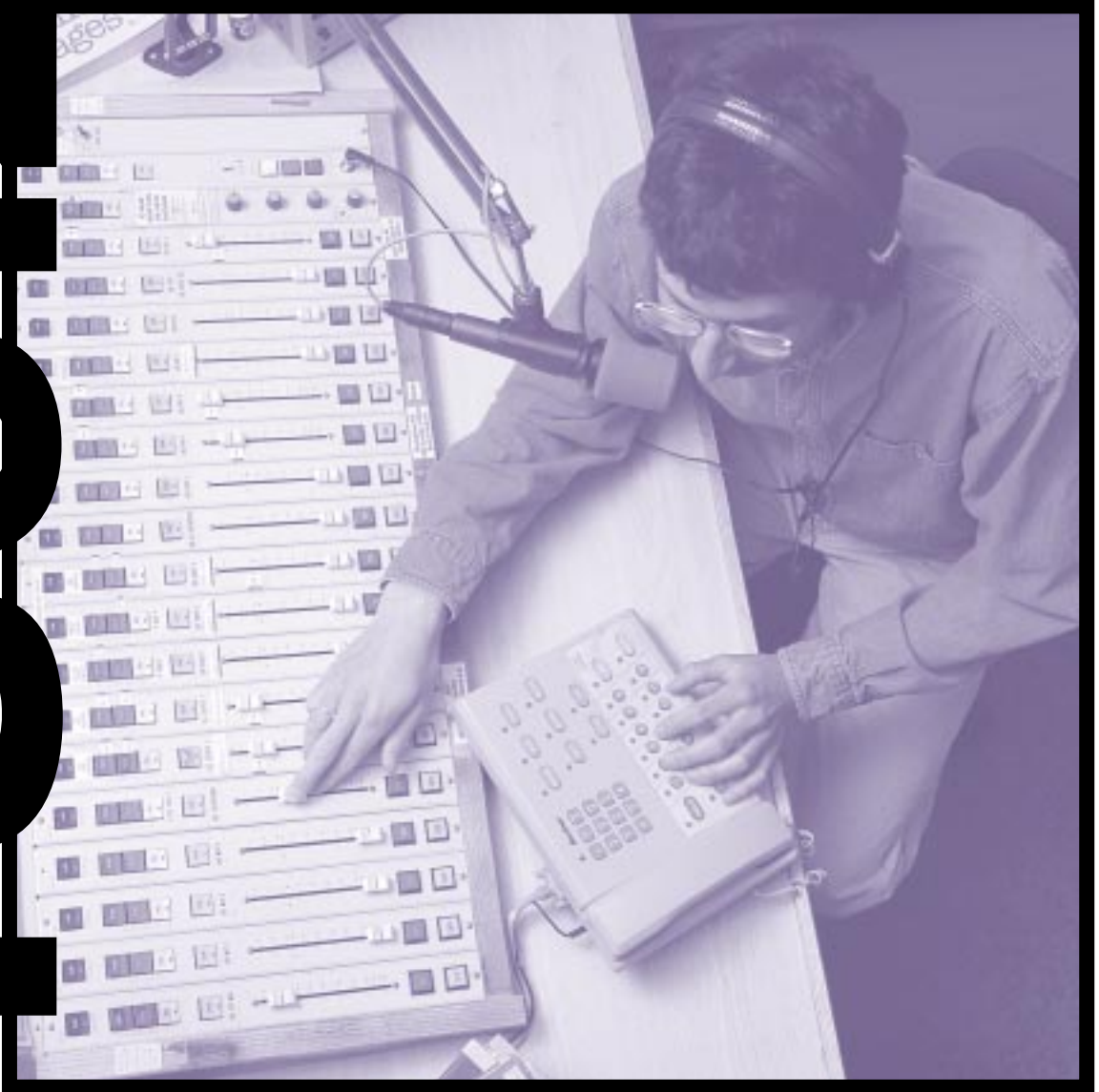


HS612



Multi-line, On-Air Phone System

Installation & Operations Manual



Perfect Communication through Technology, Service, and Education.™

TS612 Installation and Operations Manual
Gentner Part No. 800-003-000 (Rev. 2.5)
October 1998

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Manual Development: Gerry Carpenter, Jennifer Jewkes

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This equipment complies with the requirements of the EU guidelines:



89/336/EEC "Electromagnetic Compatibility"

73/23/EEC "Electrical operating material for use within specific voltage limits"

Conformity of the equipment with the above guidelines is attested by the CE mark.

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1 Introduction

The TS612 multi-line telephone system is designed to bring caller audio into a broadcast situation. Ease of use, quick installation, and versatility have made the TS612 one of the most popular telephone interface systems in the broadcast industry today.

With release 2.5, the TS612 has many new capabilities and features never before available, allowing the product to better meet your needs. All changes are in response to the requests of our customers. The Gentner commitment is to improve our products to better serve you.

The manual has been redesigned to be more readable and easier to use. We recommend that you familiarize yourself with this manual in order to take full advantage of all of the TS612's capabilities.

What's In This Manual

The manual is divided into the following sections:

“Overview” is a basic introduction to the TS612, including a brief discussion of the new features that are available with the release of the new firmware version 2.5.

“Installation” explains how to install the TS612 in a professional setting. Detailed diagrams and descriptions will help you decide on the best configuration settings for the needs of your environment.

“Operation” describes how to use the TS612 on a day-to-day basis. It also contains information on how to set up the control surfaces using the new features available with version 2.5.

“Appendices” include additional information such as schematics, connector pinouts, and serial communications protocol.

Be sure to refer to our new glossary and alphabetical index for quick reference information.

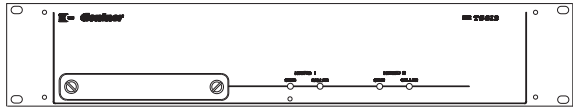
For additional help on how to install, set up, or operate the TS612 system, please contact Gentner in any of the following ways:

Telephone:	1.800.283.5936 (USA)	or	1.801.974.3760
Fax:	1.800.933.5107 (USA)	or	1.801.977.0087
Internet:	www.gentner.com	e-mail:	tech@gentner.com

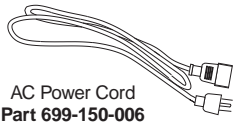
Gentner Communications Corporation
1825 Research Way, Salt Lake City, UT 84119

Unpacking

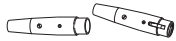
Please check that the following was received with your shipment:



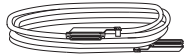
TS612 Mainframe
Part 850-003-006



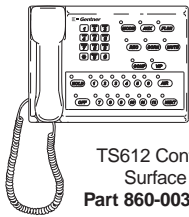
AC Power Cord
Part 699-150-006



XLRs
One male, One female
Parts 664-600-003
and 664-500-003



25-foot Telephone
Cable
Part 830-000-025



TS612 Control
Surface
Part 860-003-200



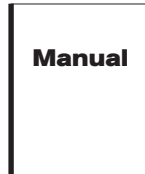
Direct Plug-In Power
Transformer
Part 830-003-203



25-foot Control
Surface Cable
Part 830-003-025



TS612 Operations
Quick Reference Card
Part 800-003-003



TS612 Installation and
Operations Manual
Part 800-003-000



Gentner Communications is not responsible for product damage incurred during shipment. You must make claims directly with the carrier. Inspect your shipment carefully for obvious signs of damage. If the shipment appears to be damaged, retain the original boxes and packing material for inspection by the carrier. Contact your carrier immediately.

Warranty Instructions

Please register your TS612 online by visiting Gentner Technical Support on the World Wide Web at <http://www.gentner.com>. When your product is properly registered, Gentner Communications will be able to serve you better should you require technical assistance. Warranty information will also be used to notify you of upgrades, new product information, etc.

2 Overview

About the TS612

The TS612 is a multi-line telephone system with a separate mainframe and control surface. The mainframe contains two internal digital hybrids which provide high-quality interface to six telephone lines (expandable to 12). The dual hybrids allow the TS612 to operate as a single-studio telephone system able to conference up to four callers simultaneously, or a two-studio system able to conference two callers to each studio.

Off-Air Telephone Use

The TS612 operates off-air like a standard multi-line telephone system. Using the control surface, outgoing and incoming calls can be placed and answered in complete privacy, even while other calls are on-air.

On-Air Telephone Use

Once connected, any call can be placed on-air at the touch of a button. Special features such as SCREEN, NEXT, and VIP, enable you to make sure that the right call goes on-air at the right time.

Dedicated Screening Station

The TS612 supports a dedicated call-screening control surface. An off-air screener takes incoming calls and places them in a screened-hold queue. The on-air talent or producer presses the NEXT button on the main control surface and the call is immediately on-air.

About Version 2.5

The new firmware version 2.5 introduces new capabilities to the TS612. We have added the operational features most requested by customers while retaining the existing functions. New features include split-caller mode, split-hybrid mode, previous-hold, two-button hold, and two-button off. These and others features will be discussed in detail in Chapter 3—Installation and Chapter 4—Operation.

Split-Caller Mode

You can now use the TS612 as a single studio system, yet bring two callers out to the audio console independently.

Split-Hybrid Mode

Like Split-Caller Mode, you can bring two callers out to the console independently. However, Split-Hybrid Mode also allows you to return the program mix to the TS612 on two separate channels for additional mixing and processing.

Previous-Hold

This mode places calls on hold automatically when you select another line. You can choose to switch between previous-hold mode and traditional line switching (with automatic disconnect) by just pressing buttons on the control surface.

Two-Button Hold

This option allows you to place a single call on hold when two or more lines are conferenced together.

Two-Button Off

This mode allows you to disconnect any line by pressing the OFF button followed by the button for the line to be disconnected.

Firmware version 2.5 was designed with you, the customer, in mind. As always, we welcome your suggestions so that we can continue to provide you with the solutions you need.

Operational Requirements

Telephone Line Requirements

The TS612 requires analog (POTS) telephone lines or analog extension lines from a PBX that fully emulates analog lines (loop-start plus battery).

To simplify TS612 installation with POTS lines, request that your telephone company provide lines with an RJ21X connector (wired according to the pinout table on page 10). If your telephone company provides only individual lines with RJ11C connectors, an RJ11 interface panel may be ordered from Gentner Communications Corporation (part number 676-550-001). If you plan to loop through the business-telephone system, make sure you have the loop-extension cable prewired to prevent disruption to your business telephone service.

If you plan to use analog extensions of your business PBX, use a separate extension for each telephone-line input at the TS612. Remember that these lines cannot contain digitized audio or telephone-set control signals. The TS612 (handset) can transfer calls to another PBX extension provided the PBX extension supports hook flash commands.

If you are uncertain whether the your PBX extensions are analog, a good (although not infallible) test is to connect to an external modem or fax machine. If the modem or fax operates correctly, the line will probably work with the TS612. To set up analog loop-start extensions for the TS612, contact your PBX system provider.

For the best performance, Gentner Communications recommends that you connect directly to telephone-company provided POTS lines, rather than PBX extensions.

Power Requirements

The TS612 mainframe will accommodate 85-240 Vac, 50-60 Hz and uses 30 watts of power, in accordance with the supplied power module. International customers should request that the dealer provide a molded power cord (grounded) with the appropriate plug.

The TS612 control surface will accommodate 12 Vdc 500 mA, in accordance with the supplied power module. The supplied wall adapter operates on 117 Vac unless your dealer ordered the 220 Vac version.

Equipment Placement

The TS612 mainframe fits a standard 19-inch equipment rack.



Do not block ventilation holes when installing the mainframe in a 19-inch equipment rack.

3 Installation

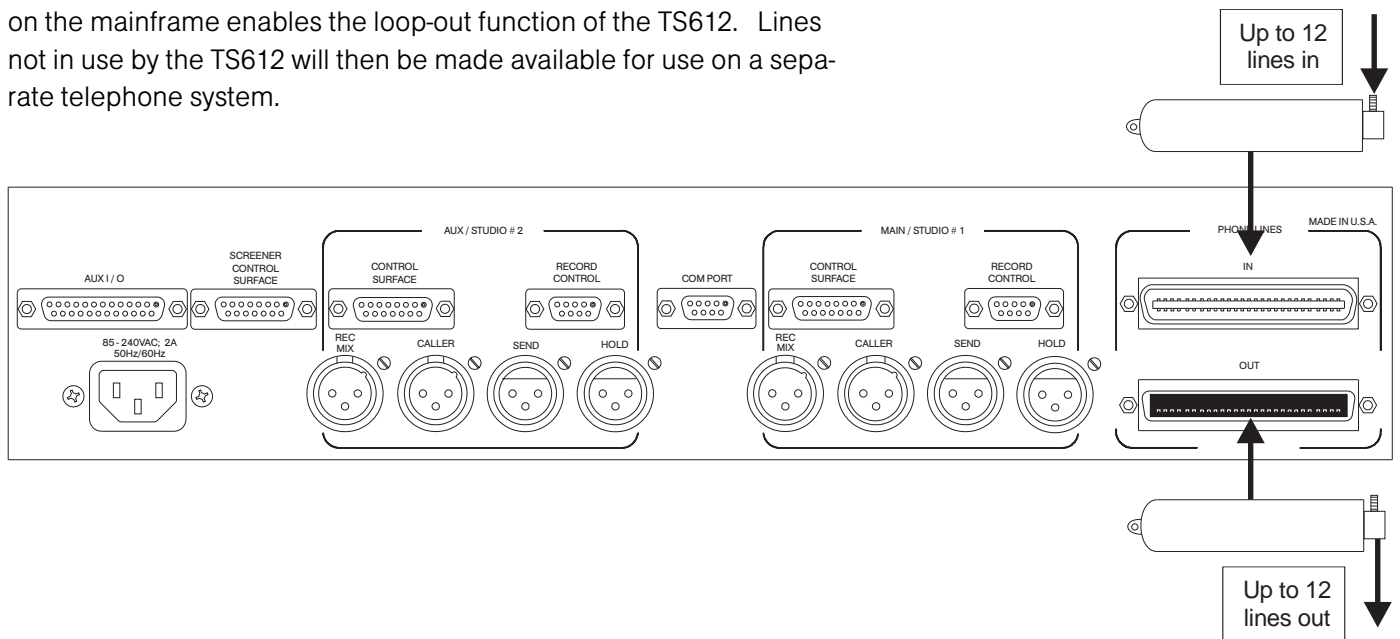
Telephone Line Setup

The TS612 connects to 6 or 12 telephone lines, depending on your hardware configuration. The basic configuration supports 6 lines. For instructions on installing the expansion cards to increase TS612 capacity to 12 lines, see page 13.

Telephone Connections

6 or 12 telephone lines may be connected to the each of the mainframe's two 50-pin Centronix connectors (RJ21X). *Phone Lines IN* is a male connector. *Phone Lines OUT* is a female connector. The pinout table for RJ21X connectors is located on the next page.

Connecting 6 or 12 telephone lines to the *Phone Lines OUT* connector on the mainframe enables the loop-out function of the TS612. Lines not in use by the TS612 will then be made available for use on a separate telephone system.



Pinout for RJ21X connector

Phone Line	Pin	Wire Color*	Pin	Wire Color*
1	1 TIP	blue/white	26 RING	white/blue
2	2 TIP	orange/white	27 RING	white/orange
3	3 TIP	green/white	28 RING	white/green
4	4 TIP	brown/white	29 RING	white/brown
5	5 TIP	silver/white	30 RING	white/silver
6	6 TIP	blue/red	31 RING	red/blue
7	7 TIP	orange/red	32 RING	red/orange
8	8 TIP	green/red	33 RING	red/green
9	9 TIP	brown/red	34 RING	red/brown
10	10 TIP	silver/red	35 RING	red/silver
11	11 TIP	blue/black	36 RING	black/blue
12	12 TIP	orange/black	37 RING	black/orange
*Wire colors are presented in the following format: base/stripe				

PBX Connections

The TS612 uses standard analog loop-start telephone lines. If you are connecting the TS612 to a PBX, the analog extension ports should be used. If you wish to optimize your system for PBX use, see the section below.

Telco Card Optimization. The TS612 system line (Telco) cards are factory configured for standard telephone lines which usually come from a central office approximately 2-3 miles away. Optimizing your Telco cards improves the impedance match between your TS612 and the telephone line. This procedure (while not required) will allow the digital hybrids to perform better on PBX lines.

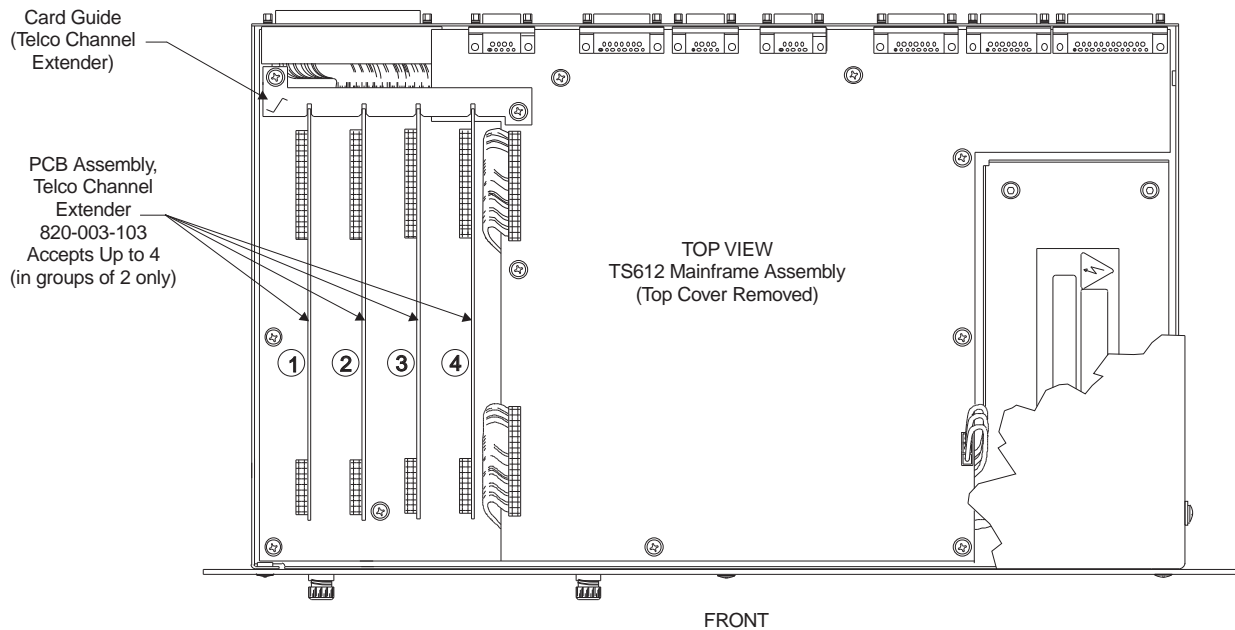
The steps on the following pages will instruct you how to optimize your Telco cards for use with a PBX:



Telco Card Optimization applies to U.S. versions only.

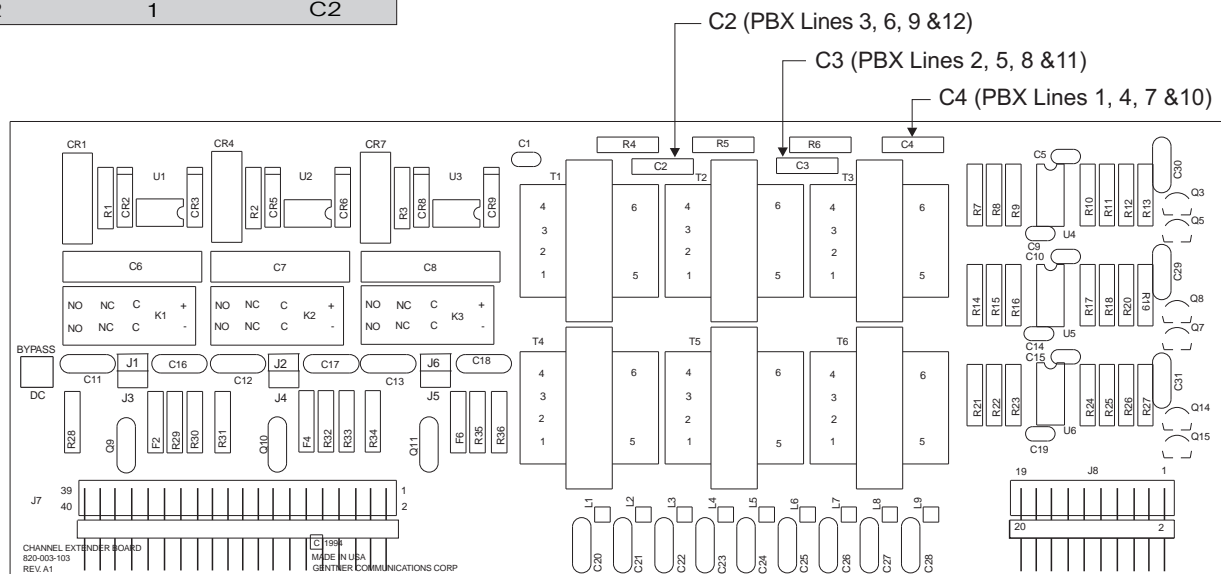
- 1) Disconnect power from the TS612 and remove it from the rack.
- 2) Remove the top cover of the mainframe chassis by loosening the four screws; two on each of the mainframe's side panels. Lift the top off carefully.
- 3) Locate the Telco cards standing vertically on the left side of the mainframe. There are four Telco card slots in the TS612; three lines are associated with each of these slots for a total of 12 lines. Remove only the line cards with PBX lines terminated to them. Remove the Telco line cards from the mainframe by pulling the cards directly up from the mainframe bottom board.

! To prevent electrical shock or possible equipment damage, disconnect the unit from all electrical power before proceeding.



Phone Line	Card Slot	Capacitor
1	4	C4
2	4	C3
3	4	C2
4	3	C4
5	3	C3
6	3	C2
7	2	C4
8	2	C3
9	2	C2
10	1	C4
11	1	C3
12	1	C2

4) Remove capacitors C2, C3, and C4, on each Telco card to optimize all three lines. Removing only one capacitor will optimize only one line. Refer to the table on the left to determine which capacitor corresponds to each telephone line.



COMPONENT SIDE

CHANNEL EXTENDER BOARD
820-003-103
REV. A1

5) Carefully return each Telco card to its proper slot. Make sure that the cards are seated properly with the 20-pin end toward the front and the 40-pin end toward the back of the mainframe.

6) Place the top chassis cover back onto the mainframe and tighten the four screws securing the cover.

7) Remount the mainframe in the equipment rack.

8) Reconnect the mainframe to your power source.

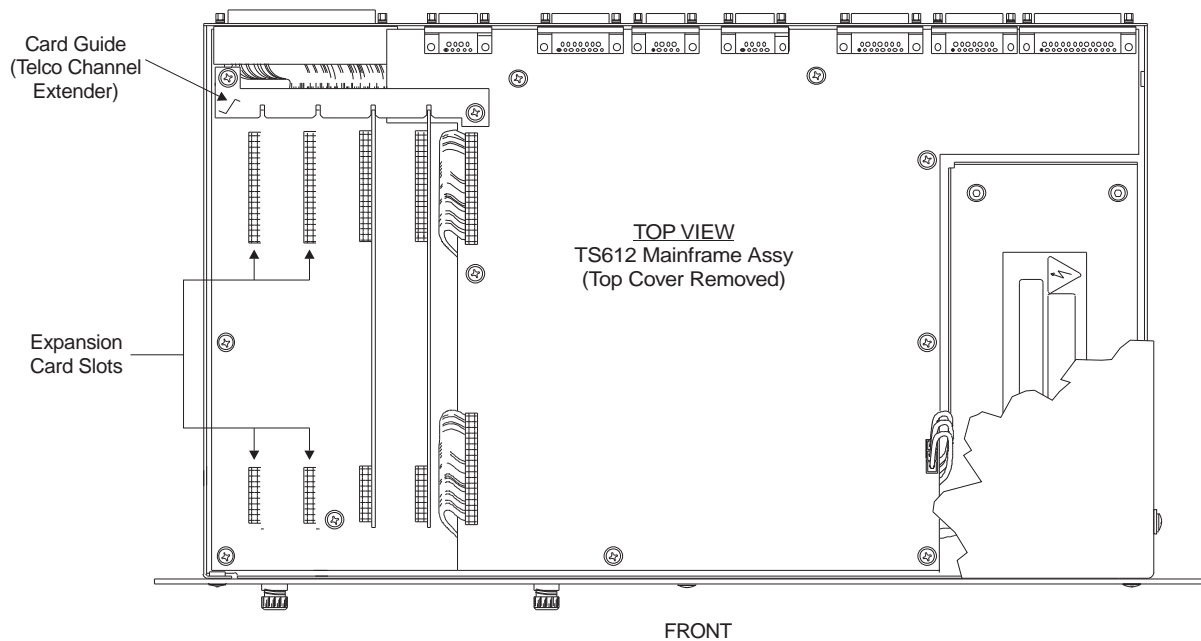
Line Expansion

The TS612 is shipped from the factory configured for six telephone lines. You may expand your system to twelve lines by adding two additional system line (Telco) cards. Cards must be installed in sets of two in order for the system to function properly. Once line expansion is completed, lines 7 through 12 will be active on your control surface.

Follow the step-by-step instructions below to ensure proper installation of additional Telco cards:

- 1) Remove the top cover of the mainframe chassis by loosening four screws; two on each of the mainframe side panels. Lift the top off carefully.
- 2) Find the two empty PC card slots. They are located on the left-hand side of the mainframe when it is viewed from the front.

! To prevent electrical shock or possible equipment damage, disconnect the unit from all electrical power before proceeding.



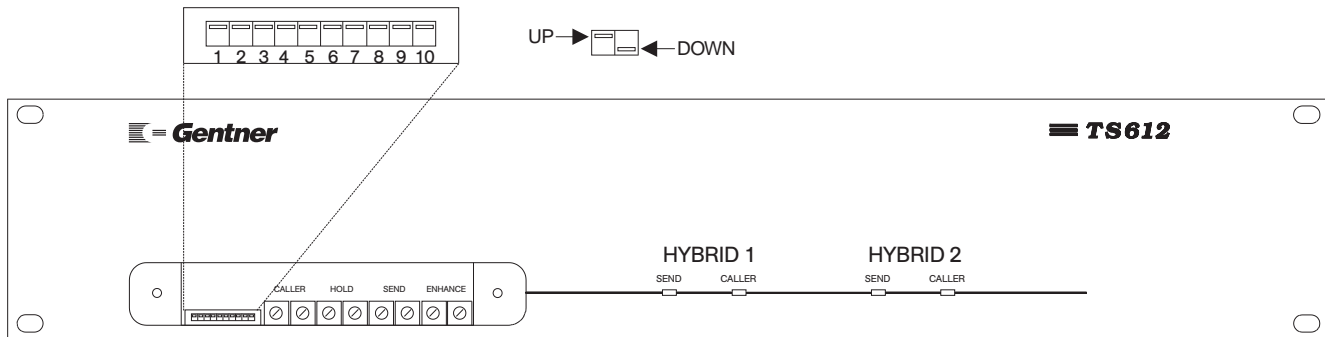
3) Carefully insert the two expansion cards into the two expansion slots. Either card can be placed in either slot. Be careful that the cards are inserted correctly. The 20-pin end must be toward the front of the mainframe and the 40-pin end toward the back. Press down gently to make certain that the cards are seated completely.

4) Place the top chassis cover back onto the mainframe and tighten the four screws.

5) Reconnect the mainframe to your power source.

Configuring the TS612

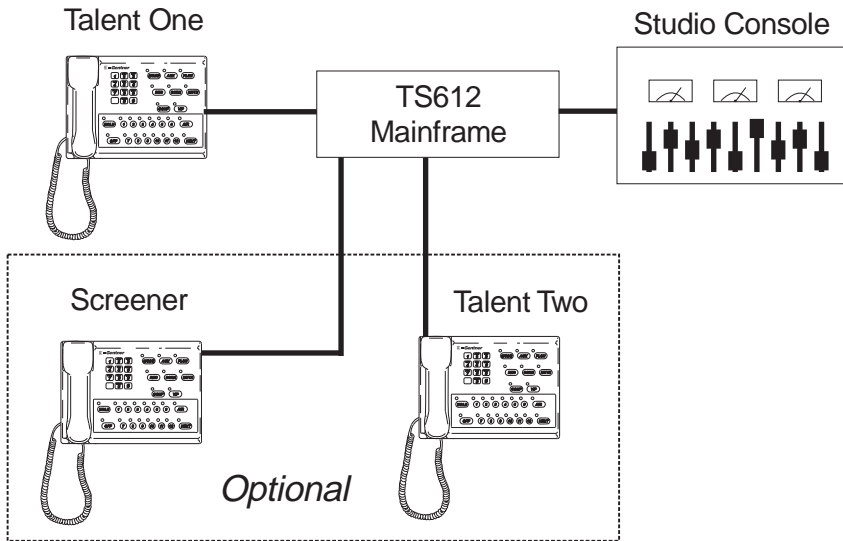
The TS612 may be configured in several ways to best suit your requirements. The type of configuration is determined by the positions of the DIP switches located behind the access panel on the front of the main frame. Unscrew the two large screws on the front of the main frame and remove the access panel to change DIP switch settings.



