



TC4400 Call-Control Console
for Telecenter® IV
Operation, Installation, and Programming

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Description

This Console allows the simple and efficient handling of multiple inside and outside calls as well as the performance of the other Telecenter functions normally handled by any administrative or display phone. The following communication resources are included on the **TC4400**:

1. Direct Select (DS) keys

These twenty keys each select a line to answer, place, or transfer a call. Each has a red and a green LED (solid-state lamp) that show the status of the **corresponding line**:

Red LED: This relates to Console action: (a) a one-second flash rate signals a call; (b) a faster, half-second, flash rate signals a call on hold; and (c) a steady glow indicates that the Console is communicating with that line.

Green LED: This relates to non-Console Telecenter activity: (a) **flashing** indicates that the line is being called; and (b) a steady glow indicates that the line is busy (calling or in communication with the Console or another line). Only dialing phones activate the green LEDs.

The DS keys can be dedicated to one of three functions. They will be divided into three groups as follows:

A. Trunk Lines (outside calls): The **first** group (starting at the top left) may have up to ten keys, the recommended system limit for "AAI" ("Attendant Answer Interconnect" lines-outside calls directed to the Console).

B. Telecenter Keys (inside calls): These keys serve two purposes: (1) receiving inside call-ins **from** rooms with speakers and switches or non-dialing phones, plus "Operator" ("0") calls from dialing phones, and (2) making inside calls and performing other Telecenter functions.

C. Monitored Extensions: **These** keys correspond to specific Telecenter lines. Although they will typically be administrative phones, both non-dialing phones and speaker-and-switch lines can be monitored. The LEDs on the key show whether a dialing phone is busy or is calling the Console ("Operator" calls from such a line will come in on its corresponding key, not a Telecenter Key). The key can be used to answer a call from the line, to call the line, or to **transfer** a call to the line.

2. A 20-Character Alpha-numeric Display

The last four positions contain special prompting characters on what to do next:

- is the Console's version of dial tone. This means that you never have to wait for dial tone, but can begin dialing a number (or pressing a DS key) immediately.

BSY means that the number you dialed is busy.

THR means that you should press the **Transfer, Hold, or Release** key next.

R/number] means you must press either **Release** or the DS key with that number. The keys are numbered 1-20, from left to right; for example, **1** is the left-most key in the first row, and **11** is the left-most key in the second row.

k/number] means you must press the DS key with that number. This prompt may occur if you attempt to transfer a trunk to a nonexistent extension. The system then wants you to go back to the original trunk before attempting another transfer.

The **first 16 characters** of the display operate like the display on a standard Administrative Display Phone. **Call-ins** from rooms with switches or non-dialing phones appear here. These call-ins are listed by their dialing numbers in the order of their priority. Up to three call-ins can be listed; as the Console **answers** and clears one call, any additional call-in that is in the queue will come onto the display.

Characters 13-16 (those just to the left of the four prompt positions) show the last number called by the Console (or any other administrative phone that shares the same display driver). A colon separates this number from the list of waiting call-ins.

3. A Standard Dial Pad

Use this for dialing numbers or entering other **Telecenter** functions, just as on a standard tone-dialing phone. Although all other dialing phones in the Telecenter require dial tone before they can begin dialing, the Console has its own direct path to the system and never has to wait.

When dialing to telephone-company lines, however, actual tones must be sent out. These tones are supplied by the system rather than the Console, so the tones will lag behind your pressing of the keys. Even if no tones are heard for a moment, finish dialing: the system will "catch up" as soon as a system dialing unit becomes available.

4. Gray Function Keys

Transfer: This is used to connect two parties together—typically, a call coming in on a “Trunk” key and an inside party on a “Monitored Extension.”

If the Console is programmed for “Direct Transfer,” press *Transfer* and then a “Monitored Extension” key to transfer the caller from the Console to directly ring the extension.

If the Console is programmed for “Pre-Screened Transfer,” press *Transfer* to put the caller on hold while you talk to an inside extension; if the person there agrees to accept the call, press *Release* to complete the transfer.

Hold: This disconnects audio communication but keeps a party on-line until you come back to him or transfer him to a Telecenter extension.

Page: If the system includes Director® switch panels, pressing the Console’s *Page* key will enable you to make an announcement over all of the speakers switched to the “A” (green) channel.

Release: Press this to “hang up” on the Console. If the Console is programmed for “Pre-Screened Transfer,” pressing *Release* after pressing *Transfer* and calling an inside extension will connect the caller with that extension and disconnect both of them from the Console (unless the extension has a speaker but no phone).

5. Audible Signals

Electronic ring signals (warbling tone) at five-second intervals announce an outside call or an inside call from an administrative or hot-line phone. When you are already busy with a call, a new call may ring only once or repeat-

Remember

~~Some older TTC4400's have no hook switch, so hanging up the handset will not end a call.~~

edly, depending upon the programming (see “Console Location Codes” in this manual).

Electronic ring signals at JO-second intervals are reminders of a call on hold.

A *short beep (single-tone)* signals a call-in from call switches or non-dialing phones. A *repeating beep* signals a call from a line programmed for emergency call-ins. This signal is augmented by the letters *EMER* on the display.

6. Hook Switch

This applies to models shipped after December 1989. You can press this to “hang-up” instead of pressing the *Release* key. If the Console is programmed for “Pre-Screened Transfer,” pressing the hook switch after pressing *Transfer* and calling an inside extension will connect the caller with that extension and disconnect both of them from the Console (unless the extension has only a speaker).

During normal operation, the hook switch functions just like the *Release* key.

7. Tone Volume Control

This is found only on models shipped after December 1989. The tone control is located at the right side of the Console’s base. Turn this control knob clockwise to increase the volume of tones heard at the Console unit. The tones can be turned down but not off.

Operation

Answering Calls

A “call” is made by a dialing phone; a “call-in” is made by a non-dialing phone or a call-in switch (see below).

An outside call or an inside “Operator” call is indicated by a flashing red LED on one of the DS keys, and a “warbling” tone.

To answer, press that key and start talking.

→ The red LED will glow steadily and you will be connected to the caller. Since the Console can be directly connected to only one line at a time, there can be only one red LED glowing steadily. The *THR* prompt on the right end of the display indicates that you must press the hook switch or the *Transfer*, *Hold*, or *Release* button to finish processing this call before starting something else.

Note: The green LED acts differently on the three types of DS keys:

On trunk keys, the green LED will not light until you press the key, for it is only then that the Telecenter answers and thereby becomes active on the line.

On Telecenter keys, the green LED never lights, because only the Console controls this operation, and its action is indicated by the red LED.

On monitored-extension keys for lines with dialing phones, the green LED will glow steadily from the start, indicating that the phone is off-hook.

On monitored-extension lines with non-dialing phones or only speakers, the green LED will never light, because that equipment does not control a line but has to be connected by the Console (or an administrative phone).

Answering Call-ins

Call-ins from extensions with only speakers or non-dialing phones appear in the left twelve characters of the Console’s vacuum fluorescent display.

To answer, first press a Telecenter key. Then:

To answer the highest-priority call-in (the left-most one on the display), press *.

To answer a different call-in, dial the number.

Notes: 1. If there are more than four call-ins “stacked up,” you can review the entire list by pressing a Telecenter key and then dialing #-2-2, which will bring the next four numbers onto the display; thereafter, pressing * will bring four additional numbers onto the display until you reach the end of the queue. When you have finished, press *Release* or the hook switch, then proceed to answer a call-in.

2. If an emergency call originates from a locking switch, someone must release the switch to clear the call-in. However, this does not affect your ability to call this room or to answer other call-ins using the dialing method.

3. Unlike single-button dialing on a regular display phone, the asterisk (*) method of answering call-ins on a Console does not tie up a system unit that gives dial tone.

Remote Answer

If the Console is unattended or busy, you can answer an incoming call to it from any administrative phone. Simply dial the special number that is used only for this function (the Architectural Number of the Console’s audio line). Your system may also have assigned a

single-digit number for this purpose.

→ You will be connected to the caller immediately. (See “One-Digit Dialing” in the programming manual [part of ICI-14351 for further information about these numbers.]

