CHAPTER 3 OPERATING INSTRUCTIONS

CONTENTS

LIST OF ILLUSTRATIONS & TABLES

3.1 SYSTEM OPERATOR PANELS

3.1.1 Common Display & Control Facilities

Figure 3.1-1

Although there are some differences between the SOPs used for different computers, they are all basically providing the same display and control facilities.

POWER ON INDICATOR - sensing either a control signal from the PSU, or the panel's +5V supply. In the latter case the indicator is not effective if a CFP/EFP is also fitted to the computer.

RUN INDICATOR (not on TC 6810/11) - indicates that the computer operates in run mode. Not effective when a CFP/EFP is also fitted to the computer (6812/13).

SYSTEM INDICATORS - eleven indicators that are program controlled via address 2E (hex code) and the BIO lines 05-15. Always effective when power is on.

IPL SWITCH - when effective and operated this switch will load the initial program. Not effective in LOCK mode (see sub-sections 3.1.2 and 3.1.3), or when a CFP/EFP is also fitted to the computer (6811/12/13).

INTERRUPT SWITCHES - ten switches that are all interrupting on level 9 (decimal), but are individually recognizable in the data word fetched via the BIO lines 06-15. Always effective when power is on.

TEST SWITCH - lights all indicators on the panel. Always effective when power is on.

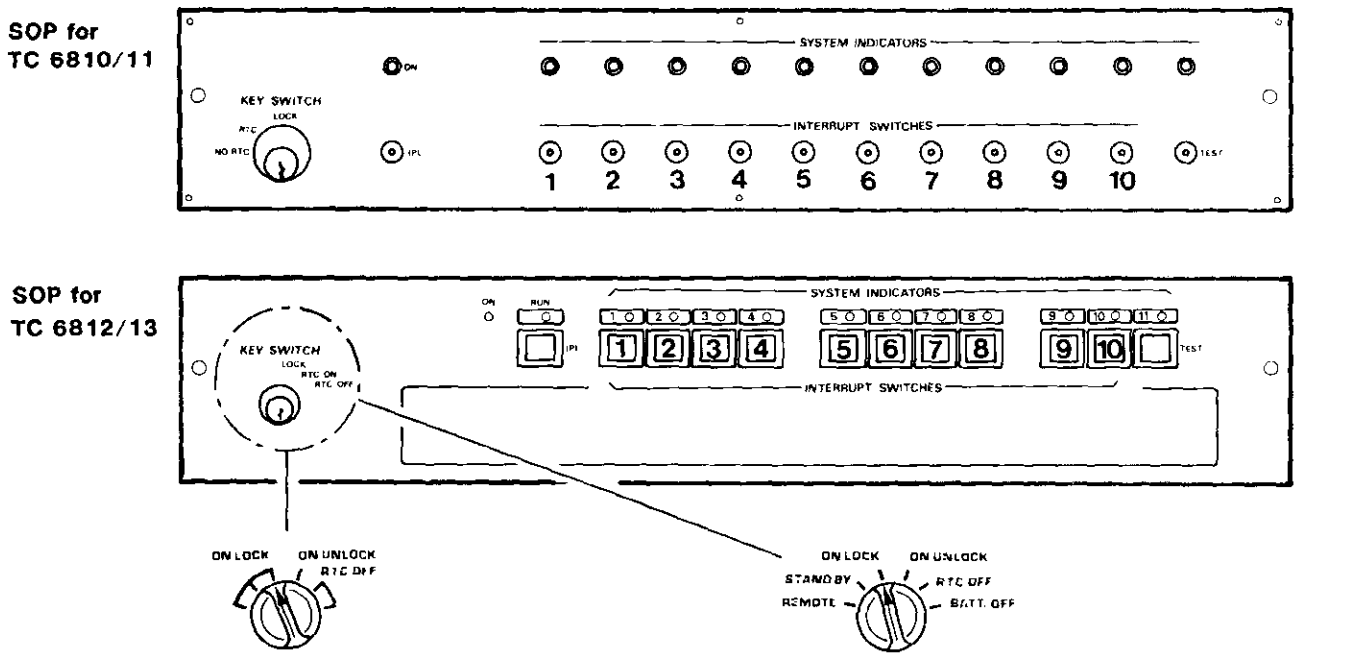


Figure 3.1-1 Existing versions of the SOP

All panels are also equipped with a mode control switch (a rotary switch, on early models controlled by a key), and here you will find the most significant differences.

3.1.2 Mode Control from SOP in TC 6810-6814

The SOPs used in TC 6810-6814 enable the selection of three different modes (each mode named in different ways on different panels):

NO RTC/RTC OFF - the computer is able to run with the Real Time Clock inhibited (necessary for certain test programs that cannot handle RTC interrupts).

RTC/RTC ON/ON UNLOCK - like above, except that the Real Time Clock is now enabled.

LOCK/ON LOCK - the computer is able to run with the Real Time Clock enabled. The IPL switch on the SOP is now inhibited, and so are all switches except INT on a fitted CFP/EFP/FRCP.

3.1.3 Mode Control from SOP in TC 6824

The SOP used in TC 6824 enables the selection of six different modes:

REMOTE - an optional remote ON/STAND BY switch is now enabled to control the computers D.C. and A.C. supply. With the switch in ON-state the PSU provides full supply; the Real Time Clock is enabled and the IPL switch is disabled. With the remote switch in state STAND BY, the PSU is only supporting the memories with maintained charging of batteries.

STAND BY - the PSU is only supporting the memories with maintained charging of batteries.

ON LOCK - like 'REMOTE', except that the remote ON/STAND BY switch is now replaced by the local one, fitted to the left on the computer's nose section.

