

XVIII. PERIPHERAL SWITCH CONTROL SUBSYSTEM

GENERAL DESCRIPTION

The peripheral switch control console, illustrated in Figure XVIII-1, is used in conjunction with peripheral switch units to transfer control of as many as eight peripheral controllers between two GE-225 Central Processors. The capability of switching between

central processors permits optimum use of both GE-225 Systems during normal operation, and permits convenient equipment substitution for maintenance purposes. Two completely unrelated programs can be run at the same time. Any type of peripheral

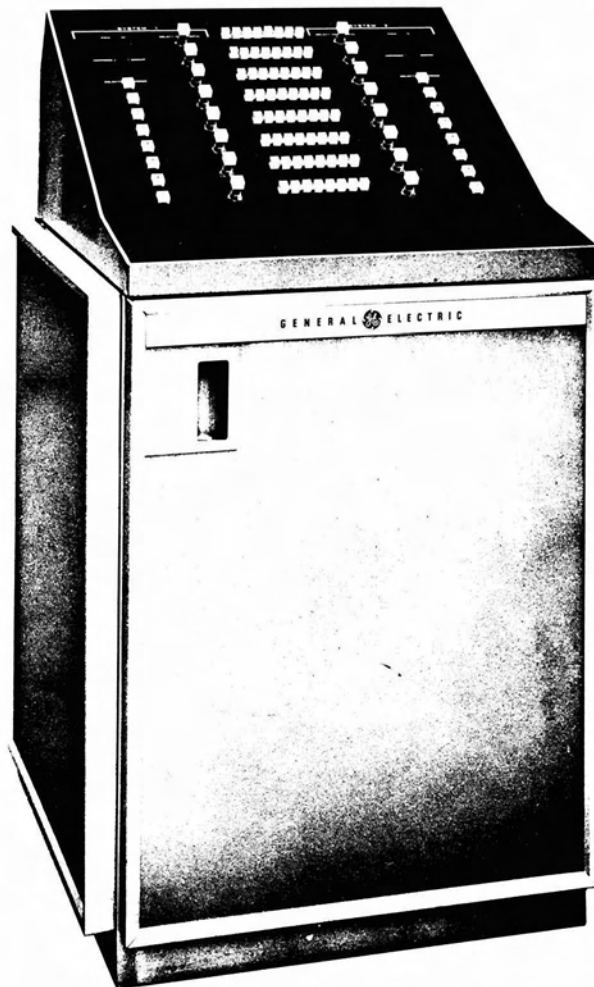


Figure XVIII-1. Peripheral Switch Control Console

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device normally connected to the controller selector can be switched by this unit. A complete peripheral switch control subsystem consists of one switch control console and eight peripheral switch units. A minimum subsystem consists of a control console and one switch unit.

Peripheral Switch Control Console

This is the control center of the peripheral switching subsystem. It contains all the controls necessary for the switching operation. The switch control console is connected to each peripheral switch unit and to the two central processors. By use of the control and indicator panel (Figure XVIII-2), the operator can select the peripheral devices to be used with each of the central processors at a specific time. He can also select the switch which determines the priority address of each peripheral controller. Selecting this address provides the same result as does selecting the controller selector plug number for a particular peripheral controller.

The photograph of the panel in Figure XVIII-2 was taken before the nameplates for the peripheral devices were added in the space allowed above each row of ADDRESS SELECTION switches. Since each installation has its own combination of peripheral devices, the names of these devices are added to the panel at the time of equipment installation. Inside the lower portion of the switch control console unit is its power supply and the power supply for the peripheral switch units.

Peripheral Switch Units

Each peripheral controller switched with the switch control console must have a peripheral switch unit. The user determines which peripheral controllers (8 maximum) are to have these switch units. The unit is a steel box 7 x 9 x 11 inches in size. It contains relays which perform the switching functions. The box is mounted inside the peripheral controller and is connected to the controller hardware. Two standard controller selector connectors on the box

