



Telecenter® IV Installation

RAULAND-BORG CORPORATION • 3450 West Oakton Street, Skokie, Illinois 60076-2951 • (708) 679-0900

Table of Contents	Page
Introduction	1
FCC Requirements	2
Initial System Installation and Checkout	3
Configure Line-Link Modules	6
Configure Speaker (and Single Link Staff Phone) Control Boards..	7
Install Field Wiring (Set External EEPROM Switch)	8
Checkout Internal Communication System	12
Install Interconnect Wiring	13
Checkout Interconnect System	16
Physical Number Layout Planning Worksheet (blank form)	17

Introduction

This manual provides instructions for installing and testing a Telecenter IV. Except for the procedure covering initial system installation and checkout, procedures for installing and checking-out the internal and interconnected communications systems are kept separate. Use only the procedures applicable to the site requirements.

Unless otherwise stated, the procedures assume the central chassis has been wired at the factory, DIP switches have been preset, and the installer has a completed copy of the **System Planning Worksheet**.

Special Note:

If interconnecting a Telecenter IV to the public utility, read the **FCC Requirements** before beginning installation.

FCC Requirements

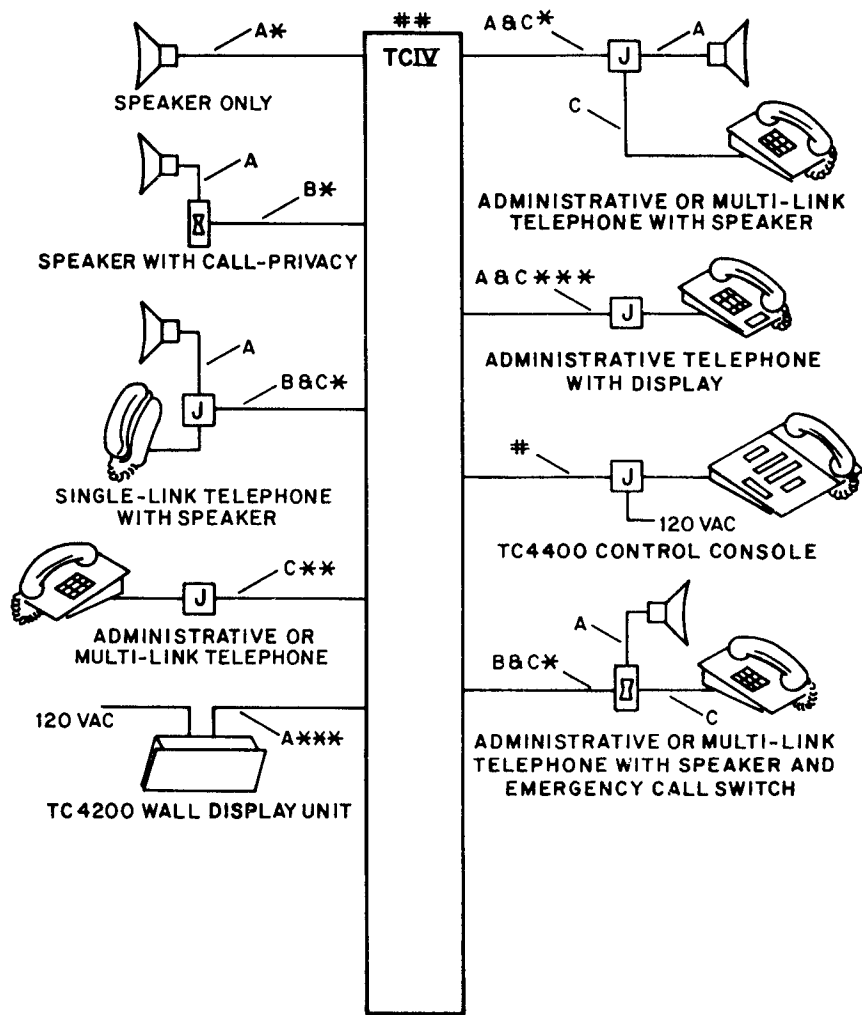
Rauland-Borg's Model TC4171 (COA Module) conforms to the requirements of the Federal Communication Commission's Rules and Regulations, Part 68, which governs the connection of circuitry to protect the telephone network. The user must be aware of the requirements pertaining to the installation and the operation of this protective device. The rules are summarized below; the complete current rules will be in the current copy of the FCC's Rules. All of the pertinent rules must be followed.

1. The TC4171 (COA) should only be connected to a standard subscriber line via the proper coupler installed by the telephone company; it should never be connected to a party line or coin line.
2. You must give the local telephone company:
 - a. notice that you want to install an FCC-approved device to their line (similar notice is required of a final disconnect.)
 - b. the registration number and the ringer equivalence, which are marked on the compliance label, and
 - c. the connection required for the TC4 171 (COA) - the RJ2 1X, RJ 1 IC, or RJ 11W (see this manual, KI-1583, the Interconnect Planning Manual, KI-1582 and wiring diagrams KM-0714 and KM-0716).
3. Once the telephone company has installed the proper connector, insert the plug coming from the TC4 171 (COA) wire-wrap terminals.
4. No repairs may be made to the TC4171 (COA) or to the TC4001 (main central assembly) while the TC4171 is connected to the phone line. If any malfunction occurs on this interconnect device or with the TC4001, disconnect the TC4171 and replace it with a unit known to be operating. If the Telecenter equipment is adjudged to be operating properly but the problem still exists, contact the telephone company. Reconnect the phone system only after determining that this equipment is not the source of the malfunction.
5. If the TC4171 (CGA) should cause harm to the telephone network, the telephone company is required, where practicable, to notify you that temporary discontinuance of service may be required. If advance notice is not practicable, the telephone company is permitted to discontinue its service immediately, provided that such an action is reasonable under the circumstances. In the case of temporary discontinuance, the telephone company is required to:
 - a. Promptly notify you of the temporary discontinuance.
 - b. Give you the opportunity to correct the situation that caused the discontinuance
 - c. Inform you of your rights to bring a complaint to the FCC pursuant to the procedures set forth in that agency's Rules. Copies of the procedure for making a complaint can be obtained from Rauland-Borg.
6. The telephone company can make changes in its facility, operations, equipment, or procedures, provided that the changes are reasonably required and are consistent with the FCC's regulations. If these changes render the customer's equipment incompatible or require that it be modified, the telephone company is required to give sufficient advance notice in writing to allow the customer the opportunity to maintain uninterrupted service.
7. Do not modify, repair, or alter this registered interconnect device, the TC4171 (COA); any such actions will void the warranty and could result in discontinuance of service from the telephone company. If the TC4171 requires service, return it to the Rauland-Borg Corporation.