ENSURE ON-STATE BEFORE RETURNING ROTARY SWITCH TO 'ON LOCK' AFTER PROGRAM LOADING!

ON UNLOCK - the PSU provides full supply regardless of ON/STAND BY switches; the Real Time Clock is enabled and so is the IPL switch.

RTC OFF - like 'ON UNLOCK', except that the Real Time Clock is now inhibited (necessary for certain test programs that cannot handle RTC interrupts).

BATT. OFF - disconnects battery from load to prevent discharging when the EMERGENCY mains switch is set in position OFF and no back-up is wanted.

3.2 BASIC PROGRAM LOADING

3.2.1 General

Programs can be loaded from three different media; cassette tape, flexible disc and peripheral disc (cartridge or fixed). The following sub-section describes how to operate the different drives.

3.2.2 Operating Media Drives

Cassette Drive 6861 Figure 3.2-1

Turn the cassette side to be loaded upwards, and the open edge towards the right. Push in the cassette until it is catched by the drive mechanism. To release a cassette; wait until the drive's indicator is switched off, then press the eject button fitted on the drive.

Cassette Drive 6865 Figure 3.2-1

Open the drive's door by pressing the eject knob to the right. Turn the cassette such that the side to be loaded faces the operator, and that the open edge is upwards. Place the cassette in the door and push the door to close. To release a cassette; wait until the drive's indicator is switched off, then press the eject knob to the right.

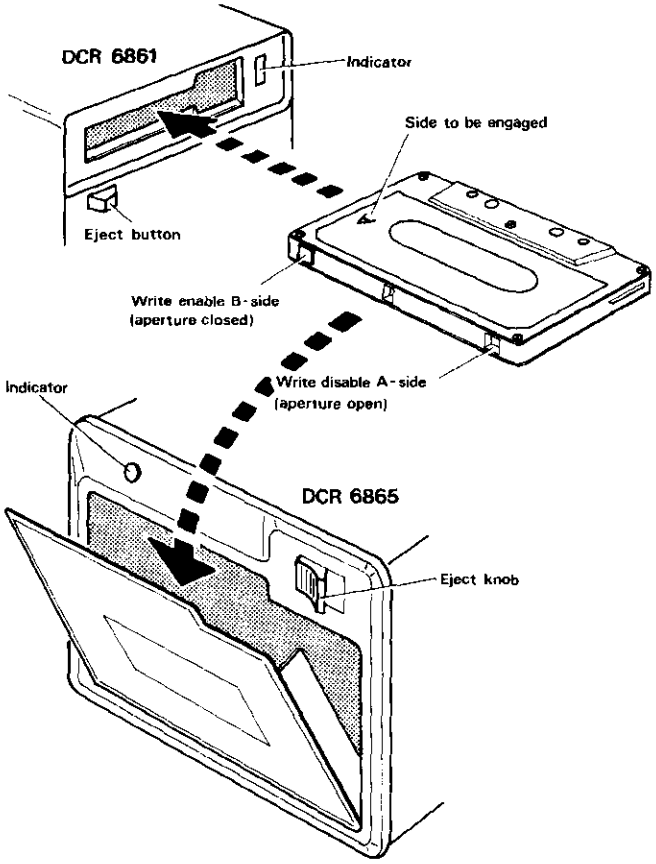


Figure 3.2-1 Operating Cassette Drives

Flexible Disc Drives Figure 3.2-2

Open door by pressing the adjacent button. Turn the flexible disc such that the label is to the left, push in the disc and close the door. To release a flexible disc; wait until the drive's indicator is switched on, open door and pull out the disc.

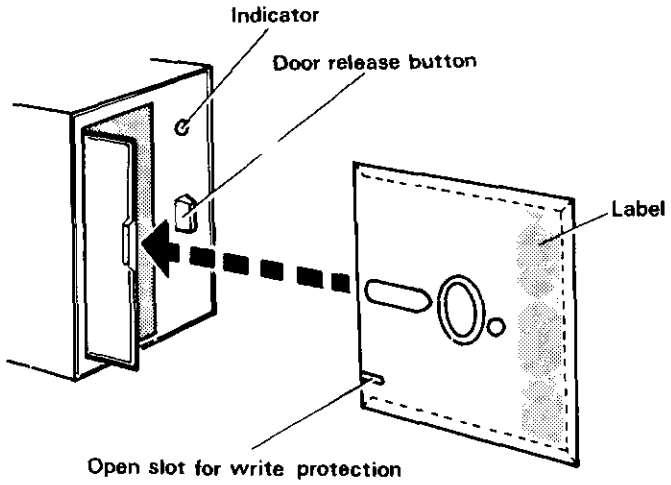


Figure 3.2-2 Operating Flexible Disc Drives

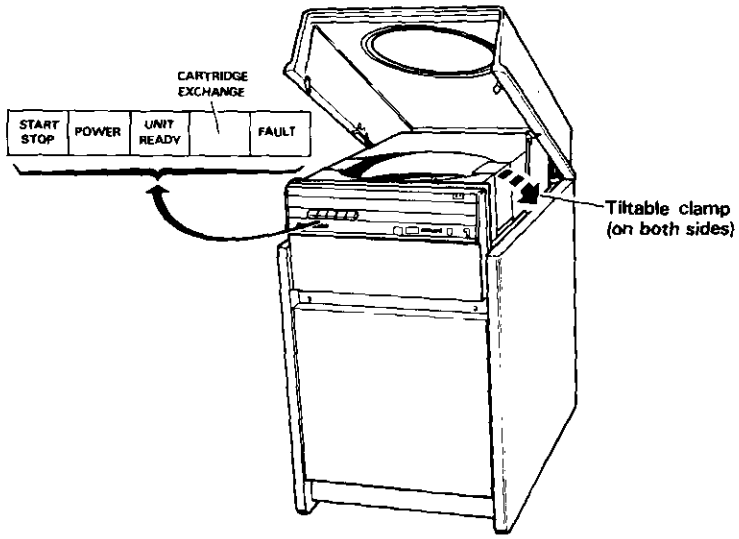
Cartridge Disc Units 6875/6876 Figure 3.2-3