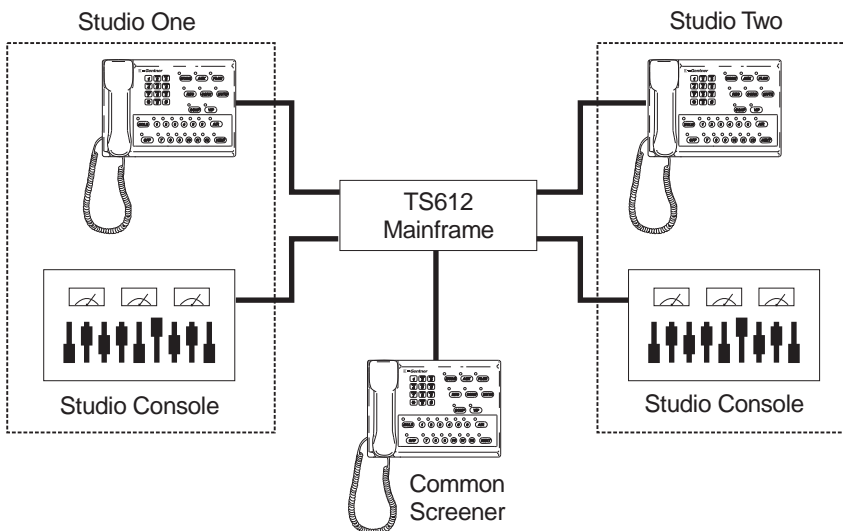
The table below indicates the configuration mode associated with each DIP switch. DIP switches 1, 3, 6, and 7 affect TS612 configuration directly and will be discussed below in relation to the possible configurations. Other DIP switches will be discussed later on in this manual.

Dip Switch	Description	Up Position	Down Position
1	Mainframe Operation	Single	Split Studio
2	Open Collector Outputs	Momentary	Latching
3	Mix-Minus	Internal	External
4	COM Port Operation	Standard Control	Network Interface
5	Not Active		
6	Split Caller	Off	On
7	Split Hybrid	Off	On
8	Loop Override	Off	On
9	Aux Inputs	Momentary	Latching
10	Operating Mode	Operational	Setup

The TS612 may be used as a single-studio or dual-studio system. In a single-studio setting, the TS612 operates as a dual-hybrid telephone system, with up to 12 lines and three control surfaces (talent, co-talent, and screener).

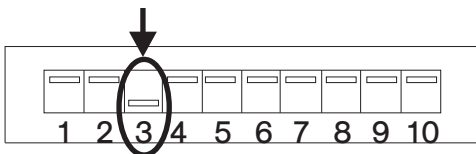
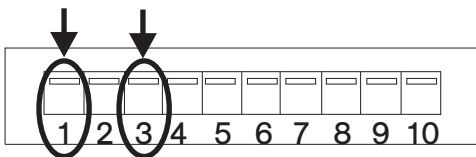
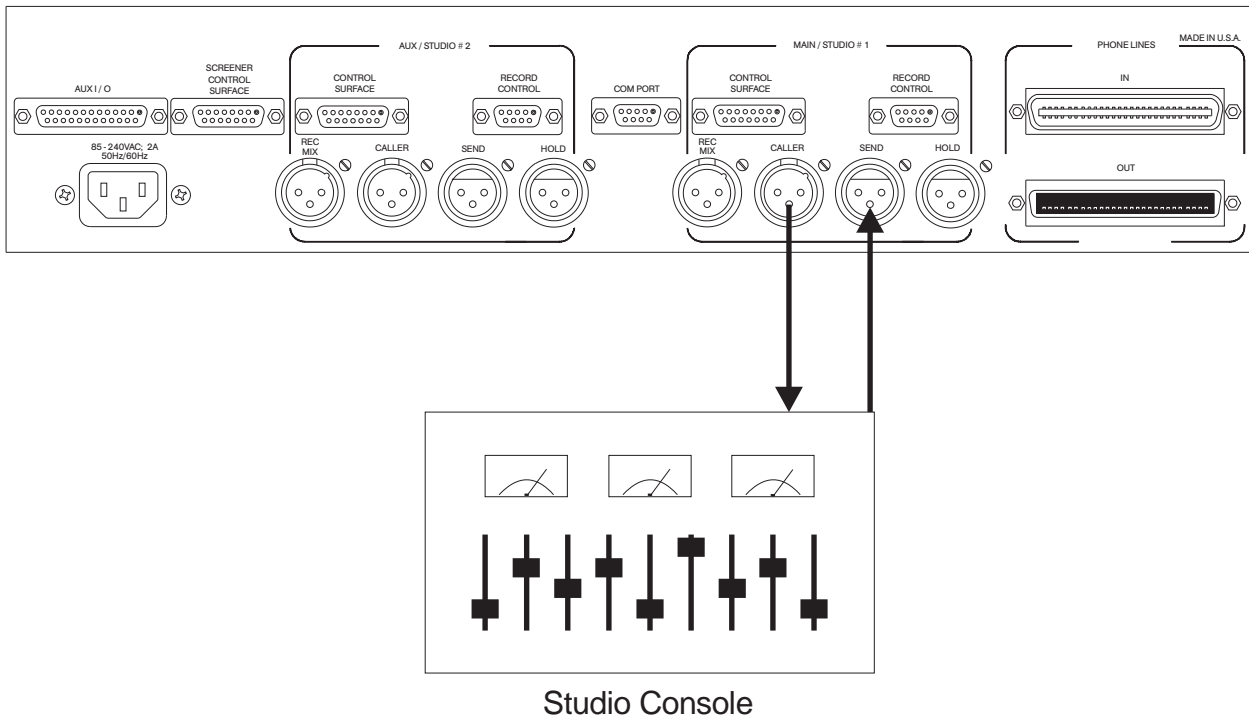


In a dual-studio setting, the TS612 operates as two single-hybrid telephone systems. A dual-studio system must have the 12-line expansion installed to operate. However, as a split-studio configuration, lines 1-6 and hybrid 1 are dedicated to studio 1, and lines 7-12 and hybrid 2 are dedicated to studio 2. The two talent control surfaces operate independently of each other, while the screener control surface can screen lines for either studio. The configurations for single-studio and dual-studio systems will be discussed in detail on the following pages.



Single-Studio Mixed Caller

In mixed-caller mode, all calls placed to air are routed to the audio console through the Main Caller output, regardless of which hybrid a call is routed through. Each of the TS612's two hybrids has two call slots. This allows up to four calls to be placed to air simultaneously by conferencing them together.



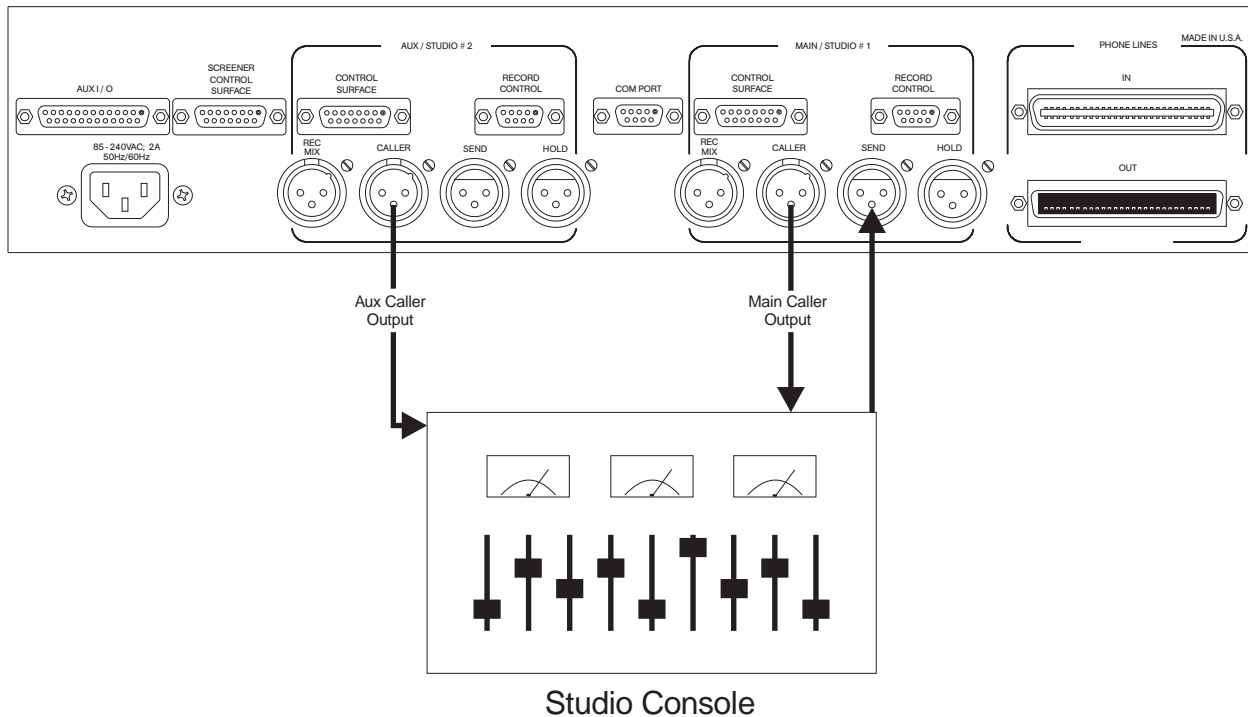
Dip Switch Settings. For mixed-caller mode, DIP switch 1 should be UP. DIP switch 3 determines the mix-minus setup for the configuration. If DIP switch 3 is in the UP position, the TS612's internal mix-minus feature is active. Full program audio (including the caller audio) may be routed to the Main Send input. Caller audio will be removed by the TS612 before transmitting the signal back to the caller.

If DIP switch 3 is in the DOWN position, external mix-minus must be provided. Caller audio must be removed from the program mix before routing the signal to the Send input.

Single-Studio Split Caller

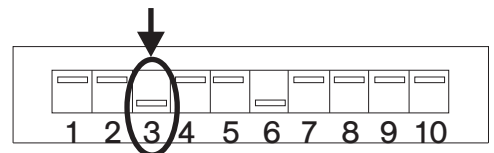
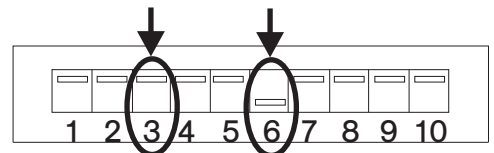
In split-caller mode, caller audio is routed to the audio console through both Caller outputs (Main and Aux) as shown in the diagram below. The advantage of split-caller mode is that caller audio is separated into two audio signals that may be processed separately. Calls are routed to the hybrids (placed on-air) in the order they are received. See the table on the right for more information. Hybrid 1 audio is routed to the Main Caller output. Hybrid 2 audio is routed to the Aux Caller Output.

Order Calls are Placed On-Air	Hybrid / Slot	Caller Output
1	H1 / S1	Main
2	H2 / S1	Aux
3	H2 / S2	Aux
4	H1 / S2	Main



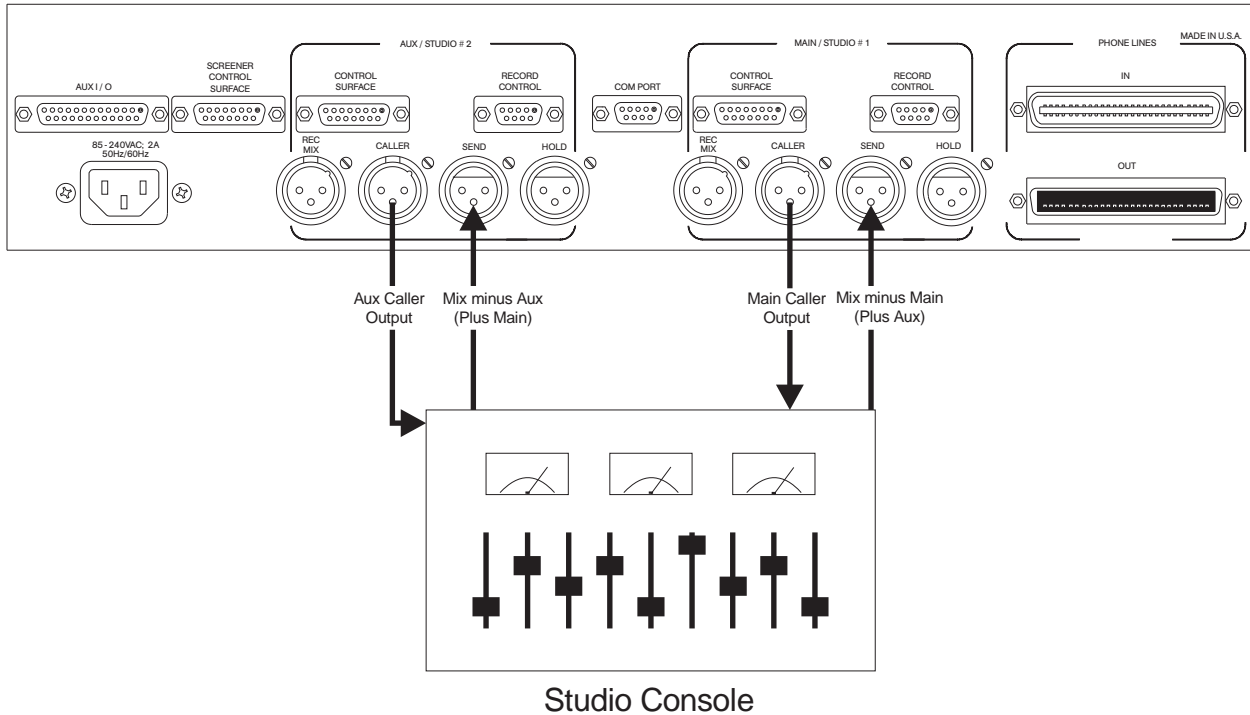
Dip Switch Settings. For split-caller mode, DIP switch 6 should be DOWN. DIP switch 3 determines the mix-minus setup for the configuration. If DIP switch 3 is in the UP position, the TS612's internal mix-minus feature is active. Full program audio (including the caller audio) may be routed to the Main Send input. Caller audio will be removed by the TS612 before transmitting the signal back to the caller.

If DIP switch 3 is in the DOWN position, external mix-minus must be provided. Caller audio from both Caller outputs (Main and Aux) must be removed from the program mix before routing the signal to the Main Send input.



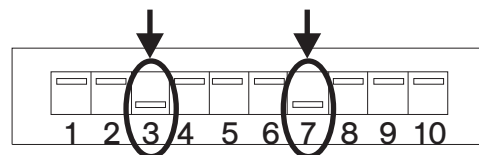
Single-Studio Split-Hybrid

In split-hybrid mode, the two hybrids operate independently. Caller audio is routed to the audio console through both Caller outputs (Main and Aux) in the same manner as split-caller mode. The primary difference is that the hybrids receive program audio through two separate Send inputs (Main and Aux). As in split-caller mode, Hybrid 1 audio is routed to the Main Caller output and Hybrid 2 audio is routed to the Aux Caller Output.



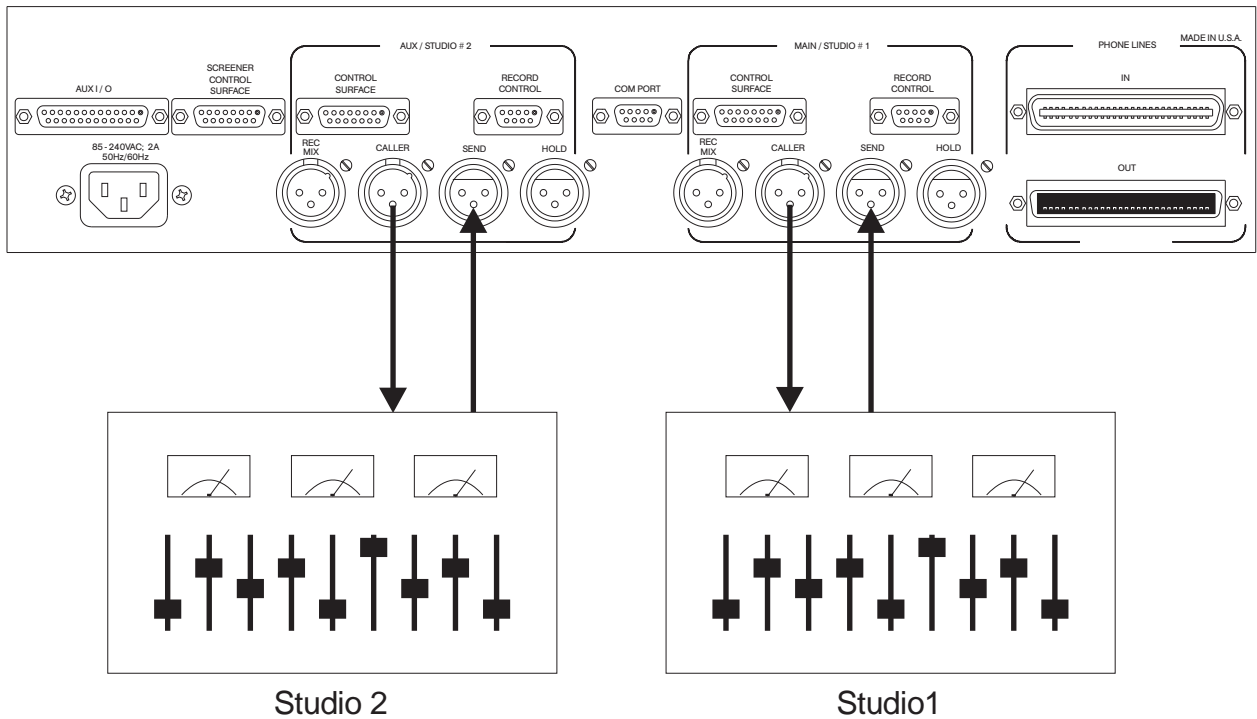
For configurations requiring internal mix-minus, we recommend that you use Split-Caller Mode rather than Split-Hybrid mode. The TS612 will operate the same and you will only have to provide one program mix from the studio console to the TS612.

Dip Switch Settings. For split-hybrid mode, DIP switch 7 should be DOWN. The recommended mix-minus setting for split hybrid mode is DIP switch 3 DOWN. This setting requires external mix-minus. The program mix routed to the Main Send input should have the Main Caller audio removed, but include Aux Caller audio. Likewise, the Aux Send input should have the Aux Caller audio removed, but include Main Caller audio. This allows the studio console operator to adjust the caller to caller level between the two TS612 hybrids.



Dual-Studio

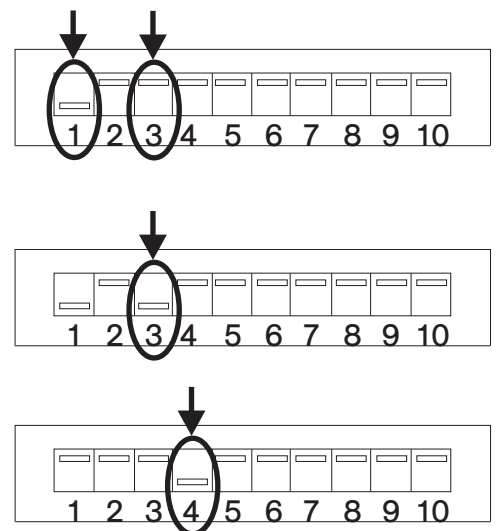
In this configuration, the TS612 operates as two single-hybrid telephone systems. The two talent control surfaces operate independently of each other. The studio 1 control surface has lines 1- 6 active on its surface and lines 7-12 inactive (no status indications). The studio 2 control surface has lines 7-12 active on its surface and lines 1- 6 inactive (no status indications). The screener has access to all 12 lines to screen calls for either talent. All calls placed to air by studio 1 are routed to the audio console through the Main Caller output. All calls placed to air by studio 2 are routed to the audio console through the Aux Caller output. Because each of the TS612's two hybrids has two call slots, each studio can conference a maximum of two calls together.



Dip Switch Settings. For dual-studio mode, DIP switch 1 should be DOWN. DIP switch 3 determines the mix-minus setup for the configuration. If DIP switch 3 is in the UP position, the TS612's internal mix-minus feature is active. Studio 1 program audio (including the caller audio) may be routed to the Main Send input and Studio 2 program audio may be routed to the Aux Send input. Caller audio will be removed by the TS612 before transmitting the signal back to the caller.

If DIP switch 3 is in the DOWN position, external mix-minus must be provided. Caller audio must be removed from the program mix by each studio console before routing the signal to a Send input.

If DIP switch 4 is down (network mode), Studio 1 and Studio 2 both have access to all 12 lines.



Equipment Interconnections

Audio Hookup

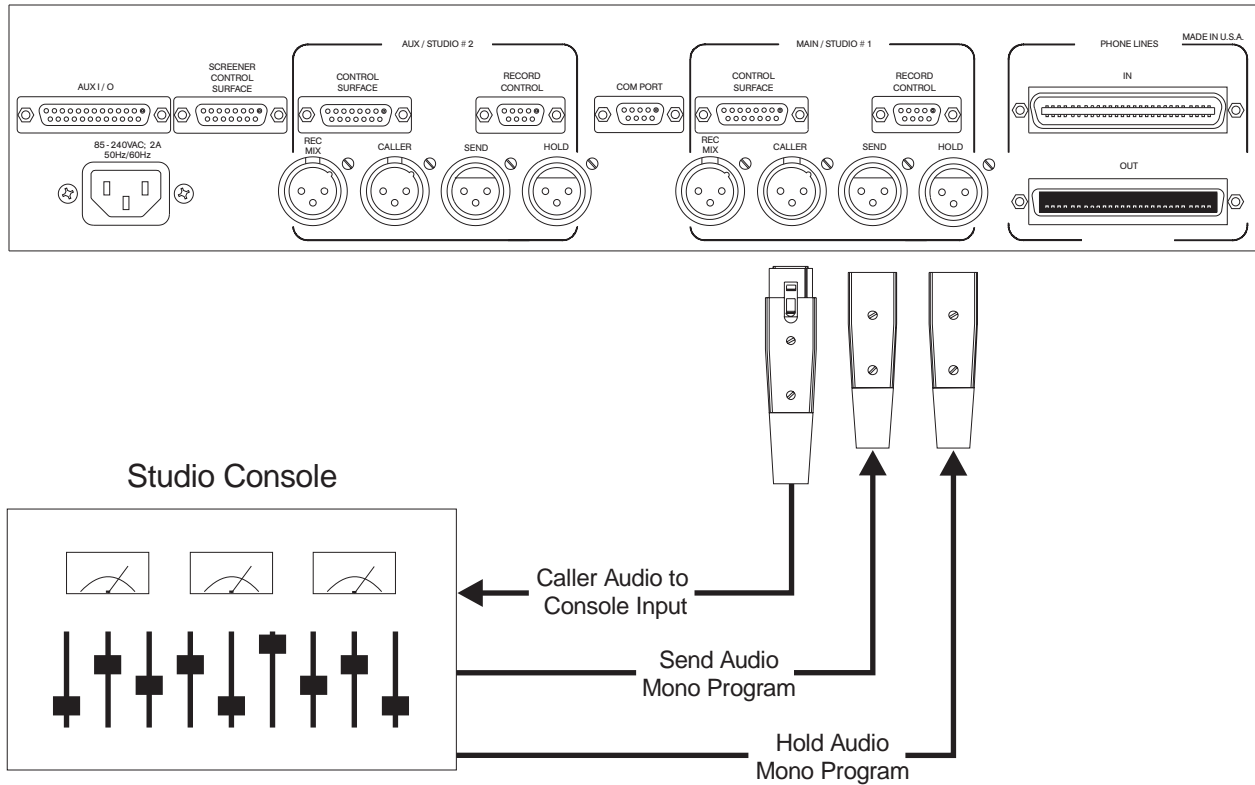
The TS612 connects easily to a professional audio console using XLR connectors. The number of connections required is determined by the studio configuration you have established using the DIP switches. For more information on configuring the TS612, see page 14.

SEND Balanced Audio Input. The TS612 has two SEND inputs: one for Main (Studio 1) input, and one for Aux (Studio 2) input. SEND is a female XLR connector. Balanced program audio is routed from the console to the SEND input for transmission to the telephone line. The nominal operating level sensitivity of this input is +4 dBu. Additional gain may be added to weak signals by adjusting the SEND trim pots. For instructions, see the Calibration section beginning on page 27.

As shipped from the factory, the TS612 is set for operation with external (console) mix-minus. If your console does not supply a mix-minus, the TS612 will generate internal mix-minus when DIP switch 3 is placed in the UP position. When internal mix-minus is selected, however, caller-to-send audio must not be increased more than 24 dB in the external loop. This external loop consists of the CALLER and SEND trim pots as well as any console trim pots. An increase of more than 24 dB in the external loop will produce echo or feedback for the caller.

HOLD Balanced Audio Input. The TS612 has two HOLD inputs: one for Main (Studio 1) input, and one for Aux (Studio 2) input. HOLD is a female XLR connector. Balanced program audio is routed from the console and pre-delay (if using a digital delay), to the HOLD input for use by the hold circuitry of the TS612. This is the audio which callers hear when placed on hold. For single-studio operation, only the Main HOLD input should be connected to the console. For dual-studio operation, both HOLD inputs (Main and Aux) should be connected.

The nominal operating level sensitivity for the HOLD input is +4 dBu. Additional gain may be added to weak signals by adjusting the HOLD trim pots. For instructions, see the Calibration section beginning on page 27.



CALLER Balanced Audio Output. The TS612 has two CALLER outputs: Main (Studio 1) and Aux (Studio 2). CALLER is a male XLR connector. This output is used to connect audio from the digital hybrid (and from the telephone line) to an input on the console. When calls are conferenced, the CALLER output contains a mix of these callers. The TS612 can conference up to four callers at a time in the conference mode. Both CALLER output connections may be required depending on the TS612's configuration (see pages 14-19—Configuring the TS612).

The nominal operating level sensitivity for the CALLER output is +4 dBu. Additional gain may be added to weak signals by adjusting the CALLER trim pots. For instructions, see the Calibration section beginning on page 27.



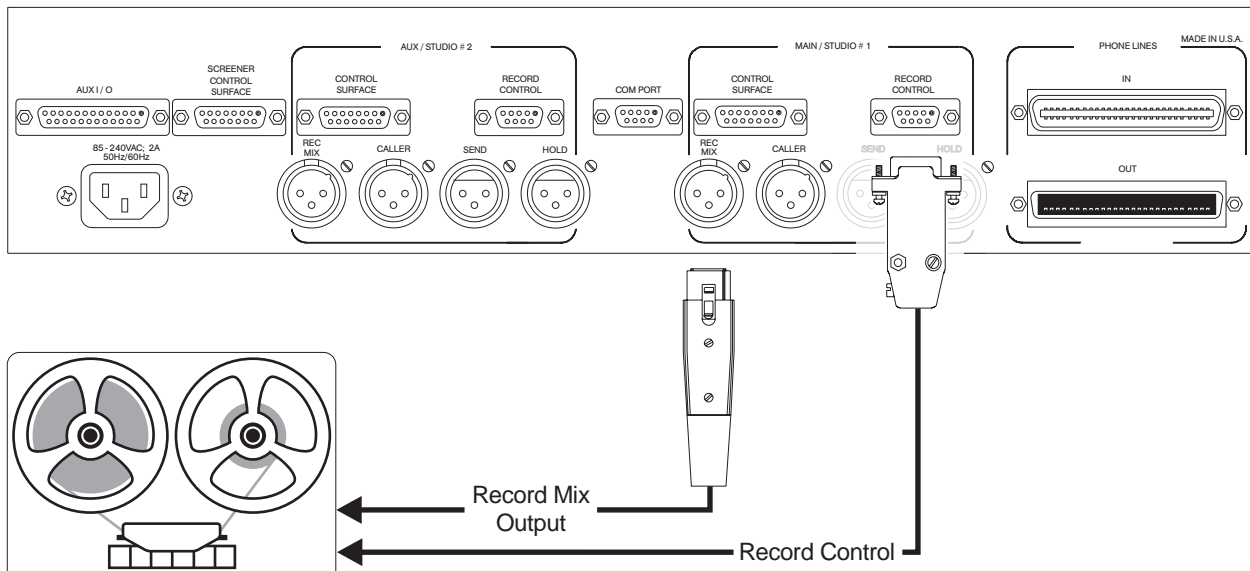
Dip Switch 2 is a global parameter. Changing the setting from momentary to latching will affect all open collector outputs, not just record control.

Record Control Hookup

You can control external recording devices with start, stop and record standby signals provided by the TS612. For dual studio operation, two separate record controls and record mix outputs may be connected (one for each studio). In single studio modes, only one recording device needs to be connected.