Perform Initial System Installation and Checkout

- Summary: Install the Telecenter IV cabinets in an office environment so that free access is provided to the front and rear. Ensure proper grounding and power is provided. Verify the system operates prior to proceeding with the subsequent installation and checkout procedures.
- Step 1. Ensure the location for the system is in a normal office **environment**. That is, there is adequate ventilation and temperatures are in the range of 55 - 80 **degrees** Farenheit; and, there are no dangerous vibrations, corrosive fumes, or chemicals.
- Step 2. Ensure technicians can **access both the front and rear** of each cabinet once the system is installed. If space is restricted, ensure it is at least sufficient to move the cabinets for access to the front and rear.
- Step 3. Ensure a **grounded power outlet on a fifteen amp circuit breaker is** located within six feet of the cabinet location and that the power cable will not lay in a traffic path. When locating the power source, consider if the cabinet must be moved to provide access.
- Step 4. Install an **AC surge supressor** on the power line.
- Step 5. Determine how wiring will be run into the space planned for the cabinets (i.e.: where it will exit the wall, ceiling, or floor and the path to and into the cabinet). For telephone (not speaker) lines, an interconnect block with 50 pin Amphenol connectors mounted on plywood is recommended to allow maximum ease of system maintenance and growth.
- Step 6. If an interconnect block with connectors is used, ensure the wires from the cable are appropriately marked for later connection to the Telecenter Line-Link Modules.
- Step 7. Install all Telephones, Speakers, Call Switches, and Displays in accordance with the wiring requirements noted in the applicable drawings and indicated in the Riser Diagram on the following page. Refer to ICI-1587 for drawings.
- | | |
|---------------|--|
| KM0681 | Speaker and Priority Switch |
| KM0682 | Speaker, Call-Privacy Switch, and Priority Switch |
| KM0683 | Single-Link Telephone with Speaker, Call-Privacy and Priority Switch |
| KM0684 | Administrative (Multi-Link) Telephone |
| KM0684 | Administrative (Multi-Link) Telephone with Display |
| KM0685 | Speaker and Call-Privacy Switch |
| KM0686 | Single-Link Telephone and Speaker |
| KM0714 | Interconnect Lines |
| KM0717 | Attendant Key System |
- Step 8. Adhere to all applicable electrical and construction codes and run wiring to the space planned for the cabinet and interconnect block, if one is used. Be sure to mark all cable ends at the rack area.
- Step 9. Verily that the power ground is in **accordance with NFPA 78**.
- Step 10. **Install the cabinet** and remove the front and back doors.
- Step 11. Before appplying power, ensure the power switch on the TC4001, Central Control Assembly, is in the OFF position (toggle switch is down).

Riser Diagram



- * MAXIMUM DISTANCE
22 GA. 1500 FT.
20 GA. 2400 FT.
18 GA. 3800 FT.
 - ** MAXIMUM DISTANCE
22 GA. 2000 FT.
20 GA. 3200 FT.
18 GA. 5000 FT.
 - *** SHIELDED PAIR NOT TO EXCEED 1000 FT. TOTAL FOR UP TO 3 DISPLAYS
 - # THREE 22 GA. SHIELDED PAIRS MAXIMUM DISTANCE 1000 FT.
 - ## CONTACT SALES ENG. FOR SPECIAL WIRING PROBLEMS, SUCH AS NOT ENOUGH CONDUCTORS.
- CABLE TYPES
A - ONE SHIELDED PAIR
B - THREE CONDUCTOR SHIELDED
C - ONE TWISTED PAIR
- TCIV
RISER DIAGRAM
KM0895**

* Maximum Distance
22 ga. 1500 ft.
20 ga. 2400 ft.
18 ga. 3800 ft.

** Maximum Distance
22 ga. 2000 ft.
20 ga. 3200 ft.
18 ga. 5000 ft.

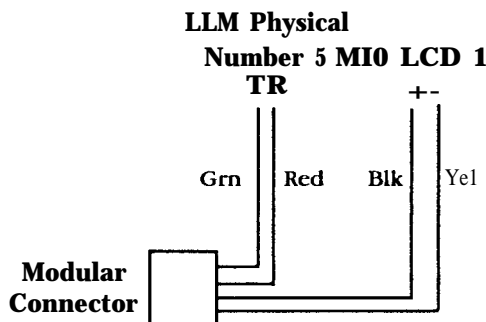
***Shielded Pair
Do not exceed
1000 ft total
for up to 3 displays.

#Three 22 ga. Shielded Pairs
Maximum Distance
of 1000 ft.

##Contact Sales Engineering
for special wiring problems,
such as: too few conductors.

Cable Types
A = One Shielded Pair
B = Three Conductor Shielded
C = One Twisted Pair

- Step 12. **Connect the power source** and verify the pilot lamp, located by the power switch on the Central Control Assembly, remains off.
- Step 13. Place the power switch to the ON position (up) and verify the **pilot lamp lights**. Note: Other lamps may also be seen to illuminate within the TC4001.
- Step 14. Place the **power switch in the OFF** position and verify all illuminated lamps go out.
- Step 15. Install a modular connector at a convenient place in the cabinet and connect the "T" and "R" twisted pair to physical number 5 of LLM 0 (TC4150) located in the TC4001 and the Black and Yellow twisted pair to the **LCD 1** pins on the **MI0 (VC7166)**, as shown in the following figure.



NOTE: These connections can be paralld for connecting another phone, if necessary.

- Step 16. Connect **a display phone** to the modular connector installed in Step 15.
- Step 17. Place the power switch to the ON position and verify the display shows the message:

Telecenter IV

- Step 18. Lift **the receiver** of the display phone and verify dial tone is received, then place the phone back on hook.
- Step 19. If Central Office or PBX trunks are installed or if there are any lines which leave the building, ensure lightning protection is installed on each (see drawing KM0714).

Configure Line-Link Modules

Summary: Ensure the DIP switch setting on each TC4150 Line-Link Module (LLM) is in accordance with system requirements.

Equipment required: Small flashlight, six-inch long, small shank (#1), flat-bladed screwdriver, pliers.

Step 1. Refer to the Physical Number Layout Planning Worksheet and determine which LLM's are required to support the physical numbers noted on the System Planning Worksheet for Central Equipment Phone LLM's.

Step 2. Go to the front of the system cabinet and locate the LLM's. LLM 0 is in the Central Control Assembly (TC4001) and all other LLM's are immediately below in the expansion chassis.

Step 3. Using the flashlight, peer through the inspection port on the left side of each LLM and locate the DIP switch behind the ribbon cable connector. Compare the factory set DIP switch settings with the LLM DIP Switch Settings Table below, keeping the following in mind:

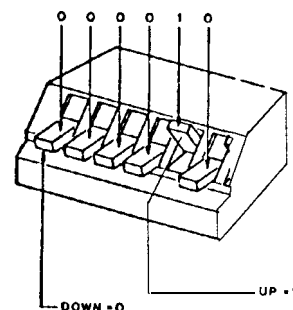
The DIP switch setting provides the system address for the range of physical numbers supported by a particular LLM.

The LLM number (0-31) is determined by the physical numbers required, not the number of LLM's in the system. Refer to the column marked PHYS. in the table below for the range of physical number associated with each LLM.

0 means the switch is down.

1 means the switch is up.

Step 4. If setting must be changed, use this figure as a guide to toggle the switches as necessary. This can be done in one of two ways: Insert the screwdriver through the inspection port; or, go to the rear of the cabinet and remove the LLM after straightening the retaining tabs which hold it in place.



Step 5. On the chassis near the ID strip, mark the LLM with the first and last physical numbers it supports and remove any conflicting factory markings.

