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Technical Practice

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SYSTEM 605 DID POWER FAILURE TRANSFER SYSTEM

Contents

1. General Description

1.1 NEW PRACTICE ISSUE Issue 10 of the System 605 Technical Practice is released due to several changes in the installation of the unit. A detailed discussion of these changes can be found in section 2 of this practice. This practice applies **ONLY** to systems with serial number 605-00590 and later.

1.2 SYSTEM OVERVIEW The System 605 is designed to provide Power Failure Transfer (PFT) capability for two-wire Central Office (CO) Direct Inward Dial (DID) trunk lines associated with a PBX or other specialized telecommunication system. The System 605 consists of a wall-mounted cabinet, four rechargeable batteries, and a 601-A Common Control Card. The System 605 cabinet has eight card slots in which to install 602 Full PFT Cards or 603 Busy Only PFT Cards. Each 602 card provides power failure transfer for two DID trunks. This allows the System 605 to provide full PFT for up to 16 DID trunks when all eight 602 cards are installed. A 603 Busy Only PFT Card provides four circuits of "busy only" PFT. This allows the System 605 to provide a special busy only function for up to 32 DID trunks when eight 603 cards are installed. The 602 and 603 cards can be used together in any combination in the same cabinet, and are purchased individually for flexibility in configuring the completed system.

1.3 POWERING THE 605 In most cases a Gordon Kapes, Inc. Model 723 Power Supply will be included with the System 605. The 120Vac input/–48Vdc output, UL-listed Model 723 will provide power for the unit.

1.4 601-A COMMON CONTROL CARD DESCRIPTION The 601-A Common Control Card contains circuits to provide the support functions required by the System 605. These include battery charging, +12Vdc generation, incoming power and battery undervoltage sensing, progress tone generation, auxiliary audio input, timing generation, buzzer testing, LED status indicators, fusing, transfer control lines, and overall system control. One 601-A is required for System 605 operation and installs in card slot J9 of the System 605 cabinet. Note that System 605 units with serial number 605-0419 or earlier use the 601 card—not the 601-A card. If you are in doubt about which card to use, contact the factory for details.

1.5 602 FULL PFT CARD DESCRIPTION The 602 Full PFT Card is designed to connect two-wire CO DID trunk lines to selected station telephones in the event of a power failure or system malfunction. Each 602 card supports two DID trunks. Circuitry in the 602 provides for wink or immediate start operation, answer supervision, progress tone control, delay transfer upon return to the normal mode, and status LEDs. The pulse or DTMF address signaling sent by the CO is

absorbed. When the system is in the normal (non-transfer) mode, the 602 connects the two DID trunk lines to a PBX system's DID trunk inputs; PBX extension ports can be routed via the 602 to the PFT station telephones. The 602 card implements a delay transfer function, ensuring that a call in progress will not disconnect when the System 605 returns to the normal mode. The call will remain connected until its completion. The DID trunk will reconnect with the PBX trunk input, and the station telephone will reconnect with the PBX station port only after the call has been completed. In the transfer mode, the 602 alerts the user to an incoming call by activating a low voltage buzzer which is installed with the PFT station telephone using a second pair of wires. Two buzzers with installation kits are provided with each 602 card.

1.6 603 BUSY ONLY PFT CARD DESCRIPTION The 603 Busy Only PFT Card is designed to connect two-wire CO DID trunk lines to backup circuitry that will maintain CO/PBX connections in the event of a power failure or system malfunction. The 603 prevents the CO from "downing" trunks due to loss of loop voltage and correct signaling from the PBX. Each 603 card supports four DID trunks. In the transfer mode, the 603 provides wink or immediate start signaling, then supplies reorder (fast busy) progress tone. Optionally, in place of the reorder tone, an auxiliary audio source can be connected to the 605 and sent out via the DID trunks. The pulse or DTMF address signaling sent by the CO is absorbed. When the system is in the normal mode, the 603 connects the DID trunk lines to the PBX system's DID trunk inputs. PBX extensions and station telephones are not associated with the 603 card. Four LED indicators are provided for installer assistance.

1.7 TRANSFER MODE The System 605 is placed in the transfer mode three ways: loss of the externally-provided –48Vdc, through activation of the transfer control input, or by using the manual transfer switch on the 601-A card. The transfer control input allows a PBX power failure or system failure to place the 605 in the transfer mode. The input can be set to respond to a normally open or normally closed contact. A second input also can be activated to respond to a PBX-generated reoperate contact.

1.8 BATTERIES/BATTERY OPERATION Whenever nominal –48Vdc is provided to the System 605 a battery charger circuit on the 601-A Common Control Card maintains a full charge on the four sealed lead-acid batteries. During battery operation the System 605 will operate for approximately four hours assuming 100-percent traffic on all trunks. Operation in excess of six hours is possible with a lower, more realistic traffic figure. These estimates are made with the assumption that operation commences with the batteries fully charged, and that the batteries have been replaced according to the maintenance instructions. Allowing six hours for the batteries to recharge to a 90-percent level is a safe rule to follow. Actual time required may be substantially less. The 601-A, 602, and 603 cards utilize CMOS integrated circuits and current reduction techniques that minimize power consumption and maximize battery operating time.

1.9 POWER SOURCE The System 605 requires an external source of filtered and regulated –48Vdc, 1.25A maximum, for operation. In most cases a Gordon Kapes, Inc. Model 723 Power Supply will be used. Unless specifically excluded at time of order, a Model 723 is provided with each System 605. If an alternate source of –48Vdc is available at the installation site, it may be used in place of the Model 723. The usual alternate source of –48Vdc is from a battery system associated with a PBX telephone switch.

1.10 OPTIONAL BRIDGED RINGING INTERFACE In the transfer mode, the 602 Full PFT Card alerts users of incoming calls by activating buzzers that have been installed with the PFT station telephones. Some situations may require bridged ringing of the PFT station telephones. A bridged ringing interface is available from Gordon Kapes, Inc. The interface allows the low voltage buzzer signal to control the bridging of an externally provided source of 90Vac ringing voltage onto the PFT station telephone cable pairs. Contact Gordon Kapes, Inc. for details.

1.11 OPTIONAL RECORDED ANNOUNCEMENT INTERCEPT WITH THE 603 CARD In the standard configuration, the 603 Busy Only PFT Cards in the transfer mode provide wink or immediate start signals and reorder (fast busy) progress tone upon trunk seizure by the CO. There may be situations when it is desirable to replace the reorder progress tone with a recorded announcement or other audio signal. The 601-A card allows for connection of an external source of audio to be used in place of the reorder tone. As an example, the external audio source could be a digital message playback system. In this configuration, the 603 cards provide upon CO trunk seizure, wink or immediate start signals and connection of the external source of audio. The 603 card does not supply start or stop signals to the auxiliary audio source. The System 605's auxiliary relay contact can be used to start and stop the auxiliary audio source. The 603's circuits do not pause and wait until the start of the message before connecting the auxiliary audio source to the trunk. Upon the trunk going off-hook, the 603 will immediately connect the audio source to the trunk. This configuration provides a highly cost-effective means of intercepting DID trunks in the event of power failure or system malfunction.

1.12 DIMENSIONS The System 605 cabinet measures 16.25 inches (41.4cm) high, 17.5 inches (44.5cm) wide, 8.25 inches (20.1cm) deep, and weighs 44 pounds (20.0kg) fully loaded. The cabinet wall mounts using four #14 pan head screws. The 601-A, 602, and 603 cards are precision fabricated circuit boards, each measuring 9.5 inches (24.1cm) high, 5.5 inches (14.0cm) wide, 1.5 inches (3.8cm) thick, and weighing approximately 1 pound (0.45kg).

1.13 FCC REGISTRATION NUMBER The FCC Registration Number is EPR5ZC-15167-WP-N. The Ringer Equivalence is 0.0B.

2. Revised System 605

2.1 NEW VERSION This practice covers a revised version of the System 605, and applies to cabinets with serial number 605-00590 and later. The serial number can be located on the right exterior side of the cabinet. The following sections provide a detailed description of the changes that were made.

2.2 NO INTERNAL POWER SUPPLY Previous versions of the System 605 contained a 120Vac input/–48Vdc output power supply that was located inside the cabinet. A power supply external to the cabinet, a Gordon Kapes, Inc. Model 723, is now included with each system. The UL-listed Model 723 is intended to be wall-mounted adjacent to the cabinet.

2.3 REVISED SCREW TERMINAL STRIP With the elimination of the internal power supply, the 5-position screw terminal strip contained on previous versions has been changed to three positions.
2.4 NO AUXILIARY –48VDC OUTPUT Previous versions of the System 605 provided an auxiliary –48Vdc output. This has been eliminated as it was deemed unnecessary for proper installation and operation of the product.

3. Applications
3.1 PRIMARY APPLICATION The primary application for the System 605 is to provide PFT capability for DID trunks associated with a PBX telephone system. Connection of DID calls to dedicated station telephones is implemented with the 602 Full PFT Card. Maintaining CO/PBX connection by returning a reorder progress tone or auxiliary audio source is implemented with the 603 Busy Only PFT Card. The 601-A, 602, and 603 cards are designed exclusively for use in the Gordon Kapes, Inc. System 605 and cannot be installed with any other equipment.
3.2 NON-PFT APPLICATION The System 605 can be used to maintain DID trunk operation during PBX maintenance or a system cut-over by using the manual transfer switch. The unit can function in the transfer mode indefinitely as long as incoming –48Vdc is present.
3.3 INSTALLER-SELECTED APPLICATIONS A normally open (not shorted) relay contact is available for installer-selected applications. The contact closes (shorts) whenever the unit is the transfer mode.
3.4 USING MULTIPLE SYSTEM 605s Multiple System 605s can be connected to provide additional PFT circuits. The transfer control inputs on these systems can be bridged (connected in parallel) to provide simultaneous control by the associated PBX telephone system.