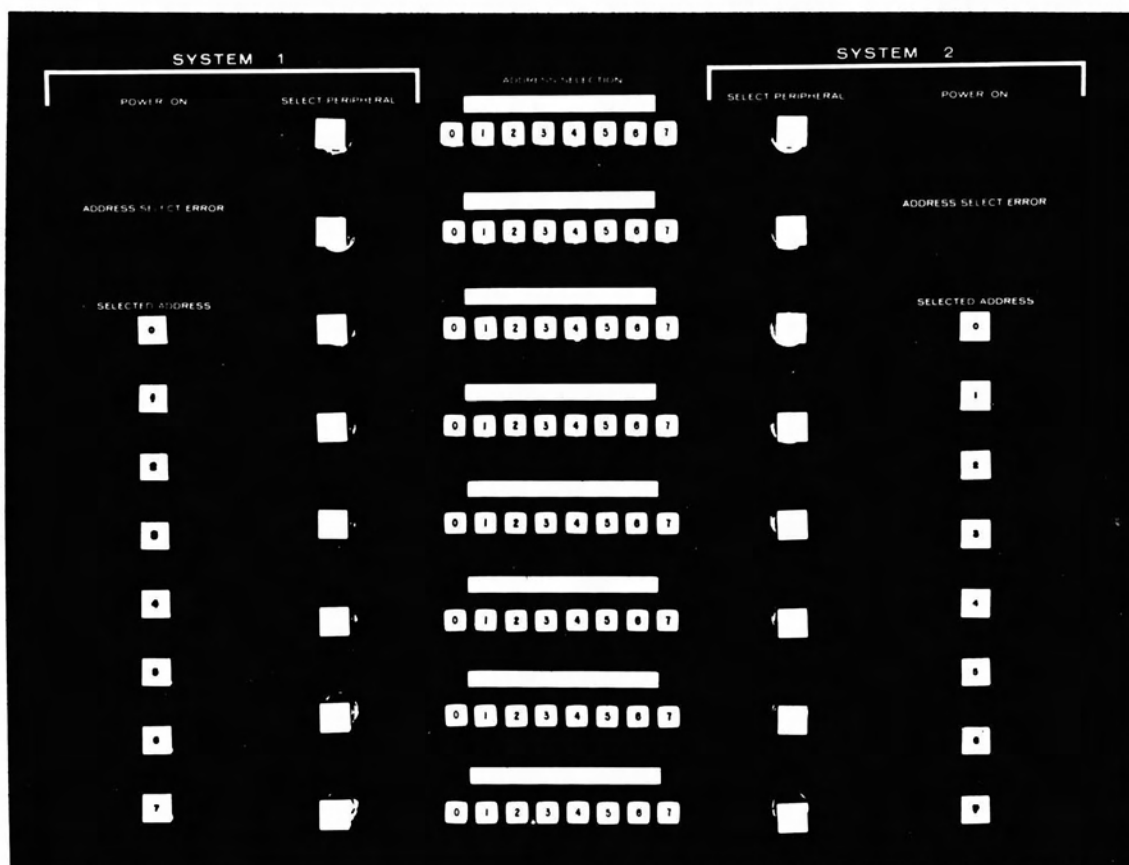


Figure XVIII-2. Peripheral Switch Control and Indicator Panel

connect it to each of the GE-225 central processors. Other connectors connect it to the switch control console.

Any combination of one or more of the following may be connected to the switch control subsystem:

- Magnetic tape controller
- High-speed printer controller
- Document handler adapter
- Mass random access data storage controller
- Auxiliary arithmetic unit controller
- DATANET-15

Figure XVIII-3 illustrates an example of cable connections for a system which chose to use one MRADS unit, two document handlers, two magnetic tape controllers, and three printers.

Switch Control Console Control and Indicator Panel

Referring to Figure XVIII-2, it will be seen that the upper left of the panel is labeled System 1. The two columns of switches and indicators under this heading apply to the central processor designated as number one. Likewise, there is a label at the upper right of the panel -- System 2. The two columns of switches and indicators under this heading apply to the central processor which is designated as number two. The actual determination of system numbers is made by service engineering personnel at the time of installation. In the center of the panel are eight columns of switches under the heading of Address Selection. These switches pertain to either System 1 or System 2, depending on operator selection. The following are the specific controls and indicators and their functions:

POWER ON Indicator (green). Each of the two systems has a POWER ON indicator which glows green when central processor power for the corresponding system is on.

ADDRESS SELECT ERROR Indicator (red). Each of the two systems has this indicator which glows red to indicate when the operator (or possibly the program) has made an error in use of the ADDRESS SELECTION switches, resulting in the connection of two peripheral devices at the same priority level (plug number).