LLM DIP Switch Settings Table

LLM	DIP	PHYS.	LLM	DIP	PHYS.	LLM	DIP	PHYS.	LLM	DIP	PHYS.
0	000000	0-15	8	001000	128-143	16	010000	256-271	24	011000	384-399
1	000001	16-31	9	001001	144-159	17	010001	272-287	25	011001	400-415
2	000010	32-47	10	001010	160-175	18	010010	288-303	26	011010	416-431
3	000011	48-63	11	001011	176-191	19	010011	304-319	27	011011	432-447
4	000100	64-79	12	001100	192-207	20	010100	320-335	28	011100	448-463
5	000101	80-95	13	001101	208-223	21	010101	336-351	29	011101	464-479
6	000110	96-111	14	001110	224-239	22	010110	352-367	30	011110	480-495
7	000111	112-127	15	001111	240-255	23	010111	368-383	31	011111	496-511

Configure Speaker (and Single Link Staff Phone) Control Boards

- Summary** Ensure the **DIP** switch on each TC4110 (SC25) and TC4120 (SCC25) Speaker Control Board is correctly set in accordance with system requirements. Throughout this procedure, both types of Speaker Control Boards will be referred to as SC's.
- Step 1.** Refer to the **Physical Number Layout Planning Worksheet** and determine which SC's are required to support the physical numbers noted on the **System Planning Worksheet** for Central Equipment **Phones and Speakers**.
- Step 2.** If Single Link Staff Phones are used, determine the installation configuration before proceeding. Single Link Staff Stations always include a Speaker but they must not be wired to the same SC board. Speaker SC's may or may not be connected to switch panels; therefore, there are two possible SC configurations when Single Link Staff Phones are used:
- One SCC25 for groups of up to 25 Speakers (no switch panels) and,
 - One SCC25 for groups of up to 25 Single Link **Staff Phones**.
- One SC25** for groups **Of up** to 25 Speakers (connected to switch panels) and,
- One SCC25 for groups of up to 25 Single Link **Staff Phones**.
- Step 3.** At the back of the system cabinet, locate the SC's above the Central Control Assembly. Speaker and Phone SC's may be identified as follows:

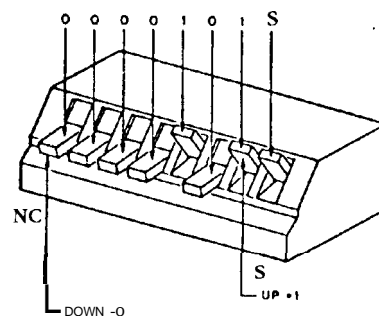
Speaker SC S1 and S2 terminals are bussed to the MIO via a shielded cable.

Phone SC S1 and S2 terminals are bussed to one LLM line via a twisted pair.

- Step 4.** Locate the DIP switch next to the ribbon cable connector on the left side of each SC and compare the switch settings with the table below, keeping the following in mind:

The switch setting provides the system address for the entire range of physical numbers supported by a particular board. The SC number (0-19) is determined by the physical numbers required, not the number of SC's in the system. (SC 48 is not normally used.)

If Single Link Staff Phones are used, Control Boards are mounted in pairs having the same DIP switch setting except for the rightmost lever (S). This lever must be **Down** for a **Phone SC** and **Up** for a **Speaker SC**.



- Step 5.** If DIP switch settings must be changed mark the new setting near the ID strip on each module and remove any conflicting factory markings.

SC DIP Switch Settings Table

SC	DIP	PHYS.	SC	DIP	PHYS.	SC	DIP	PHYS.	SC	DIP	PHYS.
48	0110000(S)	0-15	4	0000100(S)	116-140	9	0001001(S)	241-265	14	0001110(S)	366-390
0	0000000(S)	16-40	5	0000101(S)	141-165	10	0001010(S)	266-290	15	0001111(S)	391-415
1	0000001(S)	41-65	6	0000110(S)	166-190	11	0001011(S)	291-315	16	0010000(S)	416-440
2	0000010(S)	66-90	7	0000111(S)	191-215	12	0001100(S)	316-340	17	0010001(S)	441-465
3	0000011(S)	91-115	8	0001000(S)	216-240	13	0001101(S)	341-365	18	0010010(S)	466-490
									19	0010011(S)	491-511

Install Field Wiring

Summary: Using required wiring, connect the speakers, phones, and other remote cables to the TCIV according to the following procedures.

Requirements: Wire wrap tool suitable for 22 gauge modified wrap on .045 posts, plastic cable ties and/or waxed cable lacing.

Warning: **Do not install interconnect lines to the Telecenter COAs until instructed.**

Step 1. Refer to the **Field Wiring Diagram** (on the next page) and, while performing the following steps, keep these points in mind about field wiring:

Dress all wiring down the sides of the cabinet. (Do not run wiring adjacent to power cables or across boards and connectors.)

When running wires through holes in the chassis, provide adequate insulation to protect against chaffing. (Do not leave rough edges which may cut or pinch insulation.)

Use cable ties and/or lacing to keep wiring compact, organized, and flexible.

Provide adequate service loops (1 to 2 inches for each cable and 8-16 inches for boards) to allow ease of module removal, test, and repair.

On each module, ensure the physical numbers supported are clearly identified.

Wire wrap around each terminal with one wrap of insulation plus five times with solid wire. (Never wire wrap with stranded wire.)

When using wire piercing connectors insert the correct size wire and twist stranded shield wires tightly or cover with insulation prior to insertion. (The wrong wire size will cause intermittent problems and all connectors will have to be replaced.)

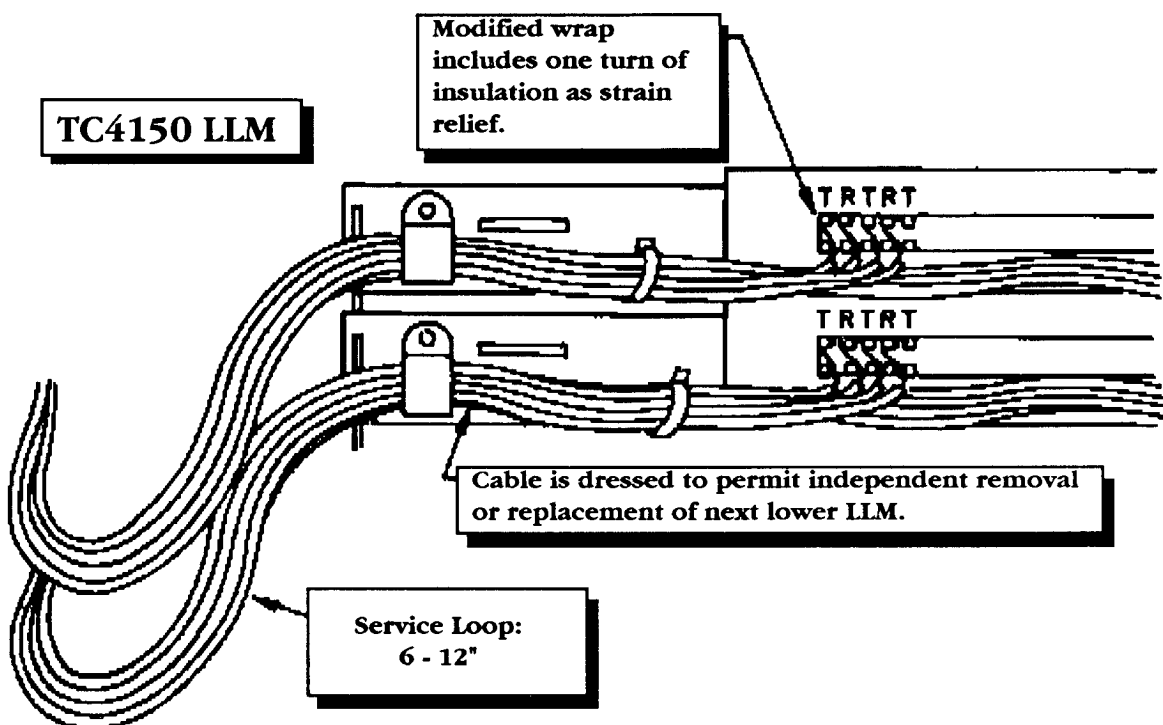
Use wires long enough to do the job. (Don't make unnecessary splices.)