To install a cartridge:

- Switch on power and ensure that the disc unit indicates CARTRIDGE EXCHANGE.
- Lift the top cover of the disc unit and press the two drive clamps outwards (at each side of the cartridge well).
- Push the de-coupler of the cartridge handle to the side, lift the handle and remove the bottom cover.
- With extreme care; place the cartridge into the drive and fold the handle into its recess. The characteristics of the correct position is that the cartridge cannot be rotated or tilted.
- Turn the bottom cover upside down and place it on top of the cartridge. Close the two drive clamps and lower the top cover of the disc unit.
- Press the START/STOP button and wait for the UNIT READY indication.

To remove a cartridge:

- Press the START/STOP button and wait for the indication CARTRIDGE EXCHANGE.
- Lift the top cover of the disc unit, press the two drive clamps outwards and remove the bottom cover.
- Push the de-coupler of the cartridge handle to the side, lift the handle and remove the cartridge with extreme care.
- Place the cartridge into its bottom cover and fold the handle into its recess.



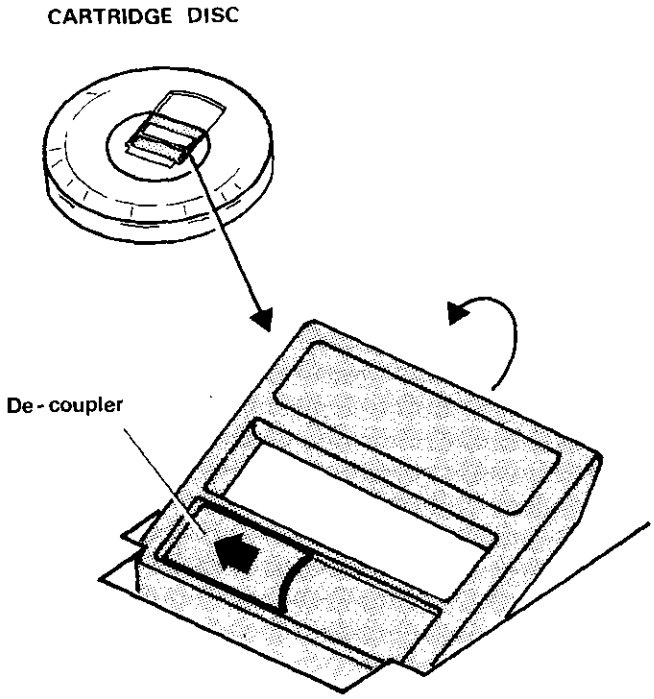


Figure 3.2-3 Operating Cartridge Disc Units, type 6875/6876

To install a disc pack:

- Make certain that the disc pack to be installed has been maintained according to the preventive maintenance instructions.
- Ensure that AC POWER is ON and raise pack access cover.
- Lift disc pack by plastic canister handle.
- Disengage bottom dust cover from disc pack by turning canister handle counterclockwise or, for newer disc packs, squeeze the levers in the center of the bottom dust cover. Set cover aside in an uncontaminated area.

CAUTION

Avoid abusive contact between the disc pack and the spindle. The read/write heads are sometimes manually positoned during maintenance procedures. Make certain that the heads are fully retracted.

- Place disc pack onto spindle. A spindle lock mechanism is actuated when the disc pack canister cover is on the spindle. The mechanism holds the spindle stationary while loading or unloading a disc pack.
- Twist canister handle clockwise to lock disc pack in place. A click may be heard as the spindle lock mechanism engages.
- Lift canister clear of disc pack, place bottom dust cover on canister, and set aside in an uncontaminated area.
- Close pack access immediately to prevent entry of dust and contamination of disc surfaces.

To remove a disc pack:

- Press the operator panel START switch to extinguish the START indicator.
- Check that disc pack rotation has stopped. (Stopping time is approximately 1.5 minutes without brake and 20 seconds with brake.)
- Raise access cover.

CAUTION

The read/write heads are sometimes manually positioned during maintenance procedures. Make certain that the heads are fully retracted.

- Place plastic canister over mounted disc pack so that post protruding from center of disc pack is received into canister handle.
- Twist canister handle counterclockwise until disc pack is free of spindle.

CAUTION

Avoid abusive contact between the disc pack and the spindle assembly.

- Lift canister and disc pack clear of spindle and close access cover.
- Place bottom dust cover in position on disc pack and lock it.