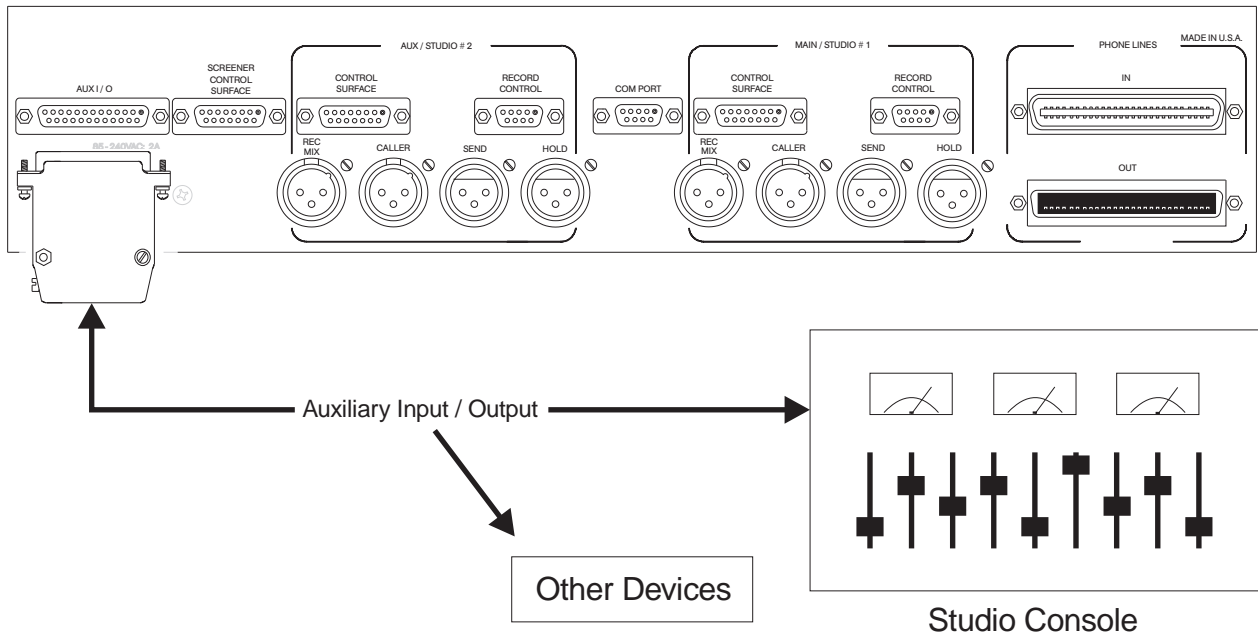
Connect your recording device to the record-control connector located in the Main (Studio 1) section of the mainframe's back panel. The record-control connector provides open collector outputs capable of sinking 40 Vdc 100 mA. It is a DB9 female connector. For pinout mapping, see Appendix B (page 54). As shipped from the factory, the TS612 is set for momentary action of the control signals. If you wish to change the action of the control signals to latch low, move DIP switch 2 to the DOWN position.

REC MIX is a male XLR connector. This output is used to connect a balanced mix of caller and send audio to an input on an external recording device.




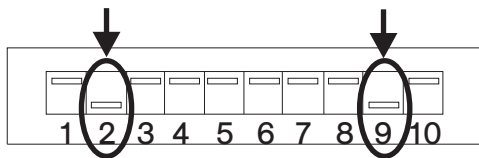
AUX I/O Hookup

The AUX I/O port is a DB25 female connector used to connect auxiliary devices to the TS612. These AUX inputs and outputs provide status information and control using the control surface AUX buttons. The six auxiliary inputs are opto-isolated and require a closure to ground for activation of the input. The eight auxiliary outputs are open-collector and will pull low when activated. Each output is capable of sinking 40 Vdc 100 mA.



As shipped from the factory, the AUX inputs and outputs are set for momentary action. If you wish to change the action of the outputs to latch low, move DIP switch 2 to the DOWN position. To change the action of the inputs to latching mode, move DIP switch 9 to the DOWN position. The tables on the following page indicate the functions associated with each input and output. For pinout mapping, see Appendix B (Page 55).

 **Dip Switch 2 is a global parameter. Changing the setting from momentary to latching affects all open collector outputs (including record control).**



AUX Inputs Functions Table

Inputs	Momentary	Latching
Screener AUX LED*	Toggles with each closure	On when latched
Studio 1 AUX LED	Toggles with each closure	On when latched
Studio 2 AUX LED*	Toggles with each closure	On when latched
NEXT button input (defaults to Studio 1 in dual-studio mode)	<ul style="list-style-type: none"> Places the next caller to handset or air with each closure. If conference is pressed on control surface each closure will conference next call to air up to four. 	<ul style="list-style-type: none"> Places the next caller to handset or air with each closure (latch on). If conference is pressed on control surface. Each closure will conference next call to air up to four.
NEXT Hybrid 1 button	<ul style="list-style-type: none"> Places the next caller to air with each closure. If conference mode is on then up to two calls can be placed to the hybrid. Remove calls from air with OFF button. 	<ul style="list-style-type: none"> Places the next caller to air with each closure (latch on). If conference mode is on then up to two calls can be placed to the hybrid. Remove calls from air with OFF button.
NEXT Hybrid 2 button	<ul style="list-style-type: none"> Places the next caller to air with each closure. If conference mode is on then up to two calls can be placed to the hybrid. Remove calls from air with OFF button. 	<ul style="list-style-type: none"> Places the next caller to air with each closure (latch on). If conference mode is on then up to two calls can be placed to the hybrid. Remove calls from air with OFF button.
*These inputs may be reassigned as Hybrid 1 Off and Hybrid 2 Off respectively. For detailed setup instructions see Setup mode, page 32.		

AUX Outputs Functions Table

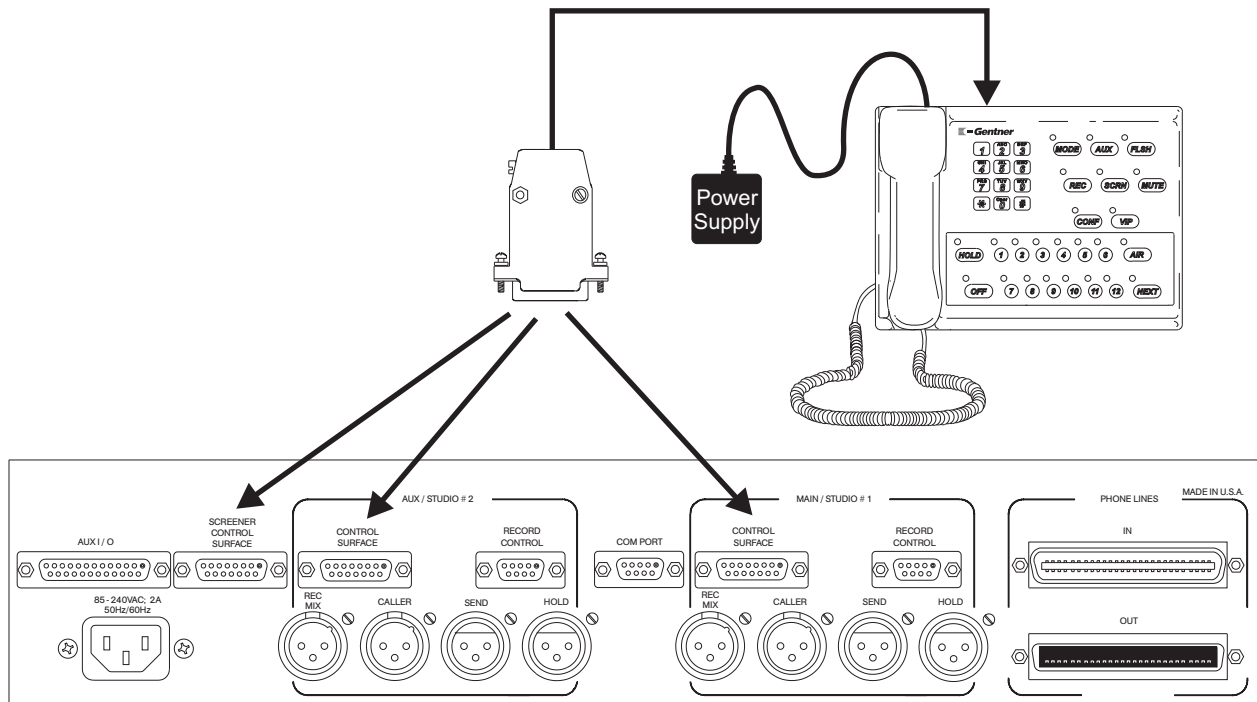
Outputs	Momentary	Latching
Screener AUX output	Pulses 500 mS when Aux button is pressed	Toggles output on and off with each press of the AUX button
Studio 1 AUX output	Pulses 500 mS when Aux button is pressed	Toggles output on and off with each press of the AUX button
Studio 2 AUX output	Pulses 500 mS when Aux button is pressed	Toggles output on and off with each press of the AUX button
Common Ring output	Activates (ON) when lines are ringing	Active when lines are ringing
Screened Hold indication	Activates when calls are in hold queue	Active when calls are in hold queue
Hybrid 1 Active	Pulses 500 mS when the hybrid turns on	Active whenever the hybrid is active
Hybrid 2 Active	Pulses 500 mS when the hybrid turns on	Active whenever the hybrid is active
Rec/Stop/Start/Enable	Pulses 500 mS when record mode is active	Latches when record mode is active

Control Surface Hookup

You may connect up to three control surfaces to the mainframe. Each Control Surface port on the back of the TS612 mainframe is a DB15 female connector. The port on the back of the control surface is a DB15 male connector. A 25-foot cable is included with each control surface. For connector pinouts, see Appendix B page 54.

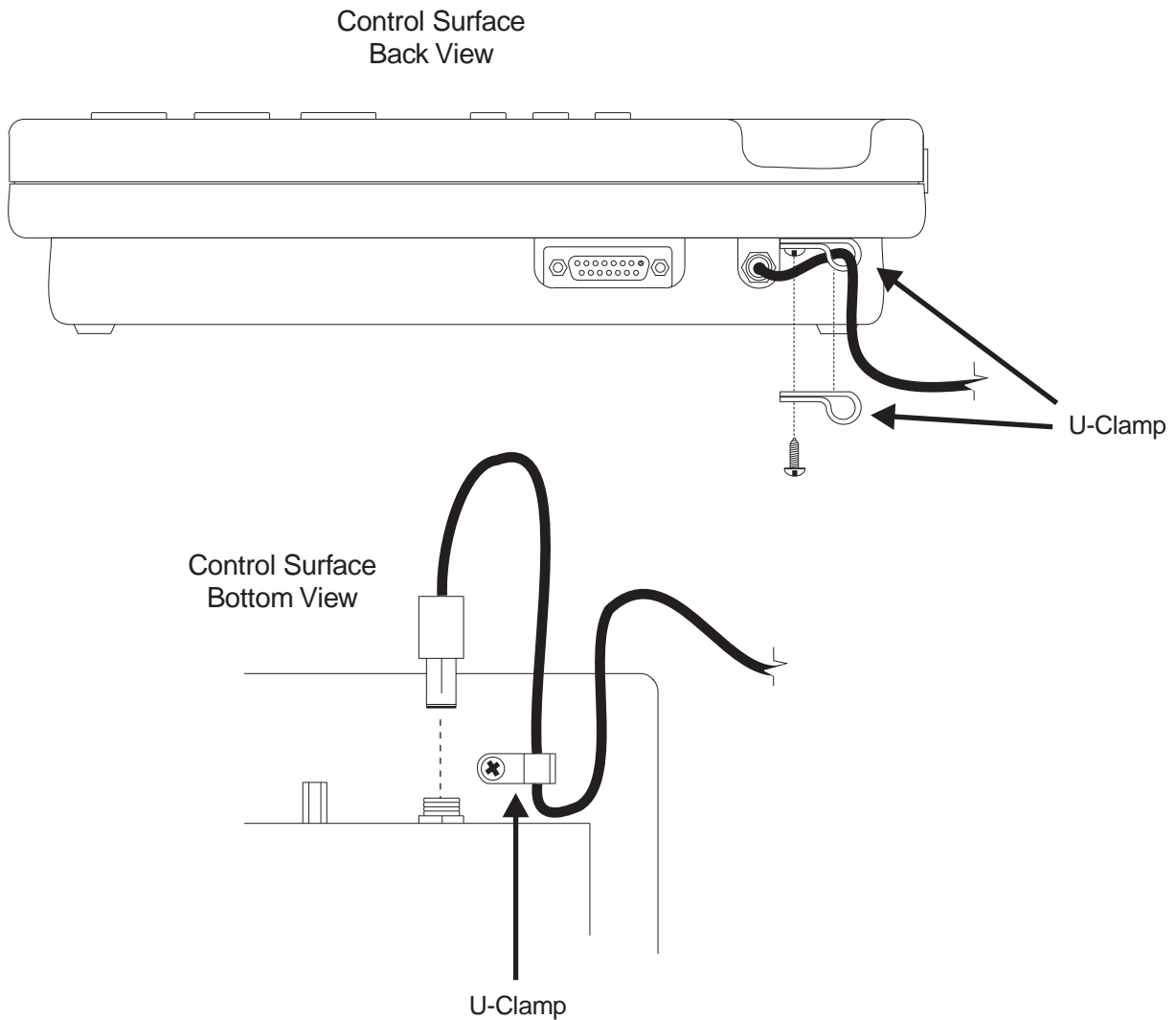
Each control surface has its own power supply. If the power supply cable is not long enough, a 25-foot extension cable is available from Gentner Communications Corporation (part number 830-003-025). Do not plug the power supply into a wall outlet until you have finished installation of your system.

Both the Main (Studio 1) and Aux (Studio 2) control surfaces have complete control of on-air operations as well as independent access to off-air calls. The screener control surface has independent access to off-air calls and the ability to screen calls, but limited control of on-air operations. Control surface capabilities and setup will be discussed in detail in the chapter on Operation beginning page 31.



To prevent accidental disconnection of power to the control surface, install a cable clamp.

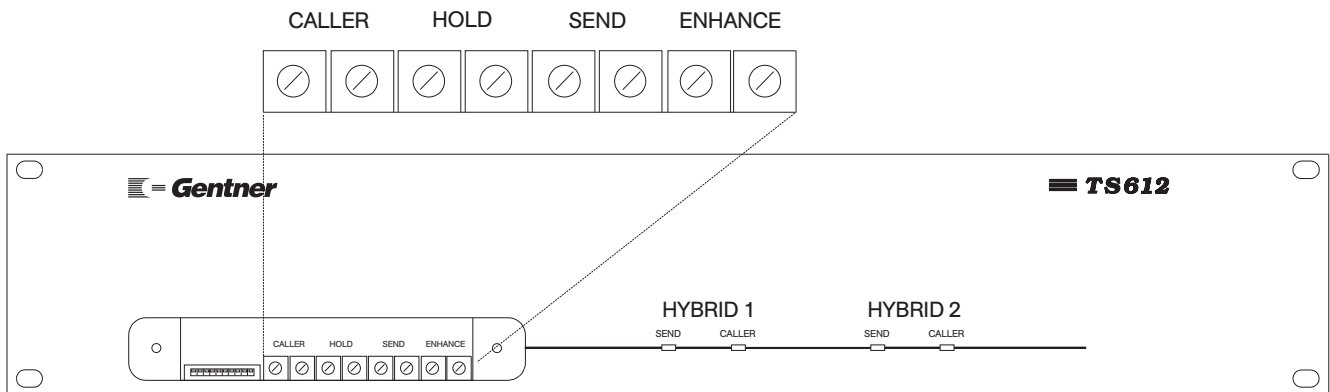
Secure the U-clamp to the bottom of the control surface. Replace the existing screw with the #4 X 3/8 PPH self-tapping screw (supplied with the U-clamp).



Calibration

Your TS612 has been calibrated at the factory to give optimum audio levels for most studios (+4 dBu). You may, however, easily make adjustments to audio levels or digital enhancement with the front-panel trim pots.

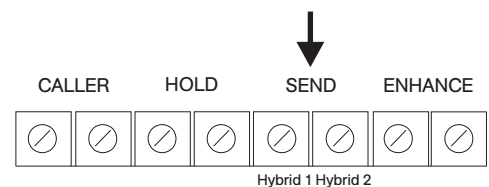
The trim pots for send audio, hold audio, caller audio, and digital enhancement of caller audio are behind the front access panel of the mainframe. Each trim pot is identified on the inside of the access panel.



Calibration of Send Audio

To adjust the send audio, perform the following steps:

- 1.** Using the talent control-surface handset in studio 1, dial an outside telephone number. Ask the answering party to create a quiet line by either disconnecting the handset cord or covering the mouthpiece of the telephone.
- 2.** Press the AIR button on the control surface to transfer the call from the handset to internal digital hybrid 1. The line indicator will glow red.
- 3.** Set the program audio at normal operating level. If you have not already connected the program audio to the SEND XLR connector in the MAIN (STUDIO 1) section of the back panel of the mainframe (page 20), make that connection now.
- 4.** Locate the hybrid 1 SEND trim pot behind the front access panel on the mainframe. While observing the hybrid 1 SEND LED indicator on the front panel of the mainframe, turn the trim pot with a small flathead screwdriver until the indicator glows green most of the time, occasionally flashing red on peak volume. Red indicates a level of 6 dB before clipping.





Step 5 through 7 apply to dual-studio and single-studio split-hybrid operations.

5. Using the talent control-surface handset in studio 2, repeat steps 1–3 above. Or, if you are using split-hybrid operation send a second call to air using any control surface.

6. Locate the hybrid 2 SEND level trim pot behind the front access panel on the mainframe, repeat steps 3–4 above.

7. Press the OFF button on the control surface to disconnect the telephone line(s).

Calibration of Caller Audio

To adjust the caller audio, perform the following steps:

1. Using the talent control-surface handset in studio 1, dial an outside telephone number.

2. Press the AIR button on the control surface to transfer the call from the handset to the internal digital hybrid 1. The line indicator will glow red.

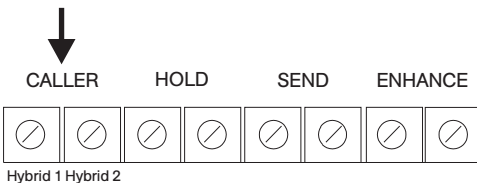
3. Set the CALLER input on the studio console to its normal operating level.

4. Locate the hybrid 1 CALLER trim pot behind the mainframe front access panel. With the called party speaking normally, turn the trim pot to match your audio equipment's input level. The caller LED indicator on the front panel of the mainframe shows the strength of the caller signal coming off the telephone line; the caller-level trim pot has no effect on this indicator.

5. Using the talent control-surface handset in studio 2, repeat steps 1-2 above. Or, if you are using split-hybrid or split-caller operation send a second call to air using any control surface.

6. Locate the hybrid 2 CALLER trim pot behind the mainframe front access panel, repeat step 4.

7. Press the control surface OFF button to disconnect the telephone line(s).

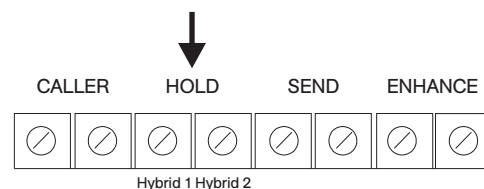


Step 5 through 7 apply to dual-studio, single-studio split-caller and split-hybrid operations.

Calibration of Hold Audio

To adjust the hold audio, perform the following steps:

1. Calibrate the send audio for studio 1.
2. Set the program audio at normal operating level. If you have not already connected the program audio to the HOLD XLR connector in the MAIN/STUDIO 1 section of the mainframe back panel (page 20), make that connection now.
3. Using the talent control-surface handset in studio 1, dial an outside telephone number.
4. Press the AIR button on the control surface to transfer the call from the handset to internal digital hybrid 1. The line indicator will glow red. The hybrid 1 SEND indicator on the front panel of the mainframe will indicate the proper audio levels being sent down the telephone line.
5. Press the HOLD button on the control surface to transfer the call to hold. The line indicator will change from glowing red to a slowly flashing green.
6. The hold audio level to the caller should be at the same level as the program audio when on-air. If the called party says there is a discrepancy between the two, locate the HOLD 1 SEND trim pot behind the mainframe front access panel. Alternately switch the line from air to hold (with the AIR and HOLD buttons), while turning the trim pot. Stop when the called party says the hold audio is at the same level as the send audio.
7. Calibrate the send audio for studio 2.
8. Using the talent control-surface handset in studio 2, dial an outside telephone number.
9. Repeat steps 4–6 (above) for digital hybrid 2 and the associated trim pot.
10. Press the control surface OFF button to disconnect the telephone line.



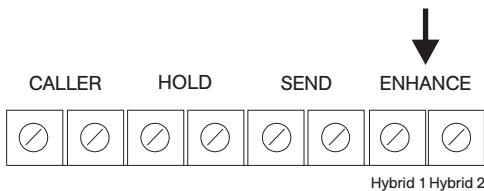
Steps 7-10 apply to dual-studio operation only.

Calibration of DEA

DEA (Digital Enhanced Audio) processes caller audio to make it sound clearer. DEA uses DSP techniques to enhance the spectral content of the caller audio. A combination of equalization, compression and harmonic enhancement is used.

As shipped from the factory, the TS612's DEA is set very conservatively. To adjust the amount of DEA, perform the following steps:

- 1.** Using a talent control-surface handset, dial an outside telephone number.
- 2.** Press the AIR button on the control surface to transfer the call from the handset to the internal digital hybrid 1. The line indicator will glow red.
- 3.** Locate the first DEA trim pot behind the mainframe front access panel. With the called party speaking normally, turn the trim pot with a small flathead screwdriver to adjust the amount of caller processing. This trimmer sets the amount of processing that will be performed on the caller audio. Turn the trimmer clockwise to increase the amount of DEA, counterclockwise to decrease the amount of DEA. If you turn the trimmer fully counterclockwise, no processing will be performed.



We recommend spending some time listening to the effects of DEA on various types of calls (e.g. both long-distance and local calls, from men and women, adults and children, etc.) to optimize your DEA adjustment.

Repeat this process for studio 2 using the second DEA trim pot with a caller active on hybrid 2.

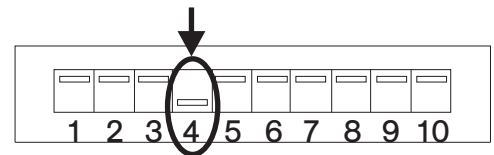
4 Operation

Operational Setup

Setup is an important part of operation, because it allows you to determine how you want the TS612 to function. During setup you will be able to configure several operational modes which are discussed in detail on the following pages.

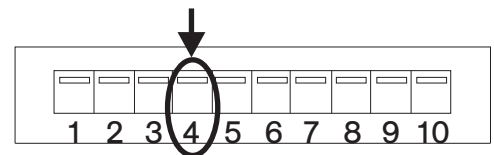
Networking Mode

The COM port located on the rear panel of the TS612 can be used to network multiple TS612 systems together. In network mode, the TS612 Network Interface (Gentner part number 910-003-320) passes line status information from one TS612 system to another, allowing several systems to share the same telephone lines. Network mode is selected by moving DIP switch 4 to the DOWN position.



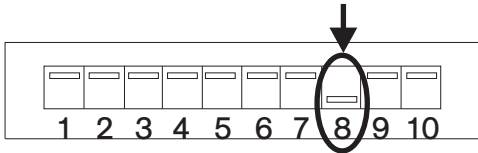
RS232 Standard Mode

In standard mode, the COM port operates as a parallel control of any control surface port. All commands received by the COM port will be treated exactly as if they came directly from the selected control surface. You may choose which control surface will be emulated by the COM port during control surface setup (page 32). For more information on serial communications protocol and serial codes, see Appendix C (page 56). RS232 standard mode is selected by moving DIP switch 4 to the UP position.



Loop-Override mode

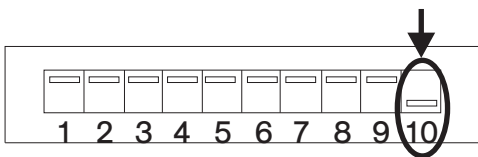
The TS612 allows you to loop telephone lines through the system for use by telephone equipment downstream of the TS612 mainframe. When these lines are in use downstream, the TS612 is normally unable to access them. An in-use line appears amber on the control surface and the line cannot be picked up by pressing the button.



Loop-override mode allows the TS612 to pick up lines which are already in use by downstream equipment. This feature should be used with caution. Once a downstream line is picked up it is no longer available to the downstream equipment. Turn ON loop-override mode by moving DIP switch 8 to the DOWN position.

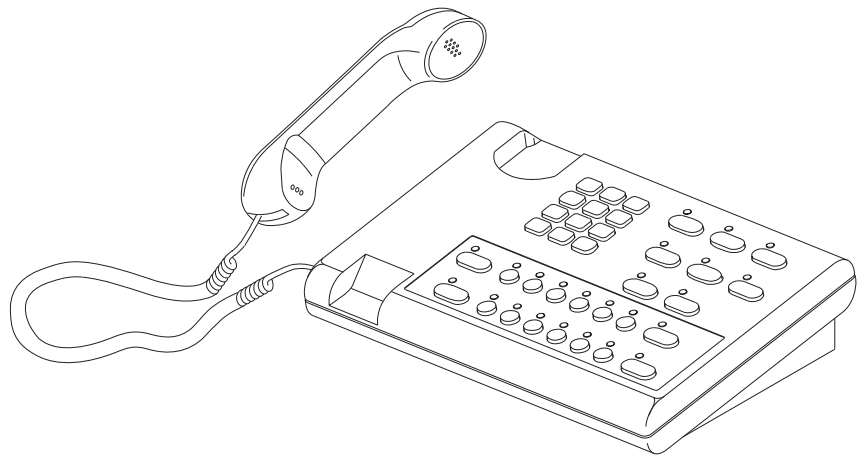
Setup Mode

This mode allows you to enable or disable the remaining operational modes of the TS612.



To enter setup mode, disconnect power to the TS612 mainframe and move DIP switch 10 to the DOWN position. Then reconnect power to the TS612 mainframe.

Setup mode uses buttons on the Main (Studio 1) control surface to enable or disable specific operational modes. The position of DIP switch 10 at power up determines whether the control surface is ready for operation or setup. The control surface must also have power during setup mode.



The table below shows the operational modes which may be selected during setup mode. Beginning on page 34, the operational modes will be discussed in the order they appear on the table.

To select an operational mode, follow the steps below:

1. Select the register. To select a programming register, press the MODE button on the control surface followed by the numbers (001 or 002) on the touch-tone dial pad. You must enter all three numbers (0-0-1) in order to select the register.

LED Color Coding. Upon power up, the MODE LED will be green. When MODE is pressed the LED will turn amber. When the touch-tone dial buttons are pressed, the assigned LINE LED will briefly light up green to indicate that you have pressed the button. Line 10 = 0, Line 1 = 1, and Line 2 = 2. After the register has been selected the MODE LED will turn green again. A red MODE LED indicates an invalid register selection

Register	Line LED	Operational Mode	Buttons Used
001	1*	Main (Studio 1) Control Surface Emulation	N/A
001	2*	Aux (Studio 2) Control Surface Emulation	N/A
001	3*	Screener Control Surface Emulation	N/A
001	4*	Master Mode Emulation (All Control Surfaces)	N/A
001	5	Line / Hybrid Status	N/A
002	1	Two Button Hold Mode	HOLD + LINE
002	2	Screener Air Control	AIR or AIR + LINE
002	3	Previous Hold Mode	MODE & HOLD
002	4	Two Button Off Mode	OFF + LINE
002	5	Hook Flash Timing	N/A
002	6	Hybrid 1 & 2 Off (Aux Inputs)	N/A

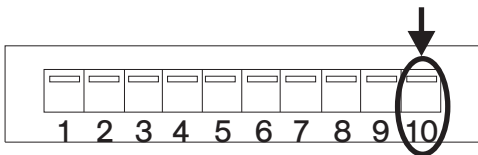
*Enable only one control surface emulation mode or the COM port will not send any data.

2. Select the operational mode. An operational mode is selected by pressing the corresponding LINE button. You may select as many operational modes as you like, except where noted on the table. For example, if you have selected register 002, pressing LINE buttons 1, 2, and 3 will activate Two Button Hold Mode, Screener Air Control, and Previous Hold mode.

LED Color Coding. The corresponding LINE LED will light up red when selected and remain lit until the mode is deselected.

3. Exit the register. To accept your changes, press the FLSH (flash) button. You may now select another register to continue setup (Steps 1 and 2), or return to operational mode.

LED Color Coding. The FLSH LED will light up red for a brief moment to indicate that the changes have been accepted to the register.



4. Return to Operational Mode. Once you have completed setup mode, disconnect power to the TS612 mainframe. Move DIP switch 10 to the UP position, then reconnect power to the mainframe. All changes made during setup are now in effect.

Additional Operational Modes

The following modes are enabled during setup mode by pressing buttons on the control surface (see table page 33).



Only one of the emulation modes marked by an asterisk (*) may be selected during setup mode. More than one selection will prevent the COM port from sending any data.

***Main (Studio 1) Control Surface Emulation.** When this operational mode is selected, all commands received by the COM port will be treated as if they were sent from the Main (Studio 1) control surface. For example, a line selected via a command to the COM port will be routed to the handset of the Main (Studio 1) Control Surface. A call sent to air will be routed to the Main (Studio 1) Caller connector. This mode is valid only when the mainframe COM port is set to RS232 standard mode (see page 31).

