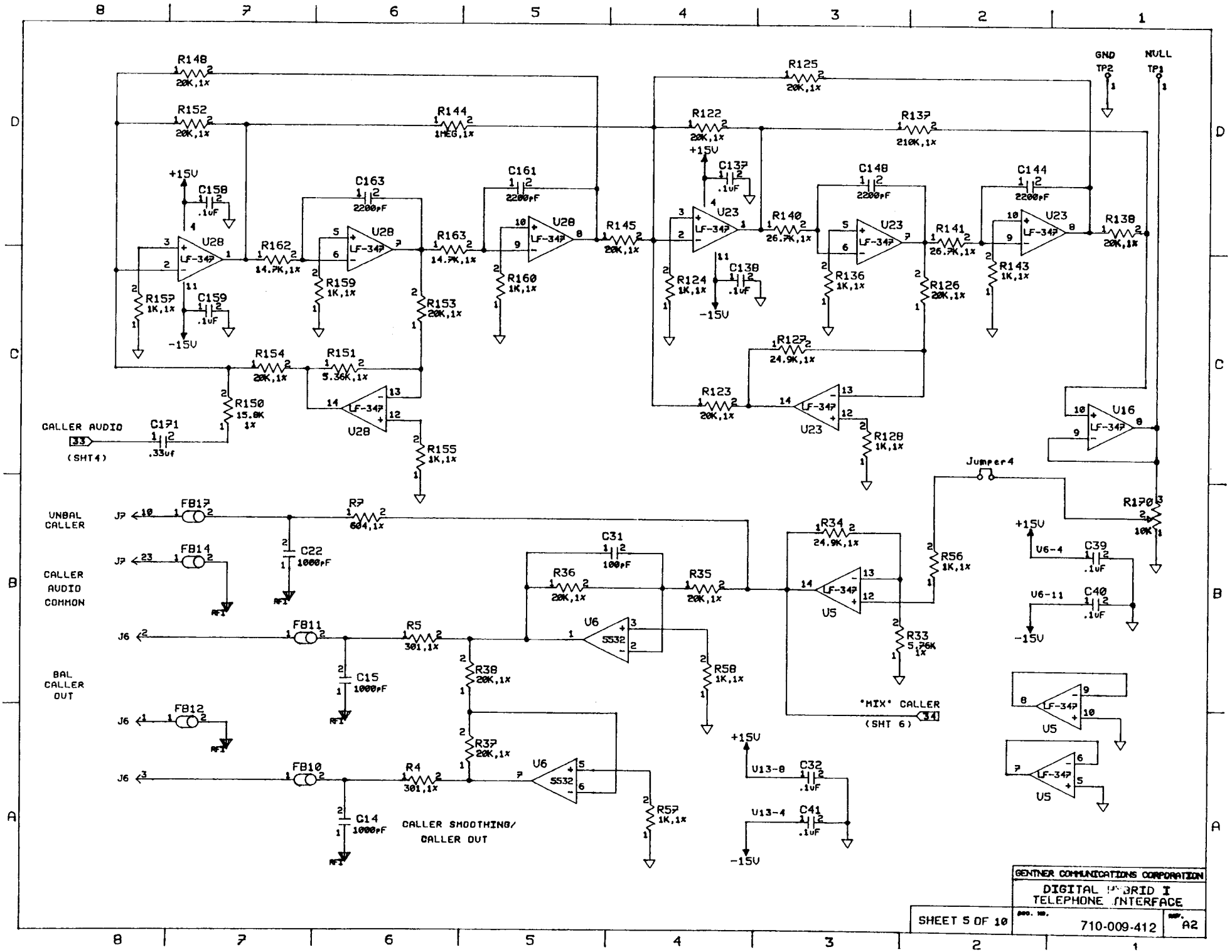
DSP56001FE2P
U31
74HC138
U33
ROM
27C64
U34
U35
U25
74HC4060
U26
DS1232
U30
74HC132
U24
CPU
R133 10K
R135 681K,1%
R134 100K,1%
R130 10K
R132 10K
R139 10K
R142 10K
R171 10K
R147 200,1%
R158 10K
RP1 2.2K
RP2 100K
RP3 100K
Y1 20.48 MHz
C136 47pF
C147 47pF
C134 .1uF
C135 .1uF
C140 .1uF
C152 .1uF
C164 .47uF MONO
C149 .1uF
C150 .1uF
C151 .1uF
C153 .1uF
CR16 1N4148
CR17 1N4148
SW2
JP8
JP7
+5L
SCO (SHT,7)
SRD (SHT2,7)
SCLK (SHT4)
SCK (SHT4)
STD (SHT4)
LS (SHT1)
LR (SHT1)
SAMP (SHT2,7)
SAMP8 (SHT2,7)
D(0:7)
ON
OFF
ON LED
OFF LED
SND GRN
RCV GRN
SND RED
RCV RED
(SHT8)
(SHT9)
(SHT10)
RESET
MODA/IRQA
MODB/IRQB
SC2
IL GND
BR
MACK
HA0-PB8
HA1-PB9
HA2-PB10
HR/W-PB11
HEN-PB12
HREQ-PB13
XTAL
EXTAL
RXD
TXD
SCK
STD
SCI
SCLK
SC0
SRD
NC


+5L
+5VA
-5VA
-15V
U20
TDA1541
U19
U13
U12
LF-347
P40D132
C102
.1uF
C130
470PF MONO
C103
C114
C120
C125
C126
C129
C131
C128
C127
C121
C115
C106
C105
C104
C101
47pF
R117
1K,1x
R70
10K
VERT. TRIM.