4. Installation
4.1 WORDS OF CAUTION As with any product, installing the System 605 requires a safety first approach.

Warning: Never install telephone wiring during a lightning storm. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations. Never touch non-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Use caution when installing or modifying telephone lines.
4.2 INSTALL ONLY IN RESTRICTED ACCESS AREAS The System 605 is to be installed only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA No. 70.
4.3 CHECKING FOR DAMAGE All System 605 components should be inspected for damage upon receipt. The components are shipped in three separate cartons: one for the cabinet, one for the cards and Model 723 Power Supply, and one for the four batteries. If damage is found, a claim should be filed with the shipper. Replacement items should be ordered if necessary.
4.4 SYSTEM 605 CONNECTIONS All connections to the System 605 are made via a 3-position terminal strip and four 25-pair plugs. These connections are located on the right side of the cabinet. The installer must provide four 25-pair cable mounted connectors (female) to mate with the System 605's plugs.
4.5 MOUNTING THE CABINET The System 605's cabinet is designed to be wall mounted on a plywood backboard. The plywood backboard must be at least ¾-inch thick. Four #14 pan head screws are included for mounting the cabinet to the plywood backboard. Included in the cabinet's shipping carton is a paper mounting template. Use this to locate the optimal position for the mounting screws. Be careful that no internal wiring, i.e. ribbon cables or the battery harness, is pinched during cabinet mounting. Start the installation procedure by removing the front cover. The cabinet cover is removed by loosening (not removing) the four Phillips head screws on the front and sliding the cover up and off.
4.6 INSTALLING THE BATTERIES After the cabinet is securely mounted on the wall, position the four batteries, terminals facing the front, in the tray located at the bottom of the cabinet. Ensure that the battery cable harness and associated slide-on terminals are not blocked by the batteries. The battery terminals **must not** touch any of the metal surfaces or shorting will occur, damaging the batteries and cabinet and endangering the installer.
4.7 CONNECTING THE BATTERY HARNESS The battery harness connects to the batteries using eight slide-on terminals labeled 1 through 8. The connections are made starting with terminal 1 on the left and moving to the right. Terminal 1 connects to the + terminal of the far left battery, terminal 2 connects to the – terminal of the far left battery, etc. An in-line fuse holder is located on the right side of the harness. Prior to making the first connection, carefully inspect the holder and fuse to be certain they are intact. We realize that the terminals can require quite a bit of force to slide over the battery terminals. We apologize for any trouble or sore fingers, but the terminals used are very high quality and must make a firm connection for long operating reliability.
4.8 CONNECTING EARTH GROUND An earth ground must be connected to pin 3 of the terminal strip. The ground wire should be connected to the PBX or related telephone equipment ground. The ground is required for safety and to ensure correct trunk signaling. Using one full pair of standard cross connect wire should be sufficient.
4.9 POWERING THE SYSTEM The System 605 uses nominal –48Vdc for operation. In most cases power will be supplied by a Gordon Kapes, Inc. Model 723 Power Supply. Other sources of nominal –48Vdc can be used to power the System 605. The –48Vdc must be filtered, regulated, and capable of supplying 1.25A maximum.
4.10 SELECTING A MOUNTING LOCATION FOR THE MODEL 723 Because the Model 723 is intended for wall mounting only, you must select a suitable position on the equipment room wall, preferably on a wooden backboard. Two factors come into play as you select the "perfect" mounting: air flow and proximity to an AC outlet. The openings in the cabinet must remain clear to allow adequate ventilation. Also, ensure that the cabinet is not located underneath terminal blocks where small pieces of wire could fall into the unit. Do not install the Model 723 on the bottom of a wiring frame, i.e., the MDF! The Model 723 contains a 6-foot (2-meter), 3-conductor power cord. If possible, select an AC outlet for the Model 723 that originates from the same electrical service as the associated PBX system.

In this way, a PBX power failure will result in the System 605 immediately detecting this condition. Do not connect the Model 723 to the 120Vac outlet at this time.

4.11 MOUNTING THE MODEL 723 Mount the Model 723 using the two screws supplied in the Model 723 installation kit. These screws are intended for use with a wooden-backboard surface (minimum thickness ¾ inch). The Model 723's cabinet is outfitted with two keyhole screw slots. Use one screw per slot and securely fasten the unit to the back-board. Do not plug in the power cord at this time. You will be instructed to do so later in this section.

4.12 MODEL 723 DC OUTPUT CONNECTIONS The DC-output connections are made via a 3-position plug-in terminal strip. The terminal strip is located on the bottom face of the unit, adjacent to the where the power cord exits the chassis. Remove the terminal strip by firmly grasping it with your fingers and pulling it straight away from the cabinet. Once it is removed, a small straight-blade screwdriver is required to loosen the clamp screws. The interconnecting wires are slipped into the openings of the terminal strip, and then the screws are tightened to secure the wires into place. A minimum wire gauge of #20 AWG or larger is recommended. Connecting the Model 723 to the System 605 is very simple. On the Model 723, strap terminals 1 (GND) and 2 (+DC) together and connect that point to terminal 2 (Ground-Power Supply) on the System 605. Then connect terminal 3 (–DC) on the Model 723 to terminal 1 (–48Vdc Input) on the System 605. After the wires are secured into the terminal strip, plug it back into the socket on the Model 723. Ensure that the terminal strip is firmly mated with the socket. The Model 723's line cord can now be plugged into its AC outlet.

4.13 ALTERNATE POWER SOURCE If a source of filtered and regulated –48Vdc, 1.25A is available, it can be connected in place of a Model 723. Connect power supply ground to terminal 2 and –48Vdc to terminal 1. Note that a separate earth ground connection must still be made to terminal 3, even if power supply ground is the same as earth ground.

4.14 INSTALLING AND TERMINATING THE 25-PAIR CONNECTORS Install the four 25-pair cable mounted connectors into plugs P1 through P4 on the right side of the cabinet. Secure the connectors to the plugs using the Velcro hold down straps. Terminate the cables to allow interconnection with your system (e.g. terminate in a "66" type block). Detailed connection information is shown in Figures 1-4, located at the end of this technical practice.

4.15 CONFIGURING THE 601-A COMMON CONTROL CARD Installation of the 601-A should begin only after the previous installation procedures have been completed. At this stage, the System 605 cabinet should be wall mounted, batteries installed and wired, and power and earth ground connected. The last five pairs of plug P1 are associated with 601-A functions, specifically the transfer control lines, auxiliary audio input, and auxiliary relay contact. The following paragraphs discuss connections to these functions. Then you will be directed to set the 601-A's configuration switches. The 601-A card MUST NOT be inserted into the system until the configuration switches have been set.

4.16 USING THE TRANSFER CONTROL LINES The 605 has two transfer control lines: contact input and re-op input. These inputs are designed to be connected to status signals on an associated PBX system. The PBX documentation may refer to these points as "bypass enable," "transfer request," "system status," etc. The status signals can be in the form of isolated contacts or closures to ground. Using the transfer control inputs is really quite easy. Start by determining what type of contact(s) the PBX provides and then connect the signal(s) to the 605's input(s). Later, the 601-A's mode select switch will be set to the appropriate position.

4.17 CONNECTING TO THE TRANSFER CONTROL INPUTS Using the PBX documentation, identify the status signals provided by the PBX. Most PBX systems provide some sort of signal for use in controlling external equipment such as PFT units. Follow the connection information for the desired mode of operation: NO, NC, or NC W/RE-OP.

NO Mode: If you have selected the normally open mode of operation, follow this section when connecting the 605 to the PBX.

Isolated Contact: If your PBX provides an isolated, normally open (not shorted) contact, connect its leads to the Violet/Green pair of P1. An isolated contact provides two leads, neither of which is connected to ground.

Closure to Ground: If your PBX provides a normally open (not shorted) contact that closes to ground, connect the contact to the Green/Violet wire of P1. If the PBX provides an associated ground lead connect it to the Violet/Green wire of P1. If the PBX does not provide a ground lead associated with the contact closure, do not connect anything to the Violet/Green wire of P1.

NC Mode: If you have selected the normally closed mode of operation, follow this section when connecting the 605 to the PBX.

Isolated Contact: If your PBX provides an isolated, normally closed (shorted) contact, connect its leads to the Violet/Green pair of P1. An isolated contact provides two leads, neither of which is connected to ground.

Closure to Ground: If your PBX provides a normally closed (shorted) contact that is closed to ground, connect the contact to the Green/Violet wire of P1. If the PBX provides an associated ground lead connect it to the Violet/Green wire of P1. If the PBX does not provide a ground lead associated with the contact closure, do not connect anything to the Violet/Green wire of P1.

NC W/RE-OP Mode: If you have selected the normally closed with reoperate mode of operation, follow this section when connecting the 605 to the PBX.

Isolated Contact: If your PBX provides an isolated, normally closed (shorted) contact, connect its leads to the Violet/Green pair of P1. If your PBX provides an isolated, normally open (not shorted) reoperate contact, connect its leads to the Violet/Orange pair of P1. An isolated contact provides two leads, neither of which is connected to ground.