***Aux (Studio 2) Control Surface Emulation.** All commands received by the COM port will be treated as if they were sent from the Aux (Studio 2) control surface. For example, a line selected via a command to the COM port will be routed to the handset of the Aux (Studio 2) Control Surface and/or on-air connector. This mode is also valid only when used with RS232 standard mode.

***Screener Control Surface Emulation.** All commands received by the COM port will be treated as if they were sent from the screener control surface. A line selected will be routed to the handset of the Screener Control Surface. Calls can be placed on hold, screened hold, or on-air (if Screener Air Control has been activated). This mode is valid only when used with RS232 standard mode.

***Master Mode Emulation (All Control Surfaces).** This mode allows commands for all control surfaces to be received by the COM port. The TS612 will treat commands just as if they were sent from the corresponding control surface. This mode is also valid only when used with RS232 standard mode.

Line / Hybrid Status. When this mode is selected, the COM port will send out data that indicates which line is active on which hybrid. This mode may be selected in conjunction with any of the above emulation modes and will function accordingly. This mode is also valid only when used with RS232 standard mode.

Two Button Hold Mode. This mode is for use when two or more calls are conferenced together. In normal operation, pressing HOLD will place all conferenced calls on hold at once. In Two Button Hold mode, you can place only one of the conferenced lines on hold by pressing HOLD followed by a LINE button.

LED Color Coding. The HOLD LED is solid red in this mode. Pressing the HOLD button will cause the HOLD LED to flash green. When a LINE button is pressed, the HOLD LED will return to red. If no LINE button is pressed, the HOLD LED will return to red after a brief delay.

Screener Air Control. This mode allows the screener control surface to place callers to air and to remove calls from the air to place them on hold. To place calls to air directly from the handset, press the AIR button. If a screened call is on hold and you want to place it to air, press AIR and then the LINE button. If a call is on-air and you want to place it on hold, press AIR and then the LINE button. The status of the call determines whether the call is placed to air or put on hold.

LED Color Coding. When you have pressed the AIR button, the AIR LED will flash red until a LINE button is pressed.

Previous Hold Mode. This mode allows you to switch from line to line quickly without disconnecting your callers. If you are on a call, pressing the LINE button on another line will place the previous call on hold automatically. To disconnect a line while in Previous Hold mode, place the handset in the cradle or press the OFF button. Normal hold mode requires you to press the HOLD button to place a call on hold before you answer another line.

Once Previous Hold mode is activated in setup (page 32), you can switch back and forth between normal and Previous Hold modes using the control surface. The change is made by pressing and holding down the MODE button followed by a quick press of the HOLD button.

LED Color Coding. The HOLD LED is amber when Previous Hold mode is enabled. When Previous Hold mode is disabled, the HOLD LED will turn off. If you are using Two Button Hold mode at the same time, the HOLD LED will follow Previous Hold Color Coding, but still flash green while awaiting a line selection.

Two Button Off Mode. This mode allows you to disconnect any call by pressing the OFF button followed by the LINE button to be disconnected. This works for calls on the handset, on air, or on hold.

LED Color Coding. The OFF LED is solid red when no calls are on air. The LED will turn off when calls are on air. In Two Button Off mode, pressing the OFF button will cause the OFF LED to flash red. When a LINE button is pressed, the OFF LED will return to solid red.

Hook Flash Timing. The hook flash function is used to signal PBX equipment or a central office switch. The timing length requirement for this hook flash varies between switch manufacturers. The default timing length is a 550 ms pulse. If you enable the Hook Flash Timing mode in setup (page 32), the timing length will be changed to a 55 ms pulse. Typically the 550 ms timing works with most switches in the U.S. and Canadian markets. The 55 ms timing works with most switches in the European and Latin American markets.

Hybrid 1 & 2 Off (Aux Inputs). When you enable this feature in setup mode (page 32), two of the AUX inputs are reassigned. The Screener AUX LED and Studio 2 AUX LED status inputs are reassigned as Hybrid 1 Off and Hybrid 2 Off inputs respectively. This provides you with parallel control to disconnect calls from the hybrids with a closure to ground.

Using the Control Surface

The control surface is your primary tool for day-to-day operations. Once the TS612 system is installed and configured, no further attention to the mainframe should be required. Up to three control surfaces may be connected directly to the mainframe: Main (Studio 1), Aux (Studio 2), and Screener. The studio control surfaces may be used as full dual controls in a single-studio setting, or as two separate control surfaces in a dual-studio setting. The screener control can be used to screen calls only (with limited capabilities), or can be used to screen calls and place them on the air.

Studio Control Surface

When plugged into a studio port, the control surface is really two telephone systems in one: a regular multiline telephone and an on-air telephone.

1. Regular Multi-line Telephone. When the handset is removed from the cradle, the TS612 routes a selected line to the handset.

2. On-Air Telephone. When you leave the handset in the cradle and select a line, the TS612 routes the call to one of the internal digital hybrids for use on-air.

Because the TS612 system is two instruments, one call can be answered on the handset and a separate call can be on-air through the internal hybrids at the same time. In conference mode, up to four calls can be on-air simultaneously while you continue answering calls on the handset.

Screener Control Surface

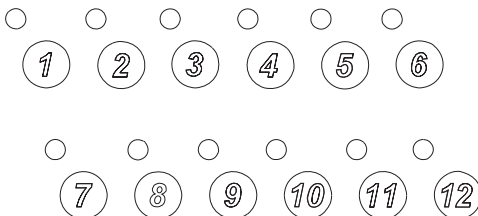
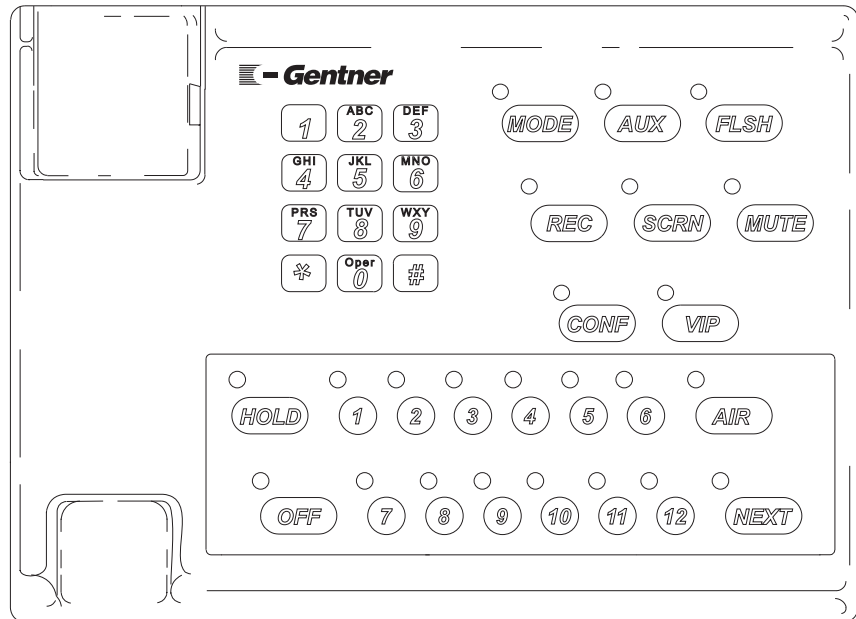
When plugged into the screener port, the control surface has limited functions. In standard mode, only the handset function is active. A call cannot be placed on-air from a screener control surface, only on hold or screened hold. When Screener Air Control is active (see page 35), the screener can also place screened calls on air, and put on-air calls on hold.



When the handset is up, all actions affect the call on the handset. When the handset is down, all actions affect the call on the hybrids (on-air).

Control Surface Buttons

The operation of each of the control surface buttons will be discussed on the following pages. The buttons will be discussed first as they function when the control surface is plugged into a studio port. A discussion of button use with the screener port begins on page 43.



Telephone Line Buttons. The LINE buttons are used for selecting telephone lines. Pushing a LINE button will select that line. If the handset has been picked up before the line is selected, the call will be connected to the handset. If the handset is down when a LINE button is pressed, the call will be placed on the air.

If you are on a call and press another LINE button, the first line will be automatically disconnected. However, the TS612 also offers a new feature called Previous Hold Mode. When this mode is enabled in setup (page 32), you can switch lines without disconnecting the previous call. When a new line is selected, the previous line is put automatically on hold. For more information about this feature see page 36.

LINE button operation does change, however, when the control surface is in conference mode. Push-on/push-off operation allows you to conference several lines together at one time, yet still disconnect individual callers from the conference. Press a connected LINE button and only the caller on that line will be disconnected. The OFF button will disconnect all of the conferenced callers.

LED Color Coding. Each LINE button has an LED line-status indicator located above it. These LED's have three colors to indicate call status: red, green, and amber. The status indications for LINE LED are described below.

Not in use. When a line is not in use, the LED is off.

Ringing. A ringing line is indicated by a green LED that flashes on at a quick 4 Hz rate for one second, then off for one second, in a repeating cycle until answered.

In use on handset. When a call is connected to the handset, the LINE LED will appear solid green.

In use on-air. A line that is in use on-air is indicated by an LED that is solid red.

In use elsewhere. When a call is in use by another control surface or downstream equipment, the LINE LED will appear solid amber.

On hold. A line on hold is indicated by a green LED that is flashing at a slow 1 Hz rate.

On screened hold. A line on screened hold is indicated by a red LED that is flashing at a quick 2 Hz rate.

Color	Activity	Status
None	None	Not In Use
Green	Solid	In Use on Handset
Green	Flashing quickly and pulsed on & off	Ringin
Green	Flashing at a slow rate	On Hold
Red	Solid	In Use On-Air
Red	Flashing at a quick rate	On Screened Hold
Amber	Solid	In Use Elsewhere

LINE LED Quick Reference Table



Touch-Tone Pad. The touch-tone pad is used for dialing out on the telephone system. Pressing any of these buttons will generate the appropriate touch tone. Remember that the touch tones generated are fixed pulse lengths. Pressing and holding a touch-tone number will not generate a continuous tone. Dialing can be done through the handset or on the hybrids (on air).

HOLD Button. The HOLD button places a call on hold. Pressing the HOLD button while the handset is off the cradle will place the call on the handset on hold. Pressing the HOLD button while the handset is in the cradle will place the call(s) that are on-air on hold.

The HOLD button is also used in Two Button Hold mode. This mode is enabled during setup (page 32). Two Button Hold works in conference mode and allows you to place only one call on hold while leaving the others connected. Just press HOLD and then the button for the line you want to place on hold. For more information on Two Button Hold, see page 35.

OFF Button. The OFF button disconnects on-air calls. The OFF button normally has no effect on handset calls. To hang up a handset call, place the handset back in the cradle. The OFF LED glows red when no lines are in use on-air. The LED is off when a line is in use on-air.

The OFF button is also used in Two Button Off mode. This mode is enabled during setup (page 32). Two Button Off allows you to disconnect any call whether it is on the air, on hold, or on the handset. Just press OFF and then the button of the line you want to disconnect. For more information on Two Button Off, see page 36.

AIR Button. The AIR button is used to instantly transfer a handset call to air. If there was a previous call on the air, it will be automatically disconnected. If you are in conference mode, the calls will be conferenced together on-air.

NEXT Button. The NEXT button is used for selecting calls which have been placed on hold. There are two different modes of operation for the NEXT button: NEXT non-screened and NEXT screened caller. When pressed in the non-screened mode, the NEXT button will select the line of the oldest holding call. In the screened mode, the NEXT button will select the line of the oldest holding screened call.

LED Color Coding. The NEXT LED is off if there are no calls on hold. The LED will glow green if there are non-screened callers on hold. The LED will glow red if there are screened calls on hold.

MODE Button. The MODE button is used during Setup mode. For more information, see page 32. MODE is also used to toggle the previous hold mode, see page 36.

AUX Button. The AUX button is used to control external equipment such as a digital delay box. Pressing this button activates an output on the AUX I/O port. The AUX LED will light up red when a closure is applied to the appropriate AUX I/O input pin. For more information, see page 23.

FLSH Button. The FLSH button is used to hook-flash (temporarily disconnect) a line that is on the handset. This feature allows your TS612 to take advantage of line-handling features like transferring a call from the TS612 to an outside extension. Refer to your PBX single-line analog-extension features to determine line-handling features.

LED Color Coding. The indicator above the FLSH button will light up when the FLSH button is pressed.

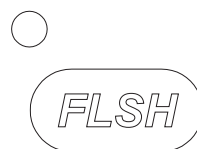
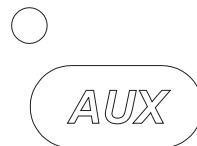
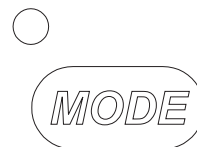
REC Button. The REC button is used to control an external recording device. REC is active for on-air calls only. If pressed when a line is selected on-air, a start-recording signal will be sent to the external recorder; if pressed a second time, a stop signal will be sent to the external recorder.

If the REC button is pressed while no line is selected to air, the TS612 will go into a record-standby mode. In this mode, the start-recording signal will be automatically sent to the external recorder as soon as a line is selected to air. When the line is disconnected, a stop signal will be sent to the external recorder. The TS612 will remain in record mode until the REC button is pressed a second time.

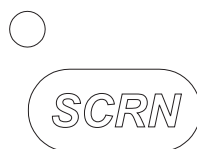
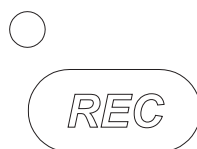
LED Color Coding. The LED above the REC button will glow red when recording and flash red when in record-standby mode. It will be off when the record mode is off.

SCRN Button. Pressing the SCRN button places the control surface in screening mode. This changes the NEXT button function from taking the oldest non-screened holding call to only taking screened calls from the screener surface.

LED Color Coding. The SCRN LED is solid red when in screening mode, and is off when not in screening mode.



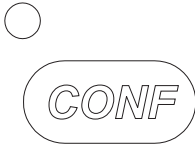
FLSH only works on the handset; it does not work for lines selected on-air.





MUTE Button. Pressing the MUTE button will mute the on-air caller audio. This button operates in a push-on/push-off mode. The caller will remain muted for as long as the MUTE button is on.

LED Color Coding. The MUTE LED is off when mute is off and solid red when mute is on.



CONF Button. The CONF button places the TS612 into the conference mode. Conference mode applies only to on-air lines, it does not apply to lines on the handset. This changes the line-button operation to push-on/push-off, allowing lines to be conferenced together.

In single-studio mode, up to four lines can be conferenced together on-air. Once four lines have been selected for conference, no other lines can be selected until one of the four conferenced lines is deselected. In the dual-studio mode, only two lines may be conferenced together per studio.

In the conference mode, if the OFF button is pressed, all active lines will be dropped. You may disconnect individual lines by pushing the line button, or by using the Two Button Off feature. The same is true for the HOLD button; all active lines will be placed on hold, unless you are using the Two Button Hold feature.

LED Color Coding. The CONF LED is red when conference mode is enabled and off when it is disabled.



VIP Button. The VIP button places line 6 or line 12 into VIP mode. When in VIP mode, a call on line 6 or 12 (whichever line is selected first) is locked on. It cannot be accidentally dropped or placed on hold. This feature is used when you have a guest on line who you do not want to accidentally disconnect. VIP mode also places the TS612 into a special conference mode, which allows you to conference line-to-line, connecting a single caller to your VIP guest.

LED Color Coding. The VIP LED is red when VIP mode is on, and off when VIP mode is not in use.



The CONF mode can be used in conjunction with the VIP mode to allow the conference of two additional callers with the VIP caller. In VIP mode and CONF mode, only three lines can be conferenced together. This provides the VIP with a dedicated hybrid for the best audio quality.

Screener Control Surface Buttons

The operation of the screener control surface is the same for many buttons, but there are some important differences. These differences will be discussed on the following pages.

OFF Button. Pressing the OFF button on the screener surface will disconnect a call. This eliminates the need to place the handset in the cradle to disconnect calls. The same is true when the screener is using a headset instead of the handset for screening calls.

AIR Button. The screener does not normally have the ability to place a call on the air. However, when the Screener Air Control feature is enabled in setup (see page 32), the screener can place calls on the air and put on-air calls on hold. If a call is on the handset, the screener can immediately send them to air by pressing the AIR button. If a previously screened call is holding, it can be placed on air by pressing AIR and then the LINE button. To put an on-air call on hold, press AIR and then the LINE button.

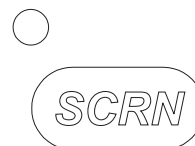
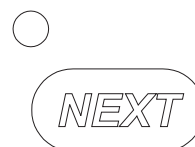
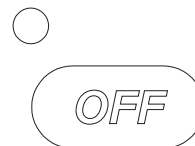
NEXT Button. The NEXT button is used for selecting calls which have been placed on hold. When pressed, the NEXT button will select the line of the oldest holding call. The indicator above the NEXT button is used to indicate callers in the hold queue. The indicator will be off if there are no calls on hold, glow green if there are callers on hold.

SCRN Button. From the screener position, the SCRN button is used to put a screened call on screened hold. When pressed, the active line will be placed on hold as a screened call. The LINE LED will flash red. These calls are also made available to the studio control surfaces as screened-holding calls.

HOLD, MODE, AUX, FLSH, LINE Buttons, and Touch Tone Pad.

These buttons operate in the same manner as when the control surface is connected to a studio port.

REC, MUTE, CONF, and VIP. These buttons are non-functional on the screener control surface.



Call Handling

On the Handset

The following section reviews how calls are handled on the handset.

Answering a Call. Pick up the handset and press the line button of the ringing (green flashing) line. You may do this at any time, regardless of whether or not other calls are already on-air. Your handset will be connected off-air to the incoming caller. The LED for that line will glow solid green. Calls can be answered by going from line to line. Each time a new line is taken, the previous line will be disconnected, unless you are in Previous Hold mode (see page 36).

Making a Call. Pick up the handset and press the line button of any line not in use. You will hear a dial tone, and the line's LED will glow green, indicating that the call is on the handset. Dial the telephone number normally.

Hanging Up a Call. To disconnect the line on the handset, replace the handset in the cradle. The LED for the line will go out.

Placing a Call On Hold. While the call is on the handset (out of the cradle) press the HOLD button. The caller will connect to hold audio. The line LED will slowly flash green, and the NEXT status indicator will glow solid green, indicating at least one call is on hold.

Taking a Call Off Hold. To take a call off hold and talk on the handset, press any green, slowly flashing line button with the handset off-hook. Your handset will be connected to the line off-air, and the line's LED will glow green, indicating that the call is on the handset. You can also press the NEXT button. This will take the oldest call on hold and connect it to your handset off-air. The LINE LED of the oldest call on hold will change from a slow green flash to a steady, green glow, indicating that the call is now on the handset.

Transferring a Call from the Handset to Air. You must be at a studio control surface to place an on-air call. (A screener control surface cannot place an on-air call, unless you have enabled the Screener Air Control feature.) With the call on the handset, press the AIR button. This immediately transfers the call from the handset to the hybrid for on-air use. The LINE LED will change from a green glow to a red glow, indicating that the call is on-air.

On-Air

The following section reviews how calls are handled on the air.

Answering a Call On-Air. You must be at a studio control surface to answer a call on the air. (A screener control surface cannot answer calls on-air.) With the handset down, press the line button of the ringing (green rapidly flashing) line. The line will be routed to a hybrid for on-air use (the LED for that line will glow red) allowing you to communicate with the caller through the audio console. Calls can be answered by going from line to line. Each time a new line is taken, the previous line is disconnected, unless you are in Previous Hold mode (see page 36).

Making a Call On-Air. With the handset down, press the line button of any line that is not in use. You will hear a dial tone through your console and the line's LED indicator will glow red, indicating that the call is on-air. Dial the telephone number using the touch-tone keypad.

Hanging Up a Call. To hang up an on-air call, press the OFF button. The LED for the line will go out.

Putting an On-Air Call on Hold. With the handset down, press the HOLD button. The caller will be connected to hold audio. The LINE LED will slowly flash green, and the NEXT status indicator will glow green, indicating at least one call on hold.

Transferring a Call from Hold to Air. You can place a holding call directly to air by pressing the holding call's LINE button with the handset down. The LINE LED will glow red, indicating the call is on-air. You can also press the NEXT button. This will take the oldest call on hold and connect it to the hybrid for on-air use. The LINE LED will change from a slow flashing green to a solid red glow, indicating that the call is now on-air.

Taking Screened Calls. Calls may be screened from the screening control surface and placed into a screened hold queue. The studio control surfaces enter screening mode by pressing the SCRNB button. The SCRNB LED will glow red. This changes the operation of the NEXT button from taking the oldest call on hold to taking the oldest screened hold call. The NEXT button will take calls in the order they were screened. If there is at least one call in the screened hold queue, the NEXT status indicator will glow red. Screened calls may also be taken by simply pressing the associated line button. The advantage of using the NEXT button is that it ensures that only screened calls are taken to air and that they are taken in the order they were screened. Return the control surface to non-screened mode at any time by pressing the SCRNB button again. The SCRNB LED indicator will go off.



The touch tones will be heard on-air unless you press the MUTE button first.



Returning to a screened caller will affect the order in the queue. The caller that the screener returned to will be bumped to the end of the queue.

VIP for Guest Talents. The VIP mode protects one VIP (usually a show guest) from accidental disconnection. While in the VIP mode, the protected line cannot be placed on hold or disconnected. VIP mode works only for either line 6 or line 12.

Handling Multiple Callers in Conference Mode. Conference mode allows up to four callers to be on-air at the same time. The first two calls in the conference mode will have excellent quality. The third and fourth calls are button-mashed on top of the first two calls in each digital hybrid, slightly decreasing the performance of each hybrid. If VIP mode is activated, one digital hybrid is reserved for the VIP guest; in that case, up to two other callers can be button-mashed onto the other hybrid for a conference with the VIP guest. In the split-studio mode, with one hybrid dedicated to each studio, the second call is immediately button-mashed. Press the CONF button of a studio control surface to enable the conference mode. The LED above the CONF button glows red.

Conference mode changes the line button operation to push-on / push-off mode. Press the line button of another line to add it to the conference. Its status indicator will glow red. Keep connecting additional lines/disconnecting existing conferenced lines, as you wish. The maximum for a conference is a total of four lines, if not in VIP mode; if in VIP mode, the VIP line and two others are the maximum possible. To disconnect a single caller from the conference, press its associated line button to disconnect only that caller from the conference.

Recording a Call. A recording device must be connected to the REC MIX and Record Control connectors (see page 22) on the back panel in order for a recording to be made. To activate the recording device, press the REC button. If at least one line is active, the REC LED will glow red, indicating that the TS612 has started the recording device. If no line is active, the REC LED will flash red, indicating that the record mode is in standby, awaiting an active line before starting to record. When a line button is pressed, the record signal will be sent, and the REC LED will glow red. The record mode will change back to standby when there are no active on-air lines. To stop recording, press the REC button again. The REC LED will go off.

5 Glossary

Balanced Audio. A two-line audio signal without reference to ground (i.e. differential-mode audio).

Console. The audio mixer used to combine all programming sources (i.e. announcer's voice, music, commercial announcements, etc.). A console is also called a mixing board, mixer, audio board, etc. In radio and TV, the console is located in a control room and is run by an announcer, operator or producer. In other applications, the console is the audio-mixing system used to combine audio sources for transmission. If using microphones, the audio console will typically be a microphone mixer. For assistance specifying a microphone mixer or console for your application, contact Gentner Communications Corporation.

Control Surface. The TS612 telephone used at the control locations. Broadcasters refer to these devices as control surfaces because of their system-control functions.

Digital Signal Processing. Digitally modifying a signal to provide a specific function or output.

DEA. Psycho-acoustic digital processing of caller audio. A technology developed by Gentner Communications Corporation which provides for a dramatically improved audio signal for on-air broadcast clarity.

DIP Switch. Dual in-line package of miniature rocker switches.

DSP. See Digital Signal Processing.

DTMF. Dual-tone multi-frequency (touch-tones by AT&T) for dialing on the phone system.

Handset. The hand held part of a communications system usually consisting of a phone, speaker and a microphone.

HOLD. As with a business telephone, the TS612 hold feature takes calls off-air, or off the handset, and places them in a waiting mode. Special hold audio can be provided.

Hybrid. See Telephone Hybrid.

Keypad. The buttons on the control surface that control TS612 functions such as dialing, line selection and other function-related options.

Latching. A control signal that remains in a fixed state until you release it. This is opposed to a momentary control which is a pulsed signal.

LED. Light Emitting Diode. A semiconductor diode used in an electronic display that emits a light when subjected to an applied voltage.

Loop Through. Where the incoming signal is brought into the system and looped back out for use by other external equipment.

Loop Start. An analog type of telephone line in which the line is idle until loop current is drawn and the line is activated.

Mainframe. In this manual, Mainframe refers to the TS612 rack-mount central processing unit for this system.

Mix-Minus. Refers to the audio that must be sent to callers to prevent feedback on the audio system through the hybrid. Mix-minus is a mix of all audio on the console, minus the caller's audio. Without a mix-minus feed, the caller audio appearing on the console will be sent back to the caller, where it will be retransmitted to the studio via the caller's telephone. This feedback can create anything from echo to a howling squeal. Many broadcast consoles provide a mix-minus feed via a telephone module.

NEXT. A special feature of the TS612. As calls are answered and placed on hold, they go into a queue (sequence) enabling them to be taken in the order that they were answered or screened. The NEXT feature enables the operator to take calls in this order by pressing a button.

OFF. Disconnects callers that are active on the system. It does not affect TS612 power.

On-Air. The operator is placing calls on the TS612 hybrids. In a broadcast application, callers are being put on-air with the announcer so the listening audience may hear the conversation.

Opto-Isolated. A control signal that is optically coupled. Usually used to prevent ground hum in an electrical system (optically isolated from the rest of the system).

PBX. Post Branch Exchange. See Telephone Line.

Pinouts. Configuration of signal-carrying lines on a connector.

POTS. See Telephone Line.

Screeener. This refers to the person previewing calls before the announcer places them on-air. A typical screener will answer ringing lines and place them on hold, then will go back to each holding line and get specific information about each caller. A screener or producer typically decides whether to place a caller on-air after initial contact.

Superhybrid. The class of telephone hybrid used in the TS612. A Superhybrid uses DSP technology to automatically match the telephone line to your audio equipment; it also creates its own mix-minus feed (See Mix-Minus.) to callers. Superhybrids also provide AGC along with DEA for improved clarity of the caller's audio.

Telephone Hybrid. A device which converts a telephone line (two-wire, low-level signal) into a balanced, four-wire, line-level signal with independent send/receive ports. A telephone hybrid provides necessary electronic matching between the telephone line and the audio equipment. Generally referred to in this manual as simply a hybrid.

Telephone Line. In this manual, a telephone line is defined as the line delivered by the telephone company to an individual subscriber. Sometimes known as a POTS (Plain Old Telephone Service) line, this is an analog line as required by fax machines or modems. The TS612 requires analog telephone lines for all phone-line connections.

You may use the TS612 in conjunction with a PBX (business telephone system). A PBX brings in a bank of telephone lines from the telephone company and provides a variety of functions with multi-line access.

Trim Pot. A potentiometer for adjusting (or trimming) signal levels.

VIP. Very Important Person. With the TS612, lines can be designated as VIP lines, preventing accidental disconnection from guest hosts and/or special interview guests.

XLR. A type of electrical connector.

5 Appendices

Appendix A: Specifications

Control Surface Dimensions

11"/48.3cmW x 2.5"(3.75" w/ handset)/4.45cm(9.5cm w/ handset)H x 8.0"/30.5cmD

Mainframe Dimensions

19"/48.3cmW x 10-1/4"/26cmH x 3.5"/8.9cmD

TS612 System Weight

12.1 lbs./5.5 kg dry 19 lbs./8.6 kg shipping

Connectors

Power:	Auto-adjusting power module
RS232:	DB9 female serial port 9200 Baud, no parity, 8 data bits, 1 stop bit
Record Control:	DB9 female. Inputs active on closure to ground at 100 mA sink current.
Auxiliary:	DB25 female
XLR:	3-pin audio connectors
PHONE LINES IN:	21X, 50-pin centronix male
PHONE LINES OUT:	21X, 50-pin centronix female
CONTROL SURFACE:	DB15

Operating Temperature Range

32–100 F/0–38 C

Humidity Range

0–80 percent

Direct Plug-In Power AdaptorControl Surface Electrical

12Vdc

Mainframe Electrical

85-240Vac 50/60Hz; 30W maximum

Telephone Specifications

Automatic Disconnect: Disconnects on loop drop or loop reversal

Hybrid: Dual transformer coupled with DSP adaptive cancellation

Key Service Compatibility: Any key system providing true tip and ring compatibility to telephone instruments

Tip/Ring Switching: One DPDT relay

Telephone Transmit

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

Send Distortion: 0.3 percent THD, 270 2800Hz
Send SNR: 62dB
Send Filter: -1dB points: 270 and 2800Hz, -30dB points: 6300Hz**Telephone Receive**

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

Receive THD +N: @ 1kHz 0.08 percent
Receive Distortion: 0.15 percent THD, 270 3300Hz
Receive Filter: -1dB points: 270 and 3300Hz, -30dB points: 100 and 6300Hz

Audio Interface

MAIN SEND Input:	10k ohm active balanced, XLR bridging input +4dBm nominal with clipping threshold of +20dBm. This connector contains either Send mix-minus or program audio depending on mode. Level is adjustable via front access panel trim pot.
HOLD Input:	10k ohm active balanced, XLR bridging input +4dBm nominal with clipping threshold of +20dBm. This connector contains the audio you want the caller to hear when placed on hold. Level is adjustable via front access panel trim pot.
CALLER Output:	Active balanced, 50ohm nominal output impedance. Nominal output level +4dBm, clip level. Level is adjustable via front access panel trim pot.
RECORD-MIX Output:	50ohm nominal output impedance; +4dBm nominal, clip level +20dBm fixed output level, set by Main Send input and Caller output.