OFFSET NULL
R72
2.0K,1x
C74
10UF
C52
.01uf
R73
1K,1x
R71
1.5K,1x
CALLER AUDIO
(SHT5)
33
STD 14 (SHT3)
SCLK 12 (SHT3)
SCK 13 (SHT3)
R95
1.00K
C73
.047uF
R93
20K,1x
R68
20K,1x
C70
.1uF
C75
.1uF
C76
.1uF
C71
.1uF
R83
10K
R82
11.5K,1x
R74
1K,1x
R80
1K,1x
R100
30.1K,1x
C82
2200pF
R87
1K,1x
R69
20K,1x
R101
30.1K,1x
C83
2200pF
R94
1K,1x
R102
2.0K,1x
C72
10UF
R81
20K,1x
R67
20K,1x
R88
1K,1x
C174
3300pF
R175
20K,1x
R174
20K,1x
R176
1K,1x
SND AUDIO
4
D/A CONVERSION
SEND/RCV
GENTNER COMMUNICATIONS CORPORATION
DIGITAL HYBRID I
TELEPHONE INTERFACE
SHEET 4 OF 10
DOC. NO. 710-009-412
REV. A2



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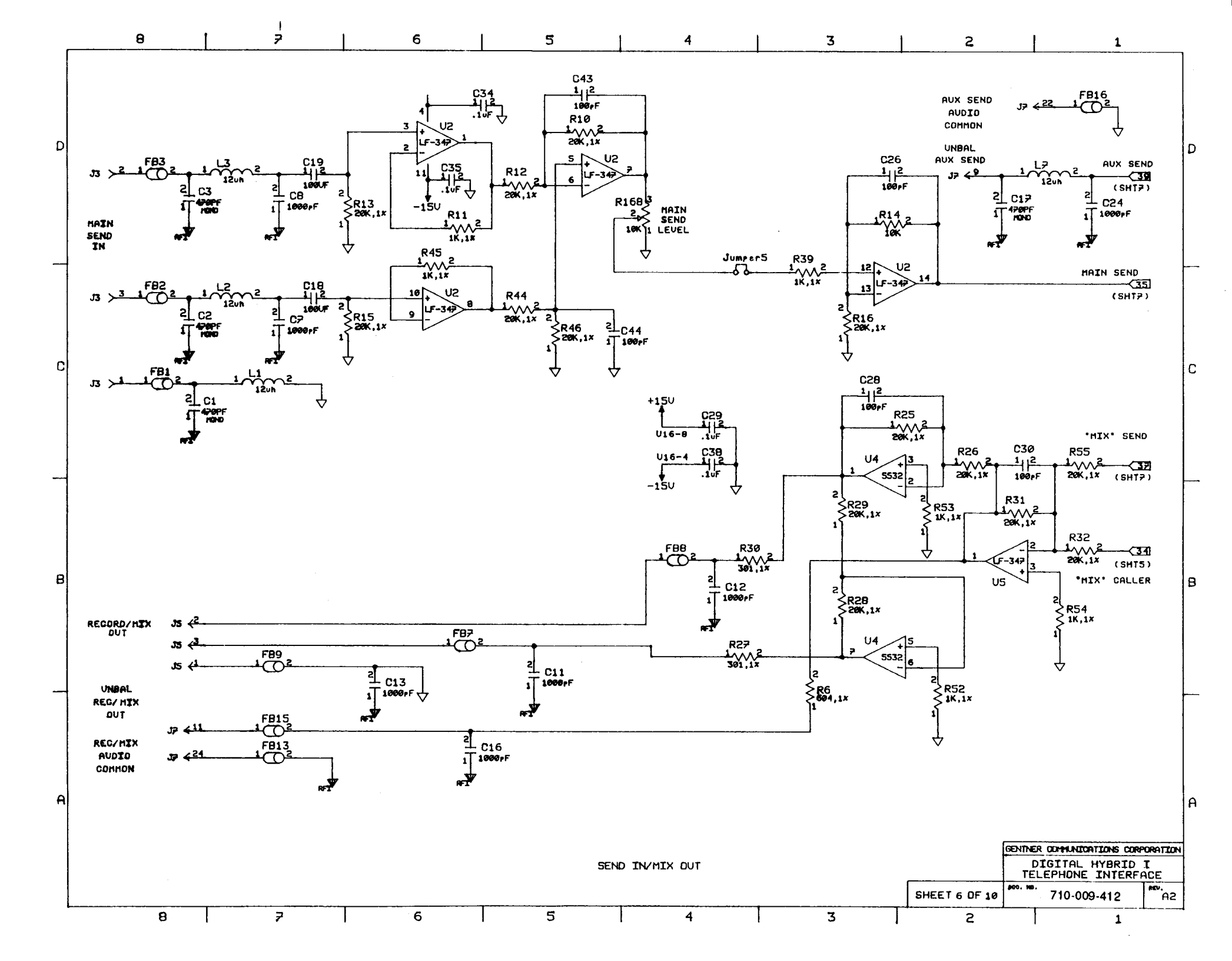
DIGITAL HYBRID I TELEPHONE INTERFACE	
SHEET 5 OF 10	DOC. NO. 710-009-412 REV. A2


MAIN SEND IN
RECORD/MIX OUT
UNBAL REC/MIX OUT
REC/MIX AUDIO COMMON
AUX SEND AUDIO COMMON
UNBAL AUX SEND
MAIN SEND LEVEL
MAIN SEND
"MIX" SEND