Closure to Ground: If your PBX provides a normally closed (shorted) contact that is closed to ground, connect the contact to the Green/Violet wire of P1. If the PBX provides an associated ground lead, connect it to the Violet/Green wire of P1. If the PBX does not provide a ground lead associated with the contact closure, do not connect anything to the Violet/Green wire of P1. If your PBX provides a normally open (not shorted) reoperate contact that closes to ground, connect the contact to

the Orange/Violet wire of P1. If the PBX provides an associated ground lead, connect it to the Violet/Orange wire of P1. If the PBX does not provide a ground lead associated with the contact closure, do not connect anything to the Violet/Orange wire of P1.

4.18 MULTIPLE SYSTEM 605s Additional 605 units can be installed together to provide additional circuits of PFT. The transfer control lines are designed to be connected in tandem. The following paragraphs detail the various installation scenarios.

NO or NC Modes: The Contact Input connections of a virtually unlimited number of 605 units can be bridged together (connected in parallel). Connect the first 605 to the PBX as per the instructions in the previous section for the NO or NC mode of operation. Connect the Violet/Green pair of P1 of the first unit to the Violet/Green pair of P1 on the additional 605s. Be certain that the polarity of the connections is maintained.

NC W/RE-OP Mode: The contact input and re-op input connections of a virtually unlimited number of 605 units can be bridged together (connected in parallel). Connect the first 605 to the PBX as per the instructions in the previous section for NC W/RE-OP operation. Connect the Violet/ Green pair of P1 on the first unit to the Violet/Green pair of P1 on the additional 605s. Connect the Violet/Orange pair of P1 on the first unit to the Violet/Orange pair of P1 on the additional 605s. Be sure that the polarity of the connections is maintained.

4.19 MODE SWITCH—601-A CARD The 601-A contains a 3-position slide switch, labeled MODE SELECT, which is used to select which transfer control lines are active and how the 605 will respond. The switch is located in the upper front corner of the card. The three positions are labeled NO, NC, and NC W/RE-OP.

Note: If no signals are to be connected to the transfer control lines, set the mode switch to the NO position. Setting the mode switch to any other position, without connecting the appropriate input signals, may cause the 605 to stay "locked" in the transfer mode.

NO Mode: Setting the mode switch to the NO position places the 605 in the normally open contact mode of operation. In this mode, the contact input is intended to be connected to a normally open (not shorted) contact that closes (shorts) when transfer is requested. The 605 will immediately return to the normal, non-transfer mode once the contact opens; each individual circuit on a 602 Full PFT Card will remain in the transfer mode until a call in progress has been completed. This type of contact is provided by many PBX systems, including the ROLM CBX and 9751, Siemens Saturn, and Northern Telecom SL-1 series. In this mode, the re-op input is not utilized and a signal connected to this input is not recognized.

NC Mode: Setting the mode switch to the NC position places the 605 in the normally closed contact mode of operation. In this mode, the contact input is intended to be connected to a normally closed (shorted) contact that opens when transfer is requested. The 605 will immediately return to the normal mode once the contact again closes; each individual circuit on a 602 Full PFT Card will remain in the transfer mode until a call in progress has been completed. This type of contact is provided by some PBX systems from AT&T. In this mode, the re-op input is not utilized and a signal connected to this input is not recognized.

NC W/RE-OP Mode: Setting the mode switch to the NC W/RE-OP position places the 605 in the normally closed with reoperate mode of operation. In this mode, the contact input is intended to be connected to a normally closed (shorted) contact that opens when transfer is requested. The re-op input is intended to be connected to a normally open (not shorted) contact that momentarily closes (shorts) when the PBX system has successfully reset after "downing" due to a power failure or system malfunction. These contacts are provided by some systems from AT&T.

Operation in the NC W/RE-OP mode is a little tricky. When the PBX is operating correctly, the contact input is closed (shorted); the re-op input is open (not shorted). When the PBX system requests a transfer, the contact input opens and the 605 enters the transfer mode. The PBX system closes the contact input when returning to partial operation. The 605 recognizes this change, but holds in the transfer mode and awaits a closure on the re-op input. After the PBX has reset and is operating correctly, it sends a momentary closure to the re-op input. This signal then "latches" the 605 into the normal mode; each individual circuit on a 602 Full PFT Card will remain in the transfer mode until a call in progress has been completed. This two-step process is a little confusing but hey, we didn't design it!

4.20 AUXILIARY RELAY CONTACT The 605 provides an auxiliary relay contact for use in installer-selected applications. It is accessible via the Violet/Slate pair of P1. This relay contact is normally open (not shorted) and closes (shorts) whenever the 605 is in the transfer mode.

4.21 SELECTION OF REORDER PROGRESS TONE OR AUXILIARY AUDIO A 2-position switch, labeled SOURCE, on the 601-A card selects whether the internally generated reorder progress tone or the auxiliary audio input signal will be sent to the eight card slots. The switch is located to the rear of the BATTERY OPERATION LED indicator light. In most cases, the switch should be set to the REORDER position. Certain installations may benefit from the auxiliary audio input, which is active when the switch is set to the AUX position. The auxiliary audio input allows an externally generated audio signal to be sent to the card slots. This configuration is intended for use with a System 605 installed with 603 cards only. An example of an auxiliary audio source would be a digital announcement system. The auxiliary audio input signal should be connected to the Violet/Blue pair of P1. The auxiliary audio input is transformer coupled, 10K ohms impedance. Virtually any line level audio source will work correctly; low or high impedance, balanced or unbalanced. The 601-A circuitry was designed so that an audio level of 0dBm (0.775Vrms) will result in the correct level on the DID trunks. The 601-A contains an input level trim adjustment control, which can be adjusted to give an optimal listening level. The control, labeled AUX LEVEL, is located adjacent to the buzzer test switch. The control should be adjusted when the system is in the transfer mode, while the audio level on one of the DID trunks associated with a 603 card is being monitored for audio level.

The auxiliary audio source must be continuous in nature, as the System 605 does not provide special start and stop signals. The auxiliary audio source can be started and stopped using the relay contact, which closes any time the unit is in the transfer mode.

4.22 INSTALLING THE 601-A CARD IN THE CABINET The 601-A's switch (labeled "MAIN POWER") is located on the bottom front edge of the card and must be set to the off (down) position before inserting or removing any cards, including the 601-A. Ensure that the manual transfer switch is in the normal (down) position and that the buzzer test switch is in the off (down) position. Previously the mode select and source switches should have been set to the desired position.

Beware: Failure to have the main power switch in the off (down) position can cause serious damage.

After placing the main power switch in the off (down) position, insert the 601-A into card slot J9. The card should be seated firmly in the mating connector.

4.23 PREPARATION FOR INSTALLATION OF 602 AND/OR 603 CARDS Eight card slots, J1 through J8, are available for 602 and/or 603 cards. Installation of the 602 and/or 603 cards should begin only after the initial System 605 installation procedure has been completed. The System 605 cabinet should have been wall mounted; batteries installed and wired; power and earth ground connected; 25-pair cables terminated; transfer control lines, audio source, and relay contact connected; and 601-A Common Control Card configured and installed.

4.24 CROSS CONNECTIONS FOR 602 CARDS Before inserting the 602 cards, cross connect the CO DID trunks, PBX DID trunk inputs, PBX extension outputs, station telephones, and station telephone buzzer wire pairs. Refer to Figures 1-4 for detailed connection information.

4.25 INSTALLING BUZZER IN PFT STATION TELEPHONES A buzzer kit is included in each 602 shipping carton. Each kit contains two low-voltage buzzers, double stick tape, two "DID PFT Telephone" stickers, and four spade tip connectors (Dracon Part No. 18050). Install the buzzers in the station telephones, using the spade tip connectors to mate the buzzer's spade lugs to the lugs associated with the second pair of wires from the telephone's modular jack. The buzzer's red or orange wire is positive, the white wire is negative. Ensure that the correct buzzer wiring polarity is maintained all the way back to the 605. The buzzer is polarity sensitive and will not operate with a reversed positive and negative lead.

4.26 INSTALLING 602 CARDS IN THE 605 CABINET The main power switch on the 601-A card must be in the off (down) position before inserting or removing any cards. After placing the switch in the off position, insert the 602 cards into the selected card slots. Observe the up arrow on the top of the 602. The card should be seated firmly in the mating connector.

4.27 SETTING 602 CARDS FOR WINK OR IMMEDIATE START Each 602 card contains one configuration switch, which must be set for the type of DID trunk being interfaced. Set it to the wink (up) position for wink start trunks, and to the immediate (down) position for immediate start trunks.

4.28 CROSS CONNECTIONS FOR 603 CARDS Before inserting the 603 cards, cross connect the CO DID trunks and PBX DID trunk inputs. Refer to Figures 1-4 for detailed connection information.

4.29 INSTALLING 603 CARDS IN THE CABINET The main power switch on the 601-A card must be in the off (down) position before inserting or removing any cards. After placing the switch in the off position, insert the 603 cards into the selected card slots. Observe the up arrow on the top of the 603. The card should be seated firmly in the mating connector.

4.30 SETTING 603 CARDS FOR WINK OR IMMEDIATE START Each 603 card contains one configuration switch, which must be set for the type of DID trunk being used. Set it to the wink (up) position for wink start trunks, and to the immediate (down) position for immediate start trunks.

5. Testing and Operation

Testing and operation should commence only after System 605 installation has been completed.

5.1 BATTERY CHARGE The batteries shipped from the factory will, in most cases, contain an amount of charge sufficient for initial testing. Before being considered capable of performing to its rated PFT operating time, the System 605 should be allowed to operate in the normal mode for at least six hours. This allows the batteries to come up to a 90-percent charge level, even if they start in a deep discharge condition.

5.2 TESTING THE SYSTEM 605 System testing should only be performed when interruption of DID service to the associated PBX telephone system is permissible, i.e., at night or on weekends. The following tests may cause CO DID trunks connected to the 605 to be "downed." This might occur if connections have to be corrected or changed.