Remote Pickup

If an outside caller on one of the first ten DS keys wants to speak with someone who is not at his extension, put the caller on hold and page for the desired party (e.g., “Ms. James, dial Line 4, please”).

The person paged can pick up any administrative phone that has been programmed to pick up calls and dial

#-4-x (“x” is the number of the key where the call is on hold—in this example, the person would dial “#-4-4”).

→ As soon as that person picks up the call, the key’s red LED will turn off (because the call is no longer held by the Console); only the green LED will remain on (to show that the trunk is in use).

Night Answer

This feature works only on systems with special wiring. This section describes how Night Answer works with the standard way of providing this wiring. If different wiring is used, the installer will provide the appropriate operating instructions.

When the Console is to be left unattended for an extended period of time (for example, after normal working hours), the system can be set so that calls to the Console will be signaled via all of the speakers.

To turn the *night-answer* function on and off, select a Telecenter key, then dial #-3-1.

→ The display will show whether the function is on or Off.

Press any dial pad key until the display shows your choice, then press *Release*.

Topfck up a call, pickup any administrative phone and dial #-3-0.

Transferring Calls

The procedure used depends upon whether the Console has been programmed to directly transfer calls or to pre-screen them.

Notes: 1. The pre-screen option is selected by including the B8 Attribute on the Console’s audio line; without this Attribute, the Console will be set with the direct-transfer function.

2. When a trunk line is transferred to a speaker, the trunk line is put on hold by the Console and must be released by the Console after the conversation has been completed.

With Direct Transfer

After talking to the party, press *Transfer*

→ The “---” prompt will appear on the display. This is the visual equivalent of dial tone, which means that the system is waiting for you to specify where you want to transfer the caller.

If there is a *monitored-extension* key for the desired extension, press that key. *Otherwise, dial the number (it*

is not necessary to use a Telecenter key for this type of transfer).

→ The caller’s line will now ring the extension (or be directly connected to a speaker). The green LED will remain on (to show that trunk is still in use), but the red LED will turn off (because the call has been transferred from the Console). If the call is not answered at the extension within the time programmed at Location 64192, it will ring back at the Console.

To pre-screen a transfer, use the *Hold* key to place the caller on hold, then call the extension.

If that party agrees to accept the call, press *Transfer* and then the caller’s DS key.

→ The extension will be connected to the caller, and the red LED will turn off (because the Console is now disconnected from the caller).

If that party refuses the call, press *Release* to end this call, then call another extension or press the caller’s DS key to talk with him again.

With Pre-Screening

Press *Transfer*.

→ The red LED on the caller's DS key will flash at the "hold" rate, indicating that the line is on hold.

Call the desired extension. (If there is no answer or if that party refuses the call, press the caller's DS key, which will disconnect you from the ringing line and reconnect you with the caller; then start over by pressing *Transfer*.)

→ When the extension answers, the display will show the prompt "Rx," which means that, after talking to the extension party, you must press either *Release* or the hook switch (to connect the two parties) or the caller's DS key (to disconnect the extension and reconnect you with the caller).

→

To transfer a call directly, (1) answer it, (2) press *Transfer*, (3) dial the number wanted or press the appropriate DS key, then (4) immediately press *Release* or the hook switch.

→ The caller will ring the desired phone directly.

Remote Hookflash

What it is: If you receive a call from a Centrex™ or PBX system and want to transfer this call back to another line in that system, you need to send a remote hookflash to get dial tone from that system. A remote hookflash goes to the outside system (which has to handle this type of transfer) without affecting the Telecenter system. After you get the other system's dial tone, you can dial the other party.

To send out a remote hookflash, press and release the trunk key of the line with the call from the outside system.

→ You will hear a confirming beep, typically followed by dial tone from the outside system.

You can send an additional remote hookflash to the outside system again if this is needed to complete the transfer.

Note: RI-1584 (*TCIV Programming*—part of KI-1435) tells how to set the duration of the remote hookflash.

Placing Outside Calls

Press a trunk DS key that is not in use (its LEDs are out).

→ The red LED will glow and outside dial tone will sound.

Dial the number.

→ As noted above, the tones will lag behind your dialing.

Once the desired party answers, you can transfer, hold, or release his line just like an incoming call.

Placing Inside Calls

To Call a Monitored Extension: If the line is not busy (the LEDs are off), press the key.

→ The red LED will light. If the extension has a phone that is rung, you will ring it (and the green LED will flash). If it has a speaker that receives calls, you will be connected to it; the green LED will not light, because it shows the activities of a dialing phone. (For full information about calling rooms with speakers, consult KI-1435.)

To Call Any Other Extension: Press a Telecenter key.

→ The red LED will glow steadily, but the green LED will never light (because the Console, not the extension, controls this line). The "... prompt will appear

on the display, indicating that you are to dial the number.

Dial the number.

→ You will not hear any tones, but the numbers will appear on the display as you dial them. When you have finished dialing, you will ring the phone or be connected to the speaker (for fuller information, consult the primary Telecenter IV manual, KI-1435).

Once the party answers, you can hold and transfer the line in the same way as you can outside calls. Remember to press *Release* to end the call, or hang up.

Paging

There are two methods of paging:

With the Page Key

This key is designed to work with Director® switch panels. The page will reach every room that is switched into the "A" (green) channel. It can also be special-wired to make an All-Call.

To page using this key, hold it down to talk and release it to end the page.

Note: For this key to work, your system must have an "A" channel power amplifier.

With Zone Paging

Provided that it has the proper programmed authorization, the Console can access zone paging like an administrative phone.

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To **page**, press a Telecenter key and dial one of the following codes:

Code	Type of Page
#00	All Page (covers all available areas)
#01-#08	A specific group (Zone) of speakers

Wait for a tone, then make the announcement. Press **Release** to end the page.

Note: Time-tone signals will override paging. If you hear them in the receiver while you are paging, pause until they have concluded, then repeat any message that may have been lost.

Planning

Planning is crucial to any communication system, especially if it is interconnected. The following are some of the major issues that must be addressed:

1. Traffic.
 2. Equipment supplied by other manufacturers and its compatibility.
 3. Incoming and outgoing call-handling procedures.
 4. The provision of features that require additional wiring or equipment, such as night answer and paging.
 5. Mechanical considerations, such as wiring connections, the accessibility of the equipment for subsequent maintenance and service, and the operating environment.
- Refer to the **Interconnect Planning Guide (KI-1582 – part of KI-1435)** for help with the general issues.

Equipment

The following equipment is needed to add a Console to the basic Telecenter IV system:

TC4400: This is the Call-Control Console, which comes with a Desk Cord, connectors, and labels for the DS keys. Only one Console may be connected to a system.

TC4410: This expanded-memory CPU is needed to hold the larger program required by the Console. It also contains a second EEPROM, for switching between two different software setups (e.g., calls might be directed to the Console during the day but to a security station at night). The switching could be done with a switch or a logic function. The **TC4410** is in all Telecenter IV central switches manufactured after October 1987.

TC4420: This module interfaces the Console with the main system. It mounts just above the TC4001 CPU, and includes a flat cable for interconnecting the interface with the CPU and **MIO** boards. The module has wire-wrap terminals for the connections to the Console.

TC4430: A **5-volt, 1.2-ampere** regulated power supply. It must be mounted within five feet of the Console.

TC4440: A surface-mount junction box for connecting the Console to (a) three shielded pairs from the central

system and (b) the **5-volt** power supply. It can be mounted on a wall, a desk, or a single-gang outlet box (but not the outlet that is used for AC power).

TC4150: The main system uses **LLMs** (Line-Link Modules) for some central-system functions and multi-link phones. The Console requires somewhat fewer lines than a Key System:

- One LLM line is needed for the Console's audio connection.
- One LLM line is needed for each outside trunk. These lines should be a **contiguous** group of Physical Numbers within the range of 6-255.
- Since the Console uses only one line at a time, it needs only one LLM line for **all** of its system operations. However, each additional Telecenter key must be assigned a Physical Number, so that the system can keep track of calls on hold, etc., and the Console can be given attributes (cf. "Programming," below). These Physical Numbers are **not** associated with any hardware (no LLM positions). The Physical Numbers assigned as the attendant's Telecenter lines must be one contiguous group within the range of 5-255.
- Like any other extensions, Monitored Extensions with dialing phones must each have their own LLM line. They must be wired as a contiguous group of Physical Numbers within the range of 6-255. If non-dialing phones or speakers are included in this group, plan carefully to avoid wasting connection points on the boards.

