



TC-100

*Installation and
Operations Manual*

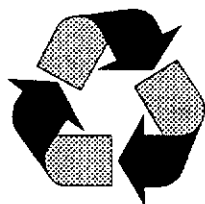
TC-100 Installation and Operations Manual

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Gentner Part No. 800-007-001



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This manual has been printed entirely on recycled paper.

1.1 Introduction

Thank you for your purchase of a TC-100. We are confident that this product will give you many years of dependable, profitable service. This manual is intended to give you all the information needed to use and operate the unit. In addition, we have provided application notes so you can get full use of your TC-100.

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1.3 Specifications

Input Barrier Strip Balanced; 600 ohm if selected for TERMINATING; 10 Kilo Ohm for bridging; < .5% distortion; -20dBm to +10dBm adjustable; 55dB SNR

Telephone RJ-11C (modular) with A-lead closure

Null 18dB Average

Power 120 VAC/240 VAC Wall Transformer

Indicators "Send": Bi-Color LED (Green-Normal, Red-Peak)
"Status": Bi-Color LED (Red-Ring, Green-Answer)

Controls Send Level, Receive Level, Null

Switches Start Momentary, Auto Disconnect, Ring Count, Null, Coupler

Remote Control Coupler (momentary or constant ground)
Do Not Answer (constant ground)

Remote Outputs (Open collectors 100 mA) Status, Ring

Remote Starts Relay Contacts (C, NO, NC)
(Constant or momentary)

Answer 60-105 VAC 15-70 Hz Ring Voltage Nominal

Disconnect Line reversal or loss of loop current

Option Board Open collectors (100mA) for all touch tones including A,B,C,D; BCD Open Collectors for all TTs; Disconnect on Dial-tone and busy signal.

Internal Options DC Bias jumper for simulating a telephone line.

TC-100 Functional Description

Front Panel

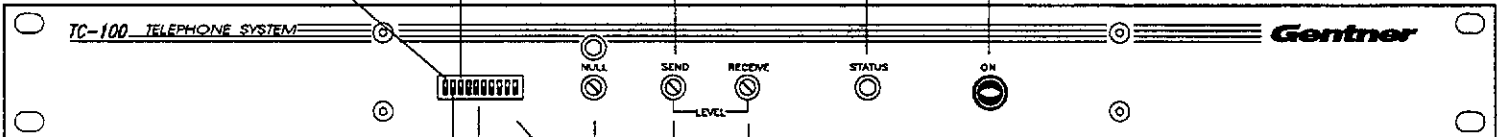
Start Momentary - With dip switch 1 in the UP position, the unit will operate the remote start relay momentarily and then relax. In the DOWN position, the relay will be energized whenever the TC-100 is on line.

Dip switch #3 is not used.

This VU LED gives you a level indication of the send audio.

This bi-color LED glows RED on rings and GREEN when the TC-100 is on line.

Depression of this switch causes the TC-100 to go on and off line.



Auto Disconnect - With dip switch 2 in the UP position, the unit will disconnect itself from the line whenever the caller hangs up.

Adjust this for the output level you need; it is factory set at line level.

Adjust this level so the bi-color LED glows GREEN on normal audio and RED on peaks.

Set the Ring Count dip switches 4, 5 and 6 as follows for automatic answering of incoming telephone calls.

●	●	●	No answer
●	●	●	1 Ring
●	●	●	2 Rings
●	●	●	3 Rings
●	●	●	4 Rings
●	●	●	5 Rings
●	●	●	6 Rings
●	●	●	7 Rings

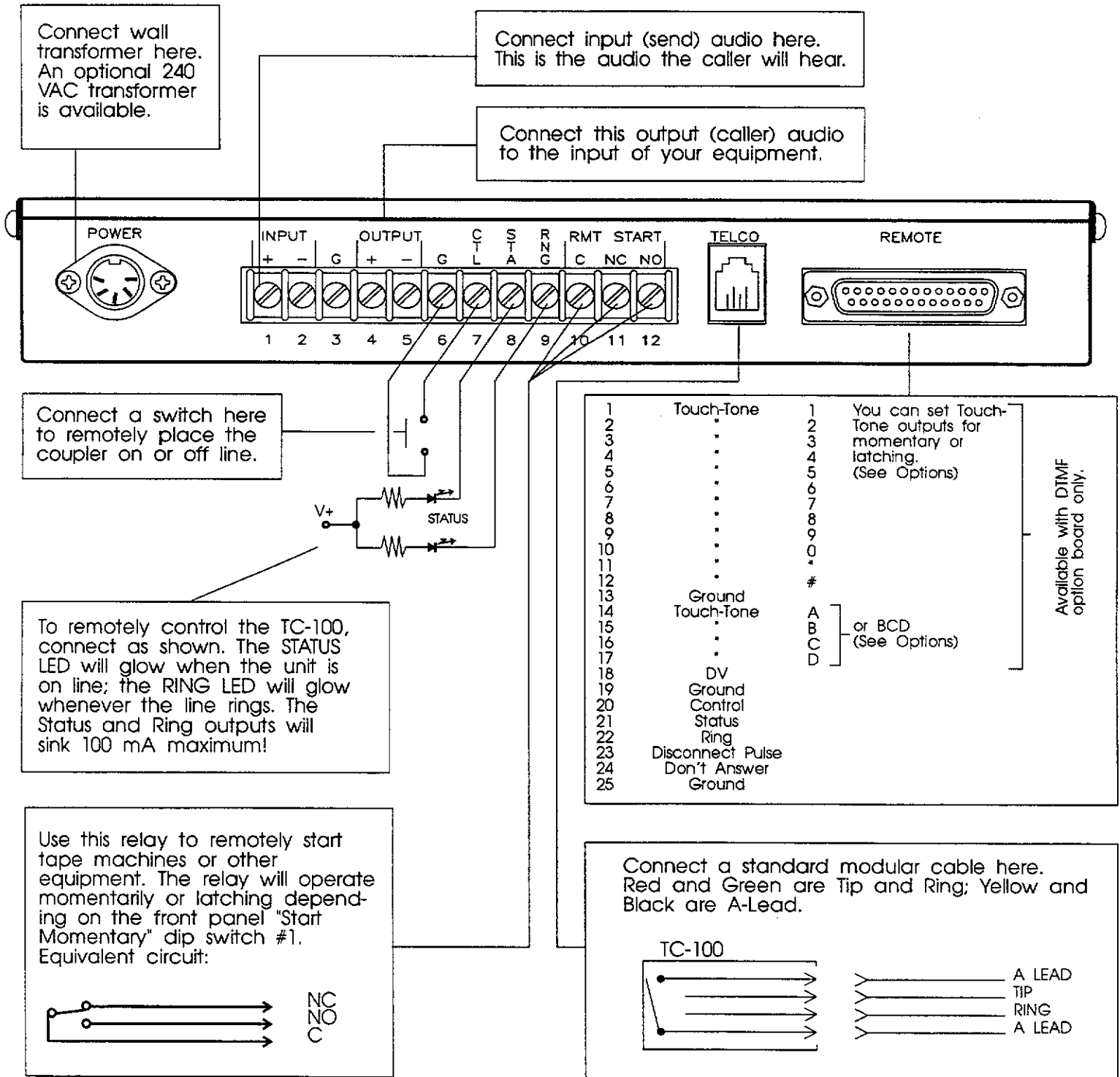
Nulling Procedure:
(Uses dip switches 7 through 10.)

1. Place a call to a quiet line.
2. Put the TC-100 on line.
3. Apply a 1000 Hz, 0 dBm tone to the SEND input.
4. Adjust the send level so the RED LED is barely out.
5. Set all NULL switches down.
6. Put a VOM or VU meter on the output.
7. Adjust the NULL ADJ trim pot for minimum.
8. Move dip switch #7 up.
9. Readjust trim pot for minimum.
10. Move dip switch #8 up.
11. Re-null trim pot.
12. Repeat for dip switches 9 and 10.
13. Determine which setting gave the deepest null.
14. Set to this configuration and renull.



TC-100 Functional Description

Rear Panel



2.2 TC-100 Functional/Operational Description

1. Front Panel.

Coupler Switch-

Depression of the coupler switch causes the unit to go on and off line. Depressing the switch causes the unit to go on line, depressing it a second time takes the unit off line.

As an option, the Coupler switch may be configured to push-and-hold to stay on line. This option is selected by a jumper located on the circuit board, the location of which is shown on the component layout diagram in section 7.2 of the manual.

This switch's control contact is brought to the rear panel barrier block and DB-25. A ground to either of these control pins is equivalent to depressing the coupler switch. This ground is either momentary or sustained, depending on the placement of the internal jumper.

Status LED-

This bi-color LED glows RED whenever the unit RINGS and GREEN whenever the unit is ON LINE. Both of these outputs are brought to the rear panel barrier block and DB-25. The outputs are an open collector capable of sinking up to 100mA.

Receive Level Adjust-

This screwdriver adjustment is used to adjust the output level (caller audio) of your TC-100. It is factory set for line level. You should adjust it to meet your equipment's input level needs.

Send Level Adjust-

This screwdriver adjustment is used to adjust the input level (send audio) of your TC-100. It is factory set for line input level. Adjust it so that the bi-color LED above the pot glows green on normal audio and red on peaks.

Send LED-

This bi-color LED is used to indicate proper send level. Adjust it for green on normal audio and red on peaks.

#1 Dip Switch: Start Momentary-

In the UP position, the unit will operate the REMOTE START relay momentarily when your TC-100 goes on line. This is used for tape or machine starts that require a momentary start closure. In the DOWN position, the relay will latch and remain in the closed position until the unit goes off line.

#2 Dip Switch: Auto Disconnect-

In the UP position, the unit will automatically go off line whenever the incoming caller hangs up, or whenever loop current is lost. (For telephone lines that do not have DC reversal on hang-up, you'll need to install the option board that disconnects on dial tone.) In the DOWN position, the unit must be manually taken off line.

#3 Dip Switch-

This switch is not used.

#4-6 Dip Switches: Ring Count-

To ALWAYS MANUALLY ANSWER, leave the switches in the DOWN position. To AUTOMATICALLY ANSWER after X number of rings, set the dip switches as follows:

Dip Switch	4	5	6	Number of Rings
	OFF	OFF	OFF	NO AUTO ANSWER
	OFF	OFF	ON	1
	OFF	ON	OFF	2
	OFF	ON	ON	3
	ON	OFF	OFF	4
	ON	OFF	ON	5
	ON	ON	OFF	6
	ON	ON	ON	7

#7-10 Dip Switches: Null Adjust-

If you are going to use your TC-100 as a hybrid, use the following null procedure, otherwise skip this section:

1. Place a call to a quiet telephone line.
2. Place the unit on line using the coupler switch.
3. Apply a 1000 Hz 0dBm tone to the input.
4. Adjust the send level until the red LED barely goes out.
5. Set all of the null switches down.

6. Place a VOM, VU, or other suitable meter on the output terminals.
7. Adjust the Null Adj trim pot for minimum.
8. Move the the first null dip switch up.
9. Re-adjust the the Null Adj trim pot. Notice if the null improves.
10. Repeat the process, adding a new dip switch after re-nulling the hybrid.
11. Determine which setting gave the deepest null.
12. Reconfigure to this setting and renull.

2. Rear Panel.

Power-

1. Connect the wall transformer here. An optional 240VAC transformer is available.

Input Audio-

1. Connect the input (send audio) here. This is the audio that the caller will hear. The TC-100 can either terminate the audio source by placing a 600 ohm load resistor across this input, or bridge the source by removing the resistor from the input. This option is selected by a circuit board jumper, the location of which is shown on the components layout diagram in section 7.2 of this manual.

The TC-100 is delivered with this option set for TERMINATING. To change this option to bridging, move the jumper on the circuit board from "TERM" to "BRIDGE".

2. If you are using your TC-100 as a hybrid, make sure that none of the output audio is included in the input audio (this condition may cause feedback). We recommend Mix-Minus audio (all audio sources MINUS caller audio) for feeding the caller.