5.3 SYSTEM SWITCHES, LED INDICATORS, AND POTENTIOMETERS The 601-A contains five switches, three LED indicator lights, and five trim potentiometers.

Switches: The five 601-A switches are labeled MODE SELECT, SOURCE, MAIN POWER, MANUAL TRANSFER, and BUZZER TEST. The mode select and source switches were set to the desired position during the installation procedure. The mode select switch determines how the 601-A will respond to signals connected to the transfer control inputs. The source switch selects if the internal reorder progress tone or the auxiliary audio source will be sent to the card slots. The remaining three switches are used during testing and maintenance. The main power switch controls power to the entire system. In the off (down) position, the incoming –48Vdc and the four 12V batteries are disconnected. Only when the main power switch is in the off (down) position should cards be inserted or removed. The manual transfer switch allows the system to be placed in the transfer mode for testing and maintenance. In the manual transfer mode, the system will only run from the internal batteries if –48Vdc is not provided to the system. The buzzer test switch activates all buzzers associated with 602 cards. These buzzers have been previously installed in the PFT station telephone. The system does not need to be in the transfer mode for the buzzer test switch to be used. This allows testing and maintenance of the buzzers while the system is in the normal mode.

LED Indicator Lights: The three LEDs are labeled MAIN POWER, TRANSFER, and BATTERY OPERATION. The main power LED is lit when the main power switch is in the on position and –48Vdc is provided to the system. The transfer LED is lit whenever the system is in the transfer mode. The battery operation LED is lit whenever the system is in the transfer mode and system power is being provided by the internal batteries.

Trim Potentiometers: The 601-A contains five trim potentiometers ("trim pots"—variable resistors intended for infrequent adjustment only). Only one is intended for field adjustment and is labeled AUX LEVEL. It is active only when the source switch is in the aux position. The aux level potentiometer is used by the installer to provide the desired auxiliary audio level to the DID trunks. The remaining four potentiometers are factory set and sealed and must not be touched. They set the frequency of the progress tones and the battery charging voltage.

5.4 EXPLANATION OF OPERATING MODES The System 605 operates in two modes: normal and transfer.

Normal Mode: Normal mode operation commences when –48Vdc is applied, the main power switch is in the on (up) position, the manual transfer switch in the normal (down) position, and the transfer control lines are in their non-transfer state. Only the main power LED is lit in the normal mode.

Transfer Mode: Transfer mode is entered due to any one of three reasons: loss of –48Vdc to the System 605, a transfer request via the contact input transfer control line, or the manual transfer switch being place in the transfer (up) position. When the System 605 loses incoming –48Vdc, the transfer mode is entered and the transfer and battery operation LEDs light. When the transfer mode is entered due to a request via the contact input transfer control line, or when the manual transfer switch is in the transfer position, the transfer LED will light. The main power LED will remain lit.

5.5 INITIAL OPERATION Bring the System 605 to the normal, non-transfer mode by placing the manual transfer switch to the normal (down) position. Only the main power LED should light. If it is not lit, check that the source of –48Vdc is correctly connected. If the main power LED is lit, but the transfer LED is also lit, check for the following conditions: the manual transfer switch should be in the down position; the mode select switch could be set to the wrong position; or the transfer control inputs are incorrectly connected. A careful review should lead you to the problem and a simple solution.

5.6 TESTING THE BUZZERS If your installation uses 602 Full PFT Cards, now is the time to test the buzzers that have been installed in the PFT station telephones. Place the buzzer test switch in the up position. All buzzers should now be happily buzzing in their normal one second on, three seconds off sequence. You must physically go to all of the PFT station telephones and listen for correct buzzer operation. The most common cause of a buzzer not operating is a polarity reversal on the buzzer wiring. Once correct buzzer operation has been confirmed, place the buzzer test switch in the off (down) position.

5.7 TESTING 602 CARD OPERATION Use the manual transfer switch to place the system in the transfer mode. The main power and transfer LEDs should light. Test 602 card operation by connecting a lineperson's handset to the CO DID trunk side of the first circuit (COT on Figures 1-4). Going off-hook will cause a wink if the card is set for wink start, activate the station telephone buzzer, light the associated trunk status LED, and return audible ring progress tone to the CO DID trunk side. Upon station telephone answer the associated station status LED will light, CO DID trunk battery should reverse, and the talk path should complete. Upon disconnect by either party, the CO DID trunk side should reverse battery and reset for the next call. If the station telephone is left off-hook, an off-hook on the CO DID trunk side will cause a wink if set for wink start and return reorder progress tone. All 602 circuits should be tested in this manner. Return the system to the normal mode by placing the manual transfer switch in the normal (down) position.

5.8 TESTING 603 CARD OPERATION Use the manual transfer switch to place the system in the transfer mode. The main power and transfer LEDs should light. Test 603 card operation by connecting a lineperson's handset to the CO DID trunk side of the first circuit (COT on Figures 1-4). Going off-hook will cause a wink if the card is set for wink start, return reorder progress tone or the auxiliary audio signal, and light the associated trunk status LED. Upon going back on hook, the progress tone should stop and the circuit should reset for the next call. All 603 circuits should be tested in this manner. Return the system to the normal mode by placing the manual transfer switch in the normal (down) position.

5.9 TESTING THE TRANSFER CONTROL INPUTS In the following sections we will be testing the transfer control inputs. It is extremely important that the System 605(s) that have been installed follow the operating status of the associated PBX system. The transfer control inputs can be the trickiest to get working correctly. Please contact Gordon Kapes, Inc. technical support if any questions arise.

5.10 TESTING THE NORMALLY OPEN MODE In this section, we will test the System 605 in an installation where the mode switch has been set to the NO position. This is the case where the PBX provides a normally open (not shorted) contact that closes when transfer is requested.

Initial Operation: At this stage, the System 605 should be in the normal mode, with only the main power LED lit. If the transfer LED is also lit, determine whether or not this is a problem. There are two reasons for the transfer mode being enabled. The first reason is legitimate: the contact input is closed (shorted), giving a command to transfer. This could be the case where a new PBX has not yet been brought up to its operating state; it is legitimately giving a command to transfer. The second reason is that the manual transfer switch is activated. Ensure that it is in the normal (down) position. After performing a review and making any required changes, the system should be in the normal mode. Only the main power LED should be lit.

Testing Transfer Operation: Momentarily disconnect the –48Vdc power source from the System 605. In most cases this will entail unplugging the Model 723 Power Supply's line cord from the 120Vac outlet. The main power LED should go out and the transfer and battery operation LEDs should light. Again apply –48Vdc. The transfer and battery operation LEDs should go out and the main power LED should light. Short the contact input at the source of the contact, e.g., at the PBX. The transfer LED should light; the main power LED should remain lit. Remove the short and the transfer LED should go out.

5.11 TESTING THE NORMALLY CLOSED MODE In this section we will test the System 605 in an installation where the mode switch has been set to the NC position. This is the case where the PBX provides a normally closed (shorted) contact that opens when transfer should take place.

Initial Operation: At this stage, the System 605 should be in the normal mode, with only the main power LED lit. If the

transfer LED is also lit, determine whether or not this is a problem. There are two reasons for the transfer mode being enabled. The first reason is legitimate: the contact input is open (not shorted), giving a command to transfer. This could be the case where a new PBX has not yet been brought up to its operating state; it is legitimately giving a command to transfer. The second reason is that the manual transfer switch is in the transfer position. Ensure that it is in the normal (down) position. After performing a review and making any required changes, the system should be in the normal mode. Only the main power LED should be lit.

Testing Transfer Operation: Momentarily disconnect the –48Vdc power source from the System 605. In most cases, this will entail unplugging the Model 723 Power Supply's line cord from the 120Vac outlet. The main power LED should go out and the transfer and battery operation LEDs should light. Again apply –48Vdc. The transfer and battery operation LEDs should go out and the main power LED should light. Open the closure connected to the contact input at the source of the closure, e.g., at the PBX. The transfer LED should light; the main power LED should remain lit. Reconnect the closure and the transfer LED should go out.

5.12 TESTING THE NORMALLY CLOSED WITH REOPERATE MODE In this section we will test the System 605 in an installation where the mode switch has been set to the NC W/ RE-OP position. This is the case where the PBX is providing a normally closed (shorted) contact that opens when transfer is requested, and a second contact that momentarily closes upon system reset or system ready.

Initial Operation: At this stage, the System 605 should be in the normal mode, with only the main power LED lit. If the transfer LED is also lit, determine whether or not this is a problem. There are three reasons for the System 605 being in the transfer mode. The first reason is legitimate: the contact input is open (not shorted), giving a command to transfer. This could be the case where a new PBX has not yet been brought up to its operating state; it is legitimately giving a command to transfer. The second reason involves the re-op input. Even if the contact input is presented with a closure, until the re-op input momentarily closes (shorts), the System 605 will stay in the transfer mode. To change from the transfer mode to the normal mode either momentarily short the contact connected to the re-op input, or move the mode select switch to the NC position and then immediately back to the NC W/RE-OP position. A third reason is that the manual transfer is in the transfer position. Ensure that it is in the normal position. After performing a review and making any required changes, the unit should be in the normal mode. Only the main power LED should be lit.