SELECTED ADDRESS Indicators (white). These indicator lights glow white to indicate which plug numbers (0 through 7) have been selected for a particular system. For example, if two SELECT PERIPHERAL switches for System 1 have been depressed, and those two peripheral units have ADDRESS SELECTION buttons set to 1 and 3

respectively, the 1 and 3 SELECTED ADDRESS indicators on the System 1 side of the panel will glow white.

SELECT PERIPHERAL Switch and Indicator (white). These back-lighted pushbuttons select the particular devices to be used with a central processor. The pushbuttons are operative only when both central processors are in the manual mode. As was already pointed out, the SELECT PERIPHERAL switches at the left of the panel make selections for System 1, and those at the right of the panel make selections for System 2. The SELECT PERIPHERAL switches are located to the left or right of and slightly below the names of the devices to which they apply. When a SELECT PERIPHERAL switch is depressed, its indicator light glows white. At the same time, the light in the switch for the same device on the opposite side of the panel goes out. For example, the document handler is selected for use on System 1 by depressing the proper SELECT PERIPHERAL switch at the left side of the panel. That switch is lit, and at the same time, the light in the switch at the right of the panel for the document handler goes out, showing that it is no longer connected to System 2.

ADDRESS SELECTION Switches. These switches apply to either System 1 or System 2, depending on which corresponding SELECT PERIPHERAL pushbutton has been depressed. Each row of switches applies to the peripheral device named on the plate immediately above it. In every case except when the peripheral device is an auxiliary arithmetic unit, the programmer has a choice of using any plug number from 0 through 7. The programmer then tells the operator the plug number to use with the program. Depressing an ADDRESS SELECTION Switch of a number brings the same result as inserting a controller selector plug of that number in an individual peripheral controller. Since the AAU is permanently wired to controller selector plug number seven, the ADDRESS SELECTION switch for the AAU must always be set at seven. If no priority level has been selected (no switch is down) for a peripheral device which is connected and has power on, the circuitry assumes that plug zero has been selected. Since this leads to errors in running the program, an ADDRESS SELECTION switch must be depressed for each peripheral device which has power on.

The operator cannot change plug numbers on a peripheral connected to a central processor when it is in operation. If he does this, he will get an address select error. The method of changing ADDRESS SELECTION switches when one central processor is operating and the other is not is given under the heading of 'Special Procedures.'