Output Audio-

1. Connect the output or caller audio to the input of your equipment here.

Control-

1. To place your TC-100 on or off line, apply a ground to the control contact. This ground can be momentary or sustained, as described at the beginning of section 2.2.
2. If momentary has been selected with the jumper, applying a momentary ground will toggle the unit on; applying a momentary ground again will take the unit off line.
3. If sustained has been selected, apply a ground to keep the unit on line; remove the ground to take it off line.

Status-

1. The open collector status output is designed to sink 100mA; connect an LED or lamp as shown in section 3.
2. The open collector will be activated whenever the unit is on line.

Ring-

1. The open collector ring output is designed to sink 100mA.
2. Connect an LED or lamp to this output. Whenever a ring is sensed on the telephone line, this open collector will be activated.

Remote Start Relay-

1. The remote start relay contacts are brought to the rear barrier block as shown.
2. These contacts are used for interfacing the remote control contacts on tape machines and other equipment.
3. The relay will operate momentarily or latch depending on the placement of the front panel start momentary dip switch.

Telco-

1. Connect a standard modular cable (USOC RJ11C) at the Telco jack.
2. The red and green conductors of the modular cable are the tip and ring of the telephone line.
3. The yellow and black wires are the A-lead.

Remote Connector-

1. The remote connector pin outs are described in section 4; Pins 1 through 18 are available only if you have purchased the DTMF option board.
2. Pins 1 through 12 are standard touch tone open collector outputs providing up to 100mA of sinking current.
3. The outputs can be strapped for momentary or latching. For more information, refer to section 3.3 of this manual.
4. Pin 13 is ground.
5. Pins 14, 15, 16, and 17 are either A, B, C, D touchtones or BCD (Binary Coded Decimal) output, as shown in the options section.
6. Pin 18 is DV (Data Valid). This output will go low when a valid touch tone is received, if the BCD option is enabled on the optional touch-tone card.
7. Pin 19 is ground.
8. Pin 20 (control) is the same as pin 7 of the barrier block. Status (pin 21) is the same as pin 8 of the barrier block.
9. Pin 22 (ring) is same as pin 9 of the barrier block.
10. Pin 23 (disconnect pulse) is an open-collector output provided to your equipment by the TC-100 on line disconnect.
11. Pin 24, when grounded, will cause the unit not to answer regardless of whether the unit is in auto answer or not.
12. Pin 25 is ground.

3.1 INTERFACING THE TC-100

The TC-100 has been designed to interface with most types of electronic equipment. This section will detail the various methods of interfacing to help you get maximum utilization of the unit.

THE BASICS-

1. Control inputs. To provide a control input to the TC-100, all you do is apply a ground to the appropriate pin. The TC-100 uses active inputs; therefore, the equivalent circuit looks like this:

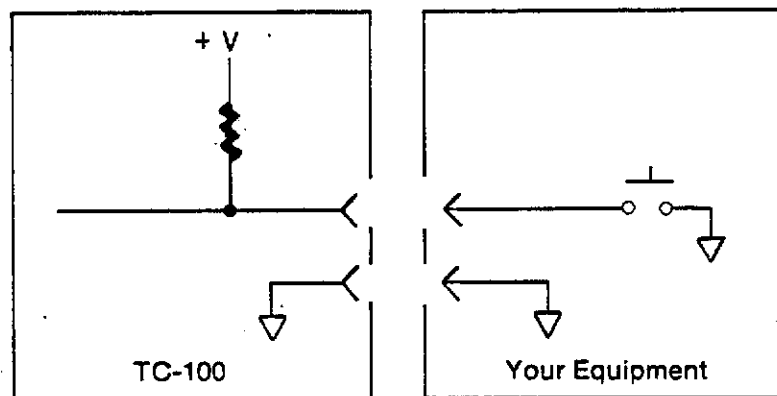


DIAGRAM A

Notice the active input remains high when no ground is applied.

2. Control Outputs. Outputs of the TC-100 provide an active ground through an open collector transistor:

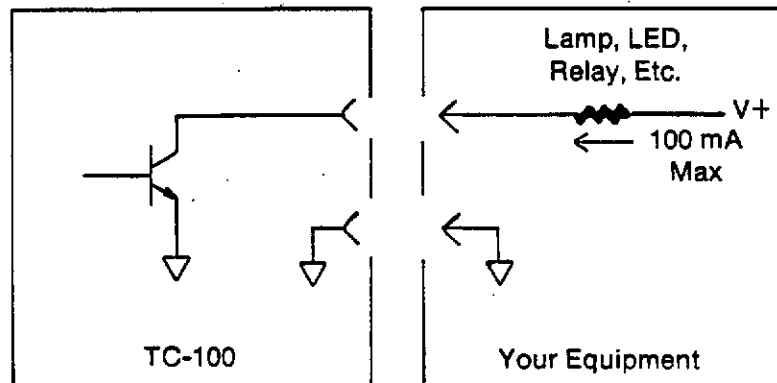
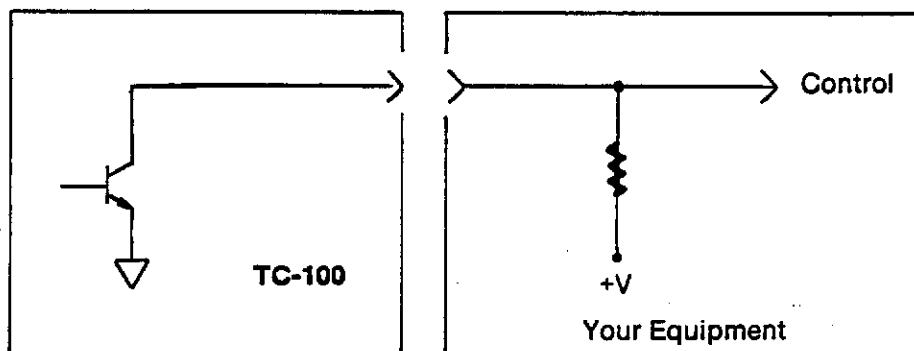


DIAGRAM B

When the base of the transistor is high, the collector goes low, thus permitting current to flow through your equipment load. Note that 100 mA is the maximum current that can be passed through the transistor.

3. Active Outputs to Active Inputs. Most modern equipment uses this configuration; therefore, you'll most likely be using open-collectors to drive active inputs:



STANDARD REMOTE CONTROL:

To remotely control the coupler, connect a switch to control pin #7 and ground pin #6 on the barrier strip (pins 20 and 25 on the DB-25); connect an LED or lamp between pins 6 and 8 for status (pins 25 & 21 on DB-25):

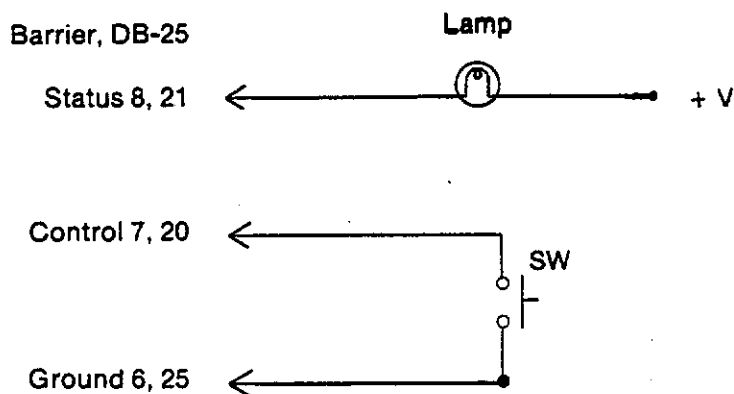


DIAGRAM D

When you apply a momentary ground to the control pin, the coupler will be put ON line and the lamp will glow. To take the coupler off line, again apply a momentary ground.

Remote control with ring detection is achieved by connecting the unit as above; in addition, connect an LED or lamp to 'ring' pin #9 on the barrier strip (pin 22 of the DB-25):

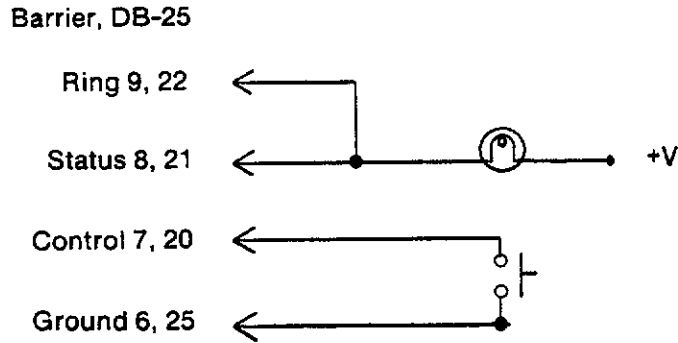


DIAGRAM E

When the TC-100 senses ring voltage, the lamp will glow.

REMOTE STARTS:

A common use of the TC-100 is to automatically play taped messages down the telephone line. To start a cart machine with the TC-100, connect to the remote start relay (via the rear panel barrier strip):

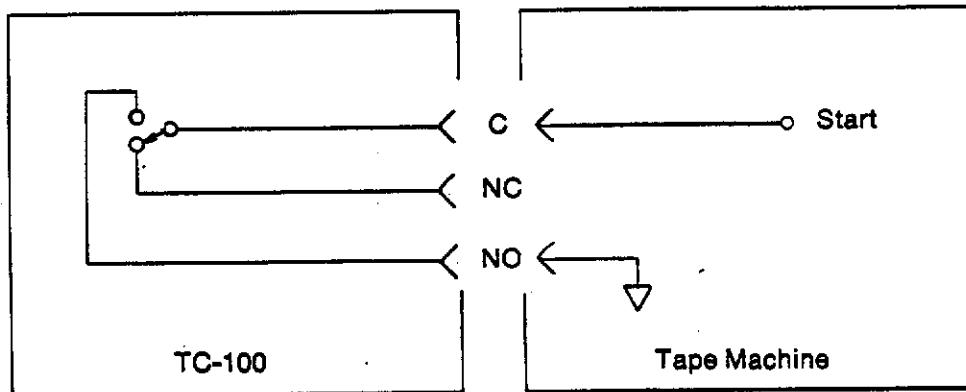


DIAGRAM F

When the TC-100 goes on line, your cart machine will be activated. The remote start relay will be either momentary or latching, depending on the placement of the front panel dip switch.

Should you wish your machine to re-cue before the TC-100 again answers the telephone, connect the "Do Not Answer" pin of the DB-25 connector to the "Ready" circuitry of your tape machine. The "Do Not Answer" pin requires a closure to ground to operate. Tape machines with automatic "fast cue" can be set up to go into cue by receiving a disconnect pulse from the TC-100. The interface is illustrated in Diagram G:

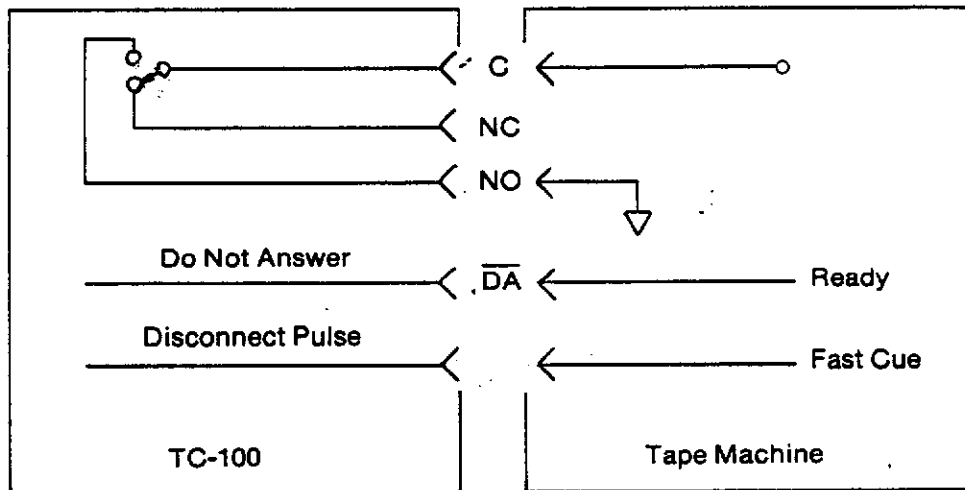


DIAGRAM G

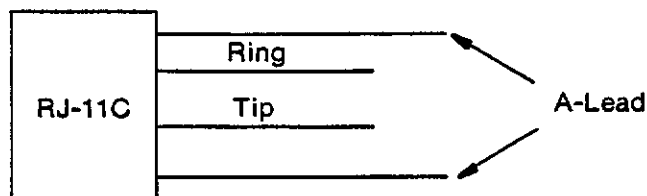
AUDIO CONNECTIONS:

Input audio is easily connected to the TC-100 via pins 1 and 2 on the barrier block; output audio (caller audio) is connected via pins 4 and 5. Pin 3 is ground. Input and output audio levels have been factory set for line level.