Properly dress shielded cables by stripping only 1/4 to 3/4 inch of shield.

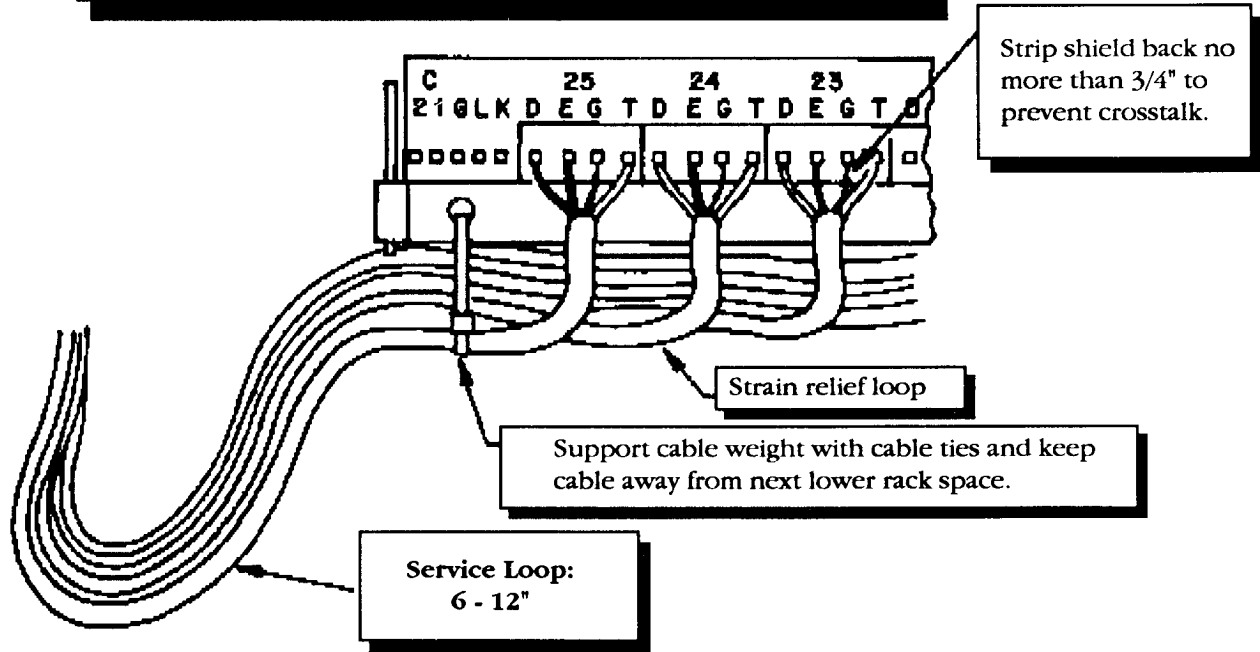
Install lightning protective devices near the point where any wires come into the building. (Do not rely on the TCIV ground for lightning protection.)

Step 2. If two completely different programming set ups are required for day and night use, connect the **EEPROM switch as** shown in Drawing KMO896. This is a custom alternative to the standard day/night function.

Field Wiring Diagram



Insulation Piercing Connectors:
Do not strip wires.
Tightly twist stranded ground wires before using.
Use SK2522 with 22 AWG only.



NOTE:

While **completing Steps 3 and 4**, periodically ensure Telephones and associated Speakers and Call switches are on the same physical numbers by performing the following test:

- A. Go to the station to be tested and take the phone off-hook for one **second**.
- B. Blow or talk into the mouthpiece and listen to the headset. If testing a multi-link phone, there should be feedback, indicating talk voltage is present. A single-link phone should not provide feedback since they do not receive talk voltage unless relay switched into a communication path.
- C. Verify the correct architectural number (if predetermined) appears on the display as a call-in. If not predetermined, the factory default is the physical number plus 100.
- D. Dial the number from the display phone and listen for room sounds. Then, go to the room and verify it is getting supervisory beep every 10 to 20 seconds from the speaker.
- E. Pick-up the staff phone: Verify it has talk voltage and the speaker stops beeping. A single link staff phone won't get talk voltage if **wired** to the wrong circuit.

Note: If this test fails, there is a wiring or programming error. See **Programming Section** and verify the following:

Staff phone (single or multi link) with speaker first (A:7) is specified.

Call-ins are enabled to the display test phone.

Also, refer to the Troubleshooting Section for information on the #73 I/O Diagnostic and Computer Aided Diagnostics. These tests bypass programming and operate directly off physical numbers.

Step 3. Using wire wraps or one of the following options, connect the shielded cable from each Speaker and Call Switch to the appropriate Speaker Control Board terminals representing their assigned physical number. Refer to the Physical Numbers Layout Planning **Worksheet** and Drawing KMO682.

CTA25	Crimp Terminal Adapters for 25 Speakers
SK2522	22 Gauge Insulation Piercing Kit for 25 Speakers

Step 4. Using wire wraps or one of the options noted in Step 3, connect the twisted pair from each Single-Link Telephone to the appropriate Speaker Control Board terminals representing their assigned physical number. Refer to the **Physical Numbers Layout Planning Worksheet** and the appropriate wiring diagram from the following list for stations equipped with Single-Link Staff Telephones:

KM0686	Single Link Staff Phone and Speaker
KM0683	Speaker, Call-Privacy and Priority Switch
KM0685	Speaker and Call-Privacy Switch

Be **sure to follow the odd and even polarity recommendations in the drawings noted above**. To reduce crosstalk in speaker applications, wire the D and E terminal connections of odd numbered single-link staff phone circuits opposite those of even numbered circuits.

Step 5. Observing polarity requirements, wire-wrap the twisted pair from each Multi-Link **Telephone to the** appropriate Line-Link Module terminals representing their assigned physical number. Refer to **the Physical Numbers Layout Planning Worksheet** and the appropriate wiring diagram from the following list for stations equipped with Multi-Link Telephones:

KM0681	Speaker and Priority Switch
KM0684	DTMF Keypad
KM0684	Display

Step 6. Connect the shielded pair from the "C" connector of each TC4200 VFD (Vacuum Fluorescent Display) and the "Y" and "B" terminals of each display telephone's modular connector to the appropriate LCD 1 or 2 inputs on the MIO (Main Input/Output Module in the TC4001). Refer to the following drawings as appropriate.

KM0674	TC400 1 Wiring Diagram
KM0674	Modular Receptacle Display Phone detail
KM0717	66E Junction Box
KC1476	TC4200 Vacuum Fluorescent Display

Step 7. If **TM432 Graphic Annunciator Modules (GAM)** are installed, ensure their power is off and connect a shielded pair from the appropriate MIO graphics driver to the first GAM module (in the first or second module chain) as required to achieve the desired indication (described below). Refer to Drawing KM0674 for wiring information.