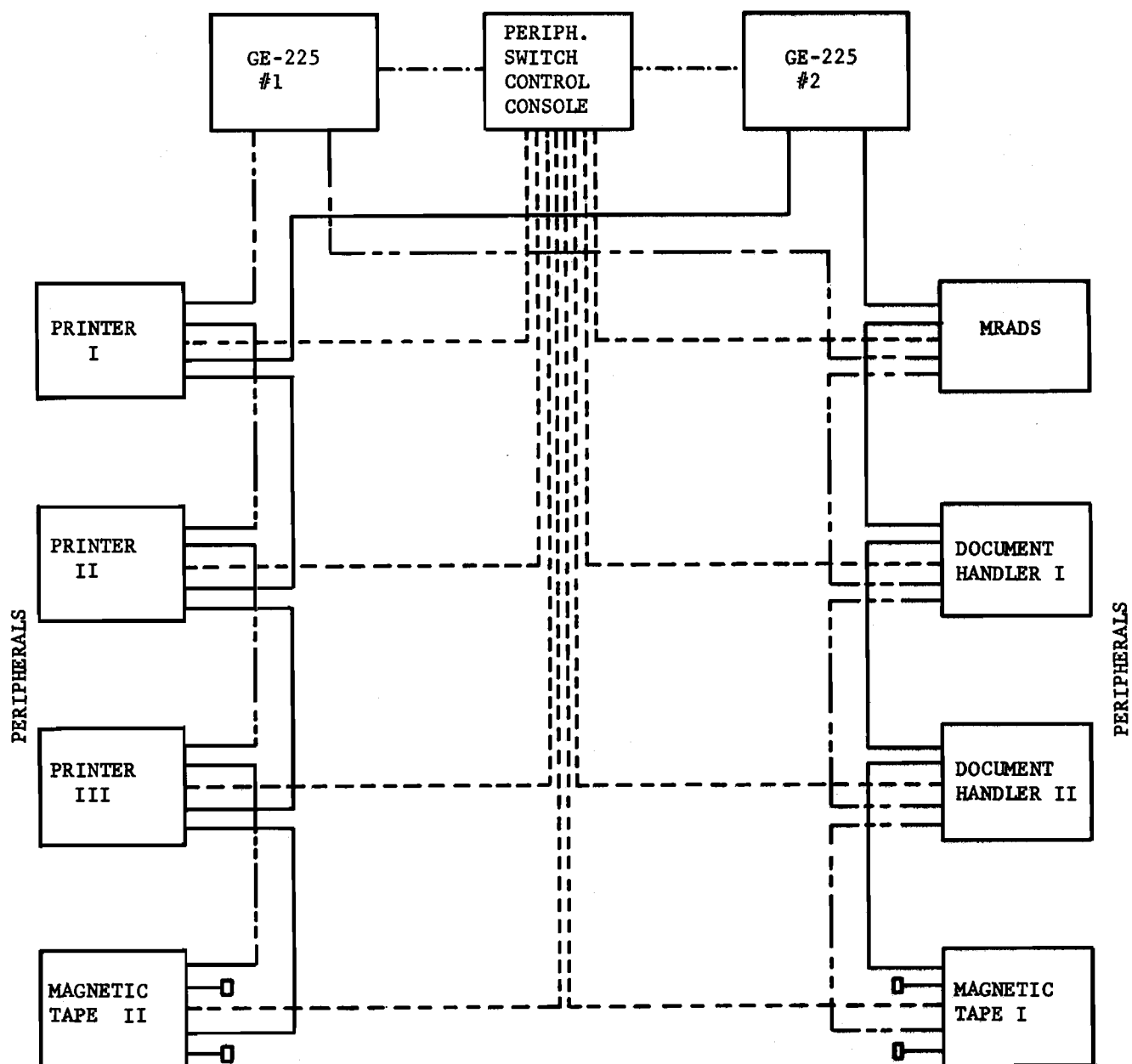


Figure XVIII-3. Example of Cable Connections

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SETUP PROCEDURE

At the time the peripheral switch control subsystem is installed, the service engineers determine which central processor is 1 and which is 2. When the switch control subsystem is used with more than one of a particular type of peripheral device, its number is also determined at the time of installation. For example, in Figure XVIII-4 two magnetic tape units and two printers are designated. The operator will need to know which units are designated as I and which are designated as II, to correspond to the switches on the control and indicator panel.

Starting a Run

The following steps are to be followed in setting up the switch control console for the operation of a run. It is assumed that all peripheral devices have been

readied for operation. (Refer to Table XXVI for a summary of controls and indicators and their functions.)

1. Check to make sure that both central processors are in the manual mode (AUTOMATIC/MANUAL switch set to MANUAL).
2. For every peripheral device to be operated with System 1, depress the SELECT PERIPHERAL pushbuttons on the left side of the panel.
3. For every peripheral device to be operated with System 2, depress the SELECT PERIPHERAL pushbuttons on the right side of the panel.
4. For every peripheral device selected, depress the ADDRESS SELECTION switch specified by the program operating instructions. Be careful to avoid duplication of plug numbers.