3.2 Telephone Interfacing

STANDARD CONNECTION-

The TC-100 was designed to directly connect to the telephone line. The unit uses a standard USOC RJ11C telephone jack for line connection; the RED and GREEN wires are Tip and Ring and the YELLOW and BLACK wires are A-Lead:



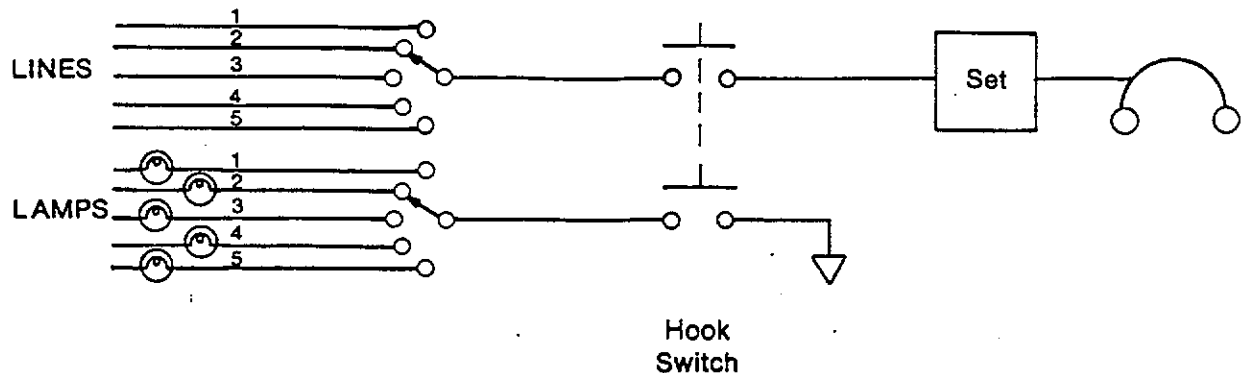
USOC RJ-11C Connector

In most cases, all you need to do for telephone interfacing is plug your telephone line into the unit via the RJ-11C jack. If your telephone line does not use a modular jack, connect the red/green pair to the tip and ring of your telephone line. The tip and ring can usually be located on a punch block in your central telephone connection area.

KSU CONNECTION-

If you are connecting the TC-100 to an internal, multi-line telephone system (KSU), connection becomes a bit more complicated. You'll need to connect the unit via a telephone set located near the TC-100. When correctly connected, the TC-100 will operate on the telephone line selected at the set.

"Fat Wire" Installation. A "fat wire" system uses 25-pair cable to bring Tip/Ring and A-lead for each line to the telephone set:



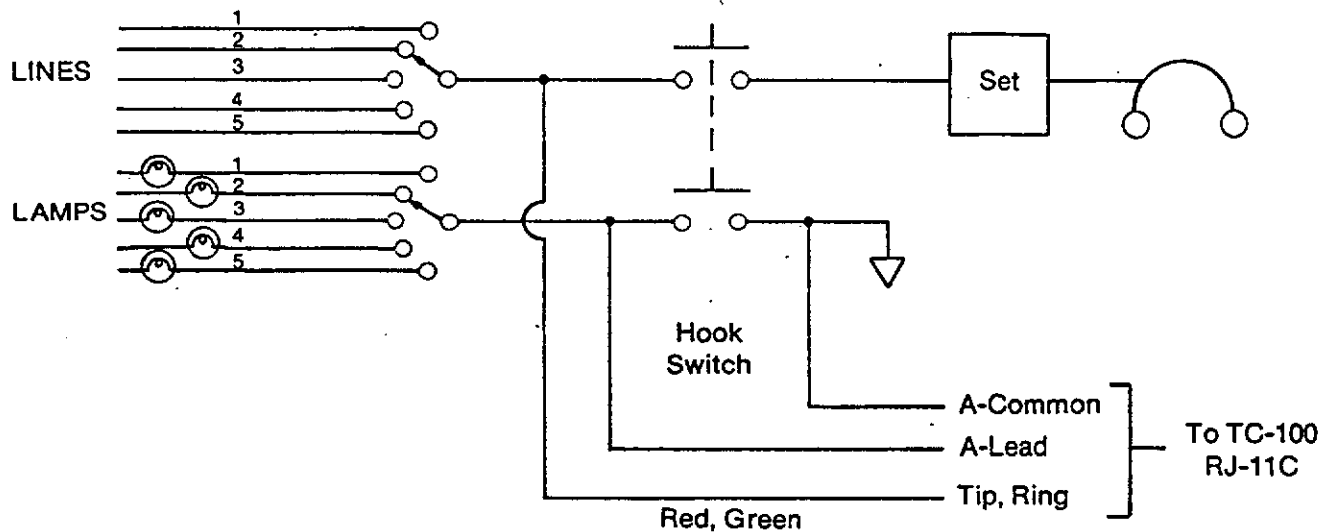
"Fat Wire" System

When a line is selected at the telephone, Tip and Ring for that particular line are routed to the phone. In addition, the A-lead pair for that line activates the appropriate lamp. To install the TC-100, you'll need to locate the Tip/Ring and A-lead for the output of the phone's call director:

1. Remove the cover of the telephone.
2. Place the handset on the cradle, or tape the hook switch closed.
3. Select a telephone line.
4. Using clip leads, short different combinations of terminals on the telephone until the lamp for your selected line illuminates. Now punch a different line. If the lamp does not follow, you've located the A-lead for one line only. Keep shorting terminals until the lamps follow the selected line. The correct A-lead pair is USUALLY black/yellow, but this may not be the case in your telephone.

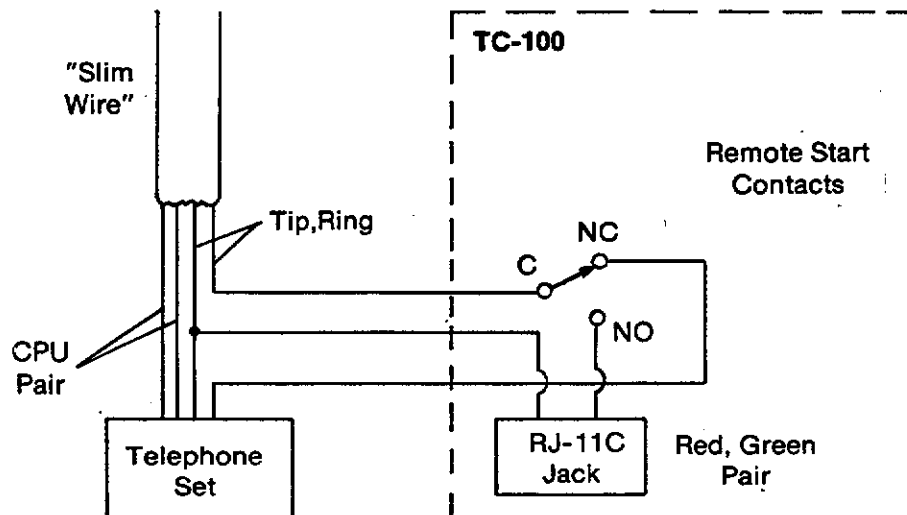
5. Verify correct line selection by punching up the telephone lines one by one. If dial tone and lamps follow the selected lines, connect the tip and ring to the red and green pair at the TC-100's modular jack and connect the A-lead to the yellow and black pair.

6. The telephone will work normally when the TC-100 is off line; however, when the TC-100 is placed on line, the telephone will not function. Note the TC-100 bypasses the hook switch of your telephone so it is not necessary to take the phone off-hook to operate the unit.



TC-100 Installation in "Fat Wire" Telephone System

"Slim Wire" (Digital) Installation. Digital multi-line telephones use 4-6 wires to connect to the telephone system. Two wires are Tip and Ring and the others contain the information for line selection and other features. When you select a line on this type of telephone, it sends a signal back to the CPU, which then pulls in the line and routes it to the telephone. To connect the TC-100, you'll need to route tip and ring through the Remote Start contacts and telco jack of the unit:



"Slim Wire" Telephone installation

1. Bridge a tip or ring wire (it doesn't matter which one) to the red or green wire of the TC-100's modular jack.
2. Connect the other wire to the Common (pin #10) on the TC-100's barrier strip.
3. Connect the NO contact (pin #12) to the remaining tip/ring wire of the TC-100's modular jack.
4. Connect the NC (pin #11) contact to the other tip or ring wire in your telephone set.
5. Set the front panel (momentary) dip switch for latching.

This connection through the remote start relay will permit you to use the telephone when the TC-100 is not in use. When the coupler is activated, the phone will be taken off line. You may want to utilize the A-lead closure in the telephone to simulate off-hook; otherwise, just remove the handset from its cradle to use the TC-100.

Note that the TC-100 will not be able to auto-answer any telephone lines in the illustration above as a result of the operating characteristics of digital telephones. First select the line to be accessed with the telephone set, and then manually put the TC-100 on line.

4.1 Connector Pin Outs

BARRIER STRIP:

Pin #	Function
1	+ Input (send) audio
2	- Input (send) audio
3	Ground
4	+ Output (caller) audio
5	- Output (caller) audio
6	Ground
7	Control - activates coupler
8	Status - activates status lamp
9	Ring - activates ring lamp
10	Remote Start Common
11	N.C. (Normally Closed) contact for Remote Start
12	N.O. (Normally Open) contact for Remote Start

DB-25:

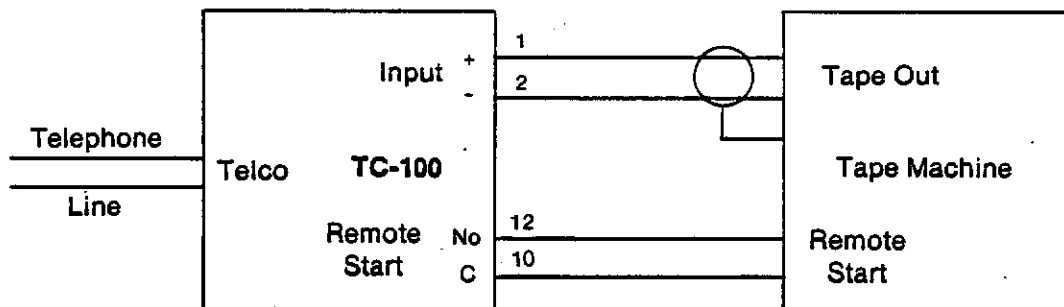
Pin #	Function
1	Touch-Tone (r) #1 (latching or momentary)
2	" 2 "
3	" 3 "
4	" 4 "
5	" 5 "
6	" 6 "
7	" 7 "
8	" 8 "
9	" 9 "
10	" 0 "
11	" * "
12	" # "
13	Ground
14	Touch-Tone (r) A (or BCD)
15	" B (or BCD)
16	" C (or BCD)
17	" D (or BCD)
18	DV (Data Valid)
19	Ground
20	Control - activates coupler
21	Status - activates front panel Status lamp
22	Ring - activates front panel Ring lamp
23	Disconnect pulse
24	Do Not Answer (if grounded, unit will NOT answer)
25	Ground

Pins 1 through 18 are available only with DTMF option board.