Wire Graphics 1 to the first GAM module in one chain to indicate Call-ins.

Wire Graphics 2 to a the first GAM module in a second module chain to show lines in use.

All TM432 GAMs in a chain must be installed in the same location. The recommended installation for the modules and the lamp power supply is in the lamp cabinet with only a shielded data line to the main equipment rack.

Pulsating indications is another option and requires a **special pulse generator, producing** 5 Vdc logic pulses, between ground and the first Graphics Annunciator Module.

Step 8. Remove each LLM which supports an Interconnect Line, **a VCM, or a Special Page Line.** Then, locate the **"UI" line hybrid associated with these lines and ensure pin 3 is cut.** This will prevent the 90 Vrms ring signal from damaging the COAs or other modules. This step should have been performed in the factory for factory installed TC4 160 VCMs and TC417 1 COAs.

Step 9. Refer to the main wiring diagram KM0674 and verify all other connections (audio control panels, power amps, system clock, etc.) have been properly made. Wherever possible, these are factory installed. However, large amplifiers may be temporarily removed from a rack for shipment. If so, they should be mounted and connected to existing wiring.

Checkout Internal Communications

- Summary: The following procedure may be used to help locate simple problems. If something is not found to work properly or the responses are abnormal, refer to the Troubleshooting section for help. Also, see the Troubleshooting Section for more detailed checks and tests.
- Step 1. Turn the power on. Verify the AC Power lamp on the back of the power supply glows. Inside the TC4001 on the VC7166 **MIO** board, an LED marked 12V and, to its right, two segments of another LED (indicating the presence of 5 VDC and -3 VDC) should also glow.
- Step 2. After a few seconds: **Telecenter IV** should show on the display, provided that there is no call-in activity on the remote lines.
- Step 3. Pick up the test phone and verify the presence of dial tone; then press any key and verify dial tone stops. Place the phone on-hook.
- Step 4. Take two phones off-hook simultaneously and verify each receives dial tone, then place one back on-hook.
- Step 5. Dial an administrative phone. Verify it rings and, when answered, supports regular telephone conversation.
- Step 6. Dial a speaker that is not in the privacy mode. Verify a talk and listen path exists through the speaker.
- Step 7. Verify Call-ins can be produced in the following three ways: The type of call-in produced depends on programming but can be simulated as follows:
- Normal Call-in: Ground the T terminal on the desired speaker control circuit.
 - Emergency Call-in: Ground the T terminal through a 1.5K resistor.
 - Normal Call-in: Pick up a multi-link staff phone.
- Step 8. Dialing #00 and verify All-Page works. Adjust the power amplifier output if necessary.
- Step 9. If a Director Panel with Emergency Announce Button is included, verify it overrides All-Page and adjust the output level at the Control Panel if necessary.
- Step 10. Activate the clock and verify speakers receive time zone tones. Types of tones and speaker zone groupings depend on programming.
- Step 11. Call the speaker of stations with staff phones and speakers and verify that the communication path moves from the speaker to the phone when the phone is taken off-hook. If the station is not programmed for speaker first answering (A:7), use the ## function.
- Step 12. If graphic displays are installed, verify they are connected correctly to drive GRI to show call-ins and/or to drive GR2 to show lines in use.
- Step 13. If a TC4400 Call Control Console is installed, check it according to the procedure in its manual, KI-1559.

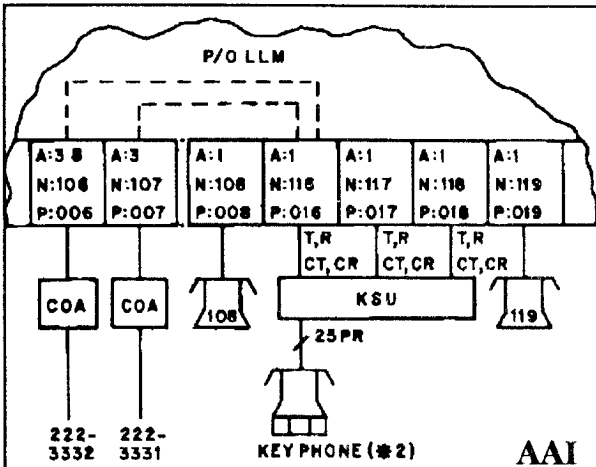
Install Interconnect Wiring

- Summary: Ensure the telephone company wiring is properly installed and tested before connecting any wiring to the Telecenter. Then, install the interconnect wiring by referring to the general interconnect drawings on the following page and those developed specifically for this system.
- Step 1. If a Key **System is** installed, ensure it has been properly wired and programmed: Then connect the twisted pairs for each line to the appropriate LLM terminals representing their assigned physical number. Refer to the **Interconnect Layout Drawing** from the Interconnect Planning Section, the Key **System's Manual**, the **Physical Number Layout Worksheet** from the Planning Section, and TCIV Key System Wiring **Drawing KM0717**.
- Note: **Use the** key system manual for details on wiring and configuring options (e.g.: audible ringing from which lines to which phones, etc.). KM0717 shows general wiring information for a standard key system. The TC4400 console has its own manual covering installation, set-up, and test.
- Step 2. If required, ensure service request is available and applied to terminal CS on the **COA (TC4171)** (refer to **Drawing KC1475**). If not, the keep-alive process may be used to handle disconnects from DISA trunks.
- Step 3. If ground-start trunks are being used, ensure ground lines have been installed and tested between the affected COA's and Central Office or PBX.
- Step 4. Remove each COA and set the jumper to the left of the transformer as required.

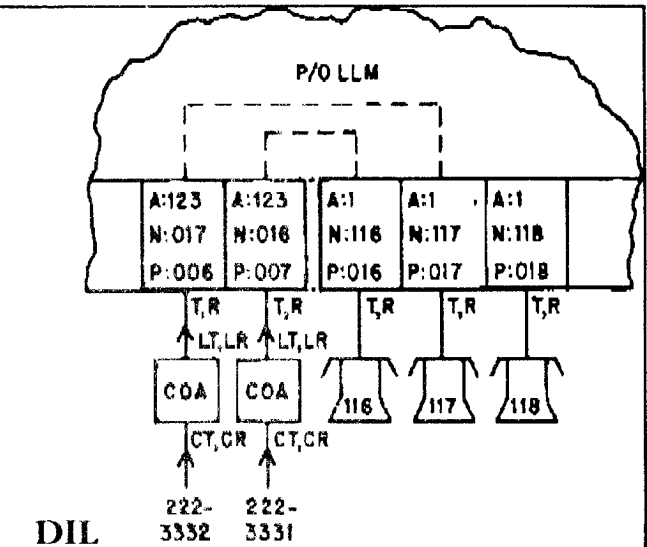
PBX Lines 600 Ohms
Central Office 900 ohms

- Step 5. Install **Repeater Amplifier Power Supply Chassis and Modules as** detailed on KM0716. Ensure the power supply is properly grounded to minimize crosstalk and digital noise on the line. Avoid setting the amplifier gain too high: 6db is typical.
- Step 6. Refer to the **Interconnect Layout Drawing** and the **Interconnect Types** figure on the next page to determine how the interconnect lines should be connected in the system.
- Step 7. **Connect** the twisted pair from each incoming interconnect line to the CT and **CR** terminals of the COA representing their assigned physical numbers. The physical number and directory number represented by each COA should be marked on the chassis in front of each COA. Refer to the **Physical Numbers Layout Planning Worksheet** from the Planning Section and **Drawing KM0716**.
- Note: If the Central Office or PBX **automatically hunts** for a line when contacting the TCIV, wire the first choice of the C.O. or PBX to the interconnect line with the highest physical number in the hunt group. Since the TCIV hunts upward, this will reduce the probability of collision between incoming and outgoing calls.
- Step 8. For "outgoing only" interconnect lines, remove the LLM **UI** line hybrid serving the associated COA module. This prevents the COA from establishing loop current or a service request. Outside callers will hear ringing but cannot get an answer.
- Step 9. For "incoming only" interconnect lines, refer to the Programming Section and:
- Do not program the line for single digit dialing (Location Codes 64016-34).
Assign a non-accessible architectural number (901 if using dial '9' for outside access).
Set the hunt bit (A:8) off on the preceding line.