Accessories (provided)

Power Transformer	25-foot interconnect cable
4 XLR connectors	Installation and Operations Manual
Rack screws	
Quick Reference Card	

Specifications are subject to change without notice.

Appendix B: Pinouts

Phone Line	Pin	Wire Color*	Pin	Wire Color*
1	1 TIP	blue/white	26 RING	white/blue
2	2 TIP	orange/white	27 RING	white/orange
3	3 TIP	green/white	28 RING	white/green
4	4 TIP	brown/white	29 RING	white/brown
5	5 TIP	silver/white	30 RING	white/silver
6	6 TIP	blue/red	31 RING	red/blue
7	7 TIP	orange/red	32 RING	red/orange
8	8 TIP	green/red	33 RING	red/green
9	9 TIP	brown/red	34 RING	red/brown
10	10 TIP	silver/red	35 RING	red/silver
11	11 TIP	blue/black	36 RING	black/blue
12	12 TIP	orange/black	37 RING	black/orange
*Wire colors are presented in the following format: base/stripe				

Telco IN/OUT Pinout Table

Pin	Description
1	No Connection
2	Receive Data
3	Transmit Data
4	No Connection
5	Ground
6	No Connection
7	No Connection
8	No Connection
9	No Connection

RS232 Com Port Pinout Table

**Record Control Connector
Pinout Table**

Pin	Description
1	Start
2	No Connection
3	No Connection
4	Stop
5	Record Enable
6	Tape Start Com
7	No Connection
8	Tape Stop Com
9	Record Enable Com

**Control Surface Connector Pinout
Tables (both cable ends are shown)**

Use twisted pair cable for the connections indicated below.

Pin	Description		Description	Pin
1	Serial TX -		Serial TX -	1
2	Serial TX +		Serial TX +	2
3	Serial RX -		Serial RX -	3
4	Serial RX +		Serial RX +	4
5	Speaker +		Speaker +	5
6	Speaker -		Speaker -	6
7	Mic -		Mic -	7
8	Mic +		Mic +	8
9	Surface Reset		Surface Reset	9
10	Ground		Ground	10
11-14	No Connection		No Connection	11-14
15	Ground		Ground	15

Pin	Description
1	Ground
2	Positive Audio (+)
3	Negative Audio (-)

XLR Connector Pinout Table

Aux I/O Connector Pinouts

Pin	Description	Pin	Description
1	Common	14	Screener Aux Lamp
2	Studio 1 Aux Lamp	15	Common
3	Studio 2 Aux Lamp	16	Next Button Input
4	Common	17	Next Hybrid 1 Input
5	Next Hybrid 2 Input	18	Common
6	Hybrid 1 Active Output	19	Hybrid 2 Active Output
7	Common	20	Output #3
8	Output #4	21	Common
9	Output #5	22	Screened Hold Indication Output
10	Common	23	Output #7
11	Studio 2 Aux Out	24	Common
12	Studio 1 Aux Out	25	Screener Aux Out
13	Common		

Appendix C: Serial Communications Protocol

The COM port of the TS612 is an RS232 serial communications port used for control by external equipment such as a PC running screening software, or a digital storage device. This section defines the protocol used for communication and control of the TS612 system.

Currently, this port has been defined to have access to all status and commands used by the TS612 for communication with the control surfaces.

The interface to the mainframe through this port is an asynchronous, full-duplex RS232 serial interface. Connection is made through a DB nine-pin female connector. The pinout table can be found on page 53.

The specification table for the serial interface is shown below.

Serial Communication Protocol

Baud Rate	9,600 Baud
Start Bit	Low
8 Data Bits	Least Significant Bit First
No Parity Bit	N/A
Stop Bit	High

Reception begins when a start bit is detected on the receive line. The bit detector samples the value on the third, fourth and fifth bits. The value accepted is the value that was seen in two of the three samples.

Hex Codes

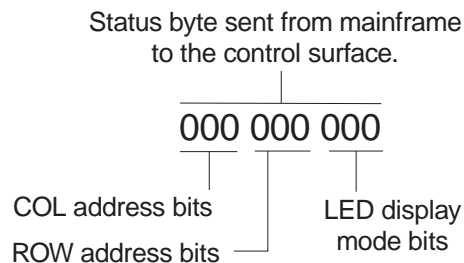
Communication between the control surface and the mainframe consists of hex codes which define button closures and lamp-status indications. The mainframe CPU maintains the status of the TS612 system. The control surface is a dumb terminal that is programmed to constantly scan and update the mainframe with a unique hex code which defines the condition of each button (released or pressed) on the control surface. The mainframe determines the proper action to take based upon the button hex codes received from each control surface. The table on the facing page shows the assigned hex codes.

Button Closure Hex Codes

Button Function	Released	Pressed	Button Function	Released	Pressed
Line 1	11	10	DTMF 1	05	04
Line 2	31	30	DTMF 2	25	24
Line 3	51	50	DTMF 3	45	44
Line 4	71	70	DTMF 4	0D	0C
Line 5	91	90	DTMF 5	2D	2C
Line 6	B1	B0	DTMF 6	4D	4C
Line 7	19	18	DTMF 7	65	64
Line 8	39	38	DTMF 8	85	84
Line 9	59	58	DTMF 9	A5	A4
Line 10	79	78	DTMF 0	8D	8C
Line 11	99	98	DTMF *	6D	6C
Line 12	B9	B8	DTMF #	AD	AC
OFF	01	00	AUX	A9	A8
HOLD	21	20	FLSH	69	68
NEXT	41	40	REC	09	08
AIR	A1	A0	SCRN	61	60
MODE	89	88	MUTE	29	28
CONF	49	48	VIP	81	80
Hook Switch on Hook		C1	Hook Switch Off Hook		C0
Control Surface Reset		F0	Control surface Query response		F1

Status Bytes

Status for the system is displayed at each control surface. Each button, other than the DTMF buttons, has a status LED associated with it. These LED's are used to indicate the various states of operation. The mainframe maintains the status information and sends updates of this status to the control surface. A separate 8 bit encoded byte is sent to the control surface for each of the 24 LED's on the control surface. This byte is encoded to contain the address of the LED and the mode to be displayed by that address. The diagram to the right defines the encoding scheme used for the control surface status bytes:



The control surface has eight different LED modes embedded in the microprocessor program for the control surface. These modes are the same for all LED's on the control surface. The tables on the following pages define each button's LED status indications.

LINE 1 Button

Status	byte	LED	Indication	Status
000	10	000	Both red and green off	Line not active
000	10	001	Solid red on	Line is selected on air
000	10	010	Solid green on	Line is selected on handset
000	10	011	Solid red and green on (amber)	Line is in use elsewhere
000	10	100	Not used	Not used
000	10	101	Flashing red @ 2 Hz rate	Line is on screened hold
000	10	110	Flashing green @ 1Hz rate	Line is on hold
000	10	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 2 Button

Status	byte	LED	Indication	Status
001	10	000	Both red and green off	Line not active
001	10	001	Solid red on	Line is selected on air
001	10	010	Solid green on	Line is selected on handset
001	10	011	Solid red and green on (amber)	Line is in use elsewhere
001	10	100	Not used	Not used
001	10	101	Flashing red @ 2 Hz rate	Line is on screened hold
001	10	110	Flashing green @ 1Hz rate	Line is on hold
001	10	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 3 Button

Status	byte	LED	Indication	Status
010	10	000	Both red and green off	Line not active
010	10	001	Solid red on	Line is selected on air
010	10	010	Solid green on	Line is selected on handset
010	10	011	Solid red and green on (amber)	Line is in use elsewhere
010	10	100	Not used	Not used
010	10	101	Flashing red @ 2 Hz rate	Line is on screened hold
010	10	110	Flashing green @ 1Hz rate	Line is on hold
010	10	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 4 Button

Status	byte	LED	Indication	Status
011	10	000	Both red and green off	Line not active
011	10	001	Solid red on	Line is selected on air
011	10	010	Solid green on	Line is selected on handset
011	10	011	Solid red and green on (amber)	Line is in use elsewhere
011	10	100	Not used	Not used
011	10	101	Flashing red @ 2 Hz rate	Line is on screened hold
011	10	110	Flashing green @ 1Hz rate	Line is on hold
011	10	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 5 Button

Status	byte	LED	Indication	Status
100	10	000	Both red and green off	Line not active
100	10	001	Solid red on	Line is selected on air
100	10	010	Solid green on	Line is selected on handset
100	10	011	Solid red and green on (amber)	Line is in use elsewhere
100	10	100	Not used	Not used
100	10	101	Flashing red @ 2 Hz rate	Line is on screened hold
100	10	110	Flashing green @ 1Hz rate	Line is on hold
100	10	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 6 Button

Status	byte	LED	Indication	Status
101	10	000	Both red and green off	Line not active
101	10	001	Solid red on	Line is selected on air
101	10	010	Solid green on	Line is selected on handset
101	10	011	Solid red and green on (amber)	Line is in use elsewhere
101	10	100	Not used	Not used
101	10	101	Flashing red @ 2 Hz rate	Line is on screened hold
101	10	110	Flashing green @ 1Hz rate	Line is on hold
101	10	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 7 Button

Status	byte	LED	Indication	Status
000	11	000	Both red and green off	Line not active
000	11	001	Solid red on	Line is selected on air
000	11	010	Solid green on	Line is selected on handset
000	11	011	Solid red and green on (amber)	Line is in use elsewhere
000	11	100	Not used	Not used
000	11	101	Flashing red @ 2 Hz rate	Line is on screened hold
000	11	110	Flashing green @ 1Hz rate	Line is on hold
000	11	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 8 Button

Status	byte	LED	Indication	Status
001	11	000	Both red and green off	Line not active
001	11	001	Solid red on	Line is selected on air
001	11	010	Solid green on	Line is selected on handset
001	11	011	Solid red and green on (amber)	Line is in use elsewhere
001	11	100	Not used	Not used
001	11	101	Flashing red @ 2 Hz rate	Line is on screened hold
001	11	110	Flashing green @ 1Hz rate	Line is on hold
001	11	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 9 Button

Status	byte	LED	Indication	Status
010	11	000	Both red and green off	Line not active
010	11	001	Solid red on	Line is selected on air
010	11	010	Solid green on	Line is selected on handset
010	11	011	Solid red and green on (amber)	Line is in use elsewhere
010	11	100	Not used	Not used
010	11	101	Flashing red @ 2 Hz rate	Line is on screened hold
010	11	110	Flashing green @ 1Hz rate	Line is on hold
010	11	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 10 Button

Status	byte	LED	Indication	Status
011	11	000	Both red and green off	Line not active
011	11	001	Solid red on	Line is selected on air
011	11	010	Solid green on	Line is selected on handset
011	11	011	Solid red and green on (amber)	Line is in use elsewhere
011	11	100	Not used	Not used
011	11	101	Flashing red @ 2 Hz rate	Line is on screened hold
011	11	110	Flashing green @ 1Hz rate	Line is on hold
011	11	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 11 Button

Status	byte	LED	Indication	Status
100	11	000	Both red and green off	Line not active
100	11	001	Solid red on	Line is selected on air
100	11	010	Solid green on	Line is selected on handset
100	11	011	Solid red and green on (amber)	Line is in use elsewhere
100	11	100	Not used	Not used
100	11	101	Flashing red @ 2 Hz rate	Line is on screened hold
100	11	110	Flashing green @ 1Hz rate	Line is on hold
100	11	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

LINE 12 Button

Status	byte	LED	Indication	Status
101	11	000	Both red and green off	Line not active
101	11	001	Solid red on	Line is selected on air
101	11	010	Solid green on	Line is selected on handset
101	11	011	Solid red and green on (amber)	Line is in use elsewhere
101	11	100	Not used	Not used
101	11	101	Flashing red @ 2 Hz rate	Line is on screened hold
101	11	110	Flashing green @ 1Hz rate	Line is on hold
101	11	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	Line is ringing

MODE Button

Status	byte	LED	Indication	Status
011	01	000	Both red and green off	Mode not active
011	01	001	Solid red on	Invalid register entry
011	01	010	Solid green on	Indicates register is selected
011	01	011	Solid red and green on (amber)	Awaiting register selection
011	01	100	Not used	Not used
011	01	101	Flashing red @ 2 Hz rate	N/A
011	01	110	Flashing green @ 1Hz rate	N/A
011	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

AUX Button

Status	byte	LED	Indication	Status
100	01	000	Both red and green off	No input to opto coupler.
100	01	001	Solid red on	Closure at opto coupler input
100	01	010	Solid green on	N/A
100	01	011	Solid red and green on (amber)	N/A
100	01	100	Flashing red @ 1 Hz rate	N/A
100	01	101	Flashing red @ 2 Hz rate	N/A
100	01	110	Flashing green @ 1Hz rate	N/A
100	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

FLSH Button

Status	byte	LED	Indication	Status
101	01	000	Both red and green off	N/A
101	01	001	Solid red on	Programming register
101	01	010	Solid green on	Generating Hook Flash
101	01	011	Solid red and green on (amber)	N/A
101	01	100	Flashing red @ 1 Hz rate	Not used
101	01	101	Flashing red @ 2 Hz rate	N/A
101	01	110	Flashing green @ 1Hz rate	N/A
101	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

REC Button

Status	byte	LED	Indication	Status
010	01	000	Both red and green off	Record mode not active.
010	01	001	Solid red on	Recording
010	01	010	Solid green on	N/A
010	01	011	Solid red and green on (amber)	N/A
010	01	100	Flashing red @ 1 Hz rate	Not used
010	01	101	Flashing red @ 2 Hz rate	Record mode enabled
010	01	110	Flashing green @ 1Hz rate	N/A
010	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

SCRN Button

Status	byte	LED	Indication	Status
000	01	000	Both red and green off	Screening disabled (studio)
000	01	001	Solid red on	Screening active (studio)
000	01	010	Solid green on	Screener control surface (on)
000	01	011	Solid red and green on (amber)	Screening locked out (studio)
000	01	100	Flashing red @ 1 Hz rate	Not used
000	01	101	Flashing red @ 2 Hz rate	N/A
000	01	110	Flashing green @ 1Hz rate	N/A
000	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

MUTE Button

Status	byte	LED	Indication	Status
001	01	000	Both red and green off	MUTE disabled
001	01	001	Solid red on	MUTE enabled
001	01	010	Solid green on	N/A
001	01	011	Solid red and green on (amber)	N/A
001	01	100	Flashing red @ 1 Hz rate	Not used
001	01	101	Flashing red @ 2 Hz rate	N/A
001	01	110	Flashing green @ 1Hz rate	N/A
001	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

CONF Button

Status	byte	LED	Indication	Status
000	01	000	Both red and green off	Conference Mode disabled
000	01	001	Solid red on	Conference Mode enabled
000	01	010	Solid green on	N/A
000	01	011	Solid red and green on (amber)	N/A
000	01	100	Flashing red @ 1 Hz rate	Not used
000	01	101	Flashing red @ 2 Hz rate	N/A
000	01	110	Flashing green @ 1Hz rate	N/A
000	01	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

VIP Button

Status	byte	LED	Indication	Status
100	00	000	Both red and green off	VIP mode disabled
100	00	001	Solid red on	VIP mode enabled
100	00	010	Solid green on	N/A
100	00	011	Solid red and green on (amber)	N/A
100	00	100	Flashing red @ 1 Hz rate	Not used
100	00	101	Flashing red @ 2 Hz rate	N/A
100	00	110	Flashing green @ 1Hz rate	N/A
100	00	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

HOLD Button

Status	byte	LED	Indication	Status
001	00	000	Both red and green off	Previous Hold Mode disabled
001	00	001	Solid red on	2 Button Hold Mode enabled
001	00	010	Solid green on	Calls in the hold queue
001	00	011	Solid red and green on (amber)	Previous Hold Mode enabled
001	00	100	Flashing red @ 1 Hz rate	Not used
001	00	101	Flashing red @ 2 Hz rate	N/A
001	00	110	Flashing green @ 1Hz rate	Awaiting line selection
001	00	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

OFF Button

Status	byte	LED	Indication	Status
000	00	000	Both red and green off	Call on air
000	00	001	Solid red on	No calls on air
000	00	010	Solid green on	N/A
000	00	011	Solid red and green on (amber)	N/A
000	00	100	Flashing red @ 1 Hz rate	Not used
000	00	101	Flashing red @ 2 Hz rate	2Button Hold Mode awaiting line selection
000	00	110	Flashing green @ 1Hz rate	N/A
000	00	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

AIR Button

Status	byte	LED	Indication	Status
101	00	000	Both red and green off	N/A
101	00	001	Solid red on	N/A
101	00	010	Solid green on	N/A
101	00	011	Solid red and green on (amber)	N/A
101	00	100	Flashing red @ 1 Hz rate	Not used
101	00	101	Flashing red @ 2 Hz rate	Screener Air Control awaiting line selection
101	00	110	Flashing green @ 1Hz rate	N/A
101	00	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

NEXT Button

Status	byte	LED	Indication	Status
010	00	000	Both red and green off	No calls in hold or screened hold queue.
010	00	001	Solid red on	Screening Mode active. Calls in Screen Hold queue.
010	00	010	Solid green on	Screen Mode not active. Calls in Hold queue.
010	00	011	Solid red and green on (amber)	N/A
010	00	100	Flashing red @ 1 Hz rate	Not used
010	00	101	Flashing red @ 2 Hz rate	N/A
010	00	110	Flashing green @ 1Hz rate	N/A
010	00	111	Flashing green @ 4Hz pulsed on and off at 1/2 Hz.	N/A

Peek/Poke, Reset, and Other Commands

Peek and Poke are special commands to the TS612 mainframe which allow the user to examine and change memory one byte at a time. The entire RAM space from 0x2000 to 0x5260 and the EEPROM memory space from 0xB600 to 0xB7FF are valid for peek/poke commands. Be aware that the TS612 is oblivious to any changes made through the peek and poke commands.

Peek Command. The Peek command allows the user to “Peek” at, or examine memory space. The command format is as follows:

```
PC sends:           0xC9  Haddr  Laddr
TS612 replies      0xC9  Haddr  Laddr  data  checksum byte
```

Note that the TS612 echoes the command back to the PC before sending one byte of data and one byte checksum. Haddr is the high order address byte of the data, and Laddr is the low order address byte of the data.

Poke Command. The Poke command allows the user to change a byte value in memory. The command format is as follows:

```
PC sends:           0xCA  Haddr  Laddr  data  checksum byte
TS612 replies:     0xCA  result
```

The result codes are:

```
0x55  “Successful command”
0xAA  “Bad checksum”
0xFF  “The address is outside of RAM and
      EEPROM ranges”
```

EEPROM Layout. The EEPROM is laid out in the following fashion:

<u>Address</u>	<u>Description</u>
B600	EEPROM Software Revision High Byte
B601	EEPROM Software Revision Low Byte
B602	RS232 Port Emulation and Data Configuration (001)
B603	EEPROM1 Software Configuration Register 1 (002)
B604	B7FF — Reserved for Future Use

Register 001. RS232 Port Configuration

<u>Bit</u>	<u>Description</u>
0	COM port emulates Control Surface 1
1	COM port emulates Control Surface 2
2	COM port emulates Screener
3	COM port is in Master Mode
4	Hybrid Status transmitted over the COM port
5-7	Not Used



Only one of the COM port bits (0-3) may be enabled at the same time.

Register 002. Software Configuration.

Bit	Description
0	2-Button Hold is enabled when set
1	Screener Air Control is enabled when set
2	Previous Hold is enabled when set
3	Two-Button Off is enabled when set
4	Hook Flash Rate = 500 mS when clear, 50 mS when set
5	Control Surface 2 and Screener Auxiliary Outputs normal when clear, Hybrid 1 & Hybrid 2 Off when set
6-7	Not Used

Mainframe Reset. The reset command resets the mainframe by sending the following code:

0xCF

Master Mode. Master mode allows the PC to simulate commands from any control surface. Master mode is enabled during Setup (see page 32). The master mode protocol is as follows:

PC sends: cmd surface
 TS612 replies: code surface

The valid cmd and code values are the assigned hex code values (see page 56). The valid surface values are **0** (control surface 1), **1** (control surface 2), and **2** (screener control surface).

Line/Hybrid Status. This mode allows the PC to retrieve status information for the emulated control surface (or all control surfaces if Master Mode is enabled). Line/Hybrid Status mode is enabled during Setup (see page 32). The Line/Hybrid Status protocol is as follows:

TS612 sends: C8 byte1 byte2 byte3 byte4 (surface)

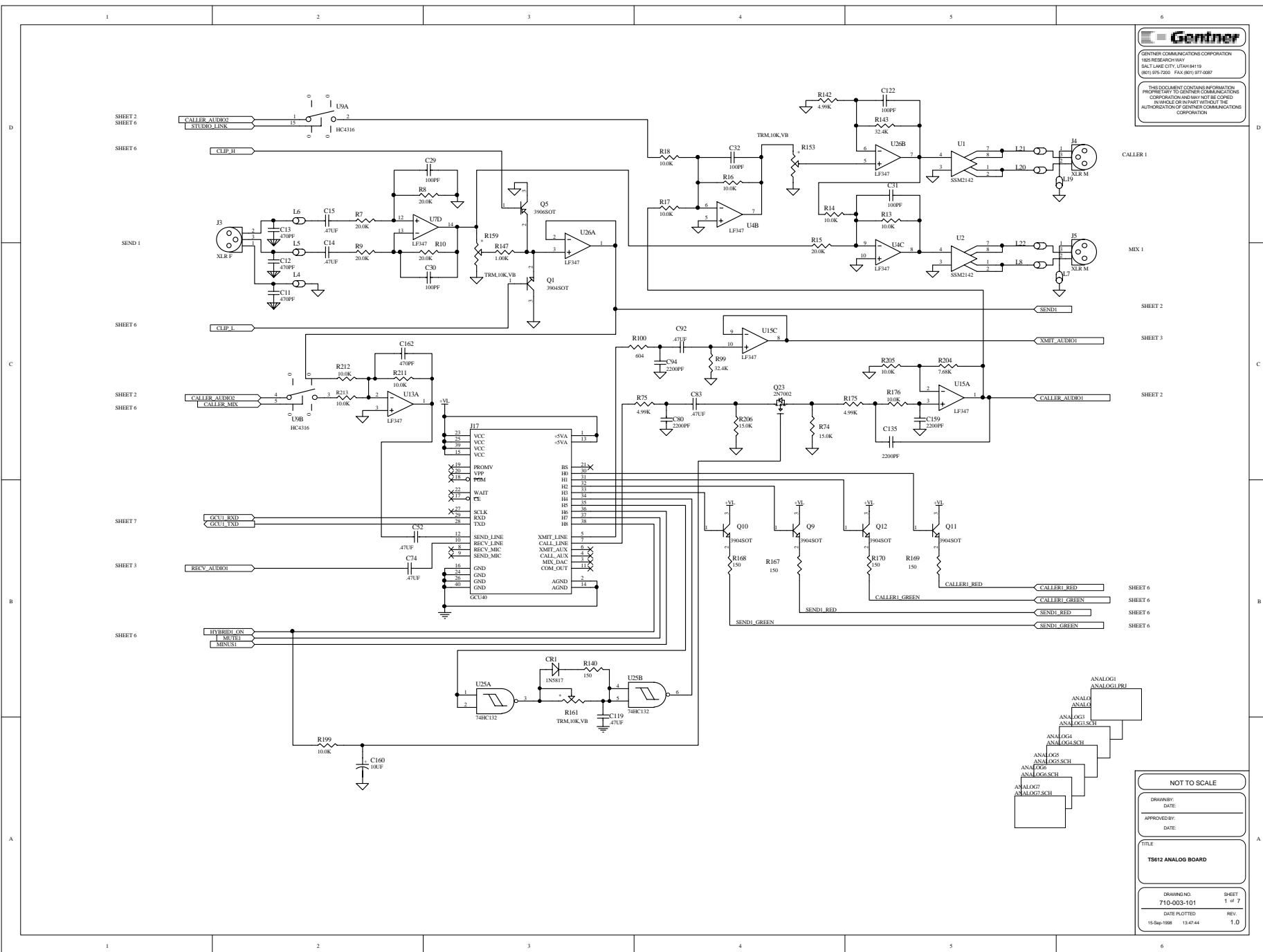
The hex code C8 is used as a flag for the line/hybrid status. The following four bytes indicate which calls are active on the hybrids in the following order:

- Byte1 = Hybrid 1 Slot 1
- Byte2 = Hybrid 1 Slot 2
- Byte3 = Hybrid 2 Slot 1
- Byte4 = Hybrid 2 Slot 2

The following table lists the hex codes and their associated lines:

HEX CODE	00	01	02	03	04	05	06	07	08	09	0A	0B	FF
ACTIVE LINE	01	02	03	04	05	06	07	08	09	10	11	12	NONE

Example: **C8 00 01 02 FF** would indicate that line 1 is active on Hybrid 1 Slot 1, line 2 is active on Hybrid 1 Slot 2, line 3 is active on Hybrid 2 Slot 1, and no line is active on Hybrid 2 Slot 2.