5.1 Applications

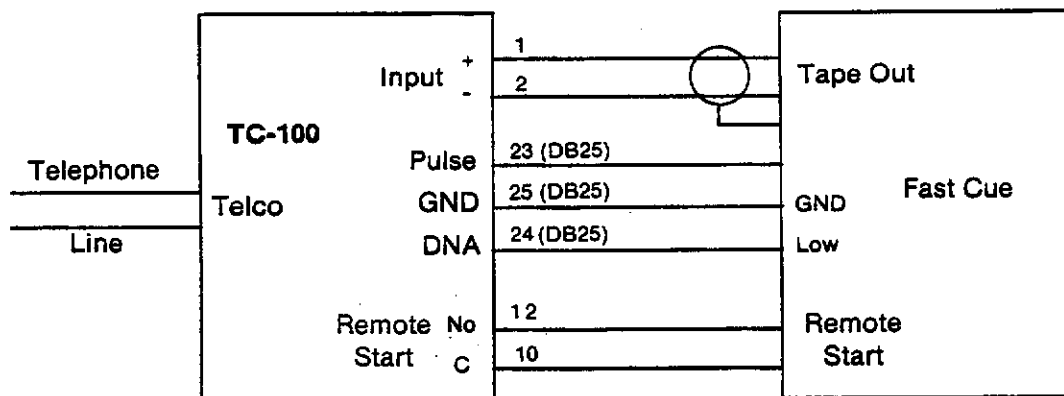
The TC-100 is the most versatile telephone coupler you'll find. This section will detail some of the unit's basic applications...but once you've worked with it for a while you'll find the applications are virtually unlimited!

A. Automatic Tape Playing. Use the TC-100 to automatically answer the phone and play a taped message:



Automatic Tape Playing

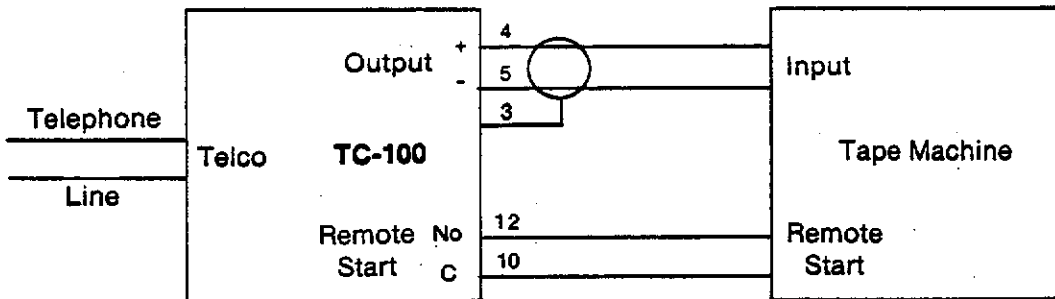
The unit will disconnect automatically when the caller hangs up. You can set up the unit to send a disconnect pulse to your tape machine and place it into fast cue. You can also set up the TC-100 to not answer unless the tape machine is ready:



Automatic Tape Playing w/Disconnect & "Ready"

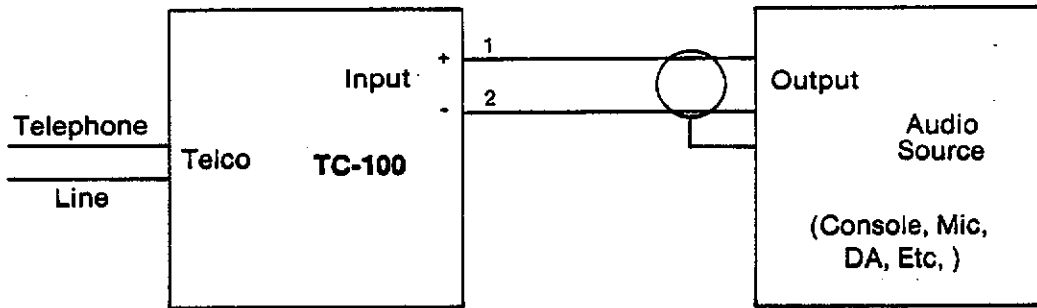
B. Automatic Tape Recording. This application is perfect for newsroom use. A reporter calls a dedicated number; the TC-100 answers and automatically starts the tape machine; the unit

disconnects and turns off the tape machine when the reporter hangs up.



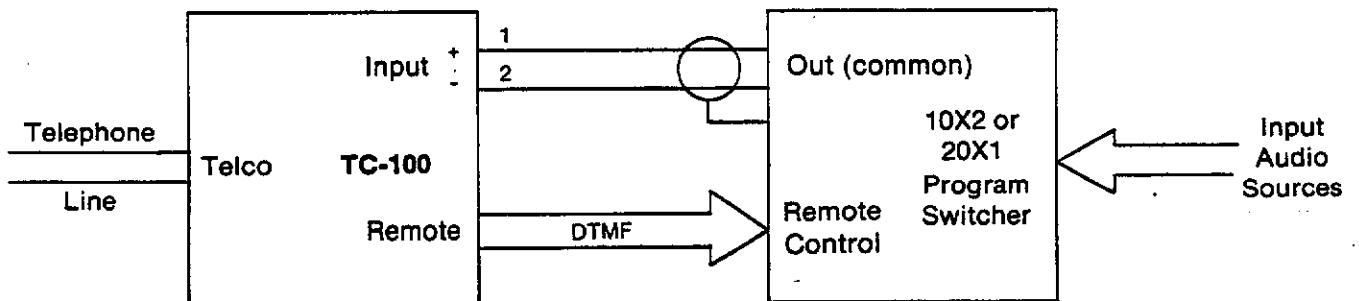
Automatic Tape Recording

C. Automatic Monitoring of Audio Source. This is similar to the first application. A radio or other constant audio source is connected to the TC-100; the unit disconnects when the caller hangs up:



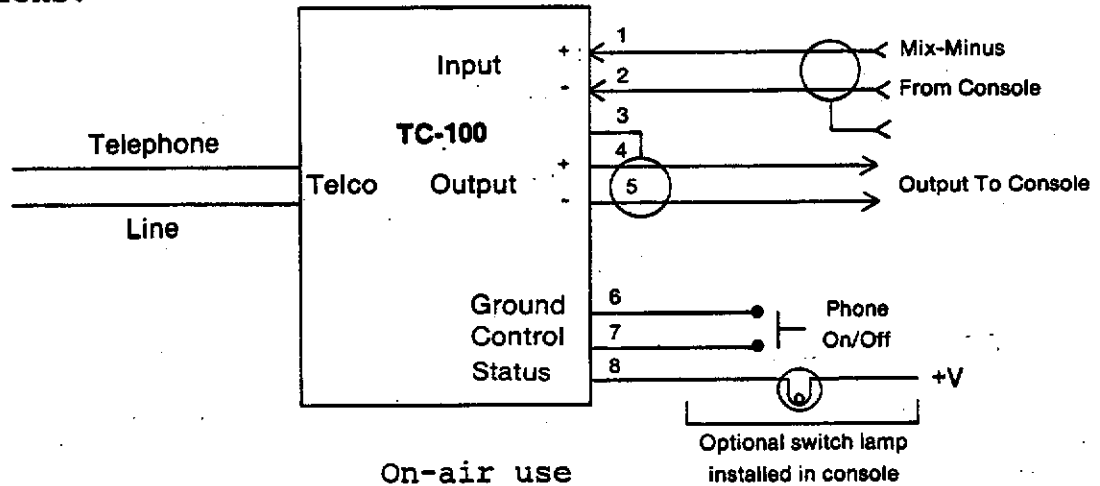
Automatic Audio Monitoring

D. Automatic Monitoring of Multiple Audio Sources. This application requires the DTMF option board. The TC-100 is connected to a Gentner Program Switcher, which in turn connects to up to 12 audio sources. (If the caller's telephone also has A,B,C,D on the tone pad, up to 16 sources can be selected). To select the desired audio, the caller simply pushes the appropriate number on the telephone's Touch-Tone (r) pad. To change audio sources, the caller pushes another number; the TC-100 will disconnect when the caller hangs up.

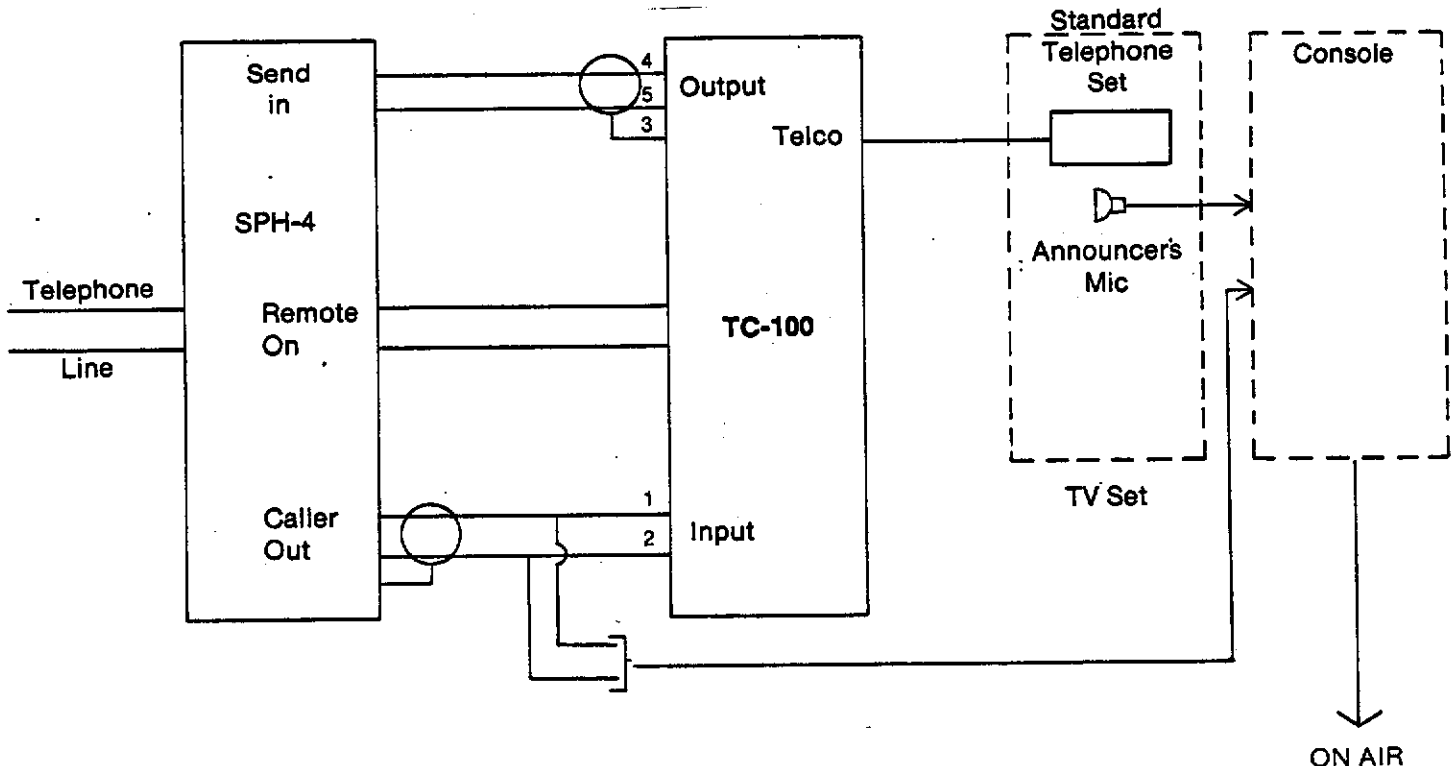


Automatic Monitoring of Multiple Sources

E. On-air use. The TC-100 is a telephone hybrid and can therefore be used for on-air calls, telephone interviews, etc. Refer to the Functional Description in section 2 for nulling instructions.