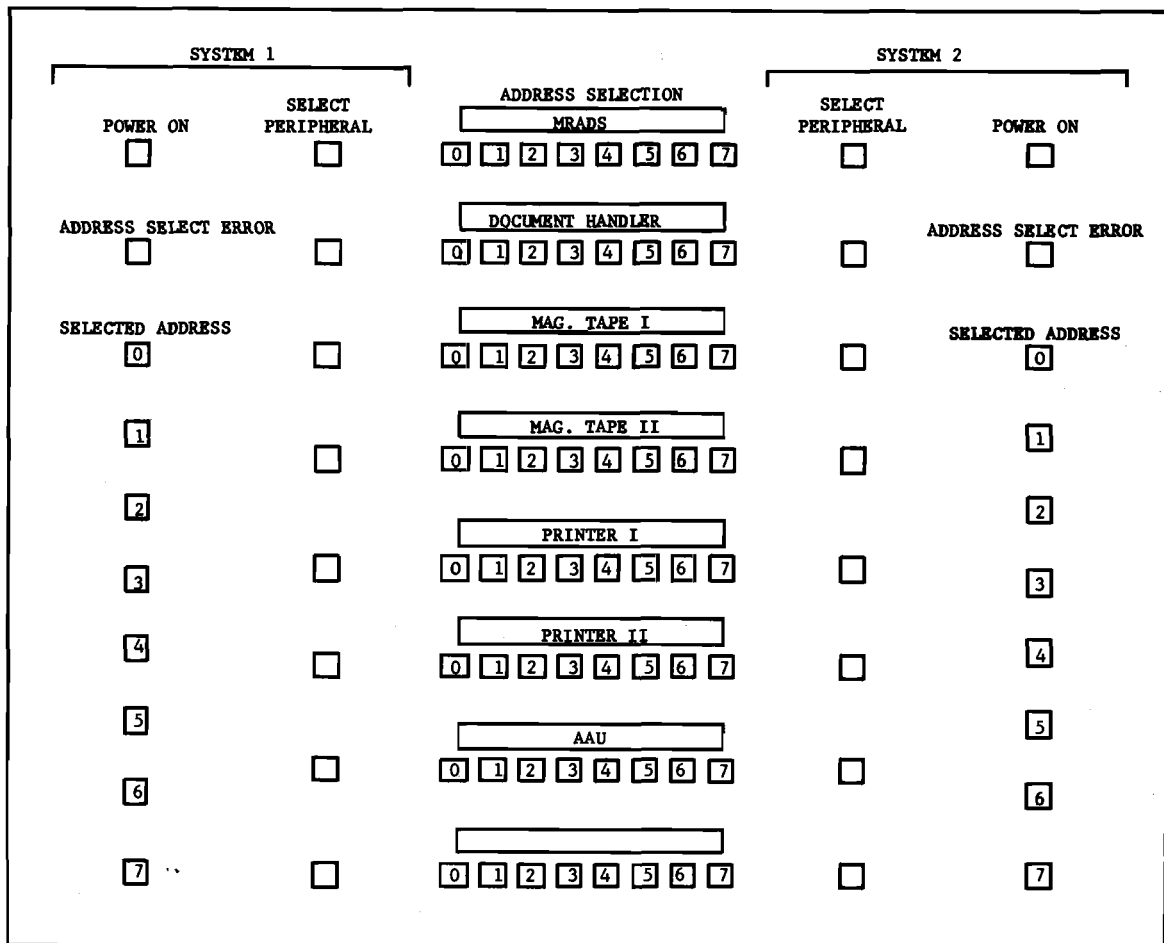


Figure XVIII-4. Control and Indicator Panel

5. For all other peripheral devices which have power on, select an arbitrary plug number which does not duplicate any selection already made.
6. Return each central processor to the automatic mode and depress START.

Switching During a Run

The following example will illustrate the procedure for switching a peripheral unit from one central processor to another and changing its priority level (plug number). Refer to Figure XVIII-4.

In this example, the document handler, which has been operating on system number one with plug number four, will be switched to operate on system number two with plug number six. It is assumed that the document handler is no longer needed on system one, is cleared of documents from the previous run, and is ready for use with another program.

The switch control console controls and indicators show the following:

The SELECT PERIPHERAL indicator at the left of the name plate for the document handler (under System 1) is illuminated.

The number 4 ADDRESS SELECTION pushbutton for the document handler is currently depressed. The steps which the operator takes to make the required change are the following:

1. Place both central processors in the manual mode. (This halts operation.)
2. Depress the SELECT PERIPHERAL pushbutton at the right of the name plate for the document handler (under System 2).
3. Visually check the SELECTED ADDRESS indicators on the right of the panel to see that plug number 6 is available. If possible, make it available. If this cannot be done, the switching operation will have to wait until that plug number is no longer in use in System 2.
4. Depress the ADDRESS SELECTION pushbutton number 6 for the document handler. (Button 4 will pop out and SELECTED ADDRESS indicator 6 will be illuminated.)

The document handler is now connected for use with the central processor of System 2, and ready to operate with plug number 6.

To continue operation, the operator need only set both central processors in the automatic mode and depress their START switches.