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CALLER 1

MIX 1

SHEET 2

SHEET 3

SHEET 2

SHEET 6

SHEET 6

SHEET 6

SHEET 6

NOT TO SCALE

DRAWN BY: DATE:

APPROVED BY: DATE:

TITLE
T8612 ANALOG BOARD

DRAWING NO. SHEET
710-003-101 1 of 7

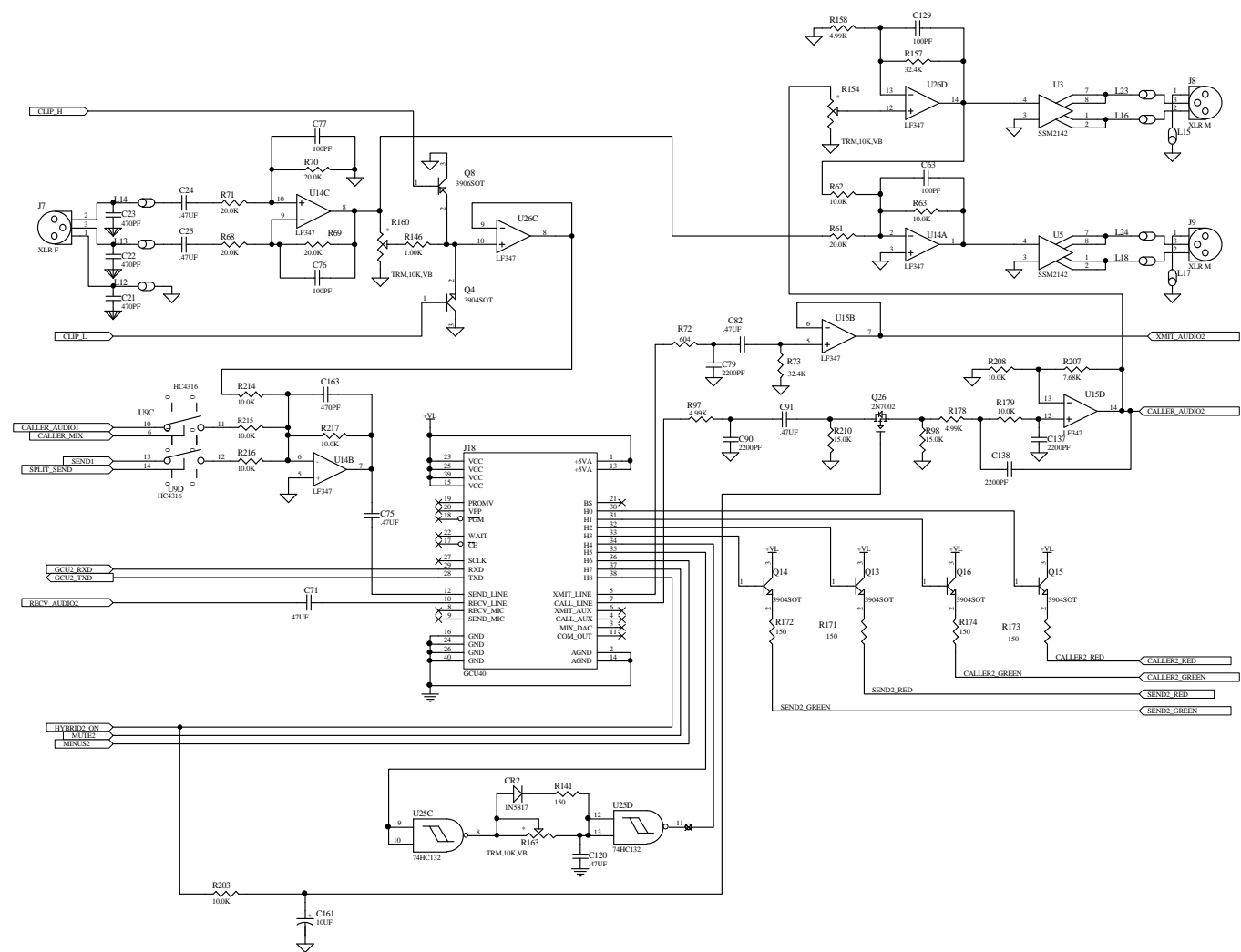
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SHEET 6
 SEND 2
 SHEET 6
 SHEET 1
 SHEET 6
 SHEET 1
 SHEET 6
 SHEET 7
 SHEET 7
 SHEET 3
 SHEET 6
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CALLER 2
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 SHEET 3
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 DATE: _____

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TITLE
TS612 ANALOG BOARD

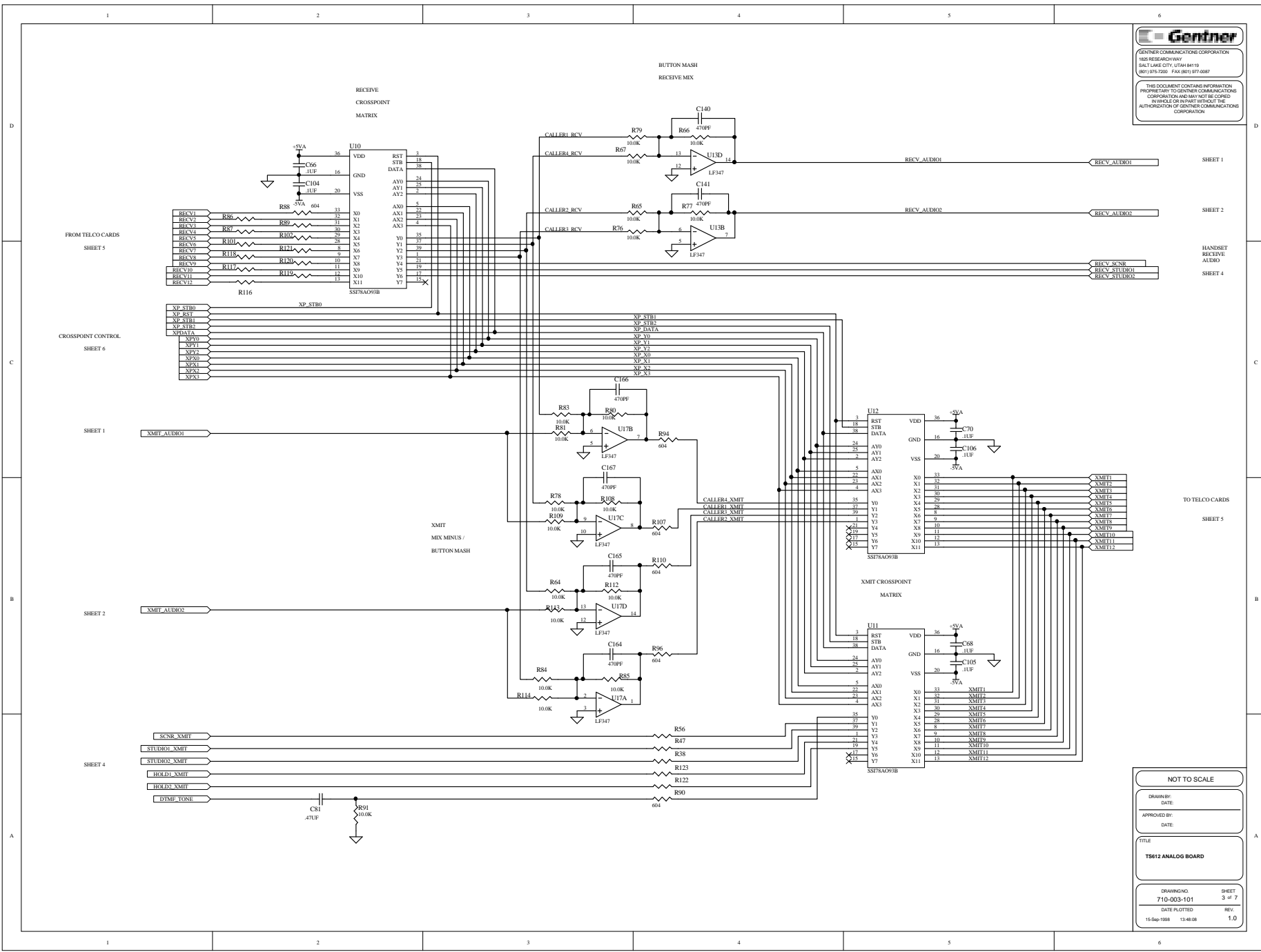
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 710-003-101 2 of 7

DATE PLOTTED REV.
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TITLE
TS612 ANALOG BOARD

DRAWING NO. SHEET
710-003-101 3 of 7

DATE PLOTTED REV.
15-Sep-1998 13:48:08 1.0

SHEET 1

SHEET 2

HANDBET
RECEIVE
AUDIO

SHEET 4

TO TELCO CARDS

SHEET 5

SHEET 2

SHEET 4

SHEET 1

SHEET 6

SHEET 5

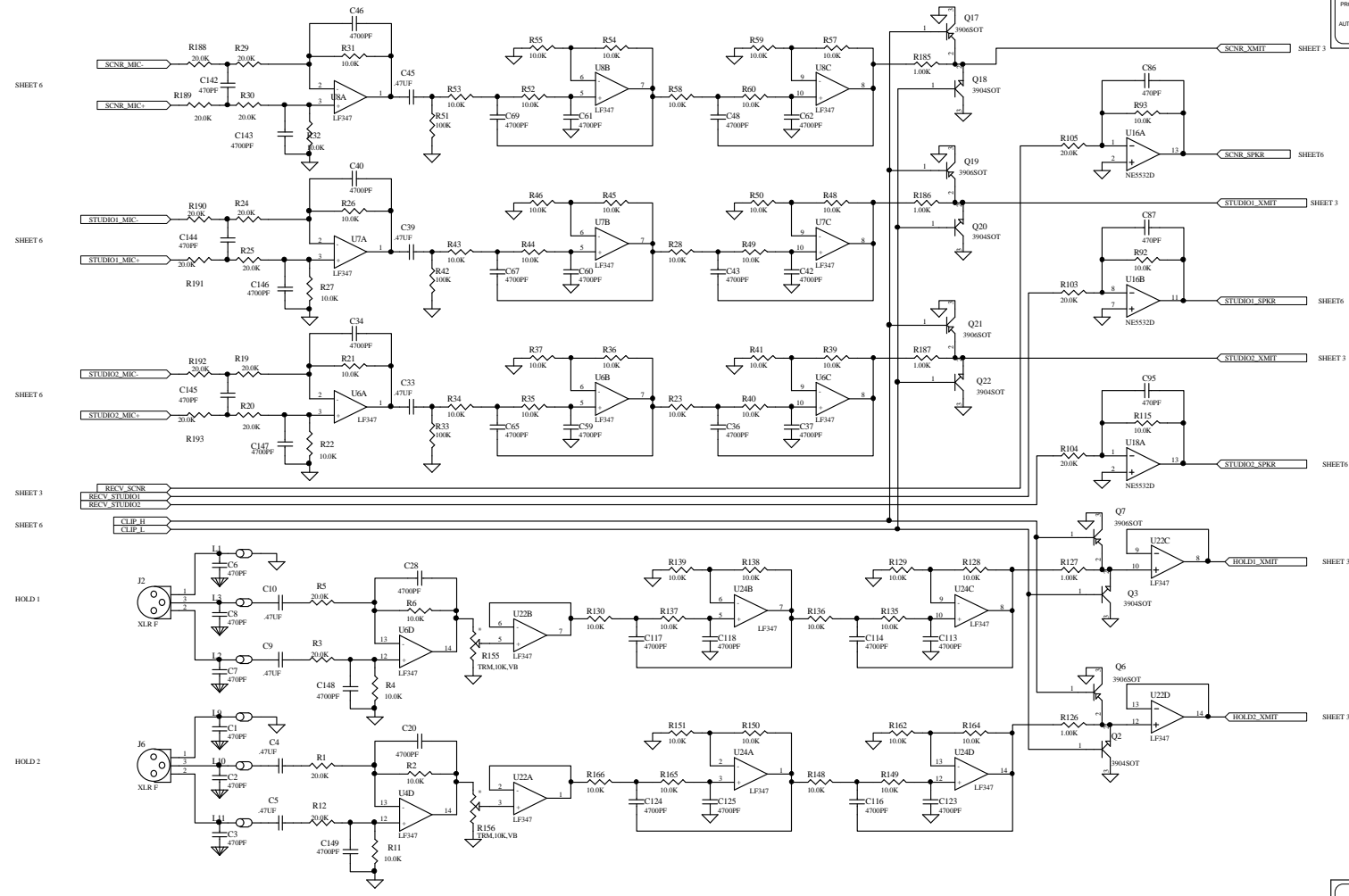
SHEET 4

SHEET 1



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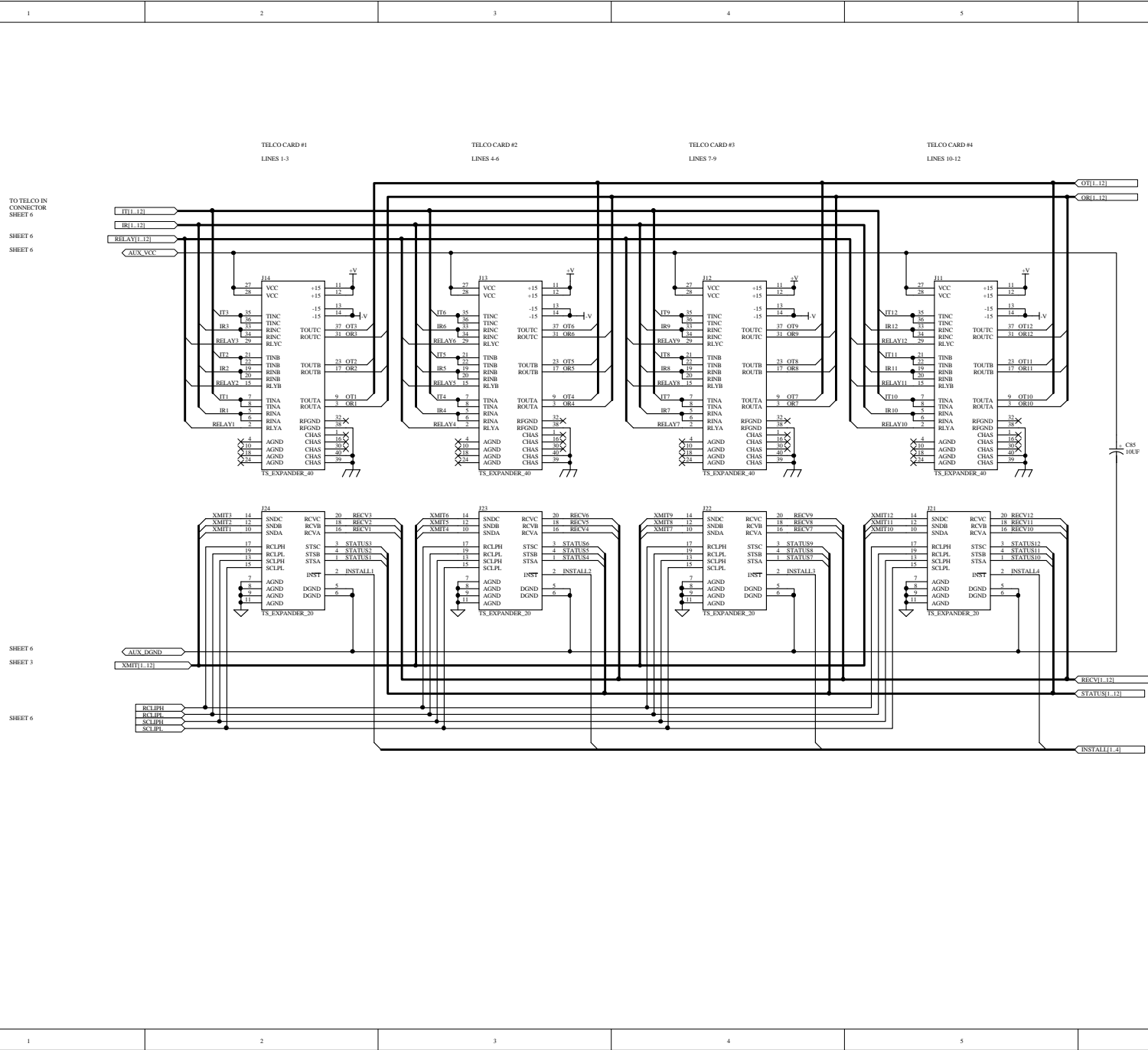
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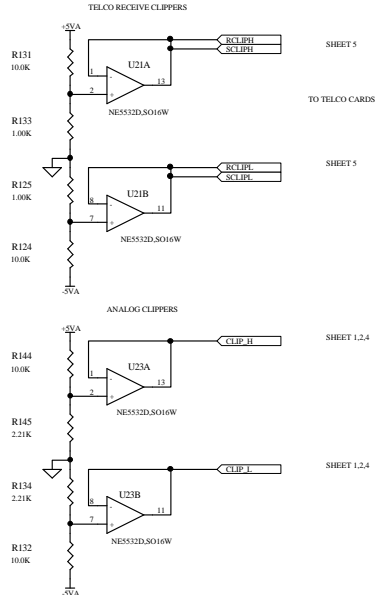
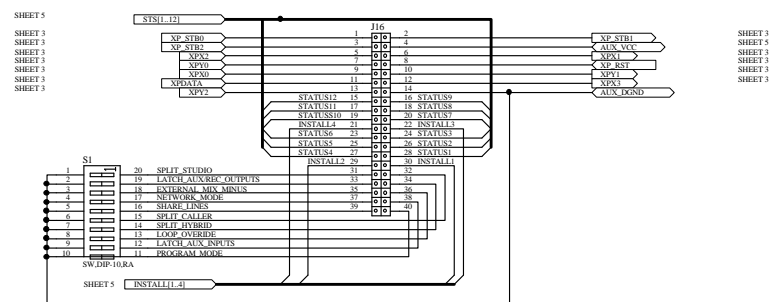
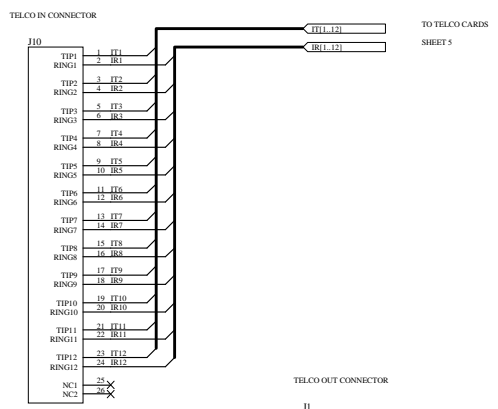
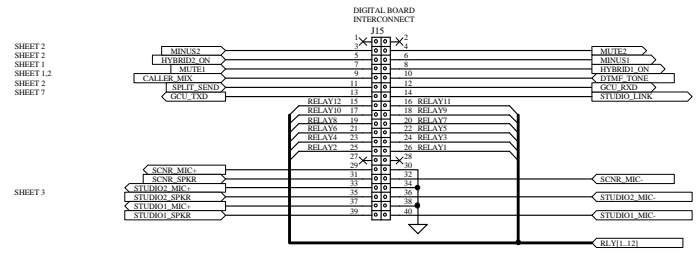
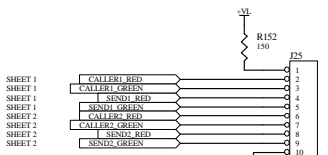
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DATE PLOTTED REV.
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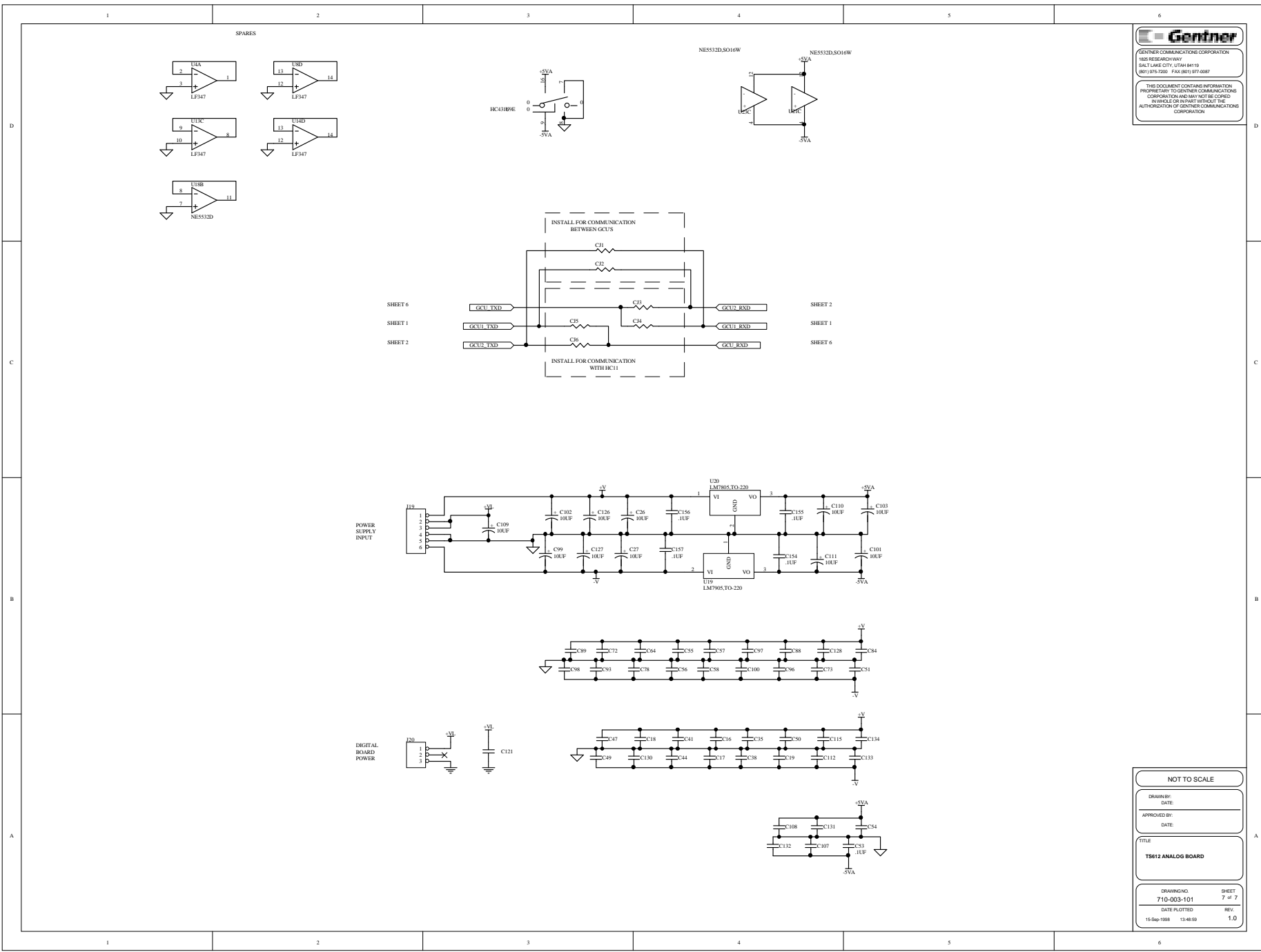
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TITLE: **TS612 ANALOG BOARD**

DRAWING NO. 710-003-101 SHEET 6 of 7

DATE PLOTTED: 15-Sep-1998 13:48:48 REV. 1.0



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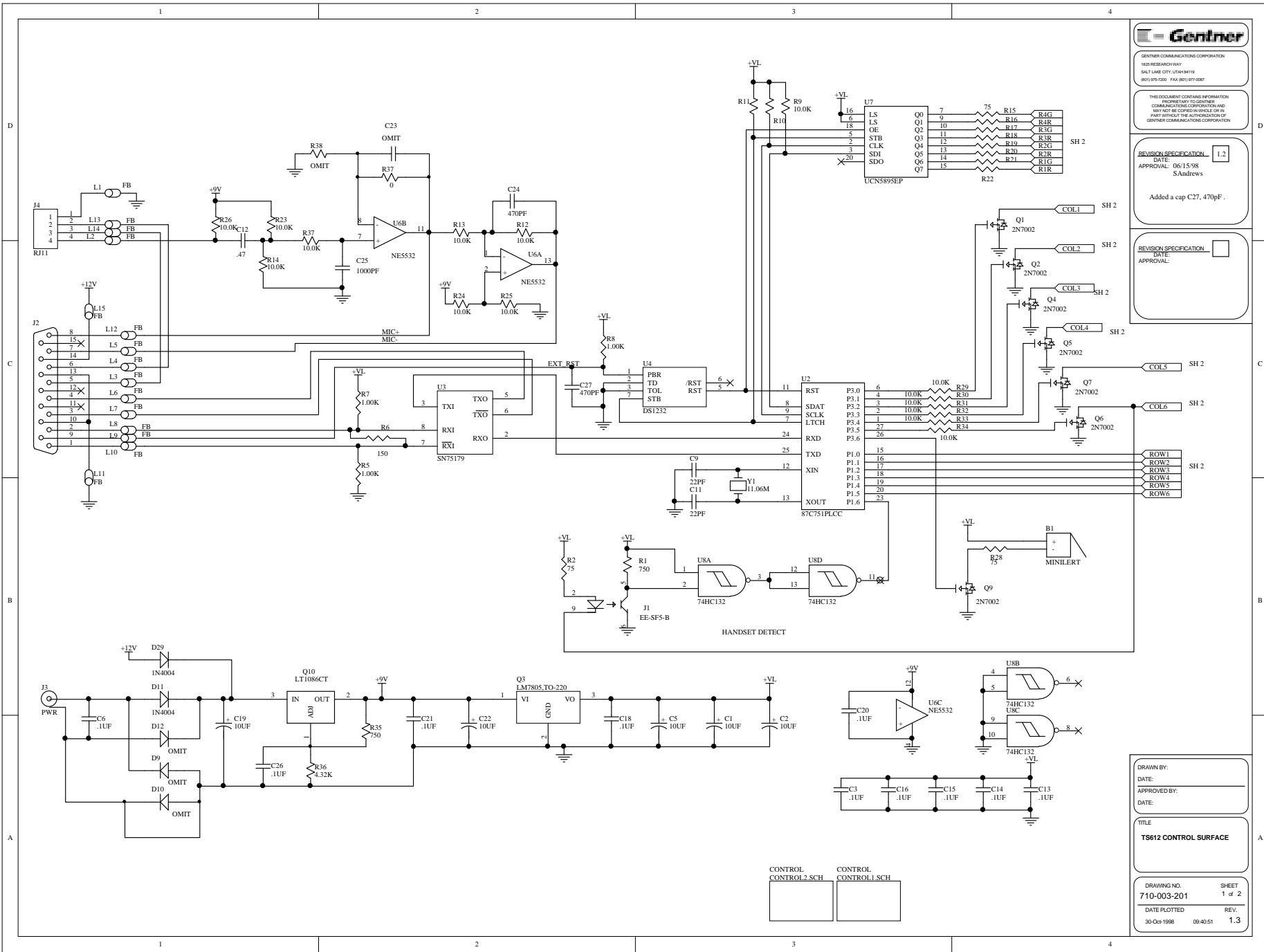
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TITLE
TS612 ANALOG BOARD

DRAWING NO. SHEET
 710-003-101 7 of 7

DATE PLOTTED REV.
 15-Sep-1998 13:48:59 1.0



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 DATE: 06/15/98
 APPROVAL: S.Andrews
 Added a cap C27, 470pF.

REVISION SPECIFICATION
 DATE:
 APPROVAL:

DRAWN BY:
 DATE:
 APPROVED BY:
 DATE:

TITLE
TS612 CONTROL SURFACE

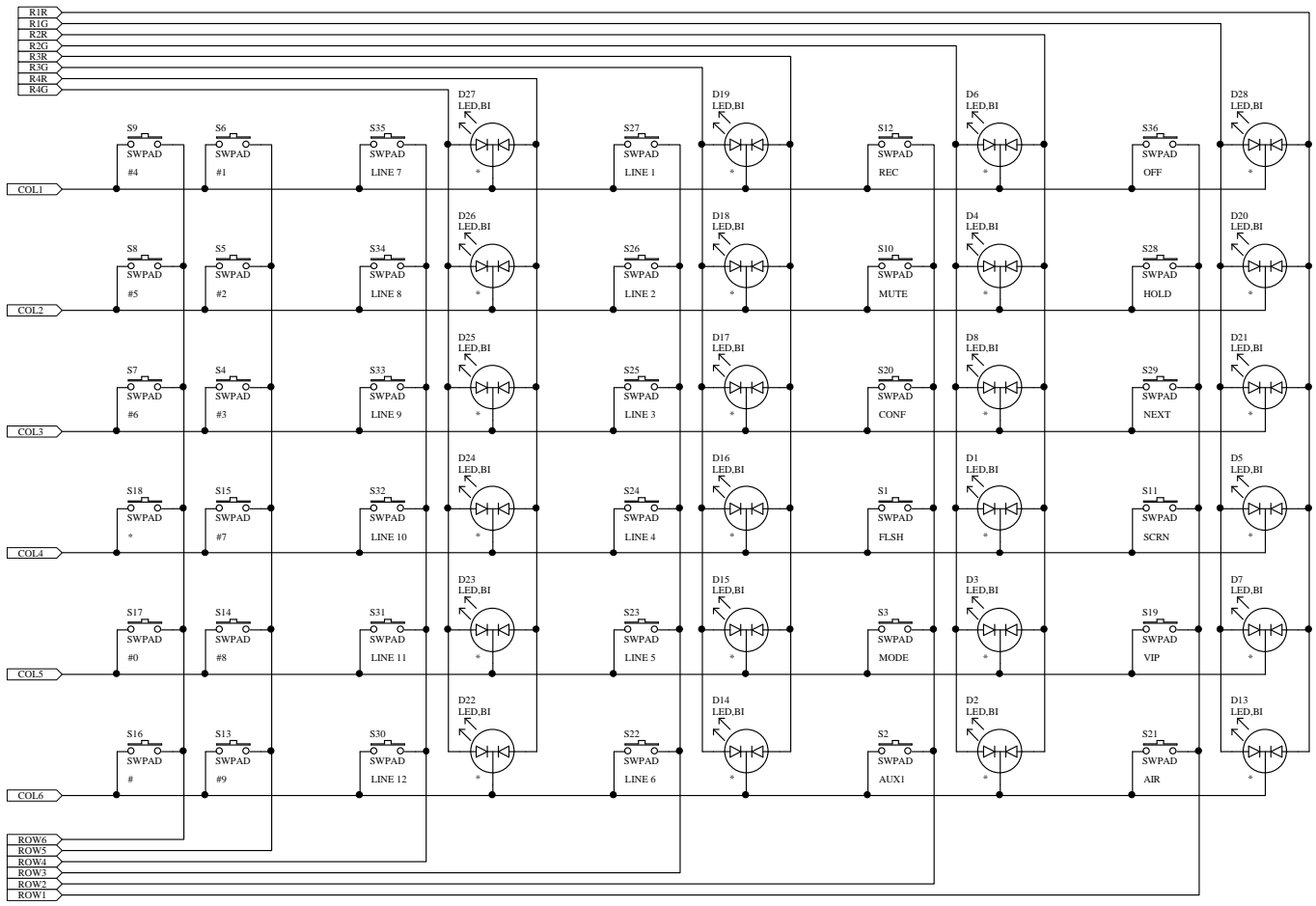
DRAWING NO. SHEET
710-003-201 1 of 2
 DATE PLOTTED REV.
 30-Oct-1998 09:40:51 1.3