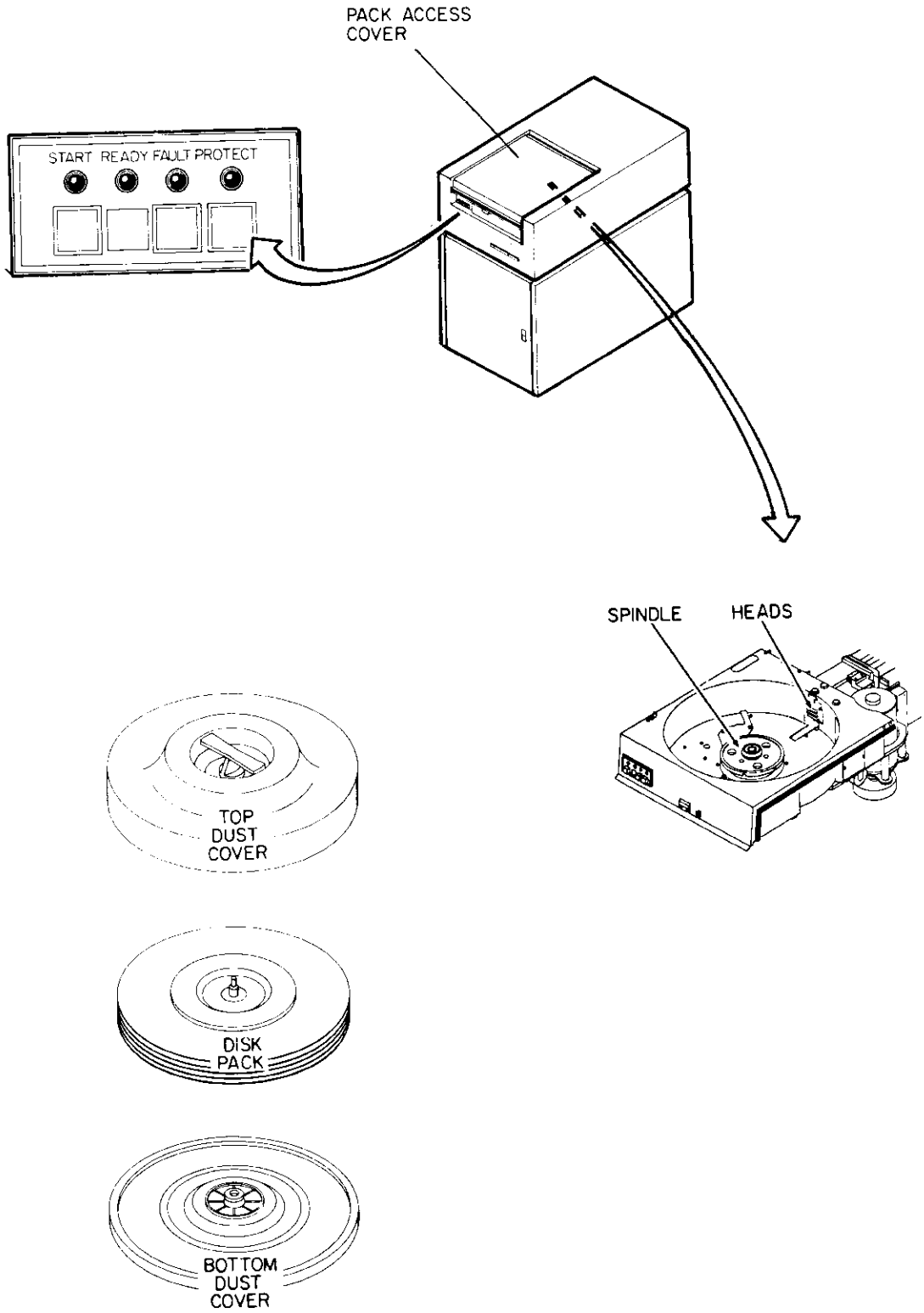


Figure 3.2-4 Operating Disc Unit, type 6877

To install a cartridge:

- Make certain that; the power is on, the START/STOP switch is out and that the indicators READY and FAULT are off.
- Release latch under lip of access door recess and pull down cartridge access door.
- To separate dust cover from the disc cartridge, push cover release button on the bottom dust cover toward the center of the cartridge.
- Disengage dust cover from disc cartridge. Set cover aside upside down to prevent dust from collecting with the cover.
- Slide the disc cartridge into the receiver track in the direction of the plastic arrow on the top dust cover, so tnat the guide pins on the top dust cover ride smoothly in the receiver track. Use the cartridge handle to insure proper horinzontal insertion of the cartridge and engagement of the guide pins in the receiver track.
- Push the top-cover handle down. Push the cartridge rearward until it stops.
- Close the cartridge access door and press the door closed until it is latched. The cartridge slides into place and centers on the spindle automatically as the access door is closed.
- Store cartridge cover upside down in some convenient location.
- Operate START/STOP switch to apply power to spindle motor.

NOTE

If the spindle motor will not rotate, disc cartridge access door may not be completely closed, the cartridge may not be properly seated on the spindle chuck or the cartridge receiver/base may not be all the way down on the lower chassis.

To remove a cartridge:

- Operate START/STOP switch to STOP (out).
- Pull down the cartridge access door after the READY indicator ceases blinking and extinguishes entirely.
- Grasp the cartridge handle and pull the cartridge out of the receiver with sufficient force to overcome the detent action.
- Replace the bottom dust cover by lining up the arrows on the top and bottom covers, so that the guide bars on the bottom cover slip into the slots on the top cover.
- When the covers are properly aligned they will lock automatically with a gentle downward pressure on the top cover.

NOTE

A disc cartridge should be installed at all times, whether operating or not, to insure proper sealing of the shroud area from environmental contaminents.