Testing Transfer Operation: Momentarily disconnect the –48Vdc power source from the System 605. In most cases, this will entail unplugging the Model 723 Power Supply's line cord from the 120Vac outlet. The main power LED should go out and the transfer and battery operation LEDs should light. Again apply –48Vdc. The main power LED should light, while the transfer LED should remain lit. The battery operation LED should go out. The System 605 has remained in the transfer mode, awaiting a momentary closure on the re-op input. Momentarily short the contact connected to the re-op input. The transfer LED should go out and the main power LED should remain lit. Open the closure connected to the contact input at the source of the closure, e.g., at the PBX. The transfer LED should light; the main power LED should remain lit. Reconnect the closure. Both LEDs will remain lit. Again, the System 605 is awaiting a closure on the re-op input. Momentarily short the contact connected to the re-op input. The transfer LED should go out and the main power LED should remain lit.

5.13 TRANSFER CONTROL INPUTS—MULTIPLE SYSTEM 605s Use the following paragraphs to test an installation where multiple System 605s have been installed.

NO Mode: Place all the System 605s in the normal mode; only the main power LEDs should be lit. On the first System 605, place the manual transfer switch in transfer (up) position. The transfer LED on this unit should light. Return the manual transfer switch to the normal (down) position. The transfer LED should stop lighting. Repeat this sequence for all the System 605s. Previously, the contact input on each of the System 605s should have been connected, and then connected to a normally open contact. Short the contact at the source of the contact, e.g., at the PBX. The transfer LED on each of the System 605s should light; the main power LEDs will remain lit. Remove the short and the transfer LEDs should go out.

NC Mode: Place all System 605s in the normal mode; only the main power LEDs should be lit. On the first System 605, place the manual transfer switch in transfer (up) position. The transfer LED on this unit should light. Return the manual transfer switch to the normal (down) position. The transfer LED should stop lighting. Repeat this sequence for all the System 605s. Previously, the contact input on all the System 605s should have been connected, and then connected to a normally closed contact. Disconnect the closure at its source, e.g., at the PBX. The transfer LED on each of the System 605s should light; the main power LEDs will remain lit. Reconnect the closure and the transfer LEDs should stop lighting.

NC W/RE-OP Mode: Place all System 605s in the normal mode; only the power LEDs should be lit. On the first System 605, place the manual transfer switch in transfer (up) position. The transfer LED on this unit should light. Return the manual transfer switch to the normal (down) position. The transfer LED should stop lighting. Repeat this sequence for all the System 605s. Previously, the contact input on all the System 605s should have been connected together, and then connected to a normally closed contact. Disconnect the closure at its source, e.g., at the PBX. The transfer LED on each of the System 605s should light; the main power LEDs will remain lit. Reconnect the closure. Both the main power and transfer LEDs will remain lit on all units. The System 605s are awaiting a closure on their re-op input. Previously, the re-op input on all the System 605s should have been connected together, and then connected to a normally open contact. Momentarily short the contact at the source of the contact, e.g., at the PBX. All System 605s should return to the normal mode; only the main power LEDs should be lit.

5.14 SYSTEM OPERATION System 605 operation commences when –48Vdc power is applied and the main power switch is in the on (up) position. Only the main power LED should be lit. The buzzer test switch should be in the off (down) position. The front cover should be attached

and secured to prevent tampering and protect system components.

6. Circuit Description

6.1 GENERAL The circuit description is intended to familiarize you with the System 605 for engineering and applications use.

6.2 CIRCUIT DESCRIPTION—601-A COMMON CONTROL CARD The 601-A contains circuitry to provide all the system functions for the System 605. All adjustments to the 601-A, with the exception of the auxiliary audio input level trim potentiometer, are factory made and must not be altered in the field.

Switch Mode Power Supplies: The 601-A contains two switch mode power supplies: one exclusively for battery charging, the other for generation of +12Vdc and "trickle" charging the batteries. The System 605 employs four 12V sealed lead-acid batteries which are connected in series, providing a nominal voltage of –48Vdc with respect to ground. For optimal performance and long life, the batteries are charged by two separate circuits. One provides a rapid charge, the other provides a long term "float" charge. The first power supply acts as the rapid charger, converting the nominal –48Vdc input to 55.2Vdc, current limited to 700mA. It will recharge an exhausted battery stack to a minimum of 90 percent of full charge in six hours. The second power supply produces +12Vdc for use by the system and cards, and, when not in the battery-operated transfer mode, a low current, high voltage trickle charge source. The trickle charger maintains the batteries in tip-top condition over the long periods of battery inactivity. The second supply gets its incoming power from two sources: the nominal –48Vdc input whenever it is present, or from the batteries when the system is in the battery-operated transfer mode.

Main Power Switch: The main power switch is used to control all power to the system. The switch is a two-pole type. One pole controls the negative lead from the –48Vdc battery stack. The other pole controls the incoming –48Vdc. The main power switch must be in the off position when installing or removing any cards or batteries.

Fusing: The 605 uses two fuses to provide protection for the system and related personnel. A fuse is located in the right side of the battery harness. This fuse prevents an incorrectly installed battery harness from causing a wiring "meltdown." The 601-A card contains two fuses. One fuse is in series with the incoming –48Vdc, protecting the 601-A and the –48Vdc source from over current damage. A second fuse protects the auxiliary –48Vdc output, which is no longer accessible to the installer.

Undervoltage Sensing: The System 605 utilizes two undervoltage detection circuits, one for the batteries and one for incoming power. Under battery powered transfer operation, the battery voltage is monitored. When the batteries have discharged such that their voltage drops below –41.5Vdc, the system disconnects them via a relay contact. This shuts down the system and protects the batteries from further, potentially damaging, discharge. The bulk of the usable energy has been delivered and the batteries must be protected for another day! Only when incoming power is again supplied to the system will the batteries again connect to the 601-A's circuitry. Incoming nominal –48Vdc power is monitored and is considered valid if it is more negative than –39Vdc. This is implemented specifically for installations that supply –48Vdc to the System 605 from a battery plant associated with a PBX system. If this "–48Vdc" starts to "droop" (rather than a full drop out) due to discharge of its own batteries, the System 605 must know when to enter the transfer mode. Since the System 605's valid nominal –48Vdc input range is –42Vdc to –56Vdc, a threshold of –39Vdc was selected to be a reliable indication that the PBX's battery system is on its way to "crashing."

LED Status Indicators: Three LED status indicators are located on the front edge of the 601-A card. The main power LED displays the status of the incoming –48Vdc. The main power LED lights only when the main power switch is in the on (up) position and the incoming voltage is more negative than –39Vdc. The transfer LED lights whenever the transfer control inputs, the manual transfer switch, or loss of incoming nominal –48Vdc has placed the 605 in the transfer mode. The battery operation LED lights when the 605 is in the transfer mode and is being powered by the internal batteries. Once the batteries have discharged to less negative than –41.5Vdc, all system operation will cease and the battery operation LED will go out.

Transfer Control Inputs: The 601-A provides contact and re-op transfer control inputs. Circuits implemented using resistors and sections of integrated circuit comparator provide a rugged interface between the 601-A and the cruel outside world. Another section of comparator, along with discreet components and a multi-pole switch, allows selection of the different operating modes.

Control Signals: The 601-A produces several control signals which are used by the 602 and 603 cards. A 30Hz master clock signal provides a reference for all timing funct-ions. A one second logic high, three seconds low clock serves as the buzzer enable signal. When the buzzer test switch is in the test position, a logic high signal is sent to all card slots. The buzzer test switch activates all buzzers in-stalled in PFT station telephones associated with 602 cards.

Progress Tones: Three sine wave generator circuits produce 440Hz, 480Hz, and 620Hz. Audible ring progress tone is produced by combining 440Hz and 480Hz, interrupted at a rate of one second on, three seconds off, continuous. Reorder tone is produced by combining 480Hz with 620Hz, interrupted 120 times per minute, 50 percent duty cycle, continuous.

Auxiliary Audio Input: A switch on the 601-A allows an auxiliary audio input to be sent to the 602 and 603 cards in place of reorder progress tone. The auxiliary audio enters the 601-A via a 10K ohm coupling transformer. A level trim potentiometer (level adjust control) on the transformer's secondary allows the installer to adjust the signal to the desired level.

6.3 CIRCUIT DESCRIPTION—602 FULL PFT CARD The 602 contains two identical circuits to provide full DID PFT for two trunks.

Power: +12Vdc and –48Vdc is provided by the 601-A. The +12Vdc powers all logic and analog circuitry, all of which utilize CMOS technology for low power consumption. The –48Vdc powers the transfer and wink/answer supervision relays, as well as providing CO trunk and station telephone interface loop current.

Control Signals: The 601-A provides a number of control signals, including 30Hz master clock, buzzer enable, buzzer test, audible ring and reorder progress tones, and transfer status.

Normal Operation: When the System 605 is in the normal, non-transfer mode, –48Vdc is present on the transfer status bus. Circuitry detects this state and causes the transfer relays to energize. These relays connect the CO DID trunks to the PBX trunk inputs, and the PBX extension outputs to the station telephones. Note that a circuit's transfer relay will only energize if its associated CO trunk is in the on-hook state during the transition from the transfer mode to the normal mode. This function, called delay transfer, maintains a circuit in the transfer mode until the call has been completed, preventing active calls from being disconnected.

Transfer Operation: In the transfer mode, the transfer status bus goes to 0Vdc, de-energizing the transfer relays. This causes the CO DID trunks and the station telephones to disconnect from the PBX and connect to the 602's CO and station interface circuits.

Central Office Trunk Interface: A conventional battery feed circuit with a split primary, 600 ohm to 600 ohm transformer is used. Two power resistors couple –48Vdc and ground to the transformer center taps via two relay contacts, and then via the transformer windings to the tip and ring leads. The relay contacts provide wink and answer supervision to the CO. An optocoupler, in series with the tip lead, is used by the logic circuitry to detect trunk off-hook status. The secondary of the transformers connects, via relay contacts, to the progress tone driver circuit and the secondary of the station telephone interface. Zener diodes provide protection from excessive signal levels and trunk voltage surges.