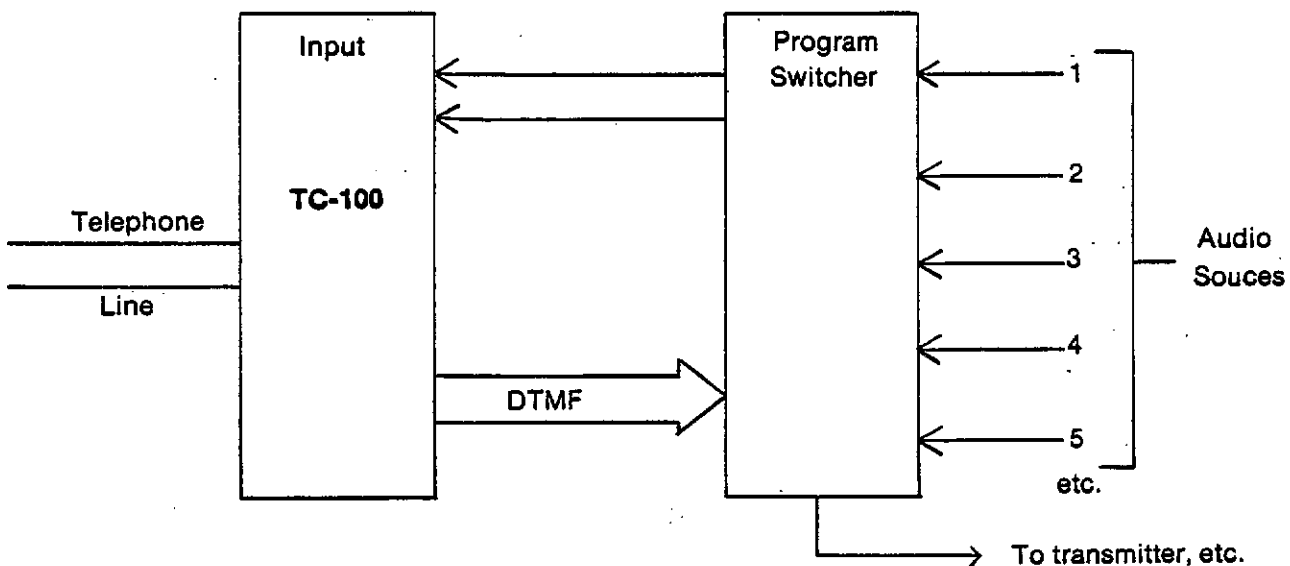


F. "The Afternoon Movie" Announcer use. Television personalities often prefer to talk with a caller via a telephone handset for a more realistic on-air look. The TC-100 provides an easy solution to this problem. The TC-100 is connected to the telephone line via a Gentner SPH-4 telephone system. Caller audio goes to the console from the SPH-4 and is also bridged to the TC-100. The TC-100 uses an "internal" telephone line to place the caller's audio on a telephone set in the studio.



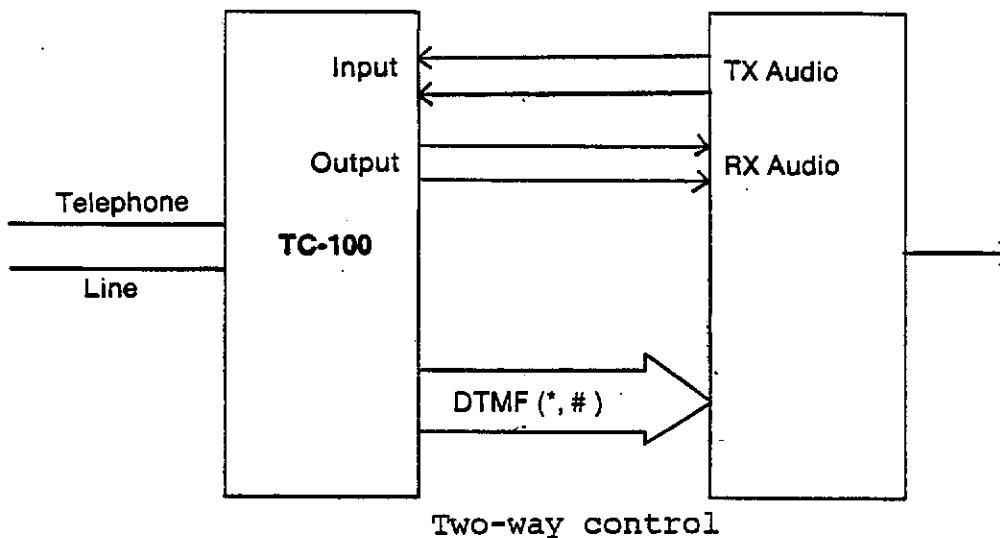
To use the TC-100 in the above application, the unit must simulate telephone line voltage. To enable this option, refer to the instructions in section 5.2.

G. Remote control. With the DTMF card installed, the TC-100 may be used for remote control of on-air audio, etc. The unit works in conjunction with a Gentner Program Switcher:



Selection of on-air sources

H. Telephone control of two-way radio. A TC-100 with DTMF card may be connected to a two-way transceiver for the ability to communicate via the telephone with field personnel. The user depresses a * to transmit and a # to receive:



Two-way control

5.2 USING TC-100 FOR SIMULATING A TELEPHONE LINE

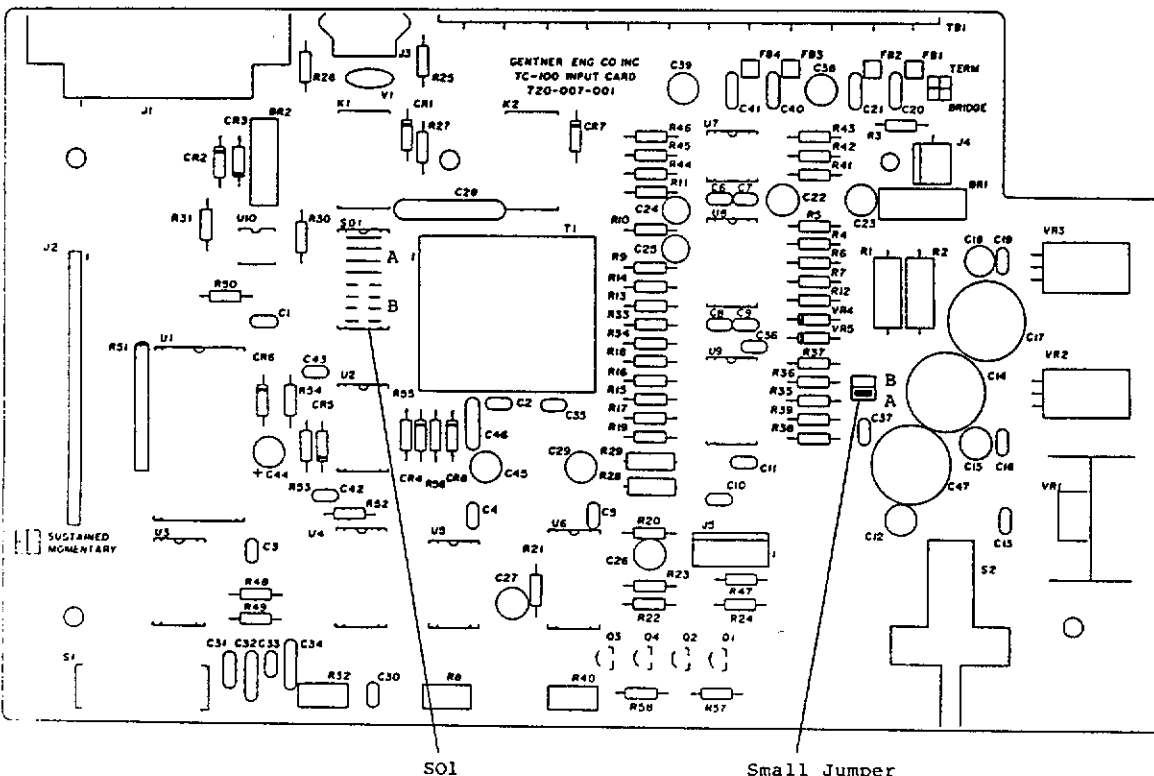
The unit is delivered in the NON-SIMULATING mode.

The TC-100 can simulate a telephone line, allowing you to interface a standard telephone instrument to your console as shown in Application F, "The Afternoon Movie", in section 5.1 of this manual.

To have the TC-100 simulate a telephone line, two jumpers on the printed circuit board need to be repositioned (see Diagram below). One of the jumpers is a small 2-pin jumper, and the other is a "programmable-short", SO1. The jumpers are shown in the standard, NON-simulating position. To have the TC-100 simulate a telephone line, reposition the jumpers as follows:

1. Note that the jumpers have two possible positions; A is NON-SIMULATING and B is SIMULATING.
2. Remove the small jumper from position A as shown below, and place it on the two pins immediately adjacent, in position B.
3. Unplug the programmable-short SO1, turn it around so that the four unbroken leads are on the B side of the socket, and gently re-insert it.

To return the TC100 to the standard, NON-simulating configuration, reverse steps 2 and 3 above to place both jumpers in Position A.



TELEPHONE LINE SIMULATE - POSITION B
NON-SIMULATE POSITION A

6.1 Quick Reference.

BASIC INSTALLATION:

1. Mount the unit in the desired location.
2. Connect the telephone line via the RJ-11C connector.
3. Connect Send audio via barrier pins 1,2.
4. Connect Receive audio via barrier pins 4,5.
5. Connect remote start relay (if desired) via barrier pins 10, 11, 12.
6. Connect remote coupler switch (if desired) via barrier pins 6, 7.
Status and Ring lamps are connected via barrier pins 8, 9.
7. Connect the unit to power using the wall transformer provided.

DIP SWITCHES:

- 1 - Start Momentary: UP - momentary; DOWN - latching
- 2 - Auto Disconnect: UP - enabled
- 3 - not used
- 4-6 - Ring Count
- 7-10- Null set (use with NULL ADJ trimpot)

SEND LEVEL ADJUST:

1. Controls level going DOWN the telephone line.
2. Adjust so indicator LED glows green on normal audio, red on peaks.

RECEIVE LEVEL ADJUST:

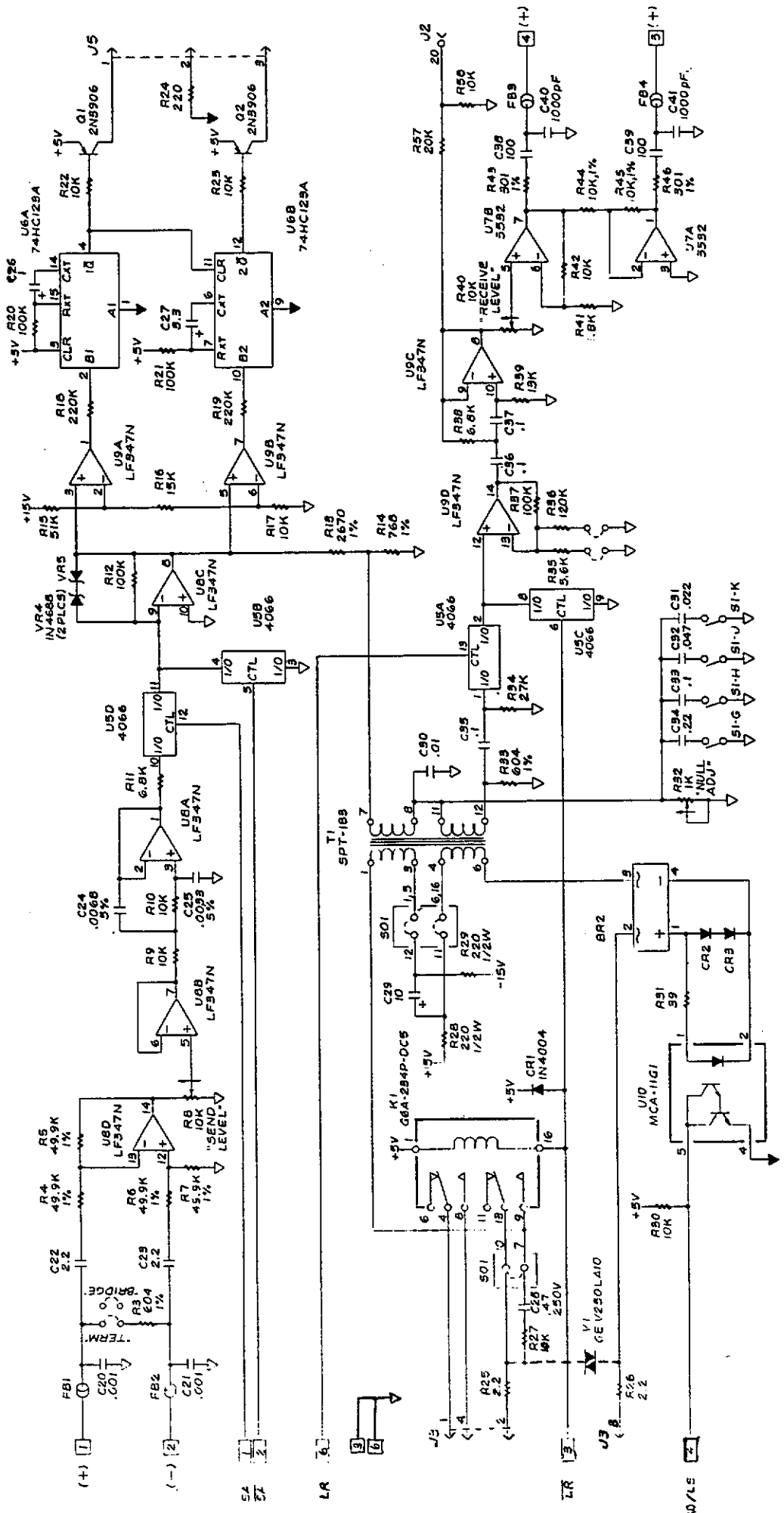
1. Controls audio (caller) level going to your equipment.