"MIX" CALLER
+15V
-15V
SEND IN/MIX OUT
GENTNER COMMUNICATIONS CORPORATION
DIGITAL HYBRID I TELEPHONE INTERFACE
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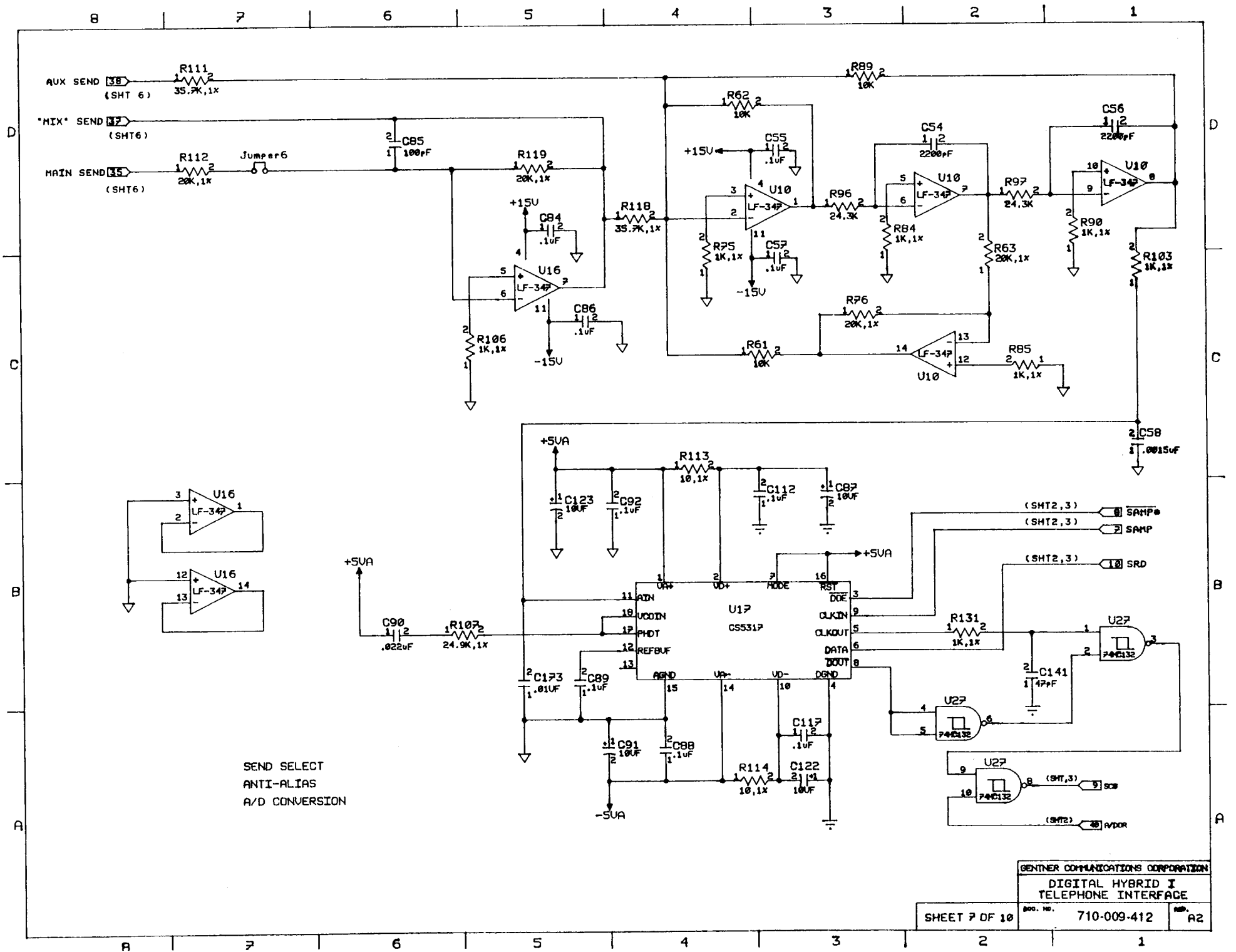

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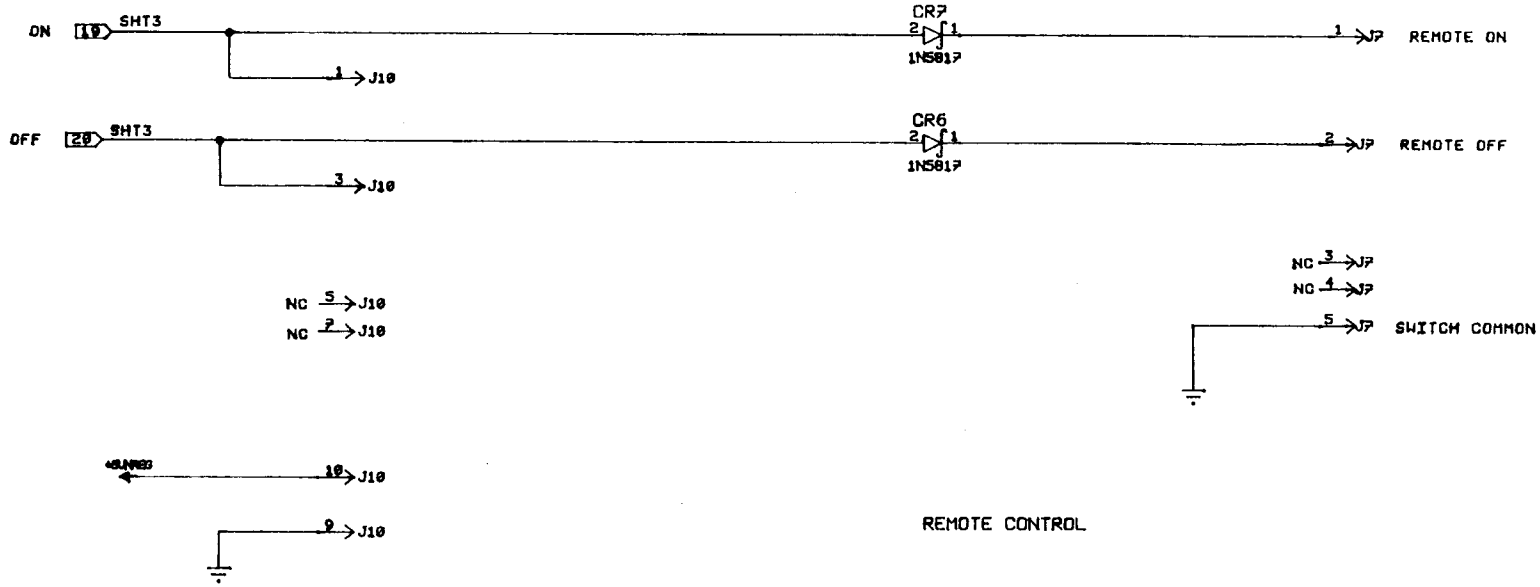
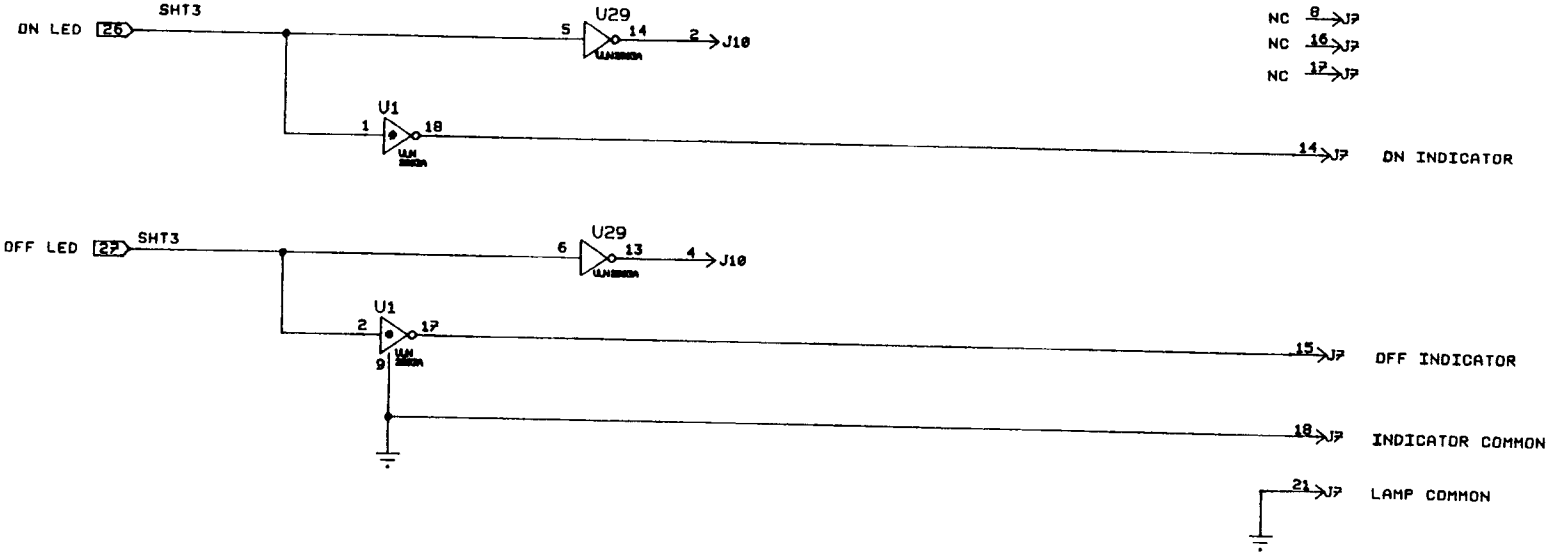


GENTNER COMMUNICATIONS CORPORATION		
DIGITAL HYBRID I TELEPHONE INTERFACE		
SHEET 8 OF 10	DOC. NO. 710-009-412	REV. A2