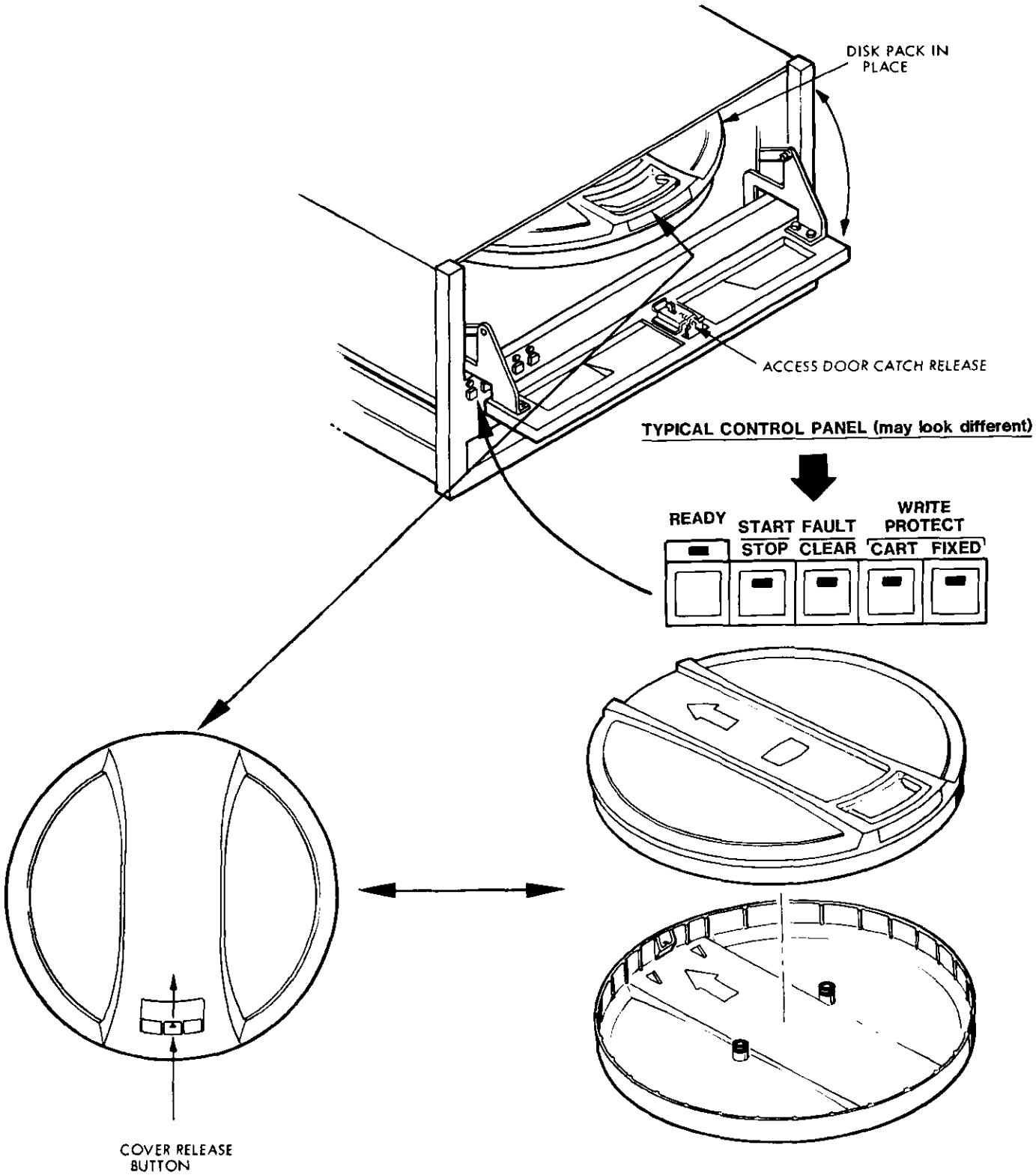


Figure 3.2-5 Operating Cartridge Disc Units, type 6961/6962

3.2.3 Control Panel Operations

The program loading is controlled from the SOP and (when fitted) from the CFP/EFP in the following manner:

- Switch on the RTC from the SOP.
- Operate the IPL switch on the SOP or, when a CFP/EFP is also fitted, the following keys in sequence on that panel: RST, MC and IPL (ERCP INST, MC and IPL).
- Set the SOP's RTC switch in position LOCK and start the prepared drive by operating the appropriate SOP switch according to Table 3.2-1.

NOTE

Flexible or peripheral discs may contain several programs, introduced by an auxiliary IPL program that enables a selection of the next program to be loaded. When the auxiliary program has been loaded the drive stops and the SOP indicators 1-10 are all lit. The selection of the next program to be loaded is made by operating another SOP switch according to a label that should be fitted on the program medium.

Table 3.2-1 Relations between SOP switches and IPL PROMS

PROGRAM LOAD SYSTEM		TYPE OF IPL PROM ON CPU BOARD*				
Media Drive	Channel**	5131 110 01142	MI-7610-5 or 4011P	5131 194 24900	5131 194 41700	5131 194 35300/66
1st DCR - left/lower	PC	Switch 1	Switch 1	Switch 1	Switch -	Switch 1
2nd DCR - right/upper	PC	2	2	2	-	2
1st FDD - left	PC	-	7***	7	7	7
" " "	IOP	-	5***	-	-	-
2nd FDD - right	PC	-	8***	8	8	8
" " "	IOP	-	6***	-	-	-
1st CDU 6875/76 - cartridge	IOP	3	3	3	3	3
" " " - fixed	IOP	4	4	4	4	4
2nd CDU 6875/76 - cartridge	IOP	-	-	-	5	9
" " " - fixed	IOP	-	-	-	6	10
1st CDU 6877	Master	-	-	5	-	-
2nd CDU 6877	Master	-	-	6	-	-
1st HDU 6961/62 - cartridge	Master	-	-	-	1	5
" " " - fixed	Master	-	-	-	2	6
Magnetic Tape	IOP	5	-	-	-	-

* When necessary; identify applicable type of PROM, positioned in co-ordinate F3 (P852), P9 (P857) or M8 (P857R/RA).