Station Telephone Interface: A conventional battery feed circuit with a split primary, 600 ohm to 600 ohm transformer is used. Two power resistors couple –48Vdc and ground to the transformer center taps, and then via the transformer windings to the tip and ring leads. An optocoupler, in series with the tip lead, is used by the logic circuitry to detect trunk off-hook status. The secondary of the transformers connects, via a relay contact, to the secondary of the station telephone interface.

Logic Circuitry: 4000-series logic circuitry implements all timing and control function.

Buzzer Output: The buzzer output signal is nominally +10Vdc with an interrupt sequence of one second on, three seconds off. The current is limited to ensure that a shorted buzzer cable pair will not damage the 602. The buzzer test switch on the 601-A makes the buzzer test bus go into the active state. The 602 senses this condition and activates both buzzer outputs. The one second on, three seconds off interrupt sequence is maintained during buzzer testing.

6.4 CIRCUIT DESCRIPTION—603 BUSY ONLY PFT CARD

The 603 contains four identical circuits to provide "busy only" PFT for four DID trunks.

Power: +12Vdc and –48Vdc is provided by the 601-A. The +12Vdc powers all logic and analog circuitry, all of which utilize CMOS technology for low power consumption. The –48Vdc powers the transfer and wink relays, as well as providing CO trunk interface loop current.

Control Signals: The 601-A provides a number of control signals, including 30Hz master clock, audible ring and reorder progress tones, and transfer status. Note that the 601-A can be configured to send auxiliary audio in place of the reorder progress tone.

Normal Operation: When the System 605 is in the normal, non-transfer mode, –48Vdc is present on the transfer status bus. Circuitry detects this state and causes the transfer relays to energize. These relays connect the CO DID trunks to the PBX trunk inputs.

Transfer Operation: In the transfer mode, the transfer status bus goes to 0Vdc, de-energizing the transfer relays. This causes the CO DID trunks to disconnect from the PBX, and to connect to the 603's trunk interface circuits.

Central Office Trunk Interface: A conventional battery feed circuit with a split primary, 600 ohm to 600 ohm transformer is used. Two power resistors couple –48Vdc and ground to the transformer center taps via two relay contacts, and then via the transformer windings to the tip and ring leads. The relay contacts provide wink signalling to the CO. An optocoupler, in series with the tip lead, is used by the logic circuitry to detect trunk off-hook status. The secondary of the transformers connects to the progress tone driver circuit. Zener diodes provide protection from excessive signal levels and trunk voltage surges.

Logic Circuitry: 4000-series logic circuitry implements all timing and control function.

7. Specifications

7.1 SPECIFICATIONS—GENERAL

RELIABILITY
MTBF 605 less 601-A card 68.0 years, 605 with 601-A card 35.2 years, per Method I of Bellcore TR-NWT-000332, Issue 3, September 1990

ENVIRONMENT
0 to 50 degrees C, humidity to 95% (no condensation)

RADIATED NOISE COMPLIANCE
Complies with the requirements in Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

BATTERY OPERATING TIME
The System 605 will operate under internal battery power for approximately four hours, under the assumption of 100 percent trunk traffic, and starting with fully charged batteries

POWER REQUIREMENT
–42.5 to –56Vdc, 1.25A maximum, filtered and regulated

CONNECTIONS
Four 25-pair male plugs (requires four 25-pair connectors supplied by the installer)
One 3-position screw terminal strip

FUSING—BATTERY HARNESS
One 2.5A, 3AG Slow-Blow, Littelfuse type 313 or equivalent, field replaceable. Replace only with same type and rating of fuse.

DIMENSIONS
16.25 inches high (41.3cm)
17.50 inches wide (44.4cm)
8.25 inches deep (21.0cm)

WEIGHT (FULLY LOADED)
44.0 pounds (20.0kg)

MOUNTING
Wall mounted, using four screws, to minimum ¾-inch thick plywood backboard

7.2 SPECIFICATIONS—BATTERIES

QUANTITY
4

TYPE
Sealed lead-acid, Panasonic LCR12V6.5P, 12 volt, 6.5 amp-hour. Replace batteries **only** with this exact type.

BATTERY DIMENSIONS
5.94 inches long (15.1cm)
2.56 inches wide (6.5cm)
3.94 inches high (10.0cm)

WEIGHT PER BATTERY
5.2 pounds (2.35kg)

7.3 SPECIFICATIONS—601-A COMMON CONTROL CARD

RELIABILITY
MTBF 32.8 years, per Method I of Bellcore TR-NWT-000332, Issue 3, September 1990

FUSING
One 2.5A, 3AG, Slow-Blow, Littelfuse type 313 or equivalent, field replaceable. Replace only with same type and rating of fuse.
One 0.25A, 3AG, Fast-Acting, Littelfuse type 312 or equivalent, field replaceable. Replace only with same type and rating of fuse.

NORMALLY OPEN RELAY CONTACT
1A maximum at 30Vdc or 100Vac (resistive)

TRANSFER CONTROL INPUTS
CONTACT INPUT
The contact connected to the contact input must be capable of handling 1.5mA at –56Vdc. Contact inputs on multiple System 605s can be bridged (connected in parallel).

RE-OP INPUT
The contact connected to the re-op input must be capable of handling 1.5mA at –56Vdc. Re-op inputs on multiple System 605s can be bridged (connected in parallel).

AUXILIARY AUDIO INPUT
Type: 10K ohm, balanced, transformer coupled
Level: 0dBu (0.775Vrms), nominal, adjustable
Level Control Adjustment Range: ±10dB

PROGRESS TONES
Complies with industry standard audible tone plan
Audible Ring: 440Hz + 480Hz, one second on, three seconds off, continuous
Reorder: 480Hz + 620Hz, 120 interruptions per minute, continuous

BATTERY CHARGING
Type: dual, constant voltage with high voltage/high frequency trickle
Charger Voltage: 55.2Vdc
Charge Current: 700mA maximum
Trickle Current: 5mA, approximate
Rate: a maximum of 6 hours is required to bring batteries to 90% of full charge

BATTERY UNDERVOLTAGE SENSING
System 605 operation ceases, and batteries disconnect when battery voltage is less negative than –41.5Vdc

INCOMING POWER SENSING
System 605 commences PFT operation when incoming nominal –48Vdc is less negative than –39Vdc

DIMENSIONS
9.5 inches high (24.1cm)
5.5 inches wide (14.0cm)
1.5 inches thick (3.8cm)

WEIGHT
Less than 1 pound (0.45kg)

MOUNTING
System 605 cabinet only

7.4 SPECIFICATIONS—602 FULL PFT CARD

RELIABILITY
MTBF 24.1 years, per Method I of Bellcore TR-NWT-000332, Issue 3, September 1990

NUMBER OF PFT CIRCUITS
2

DID TRUNK TYPE
Selectable, wink or immediate start

TRUNK PARAMETERS
Designed to provide correct operation for loop resistance of up to 1600 ohms. Nominal loop voltage –48Vdc, range –42 to –56Vdc.

STATION LOOP PARAMETERS
Designed to provide correct operation for loop resistance of up to 300 ohms. Nominal loop voltage –48Vdc, range –42 to –56Vdc.

DELAY TRANSFER
Calls in progress are not disconnected when system goes from transfer to normal mode. Individual circuits return to normal mode only after a 300mSec break in loop current.

BILLING PROTECTION
Industry standard reverse battery answer supervision and disconnect

POWER, PROGRESS TONES AND CONTROL SIGNALS
Provided by 601-A Common Control Card

NUMBER OF LED INDICATORS
4

DIMENSIONS
9.5 inches high (24.1cm)
5.5 inches wide (14.0cm)
0.75 inches thick (1.9cm)

WEIGHT
Less than 1 pound (0.45kg)

MOUNTING
System 605 cabinet only

7.5 SPECIFICATIONS—603 BUSY ONLY PFT CARD

RELIABILITY
MTBF 26.5, per Method I of Bellcore TR-NWT-000332, Issue 3, September 1990

NUMBER OF PFT CIRCUITS
4

DID TRUNK TYPE
Selectable, wink or immediate start

TRUNK PARAMETERS
Designed to provide correct operation for loop resistance of up to 1600 ohms. Nominal loop voltage –48Vdc, range –42 to –56Vdc.

BILLING PROTECTION
Answer supervision not returned as per industry standard billing specifications

POWER, PROGRESS TONES AND CONTROL SIGNALS
Provided by 601-A Common Control Card

NUMBER OF LED INDICATORS
4

DIMENSIONS
9.5 inches high (24.1cm)
5.5 inches wide (14.0cm)
0.75 inches thick (1.9cm)

WEIGHT
Less than 1 pound (0.45kg)

MOUNTING
System 605 cabinet only

8. Incorrect Operation

8.1 SYSTEM-WIDE PROBLEMS Most system-wide problems relate to incorrect 601-A Common Control Card switch configuration. Refer to the installation section of this practice for detailed information.

8.2 FUSES One fuse is contained in the battery wiring harness, and two fuses are contained on the 601-A Common Control Card. They are field replaceable, but normal installation, operation, or maintenance should never cause any of the fuses to blow. Incorrect installation of the batteries can cause one or all of the fuses to blow. After rectifying the wiring error, replace the blown fuse(s) with exactly the same type and rating. Contact Gordon Kapes, Inc. technical support if you have a situation where fuses are repeatedly being blown.