CONTROL CONTROL2.SCH
 CONTROL CONTROL1.SCH

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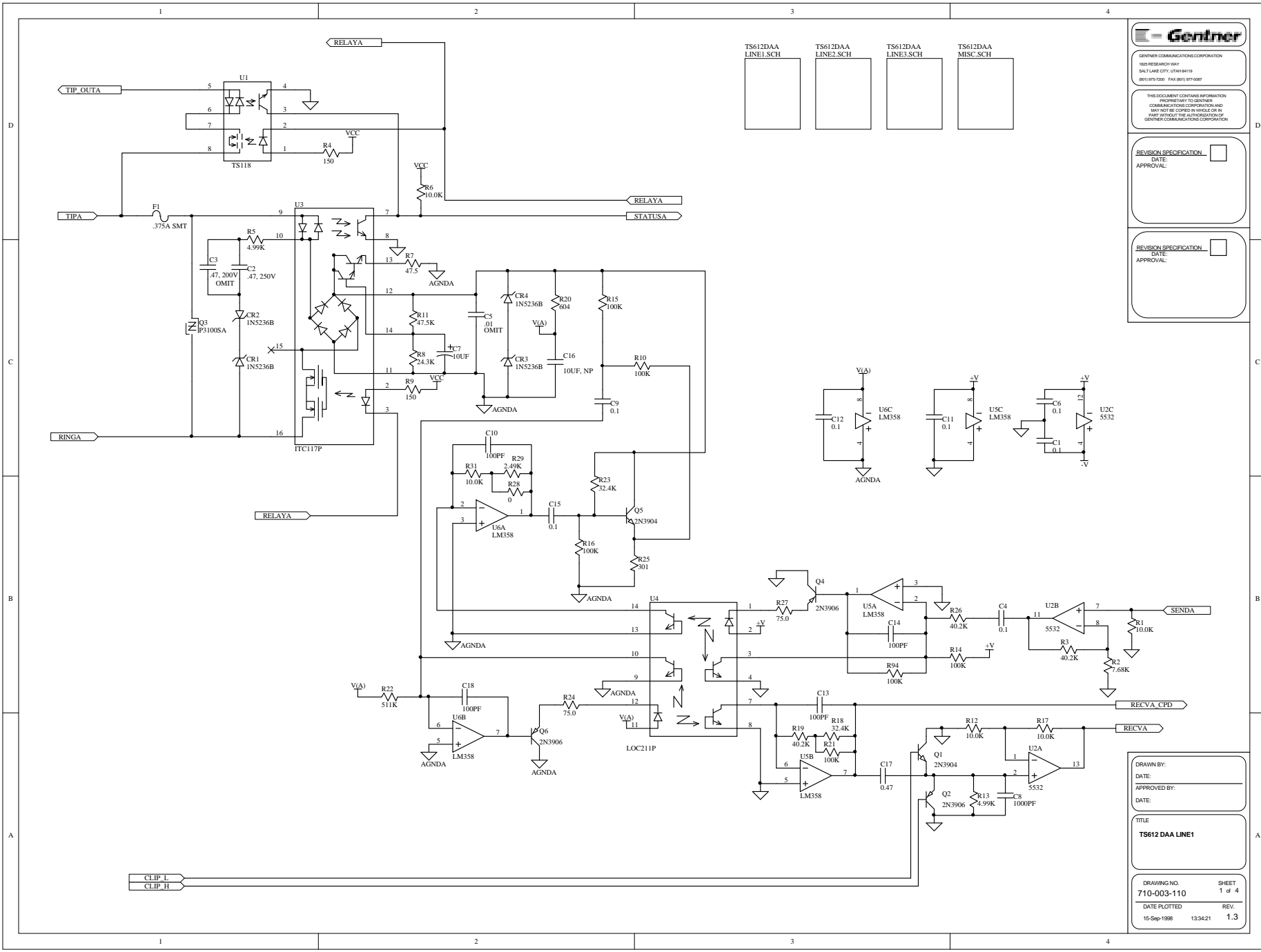


DRAWN BY: _____
 DATE: _____
 APPROVED BY: _____
 DATE: _____

TITLE
TS612 CONTROL SURFACE

DRAWING NO. SHEET
710-003-301 2 of 2

DATE PLOTTED REV.
 15-Sep-1998 14:25:13 1.3



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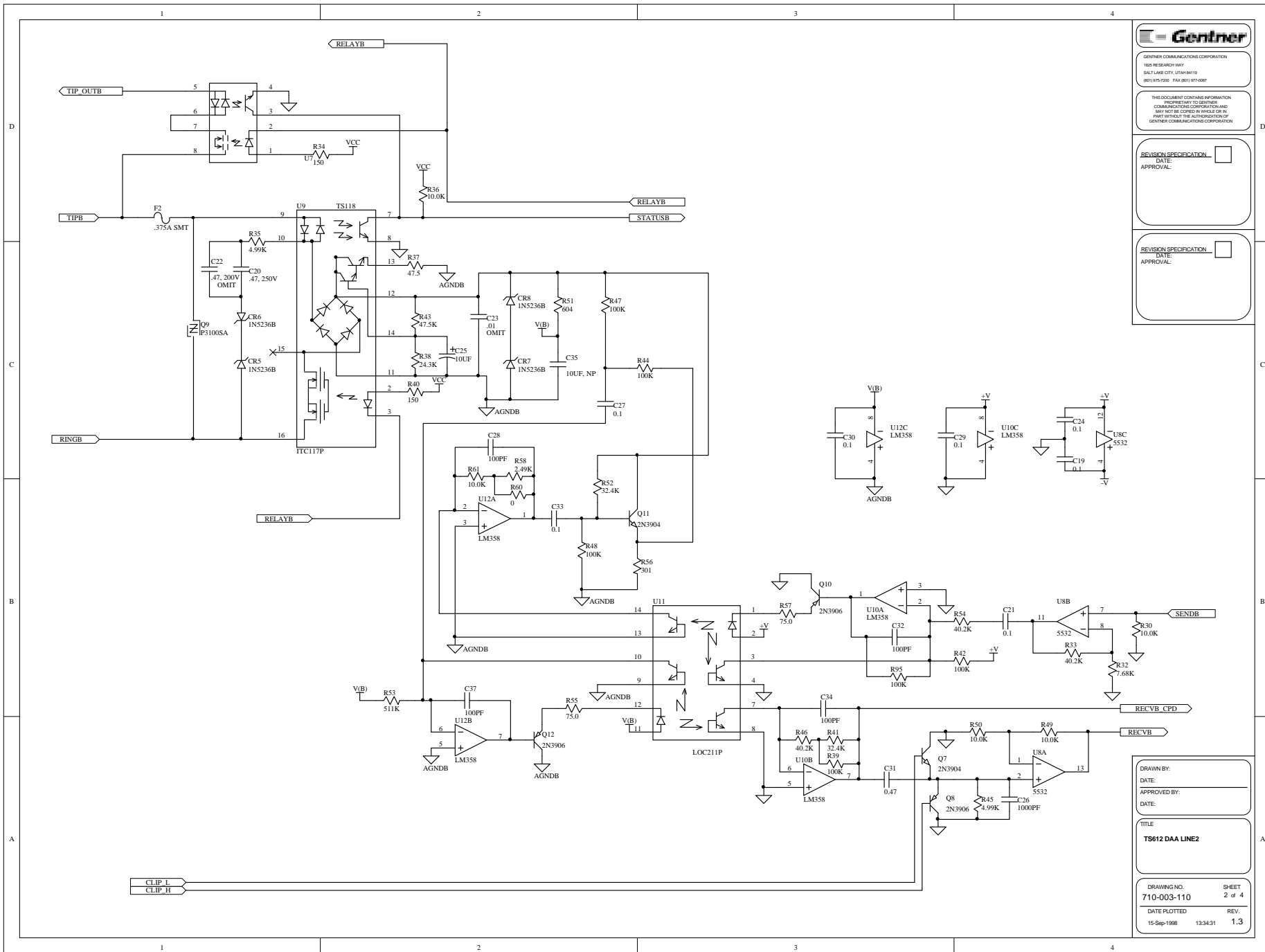
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 DATE: _____
 APPROVAL: _____

REVISION SPECIFICATION
 DATE: _____
 APPROVAL: _____

DRAWN BY: _____
 DATE: _____
 APPROVED BY: _____
 DATE: _____

TITLE
TS612 DAA LINE1

DRAWING NO. SHEET
710-003-110 1 of 4
 DATE PLOTTED REV.
 15-Sep-1998 13:34:21 1.3



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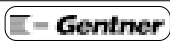
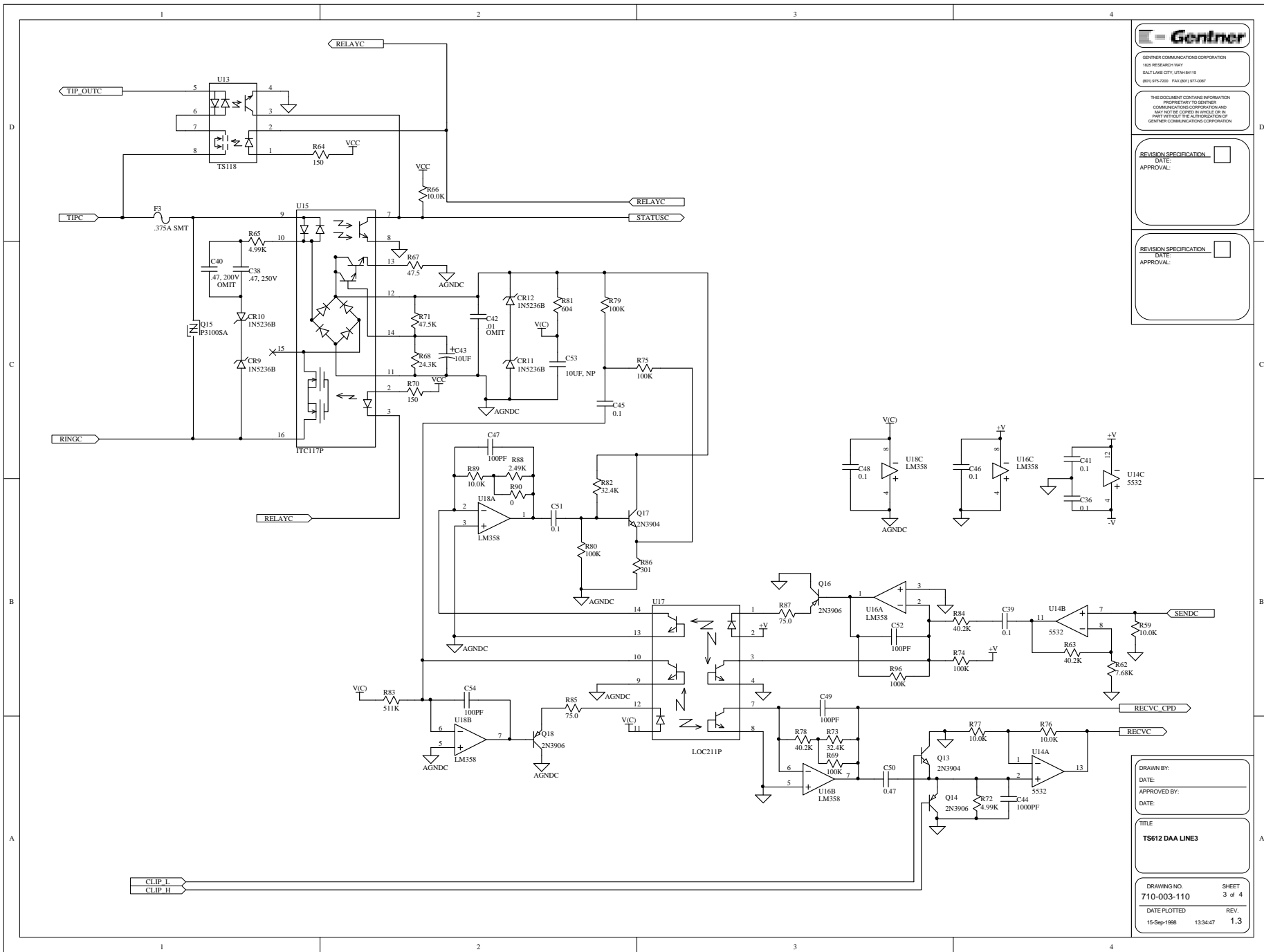
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 DATE: _____
 APPROVAL: _____

REVISION SPECIFICATION
 DATE: _____
 APPROVAL: _____

DRAWN BY: _____
 DATE: _____
 APPROVED BY: _____
 DATE: _____

TITLE
TS612 DAA LINE2

DRAWING NO. SHEET
710-003-110 2 of 4
 DATE PLOTTED REV.
 15-Sep-1998 13:34:31 1.3



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 APPROVAL: _____

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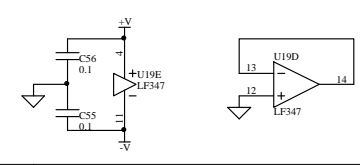
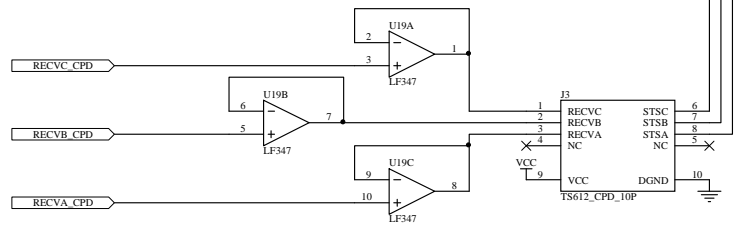
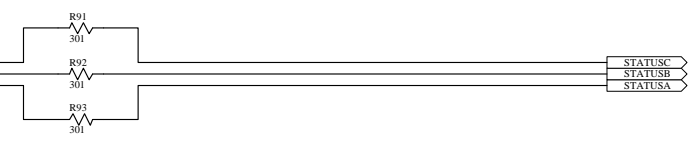
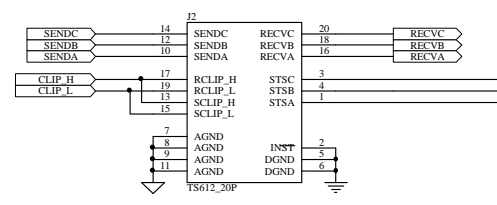
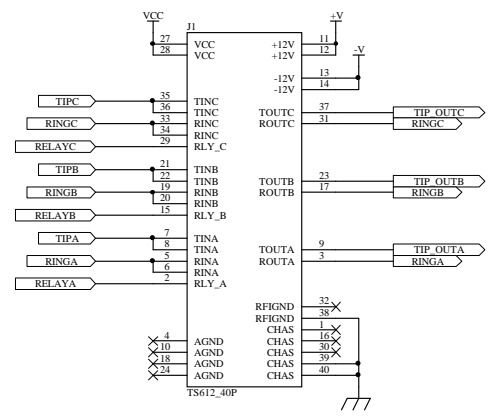
TITLE
TS612 DAA LINE3

DRAWING NO. **710-003-110** SHEET **3** of **4**
 DATE PLOTTED: **15-Sep-1998** REV. **1.3**



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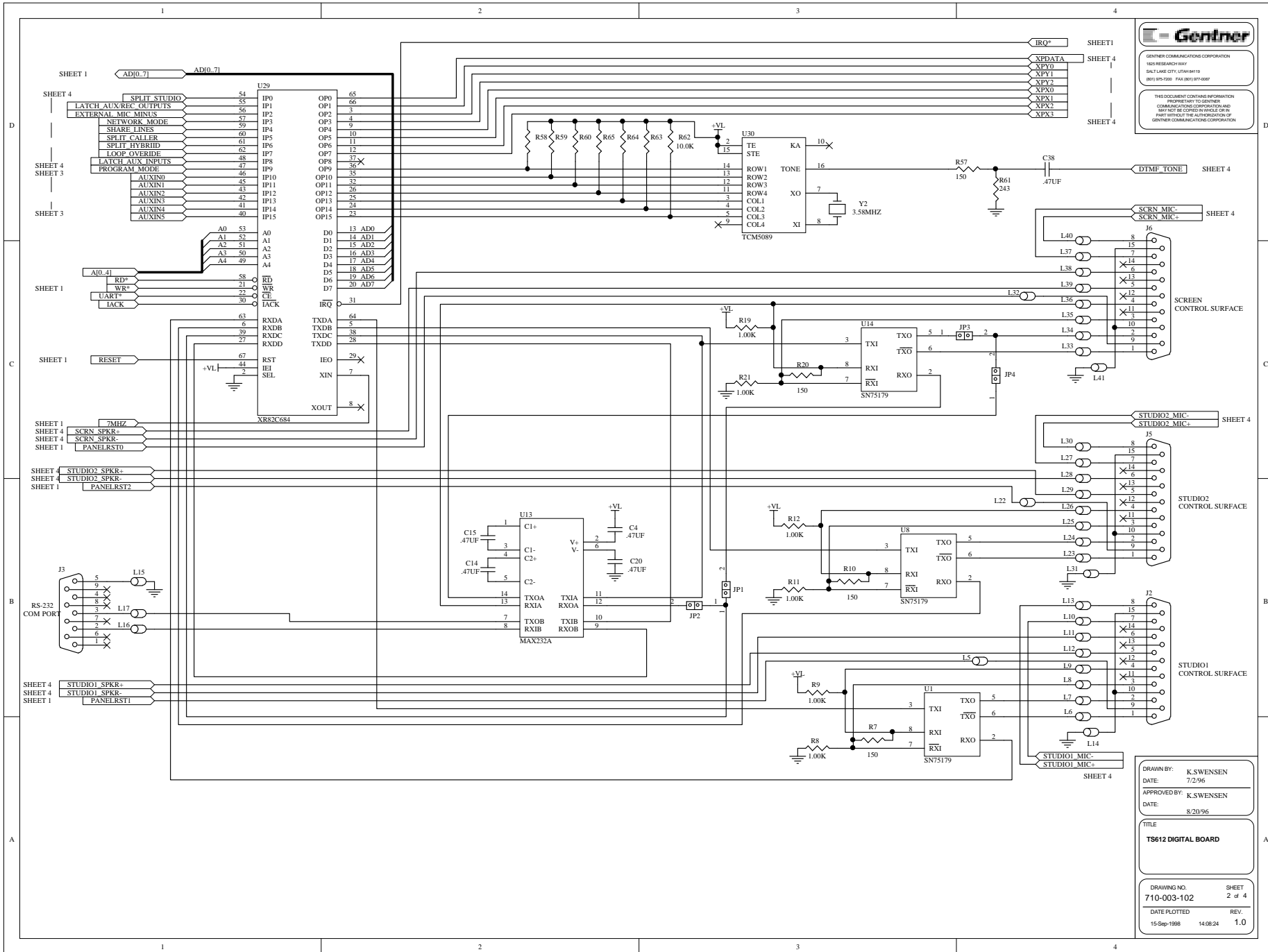
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TITLE
TS612DAA, CONN

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710-003-110 4 of 4
 DATE PLOTTED REV.
 15-Sep-1988 13.35:01 1.3



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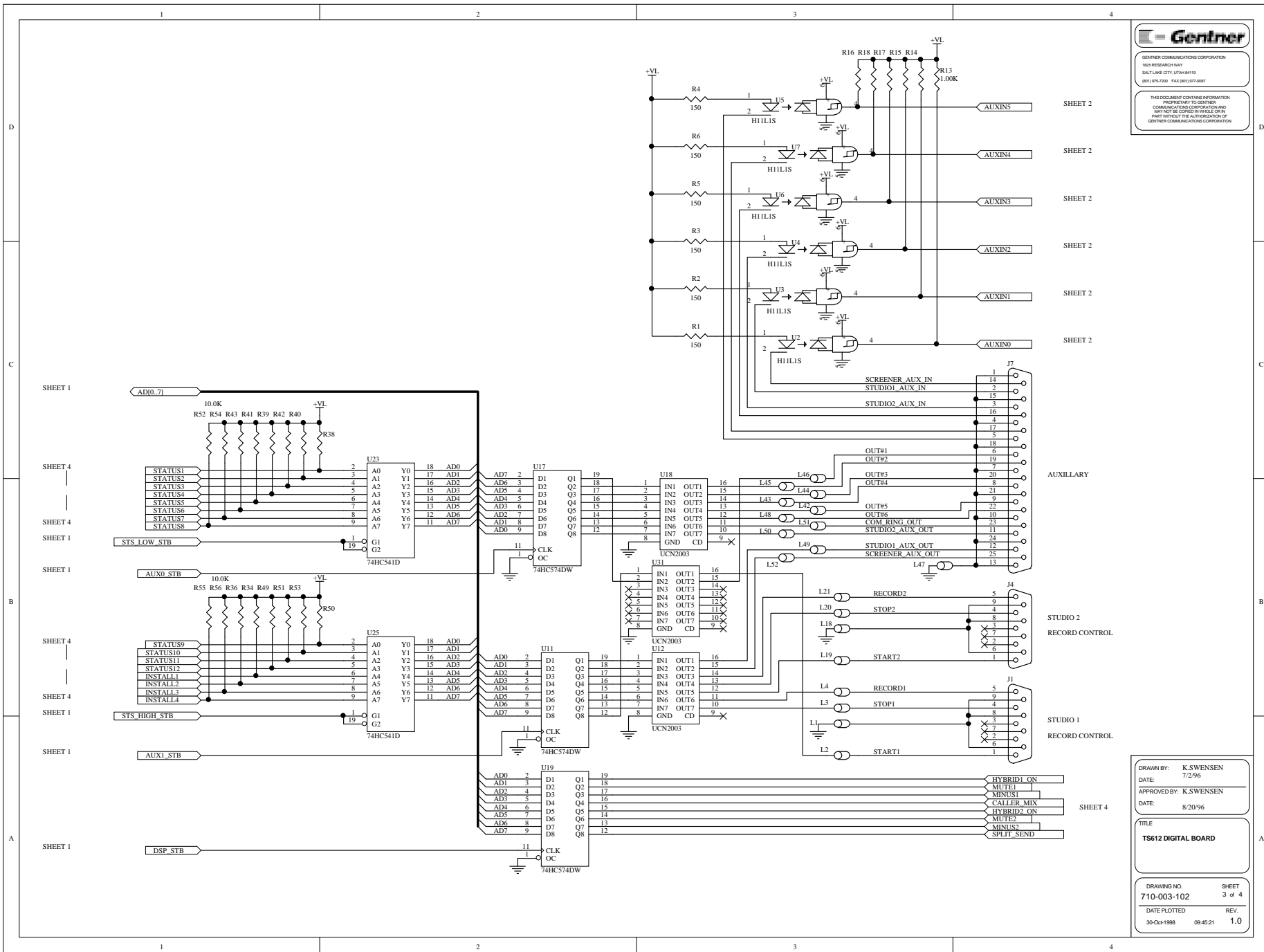
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 DATE: 7/2/96
 APPROVED BY: K.SWENSEN
 DATE: 8/20/96

TITLE
TS612 DIGITAL BOARD

DRAWING NO. SHEET
710-003-102 2 of 4
 DATE PLOTTED REV.
 15-Sep-1998 14:08:24 1.0



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 APPROVED BY: K.SWENSEN
 DATE: 8/20/96

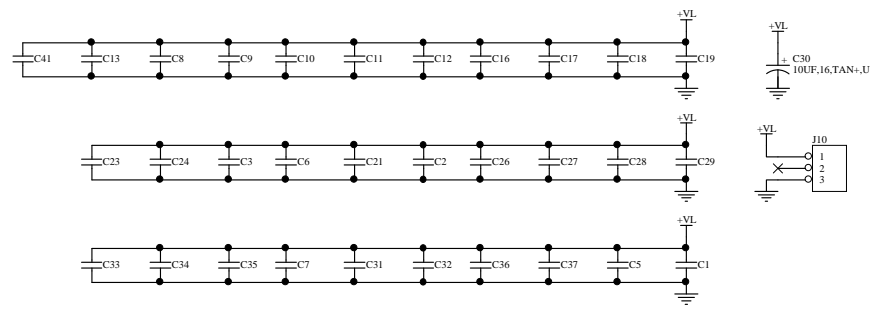
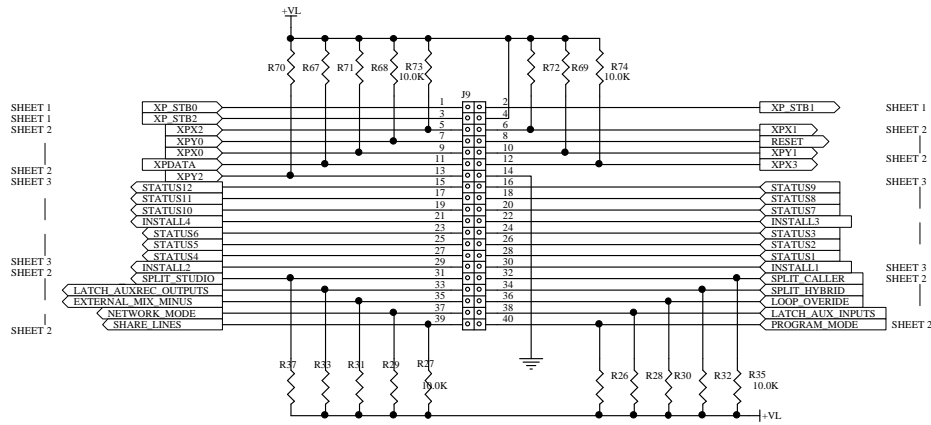
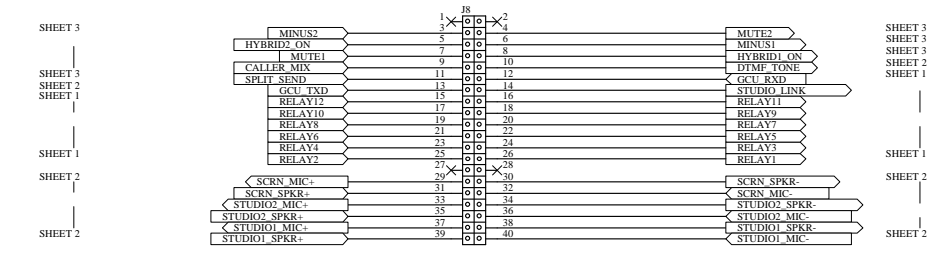
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TS612 DIGITAL BOARD

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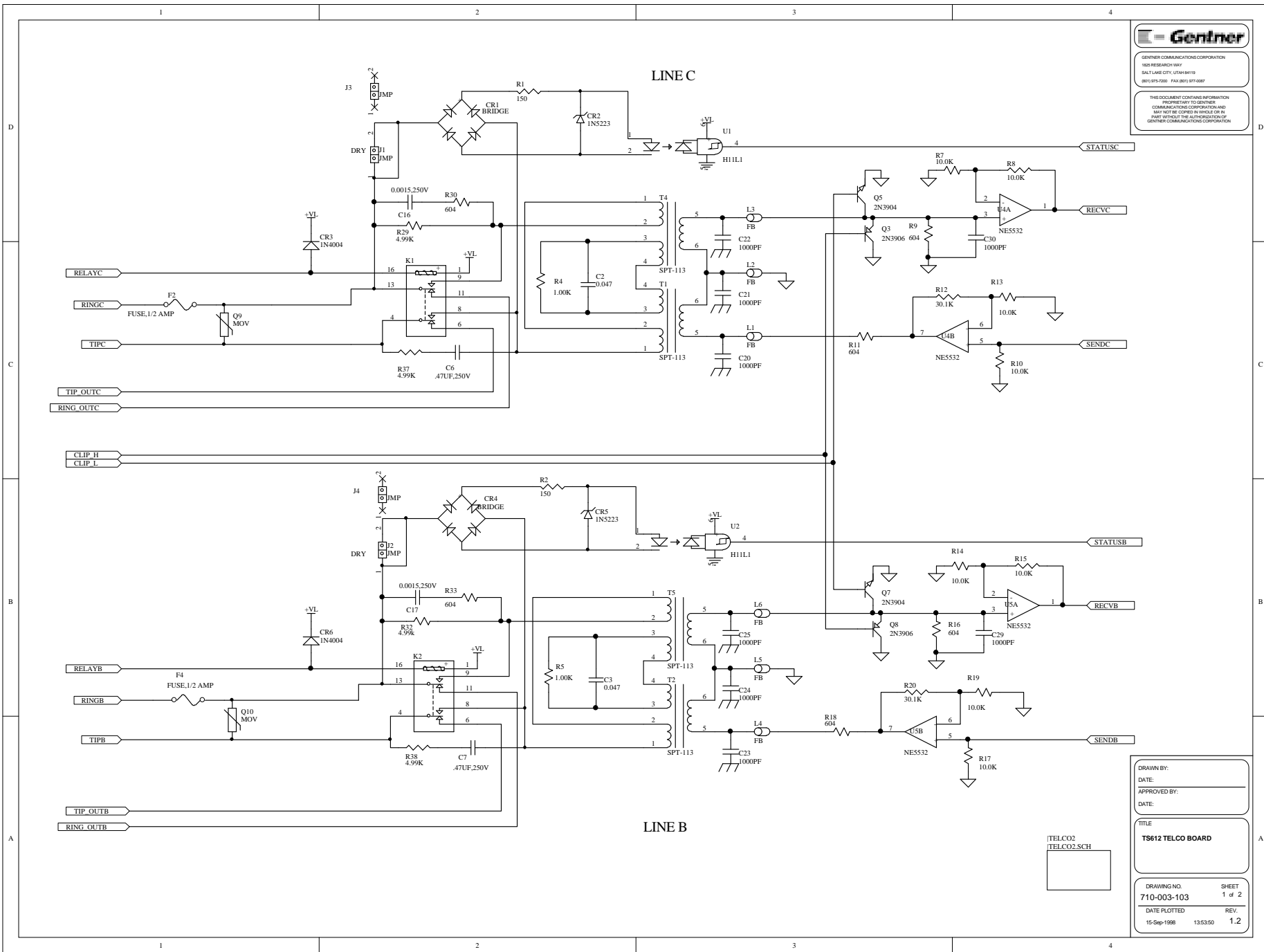
DRAWN BY: K.SWENSEN
 DATE: 7/2/96
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 DATE: 8/20/96

TITLE
TS612 DIGITAL BOARD

DRAWING NO. SHEET
710-003-102 4 of 4
 DATE PLOTTED REV.
 15-Sep-1998 14:08:46 1.0

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TITLE
TS612 TELCO BOARD

DRAWING NO. 710-003-103 SHEET 1 of 2
 DATE PLOTTED 15-Sep-1998 REV. 1.2

Appendix E: Bill of Materials

The following bill of materials is accurate as of this printing. The information herein is subject to change without notice. If you want a more current bill of materials, please contact technical support as noted on the bottom of the page.