** PC = Programmed Channel, IOP = I/O Processor Channel

*** Only for FDD 6867 (250 kByte)

3.2.4 Codes Displayed on SOP Lamps

When a system is halted due to a serious error, an error code is displayed on the SOP lamps. This code should be noted and can be used later as an aid in analyzing the dump. The following lamps may be lit (lamp 1 is leftmost on the SOP panel).

- MONITOR

  SOP LAMP NUMBERS (x = lit)

7	8	9	10	11	
			x	x	No currency buffer available.
		x		x	Illegal interrupt.
		x	x	x	Stack overflow.
	x			x	Instruction not accepted. *
	x		x	x	No blocks available.
	x	x		x	Invalid instruction (trap).
	x	x	x	x	Requested LKM processor not in monitor.
x				x	Data management (SYSGEN) error.

* SST, OTR, or INR not accepted due to a hardware error.

However, in some cases the RUN lamp is off and the SOP lamps give no indication of the cause of the problem.

- DURING IPL OR SYSLOAD

  SOP LAMP NUMBERS (x = lit)

1	2	3	
x			Load
	x		I/O error
		x	Memory overflow

SOP Lamps Codes REL. 12

Error Messages	SOP lamps										
IPL	1	2	3	4	5	6	7	8	9	10	11
IPL error (file not found or Read error)	X										X
SYSLOAD											
Read error	X									X	
Memory overflow	X									X	X
Format error	X								X		
Terminal ident error	X								X		X
User of swappable work block error	X								X	X	
MMTAB overflow	X								X	X	X
Illegal page size	X							X			
Illegal monitor option	X							X			X
Data communication block error in configuration file	X							X		X	
MONITOR											
Illegal interrupt		X									X
Stack overflow		X								X	
Instruction not accepted *)		X								X	X
No block available		X							X		
Invalid instruction (trap)		X							X		X
Request LKM processor missing		X							X	X	
Error when reading overlay segment		X							X	X	X
DATA MANAGEMENT											
DM task not found (SYSGEN errro)		X					X				X
DM core pool too small		X					X			X	
Log file size error		X					X			X	X
Log file protected		X					X		X		
Segment loding error		X					X		X		X
T.Log file I/O error		X					X		X	X	
F.Log file I/O error		X					X		X	X	X

*) SST, OTR, INT not accepted due to hardware error

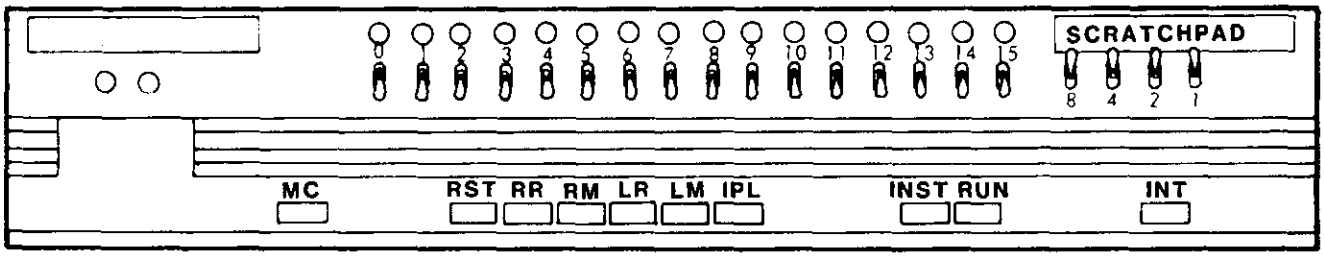
3.3 SERVICE CONTROL PANELS

3.3.1 Available Models

Three models of optional service control panels are available within the computer systems:

- Computer Full Panel, CFP 6815-002, for rack mounting in TC 6811/12
- Extended Full Panel, EFP 6817-001, for rack mounting in TC 6813
- Full Refreshed Control Panel, FRCP 6981, table-top-model for TC 6814 and 6824

COMPUTER FULL PANEL, CFP 6815-002



EXTENDED FULL PANEL, EFP 6817-001

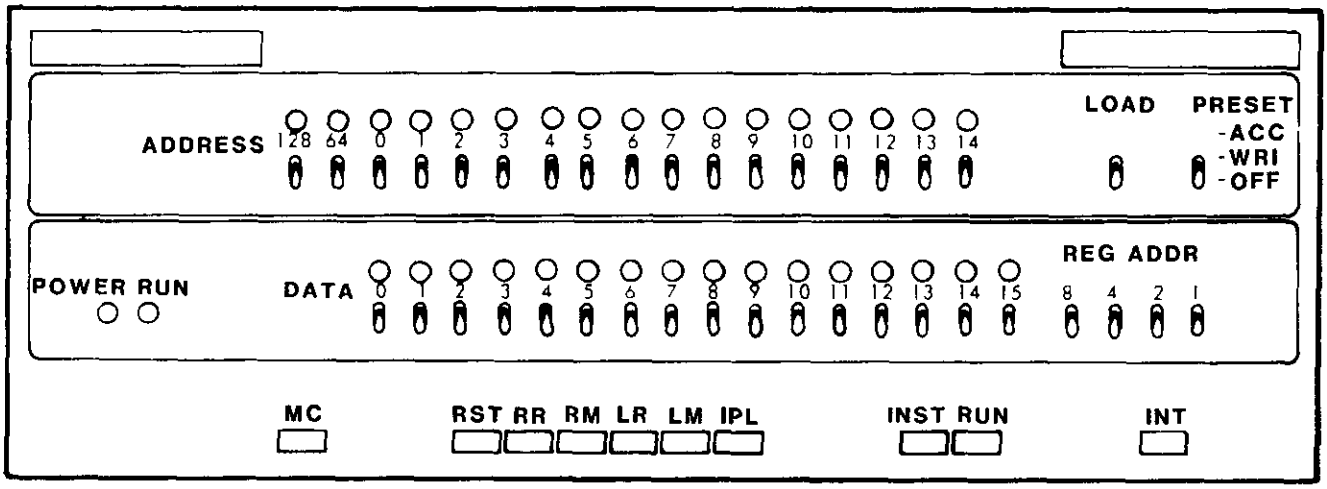


Figure 3.3-1 Computer Full Panel, CFP (top)
& Extended Full Panel, EFP (bottom)

3.3.2 Operating EFP/CP

MC — Master Clear: Clears or resets most hardware logic. Activates the GP Bus signal CLEARN, and the CPU signals MCL, MCLN.