8.3 SERVICE PROCEDURES There are a limited number of field replaceable parts associated with the System 605, specifically three fuses and four sealed lead-acid batteries. If you determine that a card or internal wiring is defective, return it for repair or replacement according to the Gordon Kapes, Inc. Warranty/Repair and Return Policy.

8.4 SAVE TIME You are encouraged to call Gordon Kapes, Inc. for technical support. We much prefer a telephone call BEFORE you tear your hair out! We do not mind "walking" you through an installation, or performing a verbal review prior to getting started. Please have these items with you: a copy of this technical practice, PBX documentation, and adequate tools. In addition, it is very helpful to have a digital VOM, such as the wonderful Fluke 70 or 80 series, a lineperson's handset, and some cross connect wire. (For those rare cases, it's not a bad idea to have some aspirin and the telephone number of a good Mexican restaurant that delivers!)

9. Maintenance

9.1 SCHEDULED MAINTENANCE It is recommended that the System 605 be tested not less than twice a year. Of great importance is testing the buzzers associated with the PFT station telephones. Be certain that each PFT station telephone is identified with a DID PFT telephone label. Moves and changes of PFT station telephones often cause the labeling or buzzer integrity to be lost. Replacement labels can be ordered from Gordon Kapes, Inc.

9.2 BATTERY REPLACEMENT The only System 605 items that need regular replacement are the sealed lead-acid batteries. The batteries supplied by the factory have an estimated life of at least eight years; however, we have selected a more conservative life of five years. Each battery is labeled with a recommended replacement date, which is five years from the System 605 ship date. The factory supplied batteries are Panasonic LCR12V6.5P, 12 volt, 6.5 amp-hour. To maintain safety compliance and optimal performance, replace batteries **only** with this exact type. Replace batteries only with the main power switch on the 601-A card in the off (down) position.

10. Repair and Replacement

10.1 NOT SO FAST Statistically, most equipment returned to Gordon Kapes, Inc. for repair actually has nothing wrong with it. A telephone call to Gordon Kapes, Inc. technical support can often help to get the equipment operating correctly. We don't mind spending time with our customers getting a site up and running.

10.2 SEND IT BACK If you determine that one or more System 605 components are defective, return for repair or replacement according to the Gordon Kapes, Inc. Warranty/ Repair and Return policy.

10.3 ONLY WE FIX IT In the event repairs are ever needed on your System 605, they should only be performed by Gordon Kapes, Inc. or an authorized representative. For further information, contact Gordon Kapes, Inc.

11. FCC Requirements—Part 15

11.1 WARNING: This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to

provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

12. FCC Requirements—Part 68

12.1 TYPE OF SERVICE Your System 605 is designed to be used on standard device telephone lines. The System 605 connects to the telephone line by means of standard jacks called USOC RJ21X. Connection to telephone company-provided coin service (central office implemented systems) is prohibited. Connection to party line service is subject to state tariffs.

12.2 TELEPHONE COMPANY PROCEDURES The goal of the telephone company is to provide you with the best service it can, within the constraints of receiving a good return on shareholder equity. In order to do this, it may occasionally be necessary for them to make changes in their equipment, operations, or procedures. If these changes might affect your service or the operation of your equipment, the telephone company will give you notice, in writing, possibly in advance, to allow you to make any changes necessary to maintain uninterrupted service.

If you have any questions about your telephone line, such as how many pieces of equipment you can connect to it, the telephone company will provide this information upon request.

In certain circumstances, it may be necessary for the telephone company to request information from you concerning the equipment which you have connected to your telephone line. Upon request of the telephone company, provide the FCC registration number and the ringer equivalence number (REN) of the equipment which is connected to your line; both of these items are listed on the equipment label. The sum of all of the RENs on your telephone line should be less than five in order to assure proper service from the telephone company. In some cases, a sum of five may not be usable on a given line.

12.3 IF PROBLEMS ARISE If any of your telephone equipment is not operating properly, you should immediately remove it from your telephone line, as it may cause harm to the telephone network. If the telephone company notes a problem, they may temporarily discontinue service. When practical, they will notify you in advance of this disconnection. If advance notice is not feasible, you will be notified as soon as possible. When you are notified, you will be given an opportunity to correct the problem and be informed of your right to file a complaint with the FCC. You have the right to remain silent, if you waive your right to remain silent...

Specifications and information contained in this technical practice subject to change without notice.

Diagram 1 System 605 and Model 723 connection diagram

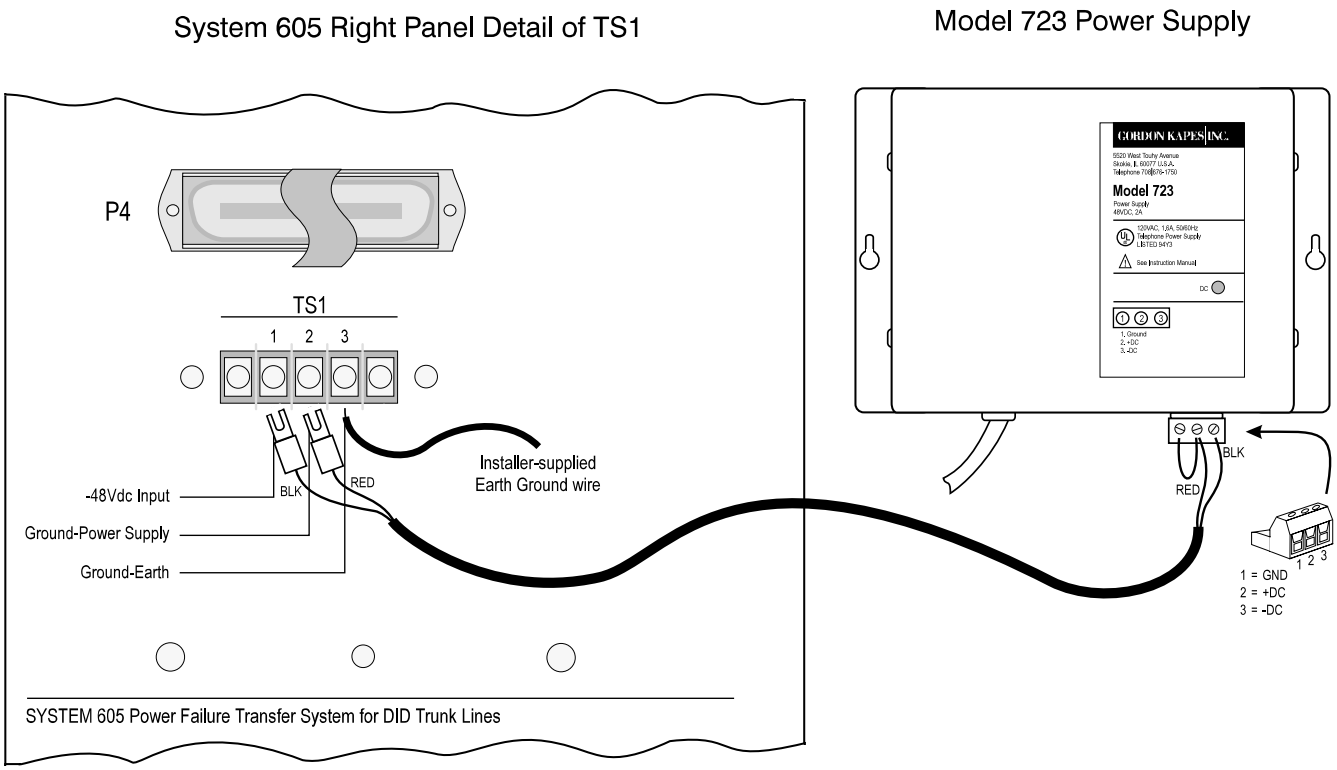
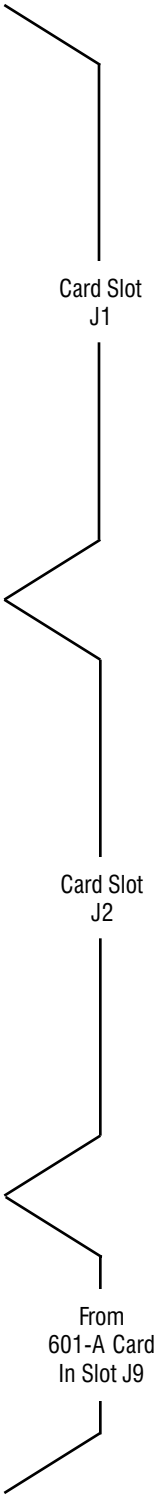