TABLE XXVI

SUMMARY OF CONTROLS AND INDICATORS FOR
THE PERIPHERAL SWITCH CONTROL SUBSYSTEM

| Location | Control or Indicator | Function |
|---|---|--|
| Switch control console control and indicator panel (Figure XVIII-4) | POWER ON indicator (green) | Glow green to indicate when central processor power is on for the applicable system. |
| | ADDRESS SELECT ERROR indicator (red) | Glow red to indicate when an error has been made in use of the ADDRESS SELECTION switches. |
| | SELECTED ADDRESS indicators (white) | Glow white to indicate which priority levels have been selected for the corresponding system. |
| | SELECT PERIPHERAL switches and indicators (white) | Make the selection of the central processor to which a specific peripheral device is attached. The switch glows white when it has been depressed. Both central processors must be in the manual mode for these switches to be effective. |
| | ADDRESS SELECTION switches | Select the plug number for the device. The central processor to which the device is attached must be in the manual mode. |

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| | SELECTED ADDRESS indicators (white) | Glow white to indicate which priority levels have been selected for the corresponding system. |
| | SELECT PERIPHERAL switches and indicators (white) | Make the selection of the central processor to which a specific peripheral device is attached. The switch glows white when it has been depressed. Both central processors must be in the manual mode for these switches to be effective. |
| | ADDRESS SELECTION switches | Select the plug number for the device. The central processor to which the device is attached must be in the manual mode. |

SPECIAL PROCEDURES

Address Select Error Recovery

The ADDRESS SELECT ERROR indicator glows red to indicate that the operator has made a mistake in the use of the ADDRESS SELECTION switches or the program operating instructions have specified the wrong plug number. The operator must examine the ADDRESS SELECTION switches to see if two sets of switches on the same system have identical plug numbers selected. When the switch error is found, the operator must refer back to the program operating instructions to find which of these identical plug numbers is correct and which is not. Then, he should correct the ADDRESS SELECTION switch which is in error.

Special Recovery Procedure

If the operator should make the mistake of trying to change the ADDRESS SELECTION switches for a peripheral device attached to an operating central processor, there will be an ECHO ALARM indication on the central processor, and the central processor will halt. When this happens, the following is the recovery procedure.

1. Set the AUTOMATIC/MANUAL switch to MANUAL.
2. Correct the ADDRESS SELECTION switch which is in error (check program operating instructions).
3. Clear the echo alarm condition on the central processor by depressing the RESET ALARM switch.
4. Cause the program to branch back to the location prior to the location indicated in the P register. This can be done by manually entering a BRU instruction to location P minus one.
5. Return the central processor to the automatic mode and depress START.

Changing Plug Numbers

With caution, the operator can change plug number selections while one central processor continues operation. The rule states that ADDRESS SELECTION

buttons (plug numbers) can be changed if the system to which they are connected is in the manual mode even though the other system continues in operation. Figure XVIII-5 and the following example explain how this can be done.

In the example, System 1 is in operation and System 2 is halted (in the manual mode). As seen in Figure XVIII-5, Magnetic Tape II and Printer II are connected to the system which is halted, so plug numbers for these two peripheral devices can be changed as long as no duplications are made in the numbers connected to System 2. Because System 1 is in operation, no change can be made to the ADDRESS SELECTION buttons (plug numbers) for the MRADS unit, Magnetic Tape I or Printer I. If a change is attempted for any of these three, an address select error will result.

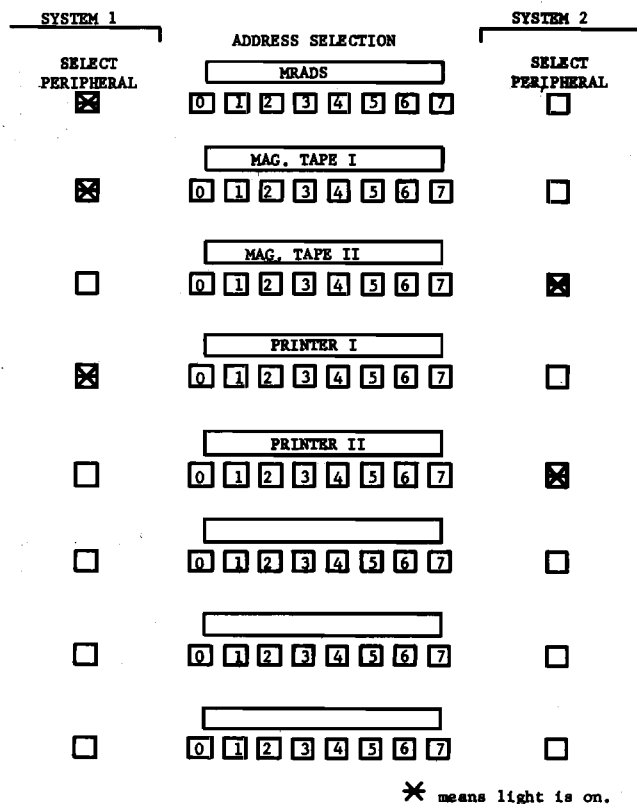


Figure XVIII-5. Example of a Switching Operation

ERRORS AND OPERATOR CORRECTIVE ACTION

Operator Errors

The following are possible operator errors. It should be noticed that all of these errors result from the wrong use of ADDRESS SELECTION switches.