RUN — Begins the program. The RUN switch sends the momentary signal START and the flip-flop signal RUNN to the CPU RUNF logic. Minipanel RUN performs IPL function.

INST — Instruction Step: Each time INST is pressed, the CPU performs the one instruction indicated by the program counter (P) and then halts. INST may be used to step the computer through a program (or part of one) instruction-by-instruction. The INST switch resets the control panel RUNN flip-flop, and sends a 113 usec. START signal to the RUNF logic.

RST — Read Status. The contents of the program status word are displayed on the DATA lamps.

RR — Read Register. The contents of the scratchpad register (AØ-A15) selected by the SCRATCHPAD switches are displayed on the DATA lamps.

RM — Read Memory. The contents of memory are displayed on the DATA lamps. Consecutive words can be read by repeated pressing of the RM button.
Std CP: memory address is selected by the program counter (P), and P is incremented with each RM.
EXt CP: memory address is selected by the ADDRESS switches.
The panel address register is automatically incremented; the program counter (P) is not used or affected. [1])

LR — Load Register. The word code set on the DATA switches is loaded into the scratchpad register (AØ-A15) specified by the SCRATCHPAD switches.

LM — Load Memory. The word code set on the DATA switches is loaded into memroy. Consecutive words can be loaded by repeated pressing of LM.
Std CP: memory address is selected by the program counter (P), and P is incremented with each LM.
Ext CP: memory address is selected by the ADDRESS switches.
The panel address register is automatically incremented; the program counter (P) is not used or affected. 1)

IPL — Initial Program Loaded. An initial bootstrap program located in a hardware read only memory is loaded into memory word locations 00 to 063_{10} (characters 00 to $7E_{hex}$).

INT — Interrupt. This button generates a level-1 Interrupt Request for the Operator's interrupt. The same interrupt can be set by the I/O console via the integral serial control unit. The interrupt may be used by the operator, for example, to change the running program with information supplied by the operator.

Data

DATA — The 16 DATA switches are used to set a data word onto the Bus BIO lines during load register (LR) and load memory (LM) operations. For all computer operations, the DATA lamps display the contents of the Bus BIO lines. When a running computer stops, the DATA lamps display the contents of the next instruction. For RR and LR operations, the DATA lamps display the contents of the scratchpad register (AØ-A15) selected by

Scratchpad Register

SCRATCHPAD — These four switches select one of the scratchpad register (AØ-A15) to be accessed by the read register (RR) or load register (LR) operation.

Address Section (Extended CP only)

ADDRESS — The ADDRESS switches are used to select an initial memory address for read memory (RM) and load memory (LM) operations. For all computer operations except RM and LM, the ADDRESS lamps display the contents of the Bus MAD lines, via the panel address register. When a running computer stops, the ADDRESS lamps display the address of the next instruction. For RM and LM operations, the ADDRESS lamps display the contents of the panel address register, which is loaded from the ADDRESS switches and incremented by the RM and LM operations. No control is provided for bit 15 (character selector) because the panel accessed only memory word addresses.

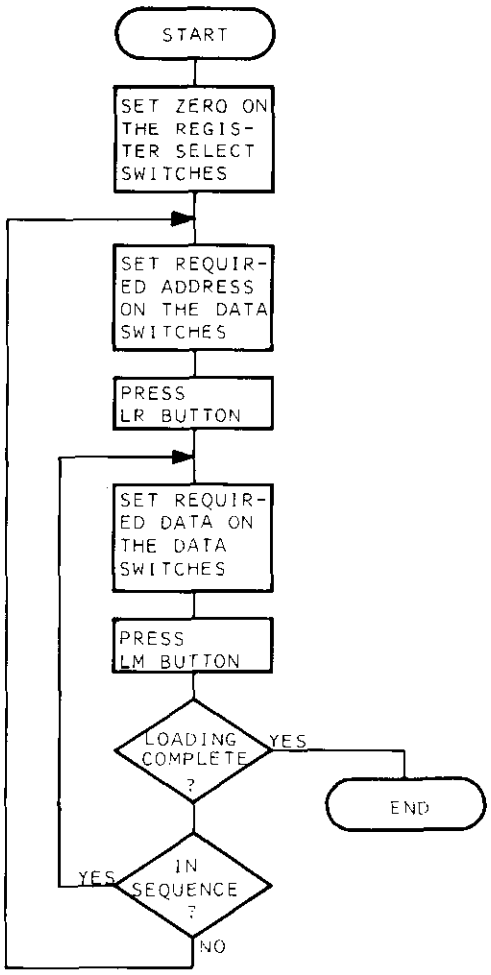
LOAD ADDR — When this button is pressed, the code set on the ADDRESS switches is immediately loaded into the panel address register. This address is incremented by successive RM or LM operations; the address register is reloaded from the MAD lines for any other operation.

PRESET — This switch is used to select a Stop On Address mode. The stop will occur when the MAD-line address, via the panel address regster, compares with the code set on the ADDRESS switches.