TC4171: One COA (**Central-Office Adapter**) module is required for each outside trunk line.

Repeater Amplifiers: One repeater amplifier is required for each trunk in Canadian installations, and is strongly recommended for all other installations. Rauland's TC4 181 is recommended for most installations. For Canadian installations, the CSA has approved the R-TEC VFR1050 (List 2), which can be obtained locally.

Installation

Throughout the wiring instructions, refer as necessary to the attached system block diagram, KM0838, and the wiring diagram, KM0812.

At the Equipment Cabinet

This manual assumes that (1) the TC4001 has the expansions needed to provide the required number of multi-link and relay lines; (2) the system, speakers,

phones, and miscellaneous accessories are wired in accordance with the main system manual, **KI-1435**; and (3) the **central-office** trunks are wired in accordance with **KI-1435** to interface ports provided by the phone company.

The following paragraphs describe the installation of the Console and give related information that is not in the main manual. If the system was ordered with the Console, many of these steps will have been done at the factory.

Important: Turn the system power off before doing any wiring or inserting and removing any modules.

Step 1. Make sure that the CPU module is a TC4410 and is equipped with version 100 or later software (the version number is marked on the two ROMs, in **U1** and **U2**). If necessary, install a new CPU module or chips.

Step 2. While the CPU module is accessed, make sure that the "EN-DIS" jumper is in the EN (Enable) position.

Step 3. On the Console Interface Module (**TC4420**), make sure that the "Norm-Test" jumper is in the Norm (Normal) position.

Step 4. Remove the bar holding the central unit's modules in place. Orient the Interface Module so that its terminals and their ID markings will be visible through the rear slot, then slide it into the slot above the CPU.

Step 5. Replace the Telecenter IV's standard two-receptacle flat-cable assembly with the three-receptacle flat-cable assembly supplied with the Interface Module. This will extend the CPU bus to the Interface Module and the MIO. Replace the support bar so that all of the modules are held securely in the **TC400 1**.

Step 6. Locate the **TC4150 (LLM)** line to be used for the Console audio. Remove the line hybrid (**U1**) to prevent ring voltage and DC current from reaching, and possibly damaging, the Console.

Step 7. Connect the **T** and **R** terminals of this line to the right-most **T** and **R** terminals of the Interface Module (see the attached wiring diagram, KM08 12).

Step 8. Connect a twisted pair from an **M (+ 12 VDC)** and a **Z (0 V)** terminal on the MIO "B" connector to the left-most M and Z terminals of the Interface Module.

Step 9. Connect the three shielded **22-AWG** pairs to the Interface Module. The shields are not used at this end and should be taped so that they will not short to anything. The other end of this cable goes to the Console junction box as shown in **KM0812**. These cables may be up to 1,000 feet long.

At the Junction Box

Step 1. Mount the junction box to a wall, desk, or single-gang wall box. It must be close enough to an AC outlet where the power supply can be plugged in and have its cord reach the connection points in the junction box. Do not lengthen the power supply's five-volt cord.

Step 2. Bring the three shielded pairs through a hole in the rear of the box.

Step 3. Insert the power-supply cord and the Console's desk cord through the oblong hole in the bottom of the box. Make a loop with these cords within the box and use the cable ties to secure them in place.

Step 4. Complete the connections in accordance with **KM0812**. The connector system in the junction box is designed to prevent reversed connections, but double-check them and all of the wires connected to the junction-box terminals. Pay special attention to the power supply: reversing or shorting its connections may cause it to fail, especially if these conditions are prolonged.

Step 5. When the wiring checks out, plug in the power supply. Proceed to the following section and check out the Console.

Console Diagnostic Check

These diagnostics are performed with the Console's own internal diagnostic program. Therefore, the Console need not be connected to the Telecenter system for this, and the system need not be turned on.

Step 1. To enter the diagnostic mode, power up the Console while pressing the top left (**#1**) DS key. Release the key after three seconds. At the left-hand side of the display, a three-character code will appear. The two digits following the "**V**" in the display correspond with the version of software currently installed in the **TC4400**.

Note: If your TC4400 software is earlier than version 10.0, and so does not show the software version on the display, skip to Step 2.

If the Console has a hookswitch and version 10 or later software, but does not show the software version in the display at power-up, you may have released the DS key too soon. Turn the Console off, then try again.

Step 2. Press each DS key.

→ Both **LEDs** should light and a corresponding capital letter (A-T) should appear on the display.

Note: If you don't get the above responses, you may have released the DS key too soon during the powering-up. Turn the Console off and try again.

Step 3. Press each function key (**Transfer, Hold, Page, and Release**).

→ Pressing any one of these will turn off the DS keys' **LEDs** and clear the display. When the **Page** key is pressed, a semicolon ("**;**") appears on the display; this is replaced by a c when the key is released. As each of the other three function keys is pressed, a corresponding lower-case letter (a, **b**, or **d**) should appear on the display.

Step 4. Press each dial-pad key.

→ Its corresponding number or character should appear on the display.

Step 5. This diagnostic test may only be performed on TC4400 Consoles with software version numbers 10 or above:

Connect a test lead so that it grounds the Console's serial output ("**CS**"—refer to schematic KC1541 or diagram KM0812). Every three to four seconds, an exclamation mark ("**!**") will appear on the display, to indicate that the collision-detection function is working correctly. Remove the lead from across the serial communications port when this test is concluded.

Step 6. When you have finished, exit the diagnostic function by doing the following:

In Consoles without a book switch, remove power from the Console. For operation, power it up without depressing any DS keys.

In Console with a book switch, hang up the handset. The Console will immediately be in the operational mode.

Console Labels

Step 1. Note that the sheet provided consists of four rows marked with two types of positions: vertical hash marks (for trunk and Monitored-Extension keys) and thicker horizontal lines (for "Telecenter" keys). Choose

two sections from these rows to match the functions of the DS keys.

Step 2. Neatly print the appropriate line number on each of the selected label positions (press-type or type-written letters will give good results).

Hint: Do the lettering before cutting out the sections. To type the label, tape it to a piece of paper before rolling it into the typewriter.

Step 3. Carefully cut out the sections used and slide them into the slots at either end of the Console windows (the clear plastic overlays above the DS keys).

Hint: The strips should be long enough to protrude slightly from the slots in the Console windows; otherwise, it may be difficult to remove the labels for future changes.

Step 4. Leave the unused portions of the label with the customer for future changes.

Programming

To do the EEPROM (user) programming, you must be able to use the functions for Attribute programming (“#99”) and Location-Code programming (“#98”); these are described in the main system manual, KI-1435.

The factory will do some of this programming when the Interface Module is installed there. If you modify the initial programming, you may be able to use the Console display; however, since the rest of the Console will not be operational until at least some of the programming is done, you may need to enter the initial programming at an administrative phone connected to Physical Number 5 (turning on or resetting the system initializes this line as a display phone).

In order to do the programming, you need to know:

- ✓ How many keys will be used for trunks (central-office lines) and the Physical Number of the first (lowest-numbered) one.
- ✓ How many keys will be used for the attendant’s Telecenter lines, and the Physical Number of the first one.
- ✓ How many extensions will be monitored, and the Physical Number of the first one.
- ✓ The Physical Number of the line used for audio to the Console. Use the blank Console planning work sheet at the back of this manual to organize and record the pertinent data.

Console Location Codes

64000: Incoming AAI calls normally go to the key phone or single-line phone whose Physical Number is stored here. Putting a 0 here tells the system that a TC4400 is being used.

64004: Listing the Physical Numbers of individual administrative phones enables them to pick up calls from the Console (“#4x”); entering a “0” gives all dialing phones this ability.

64016: Enter the Physical Number of the first attendant Telecenter line. When someone dials “0,” the call will be directed to this key.

64034: Enter the lowest Physical Number of the trunk lines. Calls from anyone who dials “9” will be routed there. See the main system manual, KI-1435, for details.