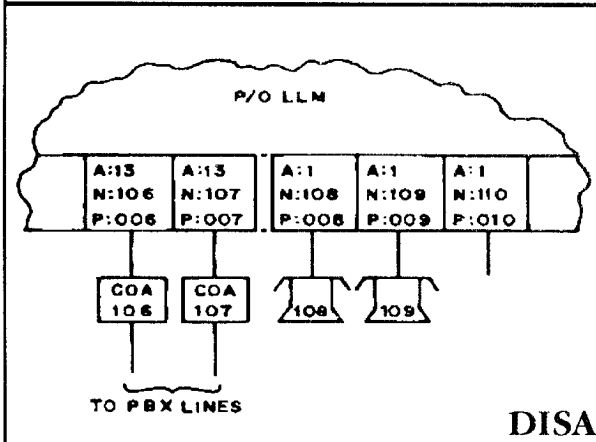
Interconnect Types



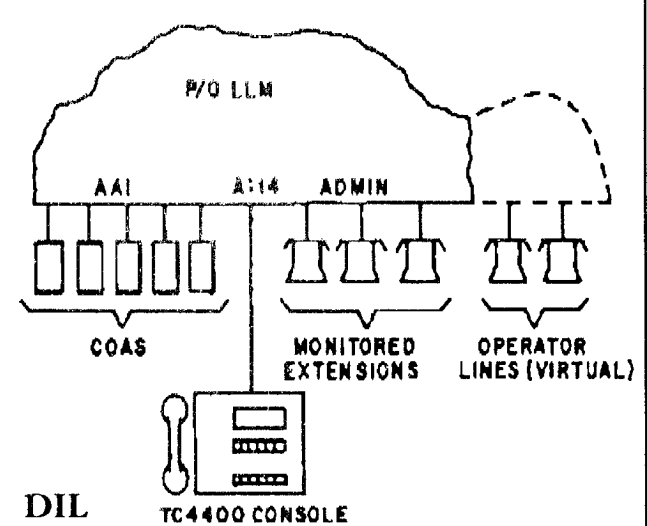
Incoming: To first available key and overflow to 119, etc.
Outgoing: Dial "9" for first available trunk (i.e.: 006, 007, ...) If allowed, a particular trunk may also be selected by using its arch no. (N:)



Incoming: To a specified trunk.
Outgoing: Not included except when set-up for a specified extension.



Incoming: Caller hears TCIV dial tone and must use tone dialing phone to select TCIV extension.
Outgoing: Dial "9" for first available trunk (i.e.: 006, 007, ...) If allowed, a particular trunk may also be selected by using its arch no. (N:)



Incoming: Audible and flashing indication on specific trunk key.
Outgoing: Status displayed right to left on trunk keys. Console can select any trunk.

Mnemonic	Model	Description
LLM	TC4150	Line Link Module
COA	TC4171	Central Office Adapter
KSU		Key System Unit

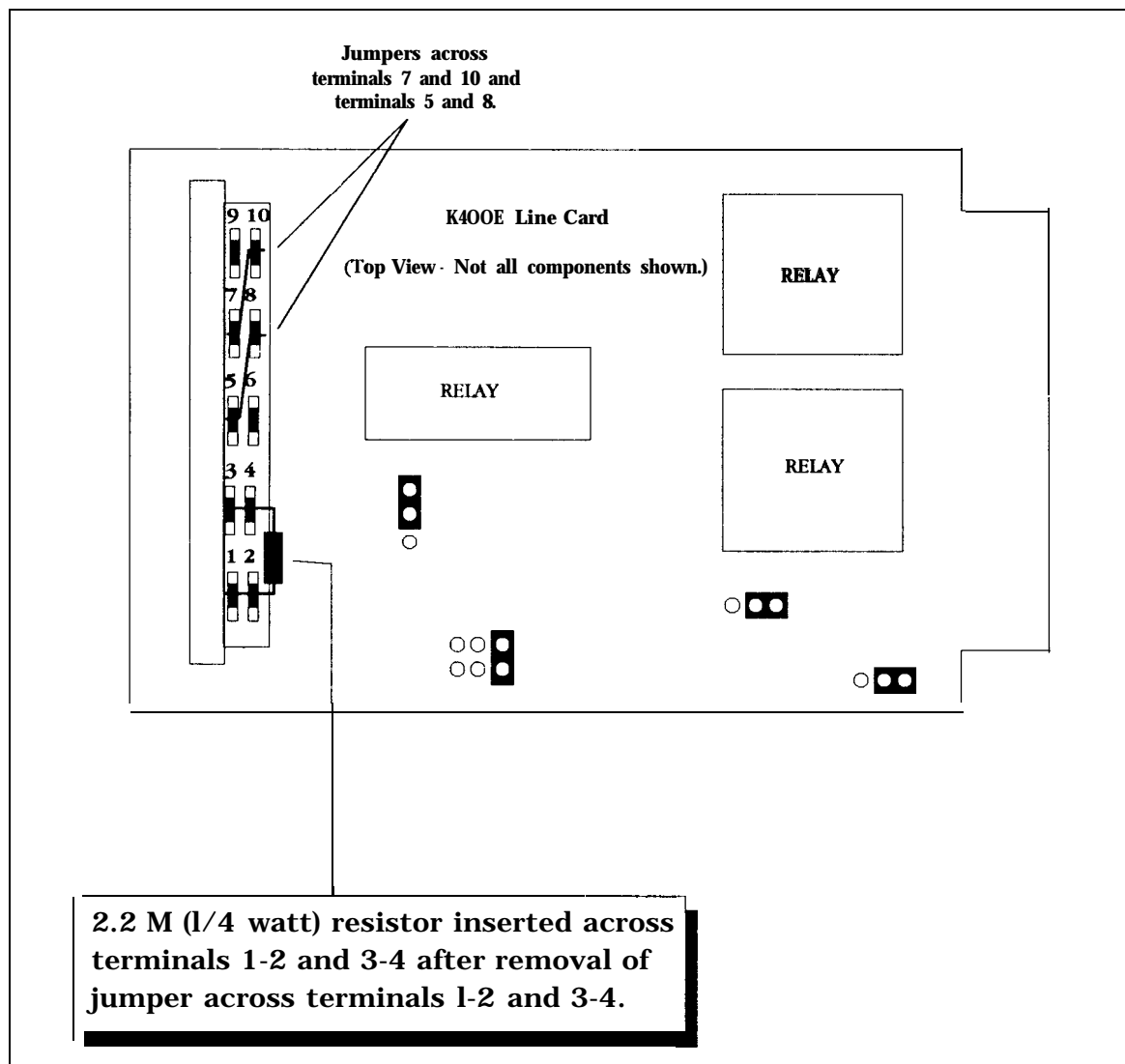
Step 10. If the key system uses **K400E Line Cards**, install a **2.2 Meg resistor** as shown in the 400E Line Card **Modification** figure below.