STATUS LAMP:

1. Glows red when the line rings.
2. Glows green when the TC-100 is on line.

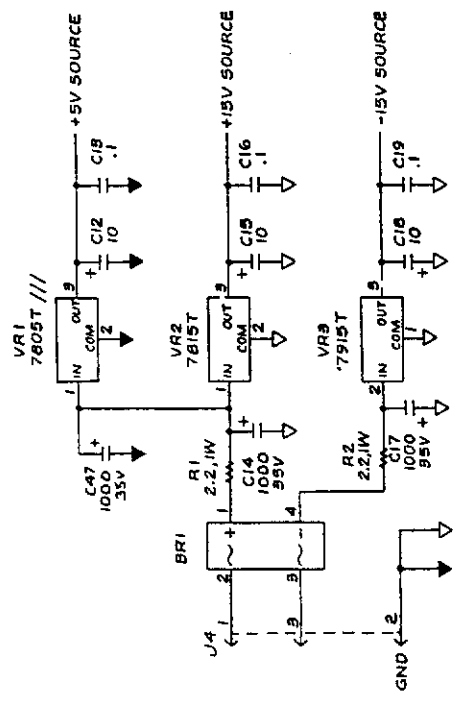
COUPLER SWITCH:

1. Push button to manually place coupler on line.
2. Push button again to take coupler off line.



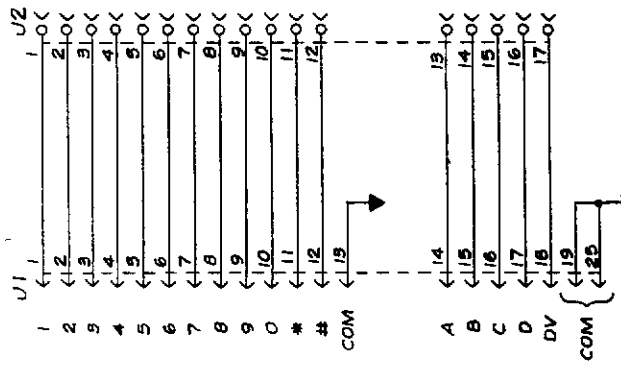
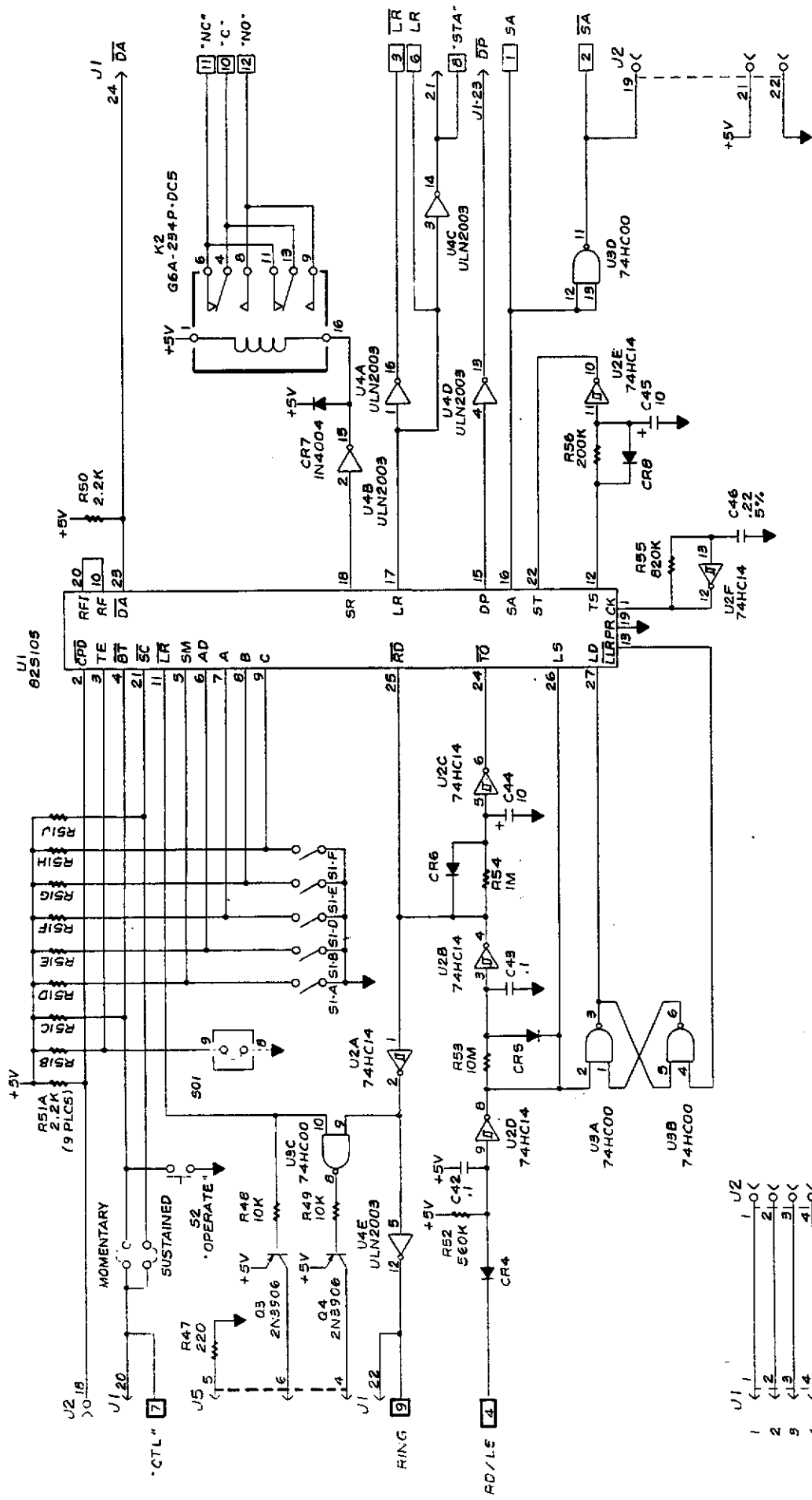
INTEGRATED CIRCUITS

REF DESIG	TYPE	GND	+5V	+15V	-15V	BYP	CARE	.1
U1	825105	1	2	8	—	—	—	C1
U2	74HC14	7	14	—	—	—	—	C2
U3	74HC00	7	14	—	—	—	—	C3
U4	ULN2003	8	—	—	—	—	—	C4
U5	4066	7	14	—	—	—	—	C5
U6	74HC123A	8	16	—	—	—	—	C6, C7
U7	5552	—	—	—	—	—	—	C8, C9
U8	LF347N	—	—	—	—	—	—	C10, C11
U9	LF347N	—	—	—	—	—	—	—
U10	MCA11G1	4	—	—	—	—	—	—



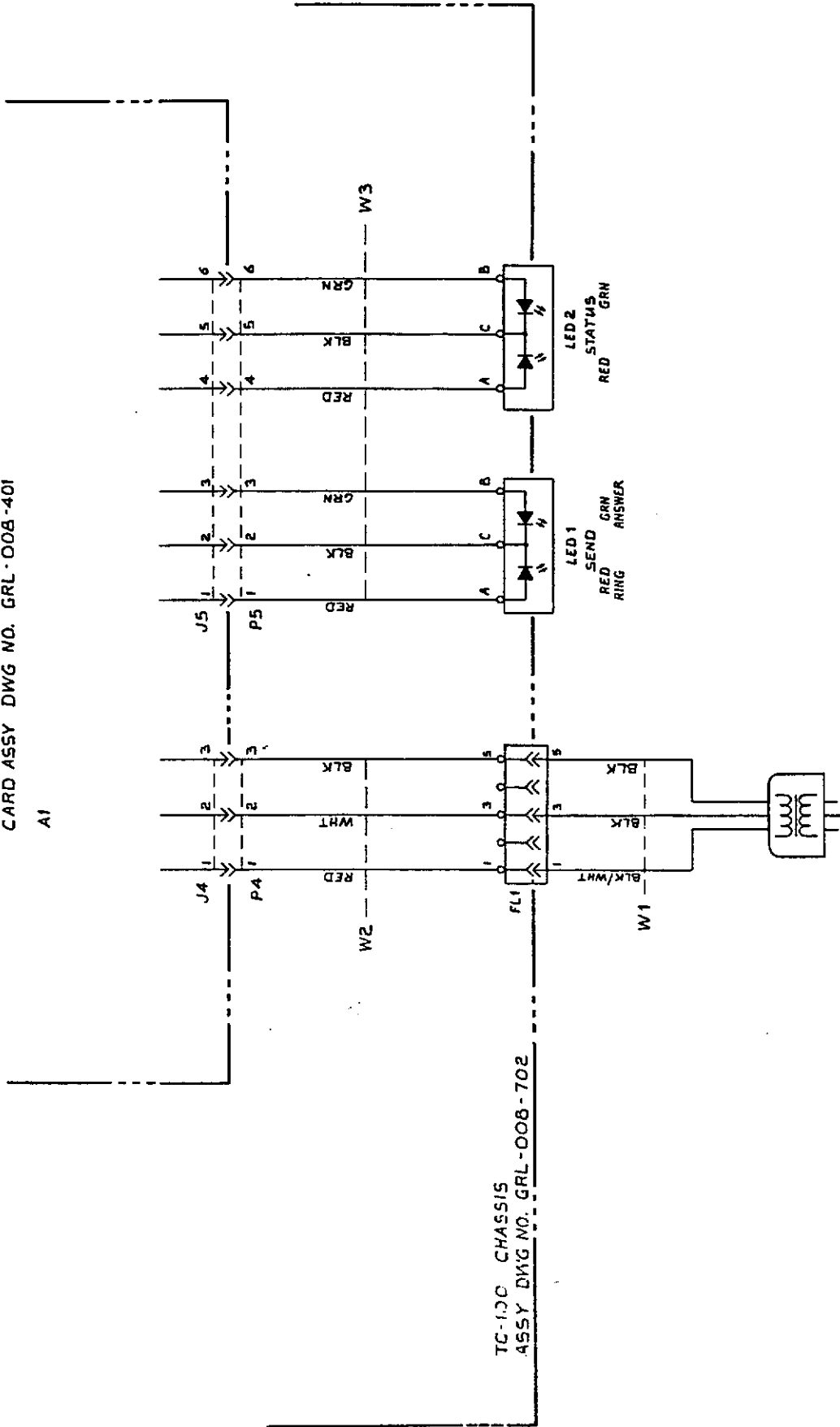
COMPONENT	REF	OMIT
RESISTOR	R55	—
CAPACITOR	C47	—
TRANSISTOR	Q4	—
DIODE	CR8	—
IC	U10	—

- NOTES:
- UNLESS OTHERWISE SPECIFIED:
 - FIXED RESISTORS ARE 1/4 WATT.
 - RESISTANCE VALUES ARE IN OHMS ± 5%.
 - CAPACITANCE VALUES ARE IN MICROFARADS.
 - VOLTAGE VALUES ARE IN VOLTS.
 - VOLTAGES ARE D.C.
 - [1], [2], [3] ETC. ARE CONNECTION ON TERMINAL BARRIER STRIP (TBI).
 - [1], [2], [3] ETC. INDICATE CONNECTIONS BETWEEN SHEETS OF THIS DRAWING.