64192: This sets the time (in 1/60-second increments) before a call transferred by the attendant is returned to the Console because of no answer.

64222: Attendant Recall: This Location is for key systems; it should be set to “0” for Console operation.

64224: This must be set to the Physical Number of the Console’s audio line. The audio line of the TC4400 is switched from link to link by the control program to provide the attendant with the requested audio connections. This Location can also be used to allow unanswered

calls to ring repeatedly. In the normal mode, a call rings only once when the attendant is busy with another call; many users do not want to be disturbed by ringing while they are handling a call. However, other users prefer repeated ringing, to prompt someone nearby to answer the call from an administrative phone (see “Remote Answer” in the “Operation” section of this manual).

To set the Console for repeated ringing, add “32768” to the Physical Number of the Console’s audio line. For example, if that is Physical Number 9, you would enter 32777 to Location Code 64224.

DS-Key Location Codes

Note: The following Locations, 64226-64232, control the mapping of the Telecenter IV Physical Numbers onto the 20 Console DS keys. Each group must begin with a Physical Number that is less than 256, and the numbers within each group must be contiguous. If there are no lines for a particular group, enter a “0” at its Location.

64226: This establishes a mapping of trunks onto the Console keys and must contain a number based upon the following equation:

$$[The\ Lowest\ Physical\ Number\ of\ the\ AAI-Trunk\ group] + [256(The\ number\ of\ trunk\ keys - 1)]$$

For an example, see Note 2, on the next page.

The trunk with the highest Physical Number will be placed on the first key (and the trunk with the lowest Physical Number on the last key). This reversal is done to reduce the chances of a “crash” between an incoming and an outgoing call (see Note 1, below).

Example of Reverse Hunt Groups

Trunk	Phys. No.	Key	Comments
267-1300	15	1	Begin C.O. Hunt
267-1301		14 2	
267-1302	13	3	
267-1303	12	4	
267-1304	11	5	
267-1305	10	6	Begin Dial-9 Hunt

Notes: 1. Incoming calls start at 267-1300 (directory listing) and hunt downward, whereas outgoing calls start at the opposite end of the group and hunt upward. In this way, there will be no contention between incoming and outgoing until all of the trunks are busy. Incoming calls progress from the left DS key (7) to the right. To achieve this ordering, two reversals are used: Trunks to Physical

Numbers (wiring per the TC4 manual) and Physical Numbers to the keys (built into the software).

2. The equation for this example is:
 Location 64226 = [10] + (256 x (6 - 1))
 = 10 + [256 x (5)]
 = 10 + 1280
 = 1290

3. It is recommended that every **AAI** trunk in your TC4 be represented by a key on the Console. However, if there are some trunks whose Physical Numbers are not assigned to keys, calls from them will be sent to the Telecenter keys.

64228: Specify some attendant Telecenter lines. Use Physical Numbers that do not have equipment associated with them, since the Console's attendant Telecenter lines do not use hardware. Use the following equation for computing the number to store at 64228:

[Lowest Physical Number] + [256 x (number of attendant Telecenter lines - 1)]

Example: For two Telecenter keys at Physical Numbers 201 and 202:

[201] + [256 x (2 - 1)]
 = 201 + 256
 = 457

64230: Enter the block of extensions that are to be assigned to the "Monitored Extension" DS keys. The operator can then monitor these extensions, or call them by pressing just one key. Use the equation given in the preceding section.

64232: This can be used for an optional second block of Telecenter **IV** extensions or speakers for which you want to assign "Monitored Extension" keys.

Here are the factory settings for the above Attributes:

Typical Factory Settings for the Console and COAs

Location	Setting
64000	0
64004	0
64016	201
64034	(The lowest Phys. No. of the trunk lines)
64192	1200 (20-second wait to recall)
64222	0
64224	(The Phys. No. of the console audio line—the one wired to the interface module)
64226	(As required to map all of the COA modules)
64228	457 (Physical Numbers 201 and 202)
64230	(A block of administrative phones)
64232	0

Setting Attributes

All Telecenter **IV** phones and speakers have Physical Numbers (Nodes) that identify the hardware addresses of

associated circuits. For each Physical Number, a set of "Attributes" can be stored and referred to as "N: A: B: Z:" ("Architectural [Dialing] Number," "A Attributes," "B Attributes," and "Zones"). These control the way the system handles those lines. The main system manual (**KI-1435**) covers the general description and uses of Attributes and tells how to set them with the **#98** and **#99** functions. The following additional information pertains to the TC4400 Console:

Audio Line (Typical Settings):

N: 777

A: 1 4

B: 12 7 (1 & 2 = interconnect access; 7 = Show call-ins from Display Driver 1 and last number dialed)

Z: (Speaker Zones)

Notes: 1. The Architectural Number (in this example, 777) is used to answer incoming calls to the Console from another phone (See "Remote Answer" in the operation section of this manual).

2. The Attribute **B:6** may be set to enable "barge in," which lets the operator reenter ongoing calls at will.

3. The **B:7** Attribute selects the system's first display driver. Since the Console cannot use the second driver, **not** selecting this Attribute would mean: (a) the Console would not receive call-ins from switches or non-dialing phones; and (b) the first 16 characters on its display would remain blank (i.e., neither call-ins nor the last number dialed would appear) except during special functions.

4. The **B:8** attribute will select the Pre-screening mode of transferring calls.

5. The **A:14** is a line type used for either the audio line or an attendant Telecenter line.

Trunk Line (Typical Settings):

N: 999

A: 3 (MI line type)

B: 12 (an inside caller's phone must be programmed to call out via a trunk with these settings)

Z: (Speaker Zones)

Notes: 1. The number "999" cannot be dialed, because dialing the first "9" will immediately give an outside line. It is not normally desirable to dial individual trunks; instead, single-digit dialing is normally used.

2. Add the **A:8** Attribute to send dialed requests for this trunk, when it is busy, to the trunk with the next higher Physical Number. **B** Attributes can be used to enable certain restrictions on making outside calls (see **KI-1435**).

Attendant Telecenter Line (Typical Settings):

N: (Architectural, or Dialing, Number)

A: 1 4 (Attendant Telecenter-line type)

B: (see **RI-1435** for Administrative Attributes)

Z: (Speaker Zones)

Note: Set A:8 (hunt bit) to route calls to the next key when this one is busy.

Monitored Extension Line (Typical Settings):

N: (The extension's dialing number)

A: 1 (Administrative-line type-or an appropriate setting for single-link phone or speaker)

B: (see **RI-1435** for Administrative Attributes)

Z: (Speaker Zones)

Troubleshooting

Note: Internal DIP switches 1 and 2 must be set correctly for operation with Version 10.0 and later Console software. Incorrectly setting these DIP switches will result in the following sequence of events when you run the diagnostics and then attempt to resume normal operations:

1. The Console diagnostic will still work correctly and indicate that “all is well.”
2. Resetting the Telecenter system will generate a beep tone at the Console.
3. After you have reset the TCIV, the message “Telecenter IV” will not appear on the Console display.
4. All Console keystrokes are ignored by the Telecenter system.

The correct switch settings of the DIP switches are:

<i>SW1</i>	<i>SW2</i>	<i>SW3</i>	<i>SW4</i>
Closed	Closed	Not Used	Open

Step 1. Perform the Console diagnostic described in the installation section of this manual. If it doesn’t work, there is some defective hardware that must be fixed before you can proceed any further.

Step 2. Check the Location-Code entries for the attendant’s Telecenter lines, trunks, and monitored extension. Double-check the computation of the numbers generated with the equations in the form of [PHYS + (256 × added lines)]. Make sure that all of the Physical Numbers used in these computation fall within the range of 4-255; higher beginning Physical Numbers won’t work.

Step 3. Make sure that Location Codes 64000 and 64222 are set to “0.”

Step 4. To rule out problems with field wiring, bring the Console and its power supply to the TC4001 and plug them in for local operation as described in the attached Console wiring diagram (KM0812). Note that 12-VDC power and the phone-line *T* and *R* connections are brought to the Interface Module by two discrete wire pairs, as shown on the diagram.