If this is not done, the key phone may continue to ring after callers have hung-up. The key system times ringing from one burst to the next in order to apply its own properly timed ringing signal. The timer is typically set to about 10 to **15** seconds although only **5** seconds is sufficient. If the timer period is too long, there will be a delay in detecting when ringing stops, resulting in a continued ring from the key system. The 1 Meg resistor decreases the timer period, causing quicker timeout and ring-stop detection. This delay is most noticeable when using the TCIV built-in Night Answer to pick-up a call from a key phone.

Step 11. Install a Ring **Trip Adapter** between the LLM "UI" line hybrid and its socket on key phone lines. Refer to drawing KMO867.

If this is not done, there may be a "ringing in **the ear**" caused by pressing a line button to answer an incoming call while holding the handset to the ear or wearing a headset. This may be objectionable.

K400E Line Card Modification



Checkout Interconnect System

- Summary:** Perform the following steps to ensure proper operation of the interconnect system. See the Troubleshooting Section for more detailed checks and tests.
- Step 1.** **Key Phones Test** (Admin A: 1--). (Refer to the TCIV and Key System Operations Instructions.) Using each key phone and each key, obtain TCIV dial tone and verify the appropriate key phone lamps light. Place a call to each key phone line thru the TCIV and verily audible ring at the proper instruments and ring flashing on the proper keys of all instruments.
- If crosstalk occurs between key phone lines, perform the **Line Rebalancing Procedure** in the Troubleshooting Section.
- Step 2.** Verily the Key Phones each act as operator consoles to perform the following functions:
- Answer incoming calls.
Transfer incoming calls.
Break into calls.
Page remote pick-ups.
Night pick-up.
Answer internal dial "0".
- Note:** Any key phone key has the following characteristics:
If not associated with a particular trunk, incoming calls go to first available key and the key clears when the call is transferred. Programming can provide dial "0" for console phone, or dial various numbers for individual keys.
- Step 3.** **Outgoing Trunk Test (DISA):**
Using an administrative phone, dial the Architectural Number of the interconnect line under test. If single digit dialing interferes with dialing the architectural number, it may be temporarily defeated (refer to the Programming Section). The CO LED on the TC4171 (COA) module should glow, indicating the presence of loop current on the Central Office's (or PBX's) side of the TC4171, and you should get a dial tone from the CO. or PBX remote system. Verify the ability to dial through and establish communication with any extension of that system. Hold the connection for 45 seconds, then hang-up and verify a proper disconnect (the CO LED on the COA goes off).
- Step 4.** **Incoming Trunk Test (AAI and DIL) :**
Have a call placed from the remote system or another CO line. When ringing occurs, the TC LED on the TC4 171 should glow, indicating that the TC4171 (COA) has responded by sending loop current to the Telecenter (an external service request will trigger the same response). As soon as the TCIV answers and gives the dial tone to the DISA trunk, the CO LED should glow, due to the loop current from the central office (or PBX).
- Note:** In the case of DIL or AAI lines, the CO LED will not light and loop current will not occur until a target phone within the TCIV goes off hook to answer the call.
- Step 5.** Once the above tests have been completed and the hardware and wiring are known to be okay, Telecenter software can be altered to meet system requirements.
(Refer to the Programming manual, K1-1584.)

Physical Number Layout Planning Worksheet

Arch.	Phys.	48 SC	0-1-LLM
REC.1	0	1	0
REC.2	1	2	1
VCM	2	3	2
FDBK	3	4	3
1 Lnk	4	5	4
Dsp.Phn	5	6	5
	6	7	6
	7	8	7
	8	9	8
	9	10	9
	10	11	10
	11	12	11
	12	13	12
	13	14	13
	14	15	14
	15	16	15
	17	17	15
	18	18	
	19	19	
	20	20	
	21	21	
	22	22	
	23	23	
	24	24	
	25	25	

These SC terminals do not have physical numbers and cannot be used by the system.

Legend

Arch. = Architectural Number
Assign these numbers using this chart. These are commonly room numbers. Do not use numbers starting with digits used for one-button dialing (e.g., 0 or 9)

Phys. = Physical Number
The number which identifies each line or node in the system. Each physical number is associated with particular pins on an LLM and an SC, as shown in this chart.

SC = Speaker Control Board
Both SC25 (TC4110) and SCC25 (TC4120) type speaker control boards are represented in this layout with the symbol SC. These boards are used for speakers and single-link staff phones.

LLM = Line Link Module (TC4150)
Multi-link phone boards.

Instructions

Select contiguous groups of physical numbers for each type of equipment, as shown in the example on Page 5 of the Internal System Planning Section.

Skip SC and LLM boards numbers as necessary to obtain the physical numbers required to meet system design needs. That is, you may use LLM boards 0, 5, and 9 without using 1, 2, 3, etc.

Upon installation, the DIP switches on each LLM and SC board must be set to provide the proper identification for recognition by system software.

Arch	Phys.	SC	LLM	Arch	Phys.	SC	LLM	Arch	Phys.	SC	LLM
		Q-S	1			1 SC				2-5	
16	1	1	0	41	1	1	9	66	1	1	2
17	2	2	1	42	2	2	10	67	2	2	3
18	3	3	2	43	3	3	11	68	3	3	4
19	4	4	3	44	4	4	12	69	4	4	5
20	5	5	4	45	5	5	13	70	5	5	6
21	6	6	5	46	6	6	14	71	6	6	7
22	7	7	6	47	7	7	15	72	7	7	8
23	8	8	7	48	8	8	0	73	8	8	9
24	9	9	8	49	9	9	1	74	9	9	10
25	10	10	9	50	10	10	2	75	10	10	11
26	11	11	10	51	11	11	3	76	11	11	12
27	12	12	11	52	12	12	4	77	12	12	13
28	13	13	12	53	13	13	5	78	13	13	14
29	14	14	13	54	14	14	6	79	14	14	15
30	15	15	14	55	15	15	7	80	15	15	0
31	16	16	15	56	16	16	8	81	16	16	1
32	17	17	0	57	17	17	9	82	17	17	2
33	18	18	1	58	18	18	10	83	18	18	3
34	19	19	2	59	19	19	11	84	19	19	4
35	20	20	3	60	20	20	12	85	20	20	5
36	21	21	4	61	21	21	13	86	21	21	6
37	22	22	5	62	22	22	14	87	22	22	7
38	23	23	6	63	23	23	15	88	23	23	8
39	24	24	7	64	24	24	0	89	24	24	9
40	25	25	8	65	25	25	1	90	25	25	10