Figure 1 Plug P1 Pinouts for the System 605 DID PFT

Plug Pin	Wire Color	602 Full PFT Card if Used in this Slot		603 Busy Only PFT Card if Used in this Slot	
26	WHT-BLU	T	EXT-A	T	TRK-A
1	BLU-WHT	R		R	
27	WHT-ORN	T	STA-A	T	COT-A
2	ORN-WHT	R		R	
28	WHT-GRN	T	TRK-A	T	TRK-B
3	GRN-WHT	R		R	
29	WHT-BRN	T	COT-A	T	COT-B
4	BRN-WHT	R		R	
30	WHT-SLT	+	Buzzer A		
5	SLT-WHT	–			
31	RED-BLU	T	EXT-B	T	TRK-C
6	BLU-RED	R		R	
32	RED-ORN	T	STA-B	T	COT-C
7	ORN-RED	R		R	
33	RED-GRN	T	TRK-B	T	TRK-D
8	GRN-RED	R		R	
34	RED-BRN	T	COT-B	T	COT-D
9	BRN-RED	R		R	
35	RED-SLT	+	Buzzer B		
10	SLT-RED	–			
36	BLK-BLU	T	EXT-A	T	TRK-A
11	BLU-BLK	R		R	
37	BLK-ORN	T	STA-A	T	COT-A
12	ORN-BLK	R		R	
38	BLK-GRN	T	TRK-A	T	TRK-B
13	GRN-BLK	R		R	
39	BLK-BRN	T	COT-A	T	COT-B
14	BRN-BLK	R		R	
40	BLK-SLT	+	Buzzer A		
15	SLT-BLK	–			
41	YEL-BLU	T	EXT-B	T	TRK-C
16	BLU-YEL	R		R	
42	YEL-ORN	T	STA-B	T	COT-C
17	ORN-YEL	R		R	
43	YEL-GRN	T	TRK-B	T	TRK-D
18	GRN-YEL	R		R	
44	YEL-BRN	T	COT-B	T	COT-D
19	BRN-YEL	R		R	
45	YEL-SLT	+	Buzzer B		
20	SLT-YEL	–			
46	VIO-BLU	+	Auxiliary Audio Input		
21	BLU-VIO	–			
47	VIO-ORN	Re-Op Input Common			
22	ORN-VIO	Re-Op Input			
48	VIO-GRN	Contact Input Common			
23	GRN-VIO	Contact Input			
49	VIO-BRN				
24	BRN-VIO				
50	VIO-SLT	COM	Normally Open Relay Contact		
25	SLT-VIO	NO	Closes (shorts) during transfer		



Notes

EXT: TIP and RING from PBX Extension Output
STA: TIP and RING to Station Telephone
TRK: TIP and RING to PBX DID Trunk Input
COT: TIP and RING from Central Office DID Trunk
Reference to A, B, C, D (e.g. EXT-A) represents circuit number of 602 or 603 Card

Figure 2 Plug P2 Pinouts for the System 605 DID PFT

Plug Pin	Wire Color	602 Full PFT Card if Used in this Slot		603 Busy Only PFT Card if Used in this Slot		
26	WHT-BLU	T	EXT-A	T	TRK-A	Card Slot J3
1	BLU-WHT	R		R		
27	WHT-ORN	T	STA-A	T	COT-A	
2	ORN-WHT	R		R		
28	WHT-GRN	T	TRK-A	T	TRK-B	
3	GRN-WHT	R		R		
29	WHT-BRN	T	COT-A	T	COT-B	
4	BRN-WHT	R		R		
30	WHT-SLT	+	Buzzer A			
5	SLT-WHT	–				
31	RED-BLU	T	EXT-B	T	TRK-C	
6	BLU-RED	R		R		
32	RED-ORN	T	STA-B	T	COT-C	
7	ORN-RED	R		R		
33	RED-GRN	T	TRK-B	T	TRK-D	
8	GRN-RED	R		R		
34	RED-BRN	T	COT-B	T	COT-D	
9	BRN-RED	R		R		
35	RED-SLT	+	Buzzer B			
10	SLT-RED	–				
36	BLK-BLU	T	EXT-A	T	TRK-A	Card Slot J4
11	BLU-BLK	R		R		
37	BLK-ORN	T	STA-A	T	COT-A	
12	ORN-BLK	R		R		
38	BLK-GRN	T	TRK-A	T	TRK-B	
13	GRN-BLK	R		R		
39	BLK-BRN	T	COT-A	T	COT-B	
14	BRN-BLK	R		R		
40	BLK-SLT	+	Buzzer A			
15	SLT-BLK	–				
41	YEL-BLU	T	EXT-B	T	TRK-C	
16	BLU-YEL	R		R		
42	YEL-ORN	T	STA-B	T	COT-C	
17	ORN-YEL	R		R		
43	YEL-GRN	T	TRK-B	T	TRK-D	
18	GRN-YEL	R		R		
44	YEL-BRN	T	COT-B	T	COT-D	
19	BRN-YEL	R		R		
45	YEL-SLT	+	Buzzer B			
20	SLT-YEL	–				
46	VIO-BLU					
21	BLU-VIO					
47	VIO-ORN					
22	ORN-VIO					
48	VIO-GRN					
23	GRN-VIO					
49	VIO-BRN					
24	BRN-VIO					
50	VIO-SLT					
25	SLT-VIO					

Notes

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STA: TIP and RING to Station Telephone
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Reference to A, B, C, D (e.g. EXT-A) represents circuit number of 602 or 603 Card

Figure 3 Plug P3 Pinouts for the System 605 DID PFT

Plug Pin	Wire Color	602 Full PFT Card if Used in this Slot		603 Busy Only PFT Card if Used in this Slot		
26	WHT-BLU	T	EXT-A	T	TRK-A	Card Slot J5
1	BLU-WHT	R		R		
27	WHT-ORN	T	STA-A	T	COT-A	
2	ORN-WHT	R		R		
28	WHT-GRN	T	TRK-A	T	TRK-B	
3	GRN-WHT	R		R		
29	WHT-BRN	T	COT-A	T	COT-B	
4	BRN-WHT	R		R		
30	WHT-SLT	+	Buzzer A			
5	SLT-WHT	–				
31	RED-BLU	T	EXT-B	T	TRK-C	
6	BLU-RED	R		R		
32	RED-ORN	T	STA-B	T	COT-C	
7	ORN-RED	R		R		
33	RED-GRN	T	TRK-B	T	TRK-D	
8	GRN-RED	R		R		
34	RED-BRN	T	COT-B	T	COT-D	
9	BRN-RED	R		R		
35	RED-SLT	+	Buzzer B			
10	SLT-RED	–				
36	BLK-BLU	T	EXT-A	T	TRK-A	Card Slot J6
11	BLU-BLK	R		R		
37	BLK-ORN	T	STA-A	T	COT-A	
12	ORN-BLK	R		R		
38	BLK-GRN	T	TRK-A	T	TRK-B	
13	GRN-BLK	R		R		
39	BLK-BRN	T	COT-A	T	COT-B	
14	BRN-BLK	R		R		
40	BLK-SLT	+	Buzzer A			
15	SLT-BLK	–				
41	YEL-BLU	T	EXT-B	T	TRK-C	
16	BLU-YEL	R		R		
42	YEL-ORN	T	STA-B	T	COT-C	
17	ORN-YEL	R		R		
43	YEL-GRN	T	TRK-B	T	TRK-D	
18	GRN-YEL	R		R		
44	YEL-BRN	T	COT-B	T	COT-D	
19	BRN-YEL	R		R		
45	YEL-SLT	+	Buzzer B			
20	SLT-YEL	–				
46	VIO-BLU					
21	BLU-VIO					
47	VIO-ORN					
22	ORN-VIO					
48	VIO-GRN					
23	GRN-VIO					
49	VIO-BRN					
24	BRN-VIO					
50	VIO-SLT					
25	SLT-VIO					

Notes

EXT: TIP and RING from PBX Extension Output
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Reference to A, B, C, D (e.g. EXT-A) represents circuit number of 602 or 603 Card

Figure 4 Plug P4 Pinouts for the System 605 DID PFT

Plug Pin	Wire Color	602 Full PFT Card if Used in this Slot		603 Busy Only PFT Card if Used in this Slot		
26	WHT-BLU	T	EXT-A	T	TRK-A	Card Slot J7
1	BLU-WHT	R		R		
27	WHT-ORN	T	STA-A	T	COT-A	
2	ORN-WHT	R		R		
28	WHT-GRN	T	TRK-A	T	TRK-B	
3	GRN-WHT	R		R		
29	WHT-BRN	T	COT-A	T	COT-B	
4	BRN-WHT	R		R		
30	WHT-SLT	+	Buzzer A			
5	SLT-WHT	–				
31	RED-BLU	T	EXT-B	T	TRK-C	
6	BLU-RED	R		R		
32	RED-ORN	T	STA-B	T	COT-C	
7	ORN-RED	R		R		
33	RED-GRN	T	TRK-B	T	TRK-D	
8	GRN-RED	R		R		
34	RED-BRN	T	COT-B	T	COT-D	
9	BRN-RED	R		R		
35	RED-SLT	+	Buzzer B			
10	SLT-RED	–				
36	BLK-BLU	T	EXT-A	T	TRK-A	Card Slot J8
11	BLU-BLK	R		R		
37	BLK-ORN	T	STA-A	T	COT-A	
12	ORN-BLK	R		R		
38	BLK-GRN	T	TRK-A	T	TRK-B	
13	GRN-BLK	R		R		
39	BLK-BRN	T	COT-A	T	COT-B	
14	BRN-BLK	R		R		
40	BLK-SLT	+	Buzzer A			
15	SLT-BLK	–				
41	YEL-BLU	T	EXT-B	T	TRK-C	
16	BLU-YEL	R		R		
42	YEL-ORN	T	STA-B	T	COT-C	
17	ORN-YEL	R		R		
43	YEL-GRN	T	TRK-B	T	TRK-D	
18	GRN-YEL	R		R		
44	YEL-BRN	T	COT-B	T	COT-D	
19	BRN-YEL	R		R		
45	YEL-SLT	+	Buzzer B			
20	SLT-YEL	–				
46	VIO-BLU					
21	BLU-VIO					
47	VIO-ORN					
22	ORN-VIO					
48	VIO-GRN					
23	GRN-VIO					
49	VIO-BRN					
24	BRN-VIO					
50	VIO-SLT					
25	SLT-VIO					

Notes

EXT: TIP and RING from PBX Extension Output
STA: TIP and RING to Station Telephone
TRK: TIP and RING to PBX DID Trunk Input
COT: TIP and RING from Central Office DID Trunk
Reference to A, B, C, D (e.g. EXT-A) represents circuit number of 602 or 603 Card