TS612 SIX-LINE UNIT (910-003-006)

Item	Item Description
400-165-124	BOX, GENERAL USE 16X12X4 (INSERTS REQD)
400-241-614	BOX, TS612 SYSTEM SHIPPING, 24X16X14
400-241-617	INSERT, TS612 MAINFRAME DIVIDER, CORR
400-241-618	INSERT, TS612 CONSOLE DUMMY, CORR
400-300-006	INSERT, CORRUGATED TS612 CONSOLE
400-300-009	INSERT, KORRVU SINGLE/DOUBLE RACK UNITS
400-300-010	INSERT, CORRUGATED END CAP (DOUBLE RACK)
400-300-011	INSERT, USE W/400-300-009 ACC. DIVIDER
432-000-019	LABEL, BLANK 3X3 1/4"w/peelaway, PKG I.D
850-003-006	UNIT ASSY, MAINFRAME, TS612 6 LINE
850-003-200	UNIT ASSY, TS612 CONTROL SURFACE
860-003-100	ACC KIT, TS612 MAINFRAME RACK UNIT
860-003-200	ACC KIT, TS612 CONSOLE

The TS612 Mainframe Unit Assembly (**800-003-006**) begins on page 86 and is followed by the bills of materials for its PCBs.

The TS612 Control Surface Unit Assembly (**800-003-200**) begins on page 91 and is follow by the bills of materials for the PCB.

ACC KIT, TS612 MAINFRAME RACK UNIT (860-003-100)

Item	Item Description
401-000-060	BAG, 12" 4MIL CLR PLASTIC TUBING
420-003-002	INST SHEET, TELCO EXPANSION TS612
664-500-003	CONN, XLR F 3P CABLE MNT
664-600-003	CONN, XLR M 3P CABLE MNT
671-000-009	HOOD, DB9
671-000-025	HOOD, DB25
671-220-009	CONN, DB9 M CABLE MT
671-220-025	CONN, DB25 M CABLE MT
681-400-002	SCREW, 10-32 X 5/8" BLK POH, DECORATIVE
684-400-001	WASHER, RACK CUP DECORATIVE
699-150-006	PWR CORD, MOLDED 8' BLK 3 COND
800-003-000	MANUAL, TS612
800-003-003	CARD, QUICK REF TS612 LAMINATED
830-000-025	CABLE ASSY, 25 PAIR D50M/D50F 25FT.

ACC KIT, TS612 CONSOLE (860-003-200)

Item	Item Description
401-000-060	BAG, 12" 4MIL CLR PLASTIC TUBING
420-003-200	INST SHEET, CABLE CLAMP TS612
460-042-002	HANDSET, W/CORD, TS612 CONSOLE
681-010-308	SCREW, 4-40 X 3/8" PPH SELF TAPPING
698-600-005	CLAMP, CABLE SCREW MOUNT .187 D
830-003-025	CABLE ASSY, 25FT SYS. INTERFACE, TS612
830-003-203	CABLE ASSY, PLUGDC/WALL XFMR12V 8FT.

UNIT ASSY, MAINFRAME, TS612 SIX-LINE (850-003-006)

Item	Item Description
401-000-070	BAG, 14" 4MIL CLR PLASTIC TUBING
432-000-015	LABEL, COMPLIANCE FCC PART 15
432-000-018	LABEL, BLANK 1.75 X 2.5, PRODUCT I.D
432-003-001	LABEL, ACCESS PANEL TS612
432-003-002	LABEL, CANADA COMPLIANCE (19706394A)
432-110-004	LABEL, CAUT ELECT SHOCK ADH BK
460-110-005	PWR SUPPLY, SWITCHING UNIVERSAL IN 40W
585-600-001	FOAM, TAPE MISC 1"
681-010-204	SCREW, 4-40 X 1/4" PPH BLK ANOD SELF-TAP
681-010-506	SCREW, #6-32 X 3/8 PPH BLK W/INTTH WASH
681-010-604	SCREW, 6-32 X 1/4" PPH
681-210-606	SCREW, 6-32 X 3/8" PPH BLK
682-010-060	NUT, 6-32 X 1/4
683-046-403	SPACER, KIT M/F 4-40 X 3/16 W/HARDWARE
683-046-620	SPACER, M/F 6-32 X 1 1/4" HEX
684-050-060	WASHER, #6 INTERN TOOTH
685-410-604	SCREW, 6-32 X 1/4" BUTTON HEX
699-360-001	MOD, PWR ENTRY RECEIPT W/EMI FILT 3 AMPS
740-003-101	CHASSIS, RU,TS612
740-003-102	PANEL, FRONT RU, TS612
740-003-107	GUIDE, TELCO, TS612
740-009-003	COVER, DH
740-009-304	PANEL, ACCESS, DH
807-003-101	FIRMWARE, U27 DIGITAL PROC, TS612
820-003-101	PCB ASSY, AUDIO/CPU, TS612
820-003-102	PCB ASSY, DIGITAL PROCESSING, TS612
820-003-103	PCB ASSY, 3 LINE TELCO BOARD, TS612
820-003-106	PCB ASSY, GCU TS612 VER 1.5B INTL
830-003-101	CABLE ASSY, MASC3P/MASC3P 18AWG 4"
830-003-102	CABLE ASSY, IDC40P/IDC40P RIBBON 4"
830-003-103	CABLE ASSY, DB50M/IDC26PF RIBBON 6"
830-003-104	CABLE ASSY, PWR AC INPUT TS612
830-110-003	CABLE ASSY, MASC 6P/MASC 6P-9"

PCB ASSY, AUDIO/CPU, TS612 (820-003-101)

Item	Item Description	Item Location(s)
432-500-010	LABEL, BLANK 1 X.5 WHT.	
500-005-817S	DIODE, 1N5817 SOD-87 PKG SMT	CR1, CR2
507-012-001	LED, RED/GRN RECTANGULAR 2X5 MM	DS1, DS2, DS3, DS4
511-012-221S	RES, 2.21 KOHM 1/10 W 1% 0805 C SMT	R134, R145
511-012-499S	RES, 4.99 KOHM 1/10 W 1% 0805 C SMT	R75, R97, R142, R158, R175, R178
511-012-768S	RES, 7.68 KOHM 1/10 W 1% 0805 C SMT	R204, R207
511-013-150S	RES, 15.0 KOHM 1/10 W 1% 0805 C SMT	R74, R98, R206, R210
511-013-324S	RES, 32.4 KOHM 1/10 W 1% 0805 C SMT	R73, R99, R143, R157
511-014-100S	RES, 100 KOHM 1/10 W 1% 0805 C SMT	R33, R42, R51
512-011-150S	RES, 150 OHM 1/8 W 1206 C SMT	R140, R141, R152, R167, R168, R169, R170 R171, R172, R173, R174
512-011-604S	RES, 604 OHM 1/8 W 1% 1206 C SMT	R38, R47, R56, R72, R86, R87, R88, R89, R90, R94, R96, R100, R101, R102, R107, R110, R116, R117, R118, R119, R120, R121 R122, R123
512-012-100S	RES, 1.00 KOHM 1/8 W 1% 1206 C SMT	R125, R126, R127, R133, R146, R147, R185 R186, R187
512-013-100S	RES, 10.0 KOHM 1/8 W 1% 1206 C SMT	R2, R4, R6, R11, R13, R14, R16, R17, R18 R21, R22, R23, R26, R27, R28, R31, R32, R34, R35, R36, R37, R39, R40, R41, R43, R44, R45, R46, R48, R49, R50, R52, R53, R54, R55, R57, R58, R59, R60, R62, R63, R64, R65, R66, R67, R76, R77, R78, R79, R80, R81, R83, R84, R85, R91, R92, R93, R108, R109, R112, R113, R114, R115, R124 R128, R129, R130, R131, R132, R135, R136 R137, R138, R139, R144, R148, R149, R150 R151, R162, R164, R165, R166, R176, R179 R199, R203, R205, R208, R211, R212, R213 R214, R215, R216, R217.
512-013-200S	RES, 20 KOHM 1/8 W 1% 1206 C SMT	R1, R3, R5, R7, R8, R9, R10, R12, R15, R19, R20, R24, R25, R29, R30, R61, R68, R69, R70, R71, R103, R104, R105, R188, R189, R190, R191, R192, R193
522-400-103	RES, POT 10 KOHM 3/8" SQ TRIMMER	R153, R154, R155, R156, R159, R160, R161, R163
533-200-132S	IC, DIG 74HC132 QUAD SCHMITT NAND GT	U25
533-204-316S	IC, MIX HC4316 QUAD ANLG SWITCH	U9
535-300-780	IC, MIX SSI78093B CROSSPOINT SWITCH	U10, U11, U12
540-300-347S	IC, ANA LF347M QUAD BI-FET OP AMP SMT	U4, U6, U7, U8, U13, U14, U15, U17, U22, U24, U26
540-405-532S	IC, ANA NE5532D DUAL OP-AMP LW NOISE SMT	U16, U18, U21, U23
543-007-805	IC, ANA REG AN7805CT 1 AMP +5V TO 220	U20
543-007-905	IC, ANA REG LM7905CT 1AMP -5V TO 220	U19
558-032-001S	FERRITE, CHIP BLM32A07 40ohm 1206 C SMT	L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24

PCB ASSY, AUDIO/CPU, TS612 (820-003-101)

Item	Item Description	Item Location(s)
561-103-904S	TRANS, 2N3904 SMT	Q1, Q2, Q3, Q4, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q18, Q20, Q22
561-103-906S	TRANS, 2N3906 PNP SMT	Q5, Q6, Q7, Q8, Q17, Q19, Q21
563-300-702S	TRANS, 2N7002 SMT	Q23, Q26
570-000-008	SOCKET, IC 8 PIN WIPER TIN	XU1, XU2, XU3, XU5
616-101-100S	CAP, 100PF 100V NPO 1206 C SMT	C29, C30, C31, C32, C63, C76, C77 C122, C129
616-104-100S	CAP, 0.1UF 50V Z5U 1206 C SMT	C16, C17, C18, C19, C35, C38, C41, C44, C47, C49, C50, C51, C53, C54, C55, C56, C57, C58, C64, C66, C68, C70, C72, C73, C78, C84, C88, C89, C93, C96, C97, C98, C100, C104, C105, C106, C107, C108, C112, C115, C121, C128, C130, C131, C132, C133, C134, C154, C155, C156, C157
616-106-016S	CAP, 10UF 16V TAN 6032 C SMT	C26, C27, C85, C99, C101, C102, C103, C109, C110, C111, C126, C127, C160, C161
616-222-501S	CAP, 2200PF 50V NPO 1206 C SMT	C79, C80, C90, C94, C135, C137, C138, C159
616-471-501S	CAP, 470PF 50V NPO 1206 C SMT	C1, C2, C3, C6, C7, C8, C11, C12, C13, C21, C22, C23, C86, C87, C95, C140, C141, C142, C144, C145, C162, C163, C164, C165, C166, C167
616-472-100S	CAP, 4700PF 100V NPO 1206 C SMT	C20, C28, C34, C36, C37, C40, C42, C43, C46, C48, C59, C61, C62, C65, C67, C69, C113, C114, C116, C117, C118, C123, C124, C125, C143, C146, C147, C148, C149
616-474-501S	CAP, 0.47UF 50V Z5U 1812 C SMT	C4, C5, C9, C10, C14, C15, C24, C25, C33, C39, C45, C52, C71, C74, C75, C81, C82, C83, C91, C92, C119, C120
620-010-011	SWITCH, DIP RA 10 POLE 20 PIN BLK	S1
664-360-003	CONN, XLR F 3P PNL MNT BLK	J2, J3, J6, J7
664-260-003	CONN, XLR M 3P PC/ PNL BLK	J4, J5, J8, J9
669-000-020	CONN, HEADER 10P DUAL ROW .34 PIN	J21, J22, J23, J24
669-000-040	CONN, HEADER 20P DUAL ROW .34 PIN	J11, J12, J13, J14
670-040-003S	CONN, 40 P M .21 H .05 X .05 SMT	J17, J18
671-720-050	CONN, DB50 F R/A PIN PC MNT	J1
673-002-002	CONN, HEADER POST 2P MASC .10 C	J25
673-012-003	CONN, HEADER POST 3P MASC .15C SPFL	J20
673-012-006	CONN, HEADER POST 6P MASC .15C SPFL	J19
678-155-022	PIN, STRIP SING 22 PIN .40 TALL	USE FOR GND PINS 1,2,3,(1 EA.)
678-200-010	PIN, STRIP DUAL 2X40=80PIN .32 TALL	J10, (26 PINS) J15, J16
720-003-101	PCB, AUDIO/CPU, TS612	

PCB ASSY, DIGITAL PROCESSING, TS612 (820-003-102)

Item	Item Description	Item Location(s)
511-011-301S	RES, 301 OHM 1/10 W 1% 0805 C SMT	R61
511-015-100S	RES, 1.00 MOHM 1/10 W 1% 0805 C SMT	R22
512-011-150S	RES, 150 OHM 1/8 W 1206 C SMT	R1, R2, R3, R4, R5, R6, R7, R10, R20, R57
512-012-100S	RES, 1.00 KOHM 1/8 W 1% 1206 C SMT	R8, R9, R11, R12, R13, R14, R15, R16, R17, R18, R19, R21
512-013-100S	RES, 10.0 KOHM 1/8 W 1% 1206 C SMT	R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R58, R59, R60, R62, R63, R64, R65, R67, R68, R69, R70, R71, R72, R73, R74
533-200-541S	IC, DIG 74HC541 OCTAL TRISTATE BUFF	U23, U25
533-204-573S	IC, 74HC573D	U26
533-204-574S	IC, DIG 74HC574W CMOS FLIP FLOP SMT	U10, U11, U16, U17, U19
533-555-089	IC, MIX VRC TP5089 NATIONAL ONLY	U30
534-006-256S	IC, DIG 32KX8 STAT RAM 100NS 5.0V SOP	U28
534-068-111S	IC, DIG 68HC11A1 MICRO CONTROLLER	U20
534-075-179S	IC, DIG SN75179 B RS422 TRANS/REC	U1, U8, U14
534-082-684S	IC, DIG 82C684 CMOS QUAD CH UART RX/TX	U29
535-102-003S	IC, ANA ULN2003A TRANS ARRAY SMT	U9, U12, U15, U18, U31
535-201-111S	IC, ANA MCAH11L1 OPTO COUP	U2, U3, U4, U5, U6, U7,
540-001-202S	IC, MIX RS232 MAX202 TRANSCEVR SMT	U13
540-001-232S	IC, DIG MAX1232CSA WATCHD TIMER 8PSO SMT	U22
558-032-001S	FERRITE, CHIP BLM32A07 40ohm 1206 C SMT	REF: L1, L2, L3, L4,, L5, L6, L7, L8, L9 L10, L11, L12, L13, L14, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30, L31, L32, L33, L34, L35, L36, L37, L38, L39, L40, L41, L42, L43, L44, L45, L46, L47, L48, L49, L50, L51, L52
570-450-028	SOCKET, IC 28 PIN .600 SPC MACH GLD	
583-180-358	CRYSTAL, 3.579545 MHZ HC-18U C	Y2
583-180-737	CRYSTAL, 7.372 MHZ HC-18U C	Y1
616-104-501S	CAP, 0.1UF 50V Z5U 0805 C SMT	C1, C2, C3, C5, C6, C7, C8, C9, C10, C11, C12, C13, C16, C17, C18, C21, C23, C24 C26, C27, C28, C29, C31, C32, C33, C34, C35, C36, C37, C41
616-106-016S	CAP, 10UF 16V TAN 6032 C SMT	C30
616-220-100S	CAP, 22PF 100V NPO 1206 C SMT	C22, C25
616-474-501S	CAP, 0.47UF 50V Z5U 1812 C SMT	C4, C14, C15, C20, C38
671-216-009	CONN, DB9 F R/A .318 FOOTPRINT	J1, J3, J4
671-216-015	CONN, DB15 F R/A .318 FOOTPRINT	J2, J5, J6
671-216-025	CONN, DB25 F R/A .318 FOOTPRINT	J7
673-012-003	CONN, HEADER POST 3P MASC .15C SPFL	J10
678-200-010	PIN, STRIP DUAL 2X40=80PIN .32 TALL	CUT 80 PIN INTO HALF. PLACE J8 & J9
678-232-008	PIN, STRIP DUAL 2X4=8PINS .32 TALL	JP1
678-250-001	JUMPER, BLOCK F 2P	JP1, JP2
720-003-102	PCB, DIGITAL PROCESSING, TS612	
807-003-102	FIRMWARE, U21 DIGITAL PROC, TS612	
807-003-103	FIRMWARE, U24 DIGITAL PROC, TS612	

PCB ASSY, 3 LINE TELCO BOARD, TS612 (820-003-103)

Item	Item Description	Item Location(s)
432-500-010	LABEL, BLANK 1 X.5 WHT.	
500-004-004	DIODE, 1N4004 1 AMP 400V	CR3, CR6, CR9
502-005-223	DIODE, IN5223 ZENER 2.7V	CR2, CR5, CR8
506-200-002	RECTIFIER, BR82D 2AMP 200V BRIDGE	CR1, CR4, CR7
510-011-604	RES, 604 OHM 1/4 W 1%	R9, R11, R16, R18, R23, R25, R30, R33, R36
510-012-100	RES, 1.00 KOHM 1/4 W 1%	R4, R5, R6
510-012-499	RES, 4.99 KOHM 1/4 W 1%	R29, R32, R35, R37, R38, R39
510-013-100	RES, 10.0 KOHM 1/4 W 1%	R7, R8, R10, R13, R14, R15, R17, R19, R21, R22, R24, R27
510-013-301	RES, 30.1 KOHM 1/4 W 1%	R12, R20, R26
513-011-150	RES, 150 OHM 1/8 W 1%	R1, R2, R3
535-201-111	IC, ANA MCAH11L1 OPTO COUP	U1, U2, U3
540-305-532	IC, ANA NE5532 DUAL OP-AMP LW NOISE	U4, U5, U6
544-250-004	VARISTOR, 250 V V25OLA4	Q9, Q10, Q11
552-100-005	XFMR, SPT-113 PC MT	T1, T2, T3, T4, T5, T6
556-502-005	RELAY, DPST 5V PC MT	K1, K2, K3
558-073-101	FERRITE BEAD, WIRE MT	L1, L2, L3, L4, L5, L6, L7, L8, L9
561-103-904	TRANS, 2N3904	Q5, Q7, Q15
561-103-906	TRANS, 2N3906 PNP	Q3, Q8, Q14
603-050-112	CAP, 0.1UF 50V MONO-CER NPO RAD .1	C1, C5, C9, C10, C14, C15, C19
605-100-064	CAP, 1000 PF CERAMIC NPO .2	C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31
605-250-128	CAP, 0.47 UF 250V POLYESTER .8	C6, C7, C8
612-051-104	CAP, 0.047 UF 50V CERAMIC NPO AX	C2, C3, C4
612-250-100	CAP, 0.0015uF 250V CERAMIC [.25"]	C16, C17, C18
640-100-500	FUSE, 1/2 AMP 125V PICO AX 1/4WATT	F2, F4, F6
678-200-025	PIN, STRIP DUAL 2X20=40PIN .25 TALL R/A	J7
678-200-020	PIN, STRIP DUAL 2X10=20PIN .25 TALL R/A	J8
678-224-004	PIN, STRIP DUAL 2X2=4PINS .24 TALL	J1, J2, J3, J4, J5, J6
678-250-001	JUMPER, BLOCK F 2P	J1, J2, J6
720-003-103	PCB, CHANNEL EXTENDER, TS612	

PCB ASSY, GCU (60 MHZ) UNPROG. SING-SIDE (820-130-017)

Item	Item Description	Item Location(s)
432-500-010	LABEL, BLANK 1 X.5 WHT.	
503-030-318S	DIODE, SCHOTTKY 30V 200 NM SOT-23 SMT	CR1
511-000-022S	RES, 2.2 OHM 1/8 W 1% 1206 C SMT	R24
511-011-604S	RES, 604 OHM 1/10 W 1% 0805 C SMT	R20, R21
511-013-100S	RES, 10.0 KOHM 1/10 W 1% 0805 C SMT	R1, R2, R3, R5, R6, R7, R8, R9, R10, R11 R12, R13, R14, R15, R16, R17, R18, R19, R22, R23, R25
511-015-100S	RES, 1.00 MOHM 1/10 W 1% 0805 C SMT	R4
534-056-004S	IC, DIG 56002 DSP 40MHZ PQFP SMT	U3
534-056-006S	IC, DIG DSP56156 60MHZ CQFP SMT	U6
535-310-849S	IC, MIX CS4215 STEREO CODEC 16BIT SMT	U7
537-127-120S	IC, DIG 29F010 1MBIT FLASH PROM 150NS	U1, U4, U5
540-001-232S	IC, DIG MAX1232CSA WATCHD TIMER 8PSO SMT	U2
584-205-409S	CRYSTAL, 4.096MHZ SX2050P PKG SMT	Y1
616-102-101S	CAP, 1000PF 100V NPO 0805 C SMT	C25, C34, C36
616-104-501S	CAP, 0.1UF 50V Z5U 0805 C SMT	C4, C5, C6, C7, C8, C9, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C26, C28, C29, C33
616-105-016S	CAP, 1UF 16V TANT 3216 C SMT	C27, C32
616-106-016S	CAP, 10UF 16V TAN 6032 C SMT	C10, C35
616-220-100S	CAP, 22PF 100V NPO 1206 C SMT	C1, C2
616-472-100S	CAP, 4700PF 100V NPO 1206 C SMT	C3, C30, C31
670-040-002S	CONN, 40 P F .21 H .05 X .05 SMT	J1
678-700-080S	JUMPER, 0 OHM 0805 C SMT	JP1
720-130-013	PCB, GCU, SINGLE-SIDED	

UNIT ASSY, TS612 CONTROL SURFACE (850-003-200)

Item	Item Description
401-000-060	BAG, 12" 4MIL CLR PLASTIC TUBING
432-000-018	LABEL, BLANK 1.75 X 2.5, PRODUCT I.D
460-003-201	PAD, SWITCH COND RUBBER, TS612 CONS
585-100-005	BUMPER, RUBBER GREY 1/2"D 14 HIGH
681-010-312	SCREW, 4-40 X 3/4 PPH SELF TAP TYPE B
681-010-320	SCREW, 4-40 X 1 1/4 PPH SELF TAP TYPE B
681-810-500	SCREW, 4 X 1/4" PPH SHT MTL TAPPING
683-046-403	SPACER, KIT M/F 4-40 X 3/16 W/HARDWARE
684-040-040	WASHER, #4 FLAT& SPLIT LOCK
740-003-201	CHASSIS, UPPER CONSOLE, TS612
740-003-202	CHASSIS, LOWER CONSOLE, TS612
740-003-203	BRACKET, CONN CONSOLE, TS612
740-003-204	OVERLAY, KEYPAD MYLAR, CONSOLE TS612
740-003-205	OVERLAY, PAPER, SCREENER CONTROL TS612
740-003-206	OVERLAY, PAPER, STUDIO CONTROL TS612
820-003-201	PCB ASSY, CONTROL SURFACE, TS612
830-003-201	CABLE ASSY, RIB DB15M/IDC16PF 12"
830-003-202	CABLE ASSY, DCPWRF/MASC2P 22AWG 12"

PCB ASSY, CONTROL SURFACE, TS612 (820-003-201)

Item	Item Description	Item Location(s)
500-004-004	DIODE, 1N4004 1 AMP 400V	D11
507-010-022	LED, BI-COLOR FLAT	D1, D2, D3, D4, D5, D6, D7, D8, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28
508-010-001	SENSOR, PHOTO	PS1
512-010-750S	RES, 75 OHMS 1/8 W 1% 1206 C SMT	R2, R15, R16, R17, R18, R19, R20, R21, R22, R28
512-011-150S	RES, 150 OHM 1/8 W 1206 C SMT	R6
512-011-750S	RES, 750 OHM 1/8 W 1% 1206 C SMT	R35
512-012-100S	RES, 1.00 KOHM 1/8 W 1% 1206 C SMT	R5, R7, R8
512-012-432S	RES, 4.32 KOHM 1/8 W 1% 1206 C SMT	R36
512-013-100S	RES, 10.0 KOHM 1/8 W 1% 1206 C SMT	R9, R10, R11, R12, R13, R14, R23, R24, R25, R26, R29, R30, R31, R32, R33, R34,
512-013-324S	RES, 32.4 KOHM 1/8 W 1% 1206 C SMT	R1
533-200-132S	IC, DIG 74HC132 QUAD SCHMITT NAND GT	U8
534-075-179S	IC, DIG SN75179 B RS422 TRANS/REC	U3
540-001-232S	IC, DIG MAX1232CSA WATCHD TIMER 8PSO SMT	U4
540-002-895S	IC, DIG UNC,5895EP 8BIT SER IIN SOURCE	U7
540-405-532S	IC, ANA NE5532D DUAL OP-AMP LW NOISE SMT	U6
543-000-086	IC, ANA REG LT1086CT 1.5A ADJ LW DRP OUT	Q10
543-007-805	IC, ANA REG AN7805CT 1 AMP +5V TO 220	Q3
558-032-001S	FERRITE, CHIP BLM32AO7 40ohm 1206 C SMT	L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14
563-300-702S	TRANS, 2N7002 SMT	Q1, Q2, Q4, Q5, Q6, Q7, Q9,
571-500-028S	SOCKET, IC 28P PLCC SMT	XU2
583-180-110	CRYSTAL, 11.0592 MHZ HC18U C	Y1
586-010-320	SPEAKER, MINILERT MCP320B2 PC MNT	B1
616-102-101S	CAP, 1000PF 100V NPO 0805 C SMT	C25
616-104-100S	CAP, 0.1UF 50V Z5U 1206 C SMT	C3, C6, C13, C14, C15, C16, C18, C20, C21, C26
616-106-016S	CAP, 10UF 16V TAN 6032 C SMT	C1, C2, C5, C19, C22
616-220-100S	CAP, 22PF 100V NPO 1206 C SMT	C9, C11
616-471-100S	CAP, 470PF 100V NPO 0805 C SMT	C27
616-471-501S	CAP, 470PF 50V NPO 1206 C SMT	C24
616-474-501S	CAP, 0.47UF 50V Z5U 1812 C SMT	C12
673-002-002	CONN, HEADER POST 2P MASC .10 C	J3
676-150-004	CONN, TELE 4P R/A LOW PRO LINE JACK	J2
678-224-016	PIN, STRIP DUAL 2X8=16PIN .24 TALL	J2
678-700-080S	JUMPER, 0 OHM 0805 C SMT	R37
681-810-500	SCREW, 4 X 1/4" PPH SHT MTL TAPPING	Q3, Q10
720-003-201	PCB, KEYBOARD, TS612	
807-003-201	FIRMWARE, U2, TS612 CONSOLE	U2

Appendix F: Warranty

Warranty

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, the 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 of 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 the 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 the Manufacturer or an authorized service representative of the Manufacturer; or,
- C.** Adaptations or accessories other than those manufactured or provided by the Manufacturer have been made or attached to the equipment which, in the determination of the Manufacturer, shall have affected the performance, safety or reliability of the equipment; or,
- D.** The equipments 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 the Manufacturer or any other liability in connection with the sale of the 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 the Manufacturer at the address set forth below in writing, giving full particulars as to the defects or unsatisfactory operation. Upon receipt of such notice, the 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 the Manufacturer assumes no responsibility for such damage. All shipping costs shall be paid by the 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

Appendix G: Compliance

FCC Part 15 Compliance

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/her own expense.

Changes or modifications not expressly approved by Gentner Communications Corporation could void the user's authority to operate the equipment.

FCC Part 68 Compliance

The Ringer Equivalence Number (REN) is 0.7B

A label containing, among other information, the FCC registration number and Ringer Equivalence Number (REN) for this equipment is prominently posted on the top plate, near the rear of the equipment. If requested, this information must be provided to your telephone company.

USOC Jacks: This device uses RJ11C and RJ21X terminal jacks.

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the RENs should not exceed five (5). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the telephone company to obtain the maximum RENs for the calling area.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice for you to make the necessary modifications in order to maintain uninterrupted service.

If you experience problems with this equipment, contact Gentner

Communications Corporation, 1825 Research Way, Salt Lake City, Utah 84119, or by phone at (801) 975-7200 for repair and warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

No user serviceable parts are contained in this product. If damage or malfunction occurs, contact Gentner Communications for instructions on its repair or return.

This equipment cannot be used on telephone company provided coin service. Connection to Party Line Service is subject to state tariffs.

IC Compliance

This equipment has been tested and approved for Canadian compliance. At the time of this printing, the CCL DOC number has not been released.

The Load Number of this equipment is: **7**

NOTICE: The Industry of Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by Gentner Communications. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Safety Information

Caution: For use only with certified telecommunications equipment.

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