Step 5. If *SW4* is set incorrectly, the Console will receive information from the Telecenter system but will not be able to send any information back to it. The buttons on the Console will not work, but the diagnostic test will run properly. Reset the system. If the Console also resets (you will hear it beep, and “Telecenter IV” will appear in the Console display), the position of *SW4* may be incorrect. To correct this, make sure that the Console DIP switch 4 is set to the “Open” position.

Step 6. To verify that there is two-way serial communication between the Console and the TCIV, press any Console DS key repeatedly. You should hear beeps from the Console indicating that:

- The TCIV received a repeated keystroke message.
- A response message was sent from the TCN to the Console.
- The Console correctly interpreted, and responded to the, message from the TCIV by producing a beep.

If this test works, then look for an error in the programming or setup in the TCIV. If it fails, then either the Console or its Interface Module may be defective. Test the Console Interface Module (TC4420) using the procedure given in the TCIV troubleshooting manual, KI-1586 (part of KI-1435).

TC4400 Software Revision History

Version 6 (Checksum: CB8Bh; First Release)

Version 8 (Checksum: D255h; Released 2/7/89)

Enhancements

All keys were given leading-edge response. All actions occur as soon as the key is depressed: they do not wait until the key is released.

Switch 1	switch 2	Console ID
0	0	0
1	0	1
0	1	2
1	1	3

Version 10 Changes (Checksum 5298h; Release date 1/22/90)

Enhancements

1. Console Identification Codes: The Console sends and receives ID codes based upon internal DIP switches 1 and 2.

For operation with the Telecenter IV system, these switches must both be set to "0."

2. Hook Switch: The hook switch will send the same codes to the system as the "Release" key.

3. Collision Detection: Collision detection is enabled for the serial port.

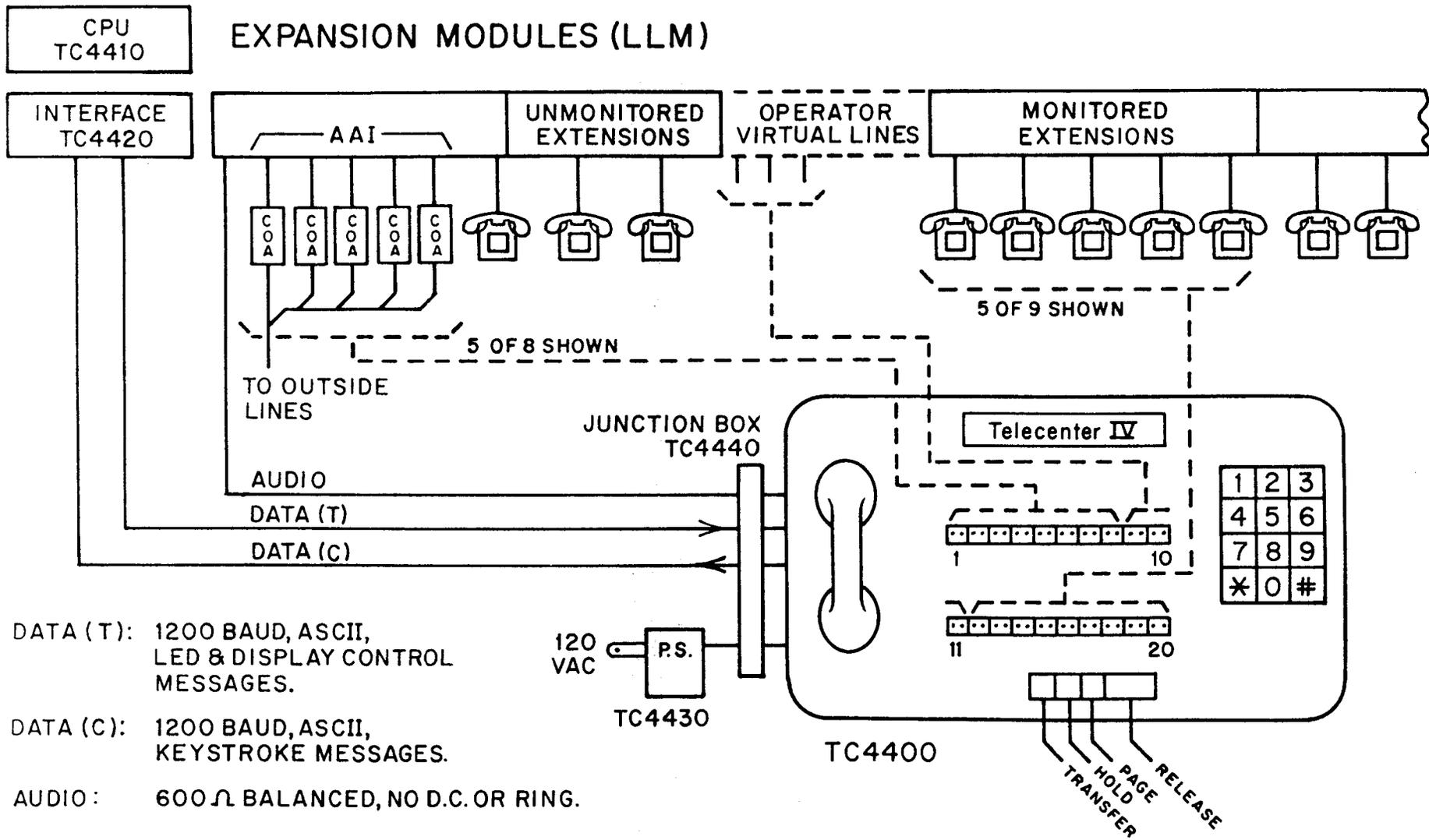
Diagnostics

1. Version Number: When the diagnostics are first entered, the software version number appears at the left side of the display. The displayed format is "Vxx," where "xx" is a two-digit version number.

2. Cursor Home: When the Console is reset by the system, the display cursor is set to the left-most position.

3. Collision Detection: The diagnostics program continually checks the serial-data port for collisions. The Console sends an ASCII null character to the serial port once every four seconds. If a collision is detected, an exclamation mark ("!") appears at the cursor in the display. This character is sent to the display each time that a collision is detected. This condition may be simulated by shorting the serial-link transmit leads to -0V.

4. Diagnostic Exit: You can now exit from the diagnostic routine without powering down the Console. Simply flash the hook switch, and the Console will reset and immediately resume normal operation.