REMOTE CONTROL

GENTNER COMMUNICATIONS CORPORATION

DIGITAL HYBRID I
TELEPHONE INTERFACE

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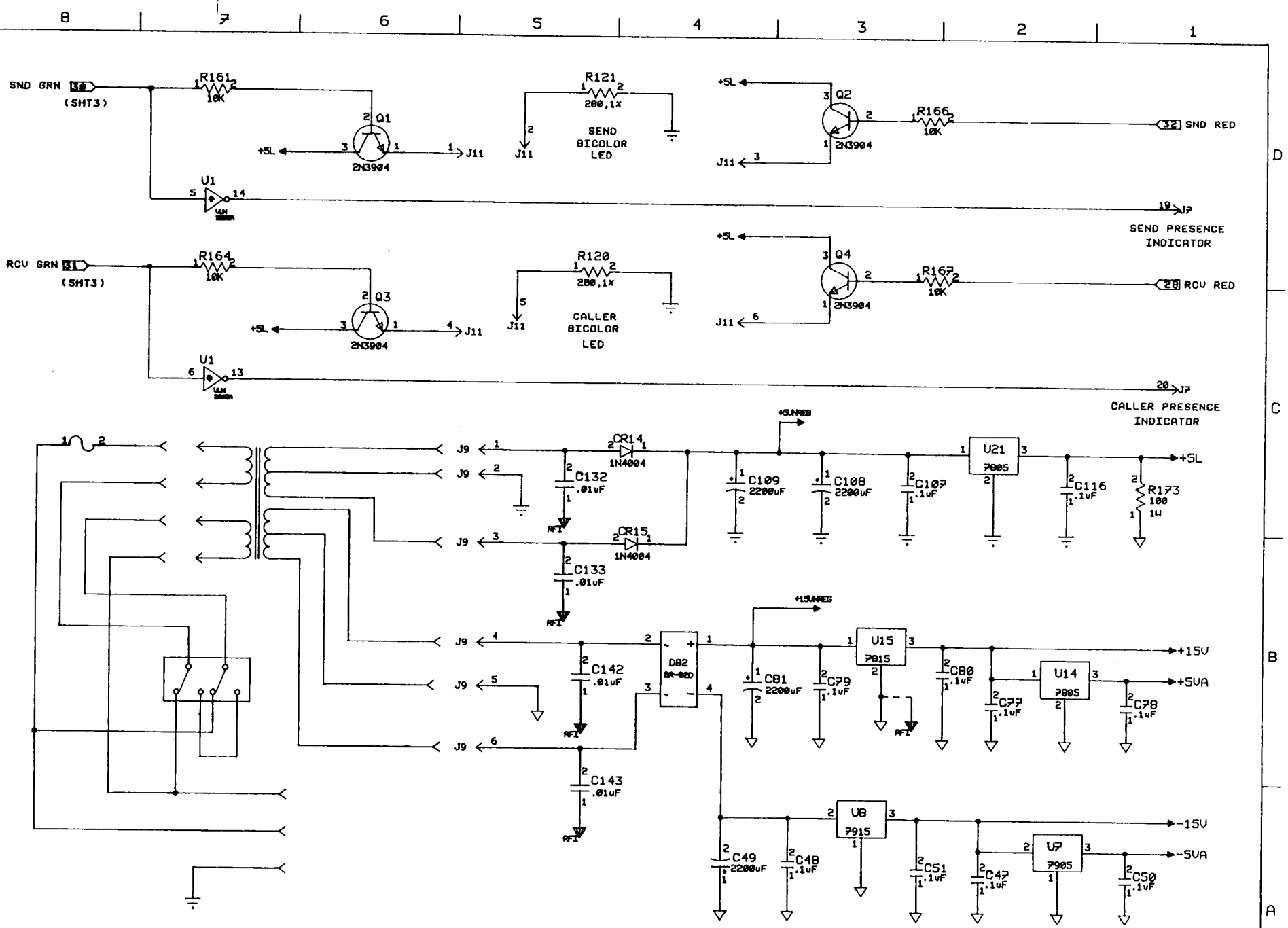
SND GRN 30 (SHT3)
R161 10K
Q1 2N3904
+5L
J11
R121 280,1%
SEND BICOLOR LED
Q2 2N3904
R166 10K
32 SND RED
U1
19 J7
SEND PRESENCE INDICATOR
RCV GRN 31 (SHT3)
R164 10K
Q3 2N3904
R120 280,1%
CALLER BICOLOR LED
Q4 2N3904
R167 10K
29 RCV RED
20 J7
CALLER PRESENCE INDICATOR
J9
CR14 1N4004
CR15 1N4004
C132 .01uF
C133 .01uF
C142 .01uF
C143 .01uF
RFI
DB2
C109 2200uF
C108 2200uF
C107 .1uF
U21 7805
C116 .1uF
R173 100 1W
+5L
C81 2200uF
C79 .1uF
U15 7815
C80 .1uF
C77 .1uF
U14 7805
C78 .1uF
+15V
+5VA
C49 2200uF
C48 .1uF
U8 7915
C51 .1uF
C47 .1uF
U7 7905
C50 .1uF
-15V
-5VA
AUDIO PRESENCE/ POWER SUPPLY
GENTNER COMMUNICATIONS CORPORATION
DIGITAL HYBRID I
TELEPHONE INTERFACE
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