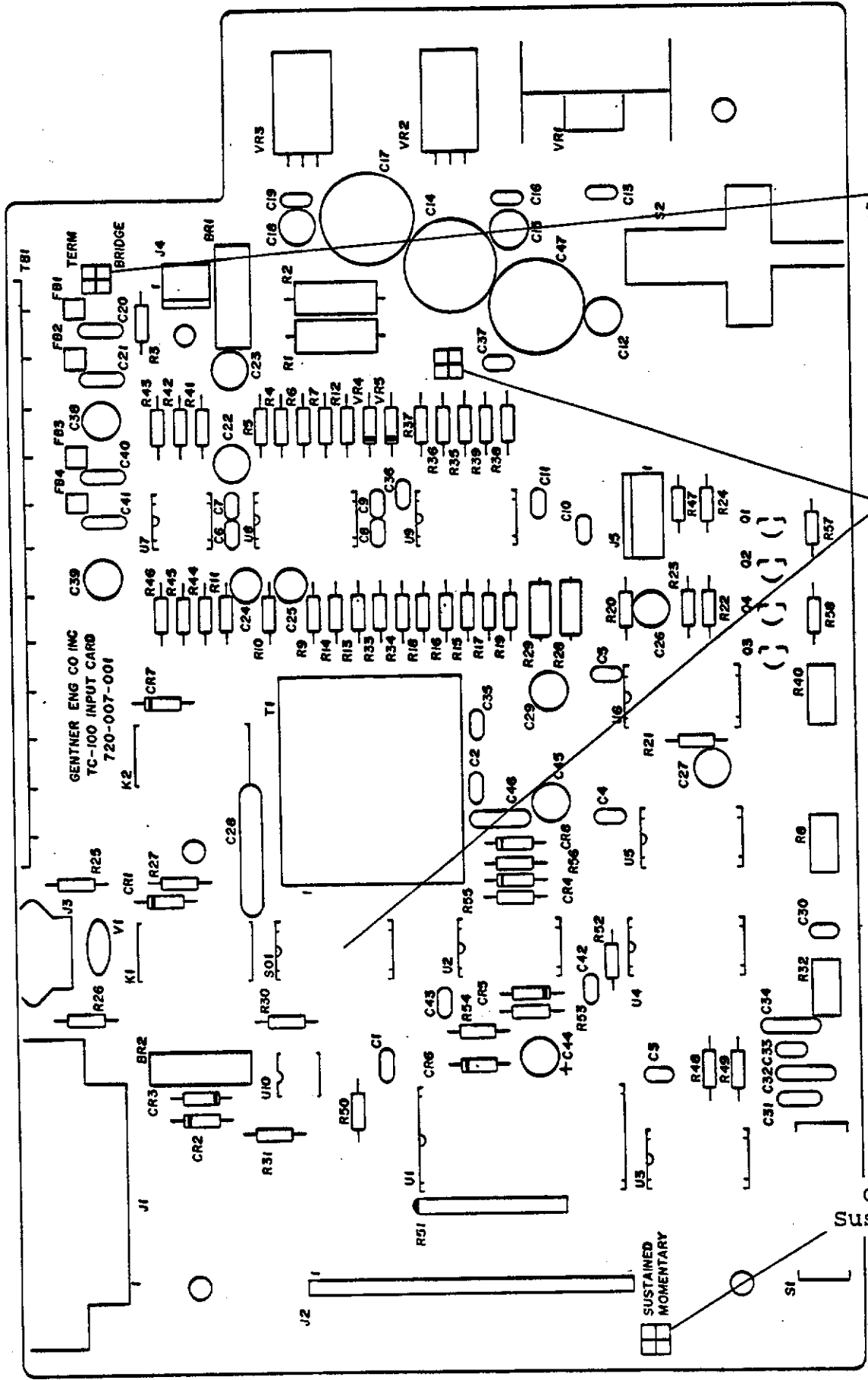


TC-100 INPUT CARD
 SCHEMATIC DWG NO. GRL-008-101
 CARD ASSY DWG NO. GRL-008-401

A1



TC-100 CHASSIS
 ASSY DWG NO. GRL-008-702



Audio Input
Terminate/Bridge

Telephone Line
Simulate
Off/On

Coupler Control
Sustained/Momentary

GENTNER ENG CO INC
TC-100 INPUT CARD
720-007-001

SUSTAINED
MOMENTARY

APPENDIX A - DTMF OPTION

This optional card provides two functions. It primarily decodes Touch-Tones(r) received over the telephone line (including *,#,A,B,C,D). Secondly, it includes a "call progress decoder" which provides automatic disconnect capabilities when a dial tone or busy signal is received (the TC-100 will thus not need the normal line reversal to disconnect).

The DTMF option is contained totally on a single printed circuit board, and is usually supplied already mounted within the TC-100. However, if you purchased it separately from the TC-100, you will need to install it using the procedure detailed in section 6.2 .

A.1 OPERATION

The Touch-Tone(r) section is delivered with individual open-collector outputs for the 12 DTMF tones 1 through 0, * and #. Additionally, a Binary-Coded-Hex (BCH) formatted output for all 16 standard tones is provided. The BCH output can optionally be changed to provided individual outputs for the A, B, C and D tones. All outputs can be selected as momentary (default) or latching with an optional jumper.

The output connection from the card is via the DB-25 REMOTE connector on the rear panel of the TC-100. The pinout for this connector is shown in the illustration on page 2-2 of this manual, and in the chart on page 4-1.

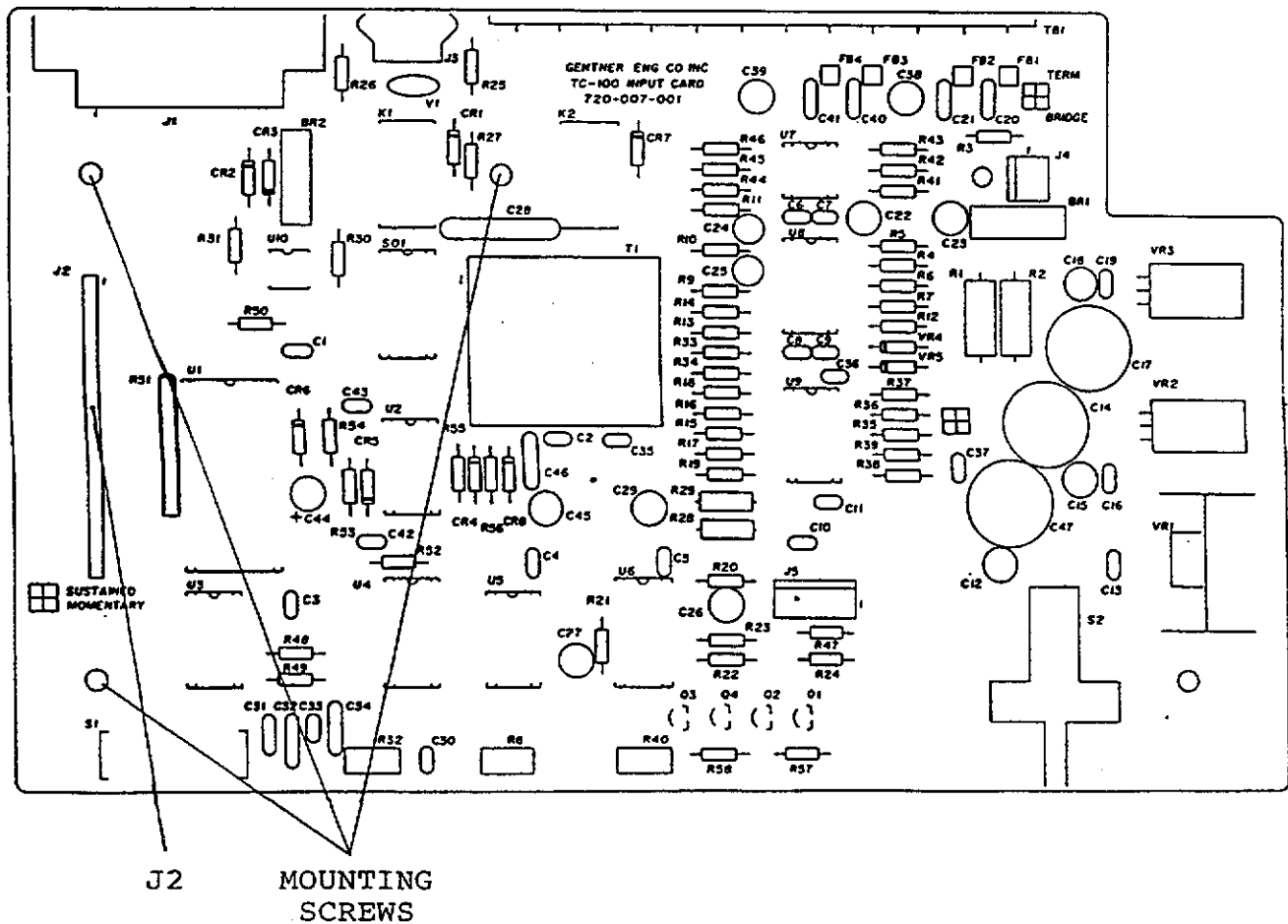
The typical application for this option is remote control. An example of this is given in application G on page 5-4, in which the outputs of the tone decoder drive the remote control inputs of a Gentner Program Switcher. This provides a means of remotely selecting an audio source to be monitored.

The standard TC-100 requires a "line reversal" on the telephone line in order to automatically disconnect from the line. Several telephone systems do not have this capability. The Touch-Tone(r) option provides an alternative means of auto-disconnecting with its "call-progress decoder". This circuitry senses the presence of either dial tone or a busy signal, which then causes the TC-100 to disconnect from the telephone line.

A.2 INSTALLATION

To install the Touch-tone(r) option in your TC-100, follow the procedure listed below.

1. Remove the TC-100 from service.
2. Loosen the four screws on the side of the cover, and remove the cover from the unit.
3. Remove the three mounting screws from the main circuit board as shown below.