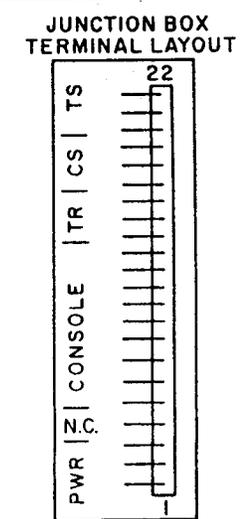
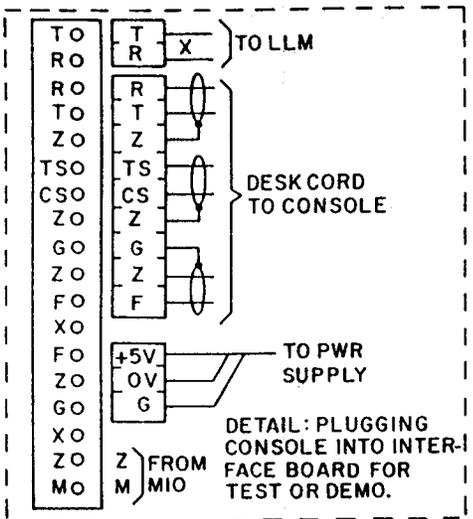
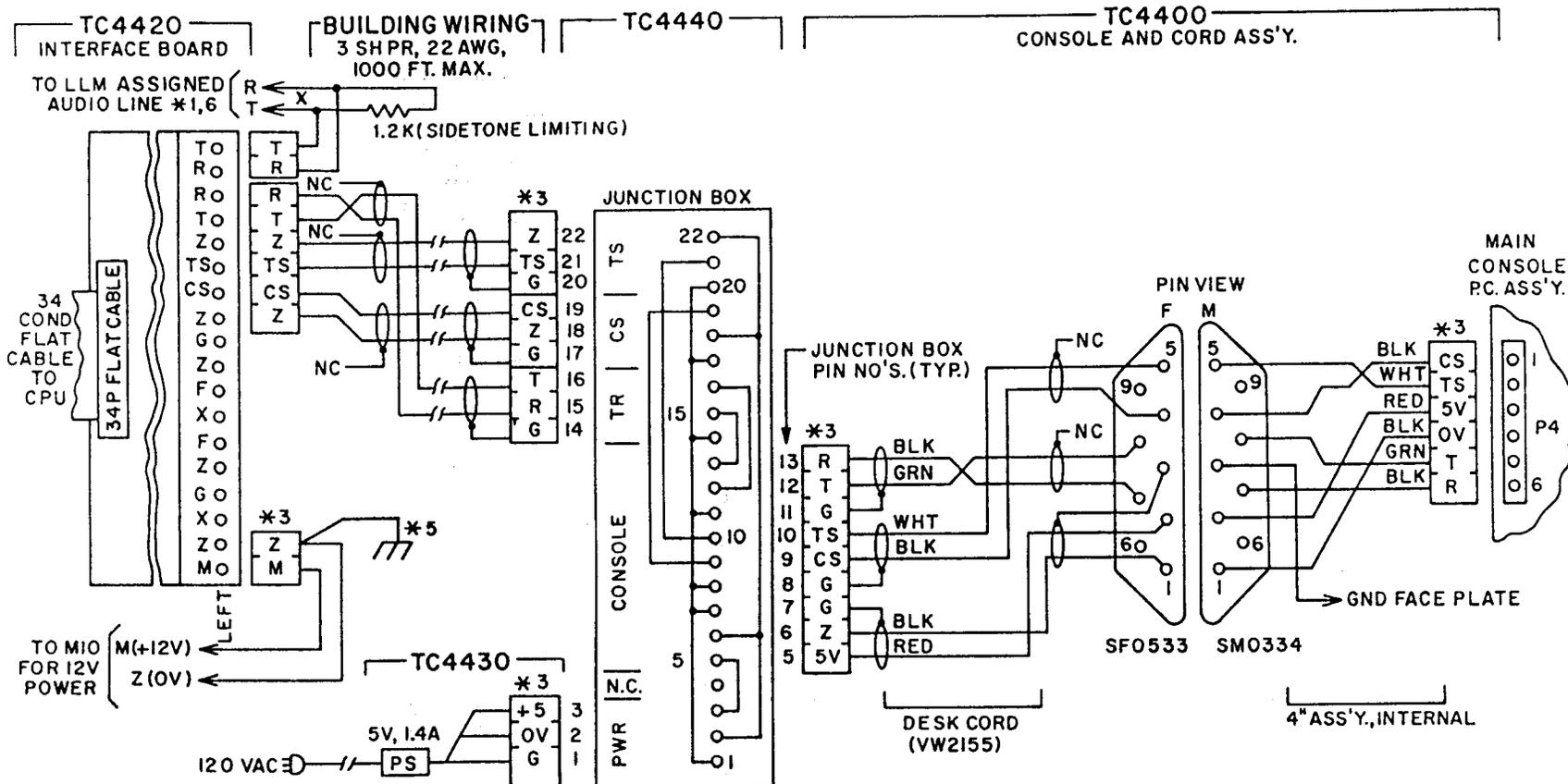
DATA (T): 1200 BAUD, ASCII, LED & DISPLAY CONTROL MESSAGES.

DATA (C): 1200 BAUD, ASCII, KEYSTROKE MESSAGES.

AUDIO: 600 Ω BALANCED, NO D.C. OR RING.

NOTE: DOTTED LINES SHOW LOGICAL CONNECTIONS, NOT WIRING. THE QUANTITY OF OUTSIDE, OPERATOR, AND MONITORED EXT. LINES MAY INDIVIDUALLY VARY. LIMIT = 20 TOTAL.

TCIV CONSOLE
KM0838



- NOTES:
1. CONNECT AUDIO PAIR TO ASSIGNED LLM (TC4150) LINE. REMOVE LINE HYBRID (UI) FROM THAT LLM CIRCUIT.
 2. 64K CPU REQUIRED, TC4410.
 3. ALL CONNECTORS SHOWN ARE .045 SQ. X .156 SPACING, EXCEPT AS NOTED. DO NOT EXTEND LENGTH OF PS. CORD.
 4. CONSOLE MAY BE PLACED IN STAND ALONE DIAGNOSTIC MODE BY POWERING UP WHILE TEMPORARILY HOLDING UPPER LEFT DIRECT SELECT P. B. IN. PRESSING P.B.'S WILL THEN AFFECT LED'S AND ALPHA DISPLAY. GRAY P.B.'S ARE USED TO TURN ALL LED'S OFF.
 5. GROUND LUG ON TC4001 CHASSIS DIRECTLY BENEATH TC4420 CONNECTOR.
 6. INSTALL RESISTOR ACROSS T & R OF THE LLM.

TC4
CONSOLE
KM0812

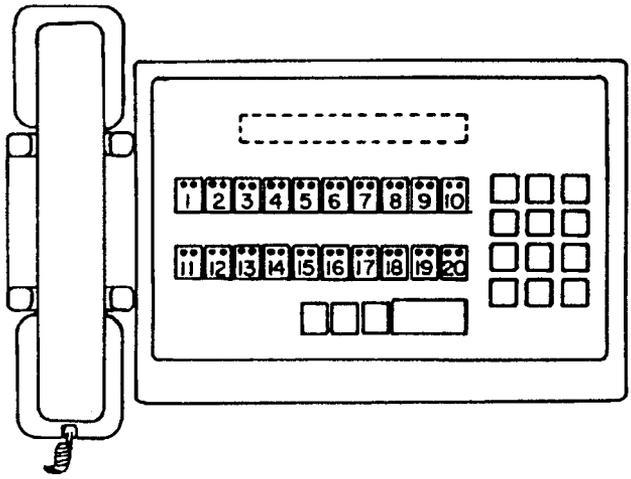
Console-Key Lines

Key	Type	Outside No.	h	Arch. #:	Digit	h	Phys. #	A:	B:
1 2									
3 4									
5 6									
7 8									
9 10									
11 12									
13 14									
15 16									
17 18									
19 20									

- Type** = 1 (trunk), 2 (TC line), 3 (monitored ext.)
- h** = hunt direction
- Digit** = Dialing number to access that line.
- Arch. #:** = The "inside," or "Architectural," number
- Phys. #:** = The "Physical Number"
- A:** = The "A" Attributes
- B:** = The "B" Attributes

Location Codes (Partial)

Location:	Setting:	Function:
64000	0	Console present
64222	0	Recall to console
64224		Console Audio line
64226		Trunk Keys
64228		Tclocator Keys
64230		Monitored Extensions
64232		Add'l. Monitored Extens.