1. One or more sets of ADDRESS SELECTION switches have no selection made. Every peripheral device which has power on and is connected into the switching system must have a plug number selected. Otherwise, the circuitry assumes that plug zero was selected. This may cause a conflict with another device which was already set on zero. Even though there is no conflict with the plug numbers, errors result. In some cases this error may cause a device to operate even though it was not supposed to be used in the program. The operator would no doubt notice this immediately and halt operations to make the correction. The program would have to be rerun from the beginning, for errors have most likely been introduced. In some cases, the operator would see no visible evidence of the error during the running of the program. He would eventually find out, however, from the programmer who returns saying that data was

missing or wrong answers were obtained for no explainable reason.

2. Two ADDRESS SELECTION switches of the same number were selected for use with the same central processor. This causes the ADDRESS SELECT ERROR indicator to glow red. The operator must then check program operating instructions and select the proper switches.
3. An attempt was made to change the ADDRESS SELECTION switches of a device while it was connected to a central processor in operation. This causes an echo alarm, and a halt.

Programmer Errors

When the programmer uses an incorrect plug number in his program or the operating instructions contain an incorrect plug number, the result is apt to be the same as that obtained when two devices are connected to the same priority level (plug number). This results in address select error, or an echo alarm, and halt.

Table XXVII lists error indications which result from operator errors or errors in the program. The table is intended to help the operator identify various errors when they occur, and then take the proper corrective action.

TABLE XXVII

SWITCH CONTROL SUBSYSTEM ERROR CONDITIONS

| Error Condition | Possible Cause | Corrective Action |
|---|--|--|
| A SELECT PERIPHERAL switch is depressed, but its indicator light does not come on | The central processor of one of the systems is in the automatic mode | Set both central processors to the manual mode, then depress the SELECT PERIPHERAL switch on the switch control console. |
| | Light bulb in the switch is burned out | If light bulb is burned out, replace it. |

TABLE XXVII (CONT.)

| Error Condition | Possible Cause | Corrective Action |
|--|---|--|
| An ADDRESS SELECTION switch is depressed and the ADDRESS SELECT error indicator glows red | An attempt was made to connect two peripheral controllers to the same plug, on the same system | <ol style="list-style-type: none"> 1. Find which two sets of ADDRESS SELECTION switches have the same plug number selected for a system. 2. Determine whether it was an operator or program error. 3. Either select the correct ADDRESS SELECTION switches or return the program to the programmer. |
| A peripheral device which was not supposed to operate in that run starts operation | One of the peripheral units connected to the switch control subsystem did not have a plug number selected, so the circuitry assumed zero which conflicted with another zero plug selected | <ol style="list-style-type: none"> 1. Observe which set of ADDRESS SELECTION switches had no plug number depressed. 2. Make a selection for that device so as to not conflict with any other plug number. 3. Rerun the program. |
| The runs apparently have operated correctly, but the programmer reports back that some of the data was missing or that incorrect results were obtained | One of the peripheral units connected to the switch control subsystem did not have a plug number selected so the circuitry assumed plug zero | Rerun the program making sure that each set of ADDRESS SELECTION switches has a plug number switch depressed. |
| A peripheral device is properly connected to the switch control subsystem and the central processor is set properly but the device (e.g. the printer) does not operate | The peripheral device was not readied for operation | Check to see that the peripheral device's power was on and check all the other possible error conditions for that device. |
| The central processor ECHO ALARM light glows red and the computer operations on that system halt | The operator tried to change ADDRESS SELECTION switches for a system while it was in operation | <ol style="list-style-type: none"> 1. Set AUTO/MANUAL to MANUAL. 2. Correct the ADDRESS SELECTION switch. 3. Depress RESET ALARM on the central processor. 4. Manually enter a BRU to P minus one. 5. Depress AUTO and START. |