Physical Number Layout Planning Worksheet

Arch	Phys	SC	L L M	Arch	Phys	SC	L L M	Arch	Phys	SC	L L M
		3 SC				5 SC				7 SC	
	91	1	11		141	1	13		191	1	15
	92	2	12		142	2	14		192	2	0 12L
	93	3	13		143	3	15		193	3	1
	94	4	14		144	4	0 9L		194	4	2
	95	5	15		145	5	1		195	5	3
	96	6	0 6L		146	6	2		196	6	4
	97	7	1		147	7	3		197	7	5
	98	8	2		148	8	4		198	8	6
	99	9	3		149	9	5		199	9	7
	100	10	4		150	10	6		200	10	8
	101	11	5		151	11	7		201	11	9
	102	12	6		152	12	8		202	12	10
	103	13	7		153	13	9		203	13	11
	104	14	8		154	14	10		204	14	12
	105	15	9		155	15	11		205	15	13
	106	16	10		156	16	12		206	16	14
	107	17	11		157	17	13		207	17	15
	108	18	12		158	18	14		208	18	0 13L
	109	19	13		159	19	15		209	19	1
	110	20	14		160	20	0 10L		210	20	2
	111	21	15		161	21	1		211	21	3
	112	22	0 7L		162	22	2		212	22	4
	113	23	1		163	23	3		213	23	5
	114	24	2		164	24	4		214	24	6
	115	25	3		165	25	5		215	25	7
		4 SC				6 SC				8 SC	
	116	1	4		166	1	6		216	1	8
	117	2	5		167	2	7		217	2	9
	118	3	6		168	3	8		218	3	10
	119	4	7		169	4	9		219	4	11
	120	5	8		170	5	10		220	5	12
	121	6	9		171	6	11		221	6	13
	122	7	10		172	7	12		222	7	14
	123	8	11		173	8	13		223	8	15
	124	9	12		174	9	14		224	9	0 14L
	125	10	13		175	10	15		225	10	1
	126	11	14		176	11	0 11L		226	11	2
	127	12	15		177	12	1		227	12	3
	128	13	0 8L		178	13	2		228	13	4
	129	14	1		179	14	3		229	14	5
	130	15	2		180	15	4		230	15	6
	131	16	3		181	16	5		231	16	7
	132	17	4		182	17	6		232	17	8
	133	18	5		183	18	7		233	18	9
	134	19	6		184	19	8		234	19	10
	135	20	7		185	20	9		235	20	11
	136	21	8		186	21	10		236	21	12
	137	22	9		187	22	11		237	22	13
	138	23	10		188	23	12		238	23	14
	139	24	11		189	24	13		239	24	15
	140	25	12		190	25	14		240	25	0 15L

Physical Number Layout Planning Worksheet

Arch	Phys	SC	LLM	Arch	Phys	SC	LLM	Arch	Phys	SC	LLM
		9 SC				11 SC				13 SC	
	241	1	1		291	1	3		341	1	5
	242	2	2		292	2	4		342	2	6
	243	3	3		293	3	5		343	3	7
	244	4	4		294	4	6		344	4	8
	245	5	5		295	5	7		345	5	9
	246	6	6		296	6	8		346	6	10
	247	7	7		297	7	9		347	7	11
	248	8	8		298	8	10		348	8	12
	249	9	9		299	9	11		349	9	13
	250	10	10		300	10	12		350	10	14
	251	11	11		301	11	13		351	11	15
	252	12	12		302	12	14		352	12	0
	253	13	13		303	13	15		353	13	1
	254	14	14		304	14	0	19L	354	14	2
	255	15	15		305	15	1		355	15	3
	256	16	0	16L	306	16	2		356	16	4
	257	17	1		307	17	3		357	17	5
	258	18	2		308	18	4		358	18	6
	259	19	3		309	19	5		359	19	7
	260	20	4		310	20	6		360	20	8
	261	21	5		311	21	7		361	21	9
	262	22	6		312	22	8		362	22	10
	263	23	7		313	23	9		363	23	11
	264	24	8		314	24	10		364	24	12
	265	25	9		315	25	11		365	25	13
	266	10 SC	10		316	12 SC	12		366	14 SC	14
	267	2	11		317	2	13		367	2	15
	268	3	12		318	3	14		368	3	0
	269	4	13		319	4	15		369	4	1
	270	5	14		320	5	0	20L	370	5	2
	271	6	15		321	6	1		371	6	3
	272	7	0	17L	322	7	2		372	7	4
	273	8	1		323	8	3		373	8	5
	274	9	2		324	9	4		374	9	6
	275	10	3		325	10	5		375	10	7
	276	11	4		326	11	6		376	11	8
	277	12	5		327	12	7		377	12	9
	278	13	6		328	13	8		378	13	10
	279	14	7		329	14	9		379	14	11
	280	15	8		330	15	10		380	15	12
	281	16	9		331	16	11		381	16	13
	282	17	10		332	17	12		382	17	14
	283	18	11		333	18	13		383	18	15
	284	19	12		334	19	14		384	19	0
	285	20	13		335	20	15		385	20	1
	286	21	14		336	21	0	21L	386	21	2
	287	22	15		337	22	1		387	22	3
	288	23	0	18L	338	23	2		388	23	4
	289	24	1		339	24	3		389	24	5
	290	25	2		340	25	4		390	25	6

Physical Number Layout Planning Worksheet

Arch	Phys	SC	LLM	Arch	Phys	SC	LLM	Arch	Phys	SC	LLM
		15	SC			17	SC			19	SC
391	1	7		441	1	9		491	1	11	
392	2	8		442	2	10		492	2	12	
393	3	9		443	3	11		493	3	13	
394	4	10		444	4	12		494	4	14	
395	5	11		445	5	13		495	5	15	
396	6	12		446	6	14		496	6	0	31L
397	7	13		447	7	15		497	7	1	
398	8	14		448	8	0	28L	498	8	2	
399	9	15		449	9	1		499	9	3	
400	10	0	25L	450	10	2		500	10	4	
401	11	1		451	11	3		501	11	5	
402	12	2		452	12	4		502	12	6	
403	13	3		453	13	5		503	13	7	
404	14	4		454	14	6		504	14	8	
405	15	5		455	15	7		505	15	9	
406	16	6		456	16	8		506	16	10	
407	17	7		457	17	9		507	17	11	
408	18	8		458	18	10		508	18	12	
409	19	9		459	19	11		509	19	13	
410	20	10		460	20	12		510	20	14	
411	21	11		461	21	13		511	21	15	
412	22	12		462	22	14			22		
413	23	13		463	23	15		(End of phys. nos.)	23		Not accessible by the system.
414	24	14		464	24	0	29L		24		
415	25	15		465	25	1			25		
		16	SC			18	SC				
416	1	0	26L	466	1	2					
417	2	1		467	2	3					
418	3	2		468	3	4					
419	4	3		469	4	5					
420	5	4		470	5	6					
421	6	5		471	6	7					
422	7	6		472	7	8					
423	8	7		473	8	9					
424	9	8		474	9	10					
425	10	9		475	10	11					
426	11	10		476	11	12					
427	12	11		477	12	13					
428	13	12		478	13	14					
429	14	13		479	14	15					
430	15	14		480	15	0	30L				
431	16	15		481	16	1					
432	17	0	27L	482	17	2					
433	18	1		483	18	3					
434	19	2		484	19	4					
435	20	3		485	20	5					
436	21	4		486	21	6					
437	22	5		487	22	7					
438	23	6		488	23	8					
439	24	7		489	24	9					
440	25	8		490	25	10					