4. Install the supplied MF Hex spacers in sockets where screws in step 3 where removed.

5. Carefully press the Touch-tone(r) board onto connector J2. Be sure that the pins are correctly aligned.

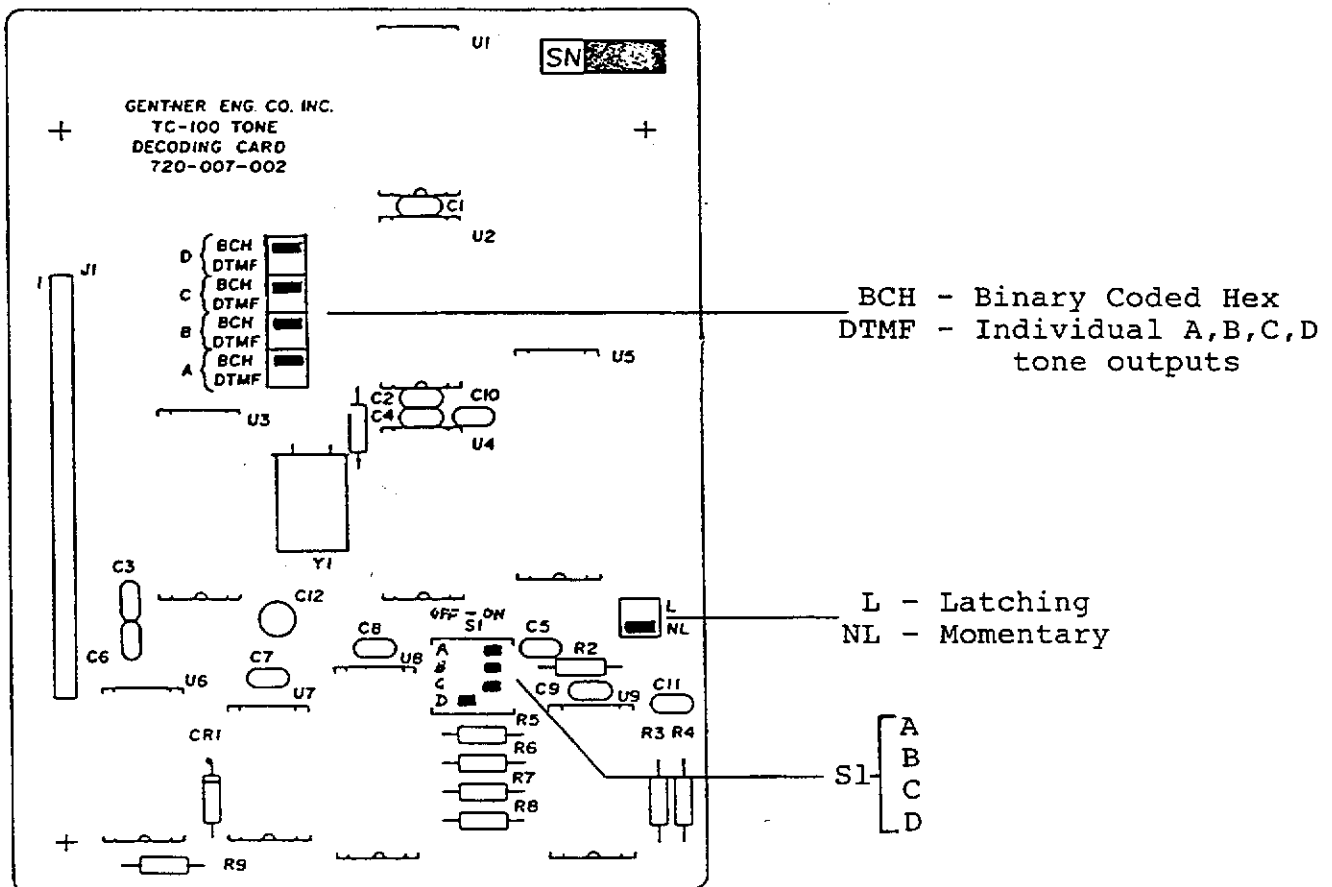
6. Use the screws removed in step 3 above to fasten the Touch-tone(r) board to the hex spacers.

7. Set the options as described in the next section.

8. Replace the cover of the TC-100, and return the unit to service.

A.3 OPTIONS

The TC-100 Touch Tone card has several options which are user selectable with jumpers and a four-part dip-switch. The positions of the jumpers and switch are shown on the diagram below, in their default settings.



JUMPER OPTIONS

LATCHING/NON LATCHING OUTPUTS

The outputs of the tone decoder section can be either momentary (as delivered from the factory) or latching. In the momentary mode, the open collector output for a particular tone will be pulled low for as long as the tone is sent down the phone line. In the latching mode, the output for a tone will remain low after the tone ceases. Sending a different tone will cause the first output to return to high, and the new tone's output will latch low.

To change from the default position of momentary (non-latching) to latching, move the jumper from the "NL" to the "L" position.

A,B,C,D OR BCH TONE FORMAT OUTPUT

When delivered from the factory, the outputs from the A, B, C and D tones are configured in the Binary-Coded-Hex (BCH) format (the other 12 tones having individual outputs). This format would be used when external processing is desired, such as could be accomplished within a computer through a parallel input port.

Alternatively, the A, B, C and D tones can also have individual open-collector outputs. To change from the BCH format to individual outputs, four jumpers on the Touch-Tone card need to be relocated. The position of these jumpers is illustrated on the previous page. The four jumpers are labeled A, B, C and D, and each has 2 positions, DTMF or BCH (BCH being the normal position). Move the four jumpers from the BCH positions to the DTMF positions in order to change to individual outputs for the A, B, C and D tones.

DIP-SWITCH OPTIONS

The standard TC-100 requires a "line-reversal" on the telephone line in order to sense that it must disconnect from the line. If your telephone system does not provide this line reversal, alternative ways of auto-disconnecting the TC-100 from the line are possible with the Touch Tone(r) card's "call progress decoder". This part of the unit will sense dial tone, ring, busy and reorder signals, each of which can be used to trigger a disconnect. The unit is delivered set for dial-tone.

AUTO-DISCONNECT SIGNAL

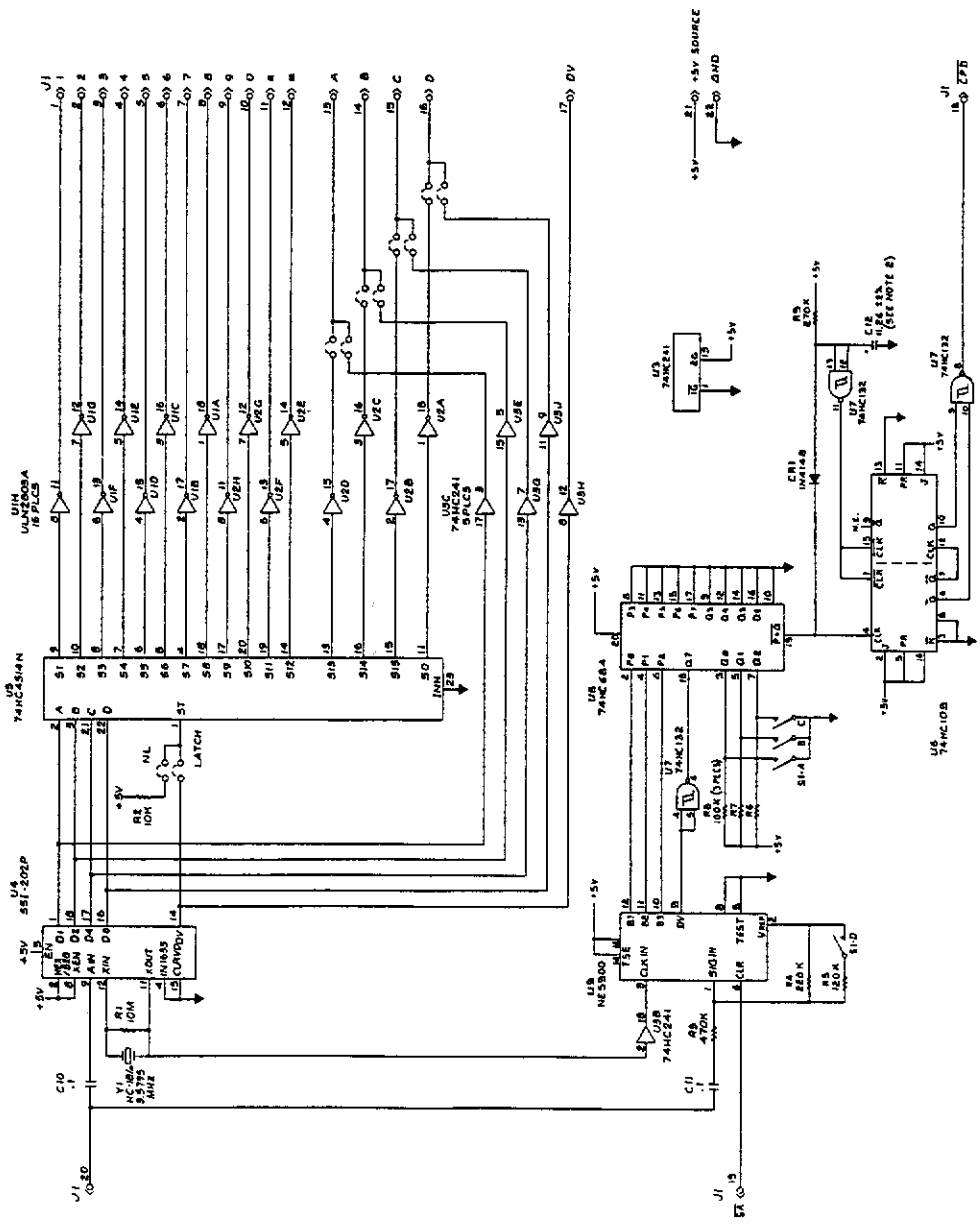
The first three (A, B & C) segments of the dip-switch are collectively used to select which signal the "call progress decoder" will respond to. These are set as listed in the chart below to select the other signals:

<u>Dip Switch</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Recognized Signal</u>
	ON	ON	ON	Dial Tone (default)
	OFF	ON	ON	Ring
	ON	OFF	ON	Busy
	ON	ON	OFF	Reorder

SIGNAL LEVEL

These signals will either come direct from the telephone company central office, or be generated by your own telephone system. The level of the signal from your own system will be considerably higher than the one from the Telephone company; thus a means of setting the sensitivity of the call progress decoder is provided by the D (fourth) segment of the dip switch. The unit is delivered set to the telephone company setting, in the OFF position.

To change the sensitivity setting of the call progress decoder for signals generated within your telephone system, move switch segment D to the ON position.



REF	TYPE	OHM	+5V	BYPASS m.f.
U1	74HC244	10	10	C1
U2	74HC241	10	10	C2
U3	74HC594N	10	10	C3
U4	555-202P	7.0	5	C4
U5	74HC244	10	10	C5
U6	74HC132	7	14	C6
U7	74HC241	10	10	C7
U8	74HC100B	10	10	C8
U9	NE5500	10	14	C9

- NOTES:
- UNLESS OTHERWISE SPECIFIED:
 - FUSED RESISTORS ARE 1/4 WATT.
 - RESISTANCE VALUES ARE IN OHMS, ±5%.
 - CAPACITANCE VALUES ARE IN MICROFARADS.
 - VOLTAGE IS D.C.
 - CAPACITOR C10 TO BE HAND SELECTED BY ENGINEERING.

TC-100 Touch-Tone(r) Option

The TC-100 may hang up the telephone line if too much send audio leaks into the receive audio circuitry of the hybrids.

Your TC-100 is equipped with a Call Progress Decoder in the receive audio circuitry. This Decoder watches for specific signals such as dial tone or busy signal and disconnects the TC-100 from the telephone line when it detects one of these signals.

Typical program audio applied to the send circuitry contains some of the same frequencies as dial tones and busy signals. All telephone hybrids allow some audio to leak from the send circuitry into the receive circuitry. If enough send audio leaks into the receive circuit over a period of time, the Call Progress Decoder can fault on program audio and disconnect the TC-100 from the telephone line.

If your TC-100 disconnects from the telephone line unexpectedly, try each of the following four remedies in the order given.

CAUTION: *Disconnect your TC-100 from power before removing the top cover.*

Remedy 1 Null the TC-100 to minimize the audio leakage from the send circuitry into the receive circuitry as described on page 2-4 of the TC-100 User's Manual. If the TC-100 is not nulled properly, too much send audio will leak over into the Call Progress circuit causing it to fault and hang up.

Remedy 2 Reduce the sensitivity of the Call Progress Decoder. The DTMF card is shipped with the sensitivity on HIGH. You can change the sensitivity as described below. Refer to page A-3 of the TC-100 User's Manual for a diagram of the DTMF card.

- Remove the top cover by loosening the four side screws.
- Locate S1 on the DTMF card.
- Slide switch D of S1 to the ON position.
- Replace the top cover.

Remedy 3 Reduce the send level by turning the send level control on the front panel counter-clockwise. If the send level is too high, send audio will leak over into the Call Progress circuit causing it to fault and hang up.

Remedy 4 Disable Call Progress Decoding as described below. Refer to page A-3 of the TC-100 User's Manual for a diagram of the DTMF card.

- Remove the top cover by loosening the four side screws.
- Locate U7 of the DTMF card. The device number is 74HC132.
- Disable Call Progress Decoding by removing U7.
- Replace the top cover.

If you have any other problems or any questions, please contact:

GENTNER COMMUNICATIONS CORPORATION
Customer Support
1825 Research Way
Salt Lake City, Utah 84119
Telephone: (801) 975-7200
Facsimile: (801) 977-0087

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, Manufacturer agrees, at its option, to:

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

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

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

THIS WARRANTY IS VOID IF:

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

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

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

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

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

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

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

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

Gentner

GENTNER COMMUNICATIONS CORPORATION

1825 West Research Way

Salt Lake City, Utah 84119

Telephone: (801) 975-7200

Facsimile: (801) 977-0087