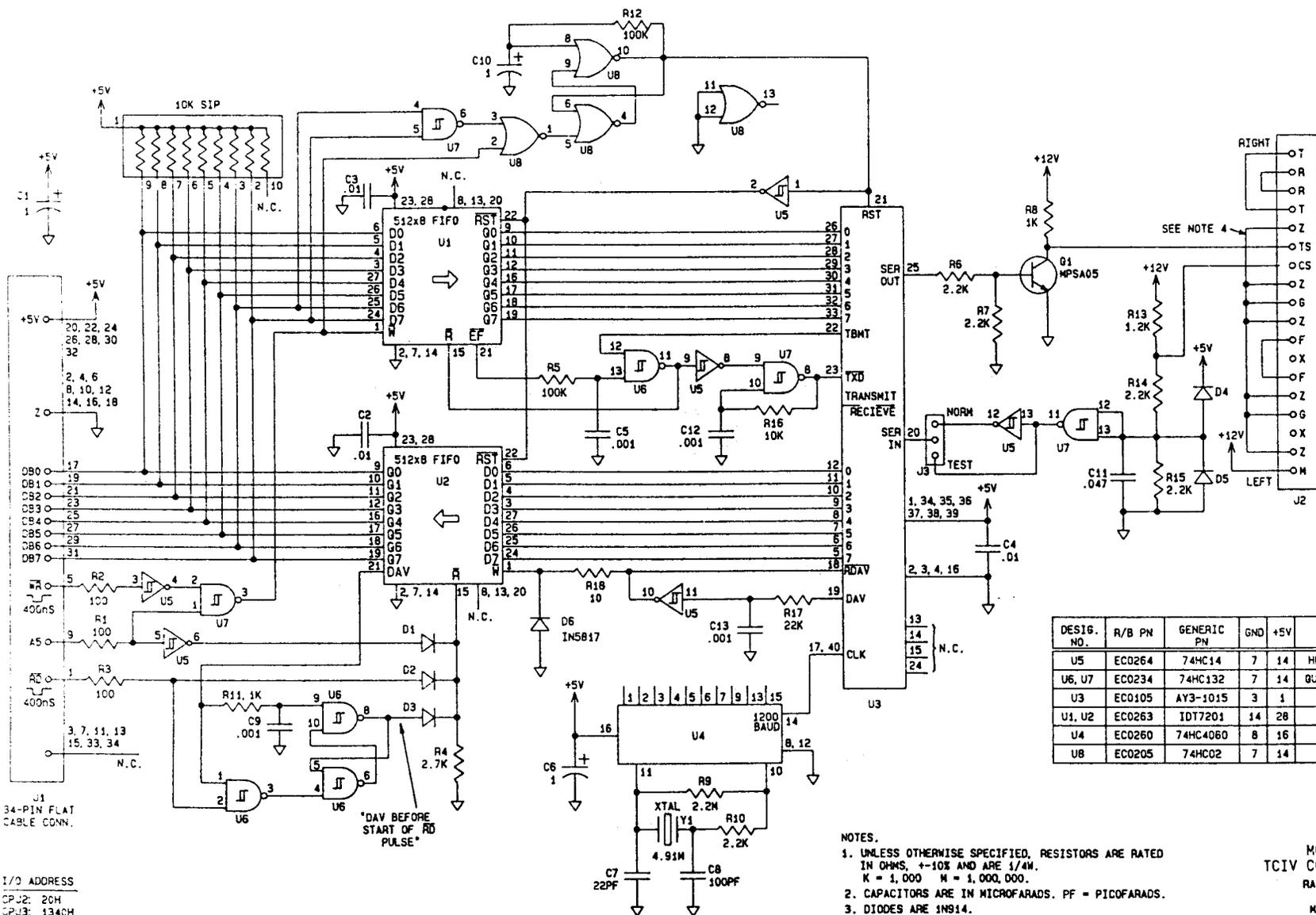
Note: Do not use this worksheet for non-console interconnect planning.

CONSOLE WORKSHEET

TC4400

IL0263A

DWG NO.	KC1551	F
ISSUE	CHANGE	
A	ADDED R17 & R18 SAM 2-18-88	
B	ADDED NC1E 4, C7 WAS 30PF, C8 WAS 82PF. I.M. 3-3-88	
C	MOVED C4 AND D5 FROM CS LINE, D4 WAS TO +12V. AAS 3-10-88	
D	B1 WAS NP56E15. PCR3990. DP-25-88 JP	
E	ADDED D6 & C13 C.M. 5-12-88	
F	ADDED I/O ADDRESS. J.M. 8-21-90	



DESIG. NO.	R/B PN	GENERIC PN	GND	+5V	FUNCTION
U5	EC0264	74HC14	7	14	HEX SCHMIDT INV
U6, U7	EC0234	74HC132	7	14	QUAD SCHMIDT NAND
U3	EC0105	AY3-1015	3	1	UART
U1, U2	EC0263	IDT7201	14	28	FIFO
U4	EC0260	74HC4060	8	16	BIN COUNTER
U8	EC0205	74HC02	7	14	QUAD NOR

- NOTES.
- UNLESS OTHERWISE SPECIFIED, RESISTORS ARE RATED IN OHMS, +-10% AND ARE 1/4W. K = 1,000 M = 1,000,000.
 - CAPACITORS ARE IN MICROFARADS. PF = PICOFARADS.
 - DIODES ARE 1N914.
 - Z AND G TERMINALS ISOLATED FROM INTERNAL DIGITAL GROUND.

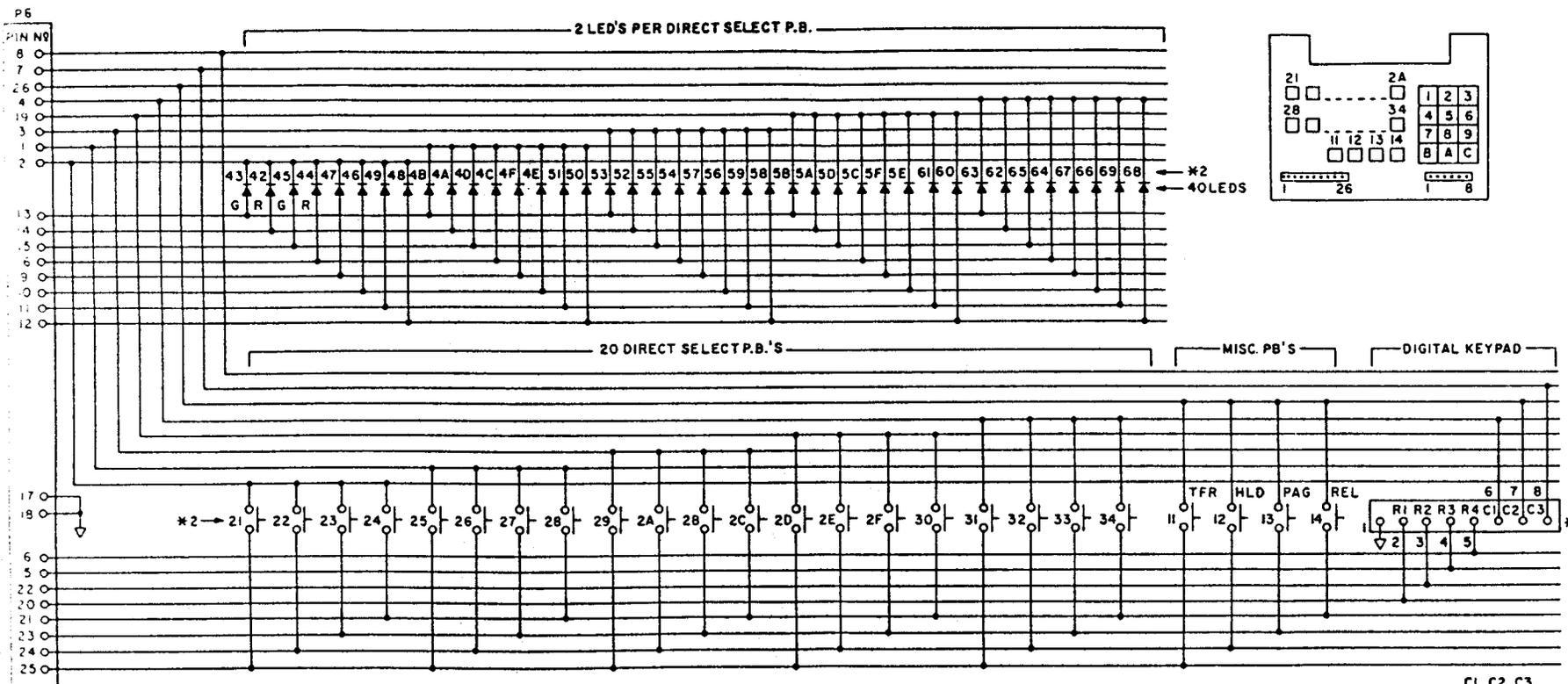
MODEL TC4420
TCIV CONSOLE INTERFACE
RAULAND-BORG CORP.
CHICAGO, IL.
MADE IN U.S.A.
KC1551 - F

I/O ADDRESS
CPU2: 20H
CPU3: 134CH

J1
34-PIN FLAT
CABLE CONN.

*DAV BEFORE
START OF RD
PULSE*

DRG. NO.	KC1552 B
DATE	6-9-87
ISS	CHANGE
A	NOTE 3 REFERRED TO COMM. P.3. 2 LEDS PER DIRECT... WAS 20 PRS. OF LINE LEDS. P.6 B MISC P.B.'S WERE UNIDENTIFIED. 6-4-87
B	REVERSED LED DESIGNATIONS BY PAIRS. 10-21-87



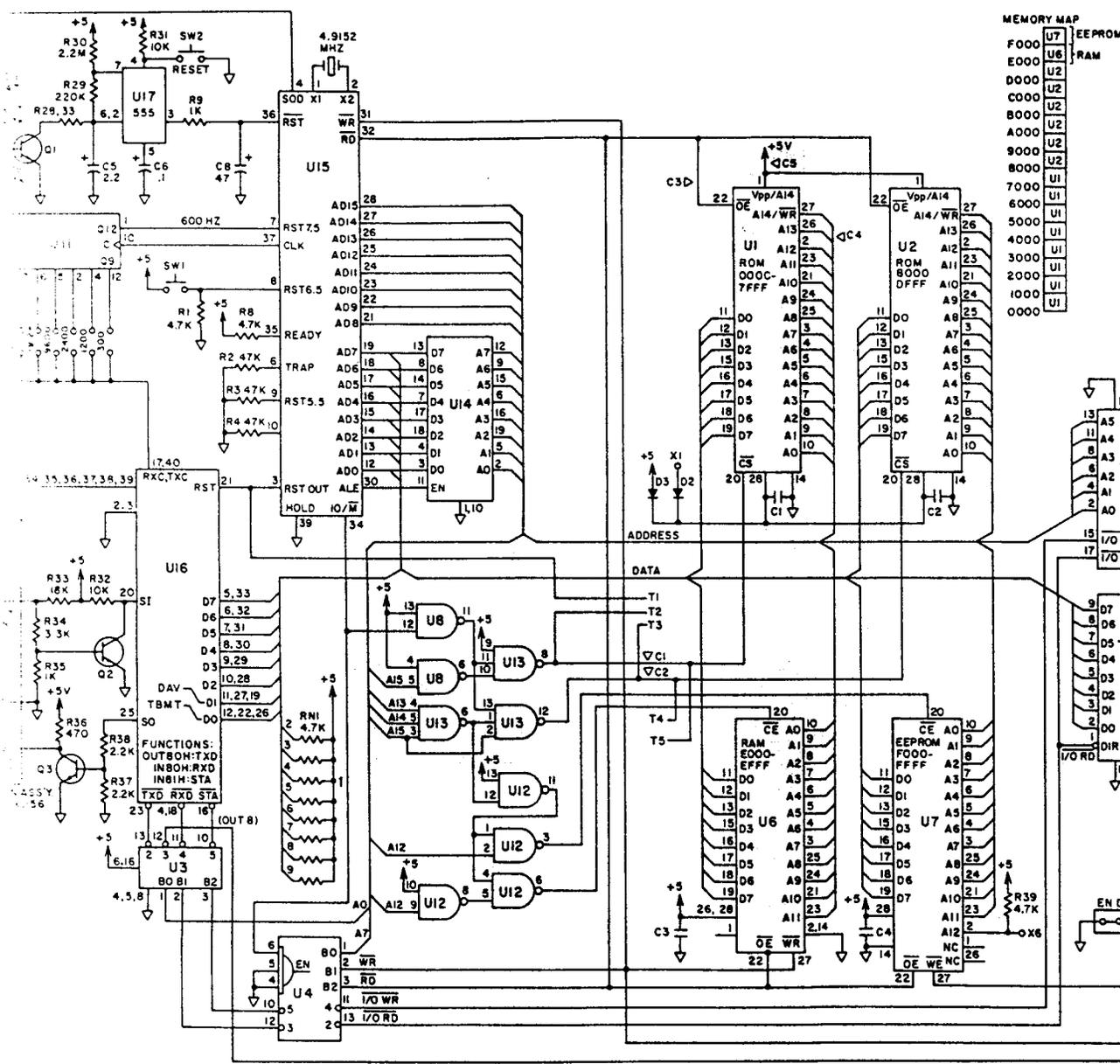
- NOTES:
1. DEPRESSING THE KEYPAD KEY SHORTS THE CORRESPONDING ROW TO THE COLUMN.
 2. NUMBERS SHOWN ARE KEY VALUES USED IN COMMUNICATION CHANNEL BETWEEN CONSOLE AND TCIX. THE RED LED FOR P.B. "M" IS NUMBERED 2M AND THE GREEN IS 2M+1.
 3. K, L, M REFER TO CPU I/O PORTS 4, 3, 1 RESPECTIVELY, AND DIGITS REPRESENT BIT NUMBERS. PIN NUMBERS CORRESPOND TO NUMBERS ON MAIN BOARD CONNECTOR P5.

	C1	C2	C3
R1	1	2	3
R2	4	5	6
R3	7	8	9
R4	*	0	*

KEYPAD ROWS/COLUMNS (#1)

MODEL TC4400
 CONSOLE KEYBOARD
 RAULAND-BORG CORP.
 CHICAGO, ILL.
 MADE IN U.S.A.
 KC1552 [B]

DRG NO.	KC1554 D
DATE	5-13-87
REV.	CHANGE
A	C6 WAS C13. C5 WAS C12. I.F. C3 WAS C6. C4 WAS D3. D3 WAS D2. U1 PINS 11-19 WAS CONNECTED TO ADDRESS BUS. 7-1-87
B	ADDED V14-5A85. 12-1-87
C	DELETED CHECKSUM TABLE. ADDED NOTE 6. ADDED TCS4510 TO TITLE. 12-10-87
D	CPU WAS CPU2. ADDED X6 & 5VDC TO LAYOUT. 9-9-88



MEMORY MAP

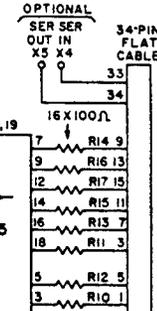
U7	EEPROM	FO00	E000	U2	RAM
U2		D000	C000	U2	
U2		B000	A000	U2	
U2		9000	8000	U1	
U1		7000	6000	U1	
U1		5000	4000	U1	
U1		3000	2000	U1	
U1		1000	0000	U1	

AUX CONNECTIONS

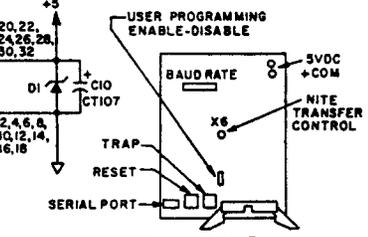
PIN	FUNC	PIN	FUNC
1	WR	16	N.C.
2	A12	17	+5
3	A7	18	A8
4	A6	19	A9
5	A5	20	A11
6	A4	21	RD
7	A3	22	A10
8	A2	23	IO/M
9	A1	24	A13
10	A0	25	A14
11	Z	26	A15
12	D6	27	D7
13	D5	28	D0
14	D4	29	D1
15	D3	30	D2

COMPONENT IDENTIFICATION

COMP.	TYPE	EC-	PIN NO'S
U1,2	27256	—	14
U3,4	74HC138	0179	8 16
U5	74HC244	0192	10 20
U6	2064	0262	14 28
U7	2864	—	14 28
U8,12	74HC00	0170	7 14
U9	4528	0206	8 16
U10	74HC4040	0203	10 20
U11	74HC4040	0193	8 16
U13	74HC10	0221	7 14
U14	74HC373	0181	10 20
U15	8085	0115	20 40
U16	AY3-10150	0105	3 1
U17	555	0004	1 8
Q1,2,3	ETMPS6513		
D1	JR0090-12		
D2,D3	IN4002		



- NOTES:
- UNLESS OTHERWISE SPECIFIED, RESISTORS ARE RATED IN OHMS ±5%. RESISTORS ARE 1/4 WATT.
 - CAPACITANCE IS RATED IN MICRO-FARADS. ALL CAPACITORS ARE CPRI-103 (0.01) UNLESS OTHERWISE SPECIFIED.
 - MEMORY ACCESS TIME = 300 ns.
 - ∇ DENOTES CONNECTION TO CIRCUIT COMMON.
 - SEE KC1459 FOR PREDECESSOR CPU, VC7164.
 - TC4410 IS USED ON TELECENTER II. TCS4510 IS USED ON TELECENTER TCS.



CPU
MODEL TC4410/TCS4510
CENTRAL PROCESSING UNIT
RAULAND-BORG CORP.
MADE IN U.S.A.
KC1554 D