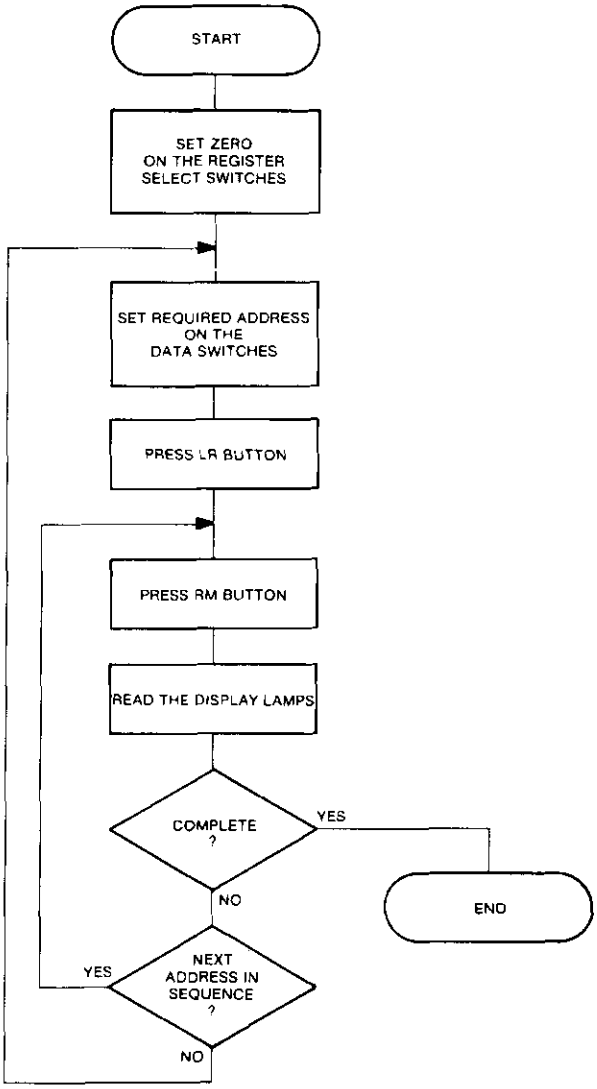
- OFF — Normal operation. Do not stop on address.
- ACC — Stop On Address, Access. Stop when any memory operation accesses the address set on the ADDRESS switches.
- WRITE — Stop On Address, Write. Stop when any memory operation writes at the location set on the ADDRESS switches.

1) To start a program load register AO(P) with the start-address as well as on the standard controlpanel as on the extended controlpanel.

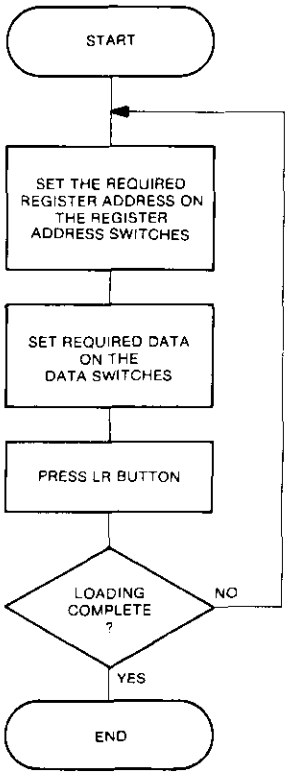
LOAD MEMORY (FULL CONTROL PANEL)



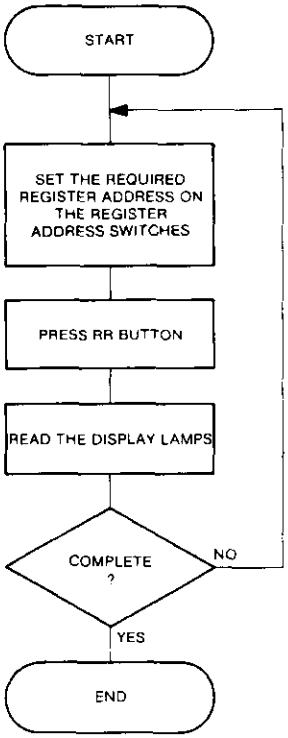
READ MEMORY (FULL CONTROL PANEL)



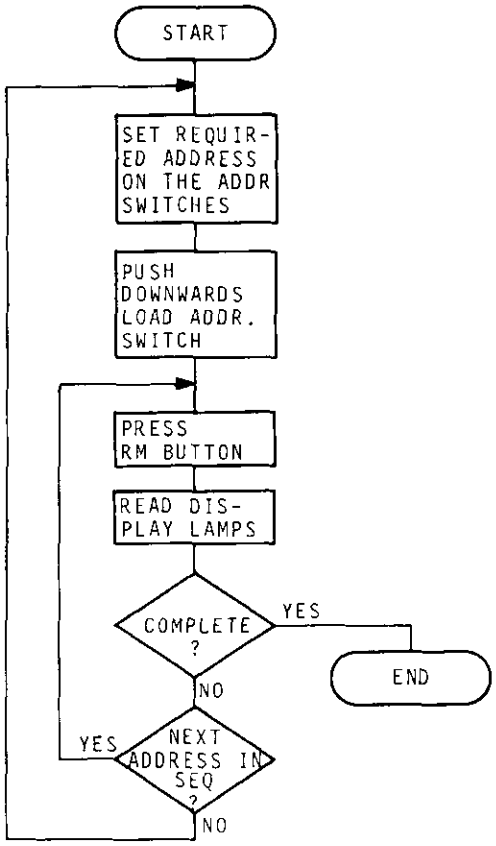
LOAD REGISTER



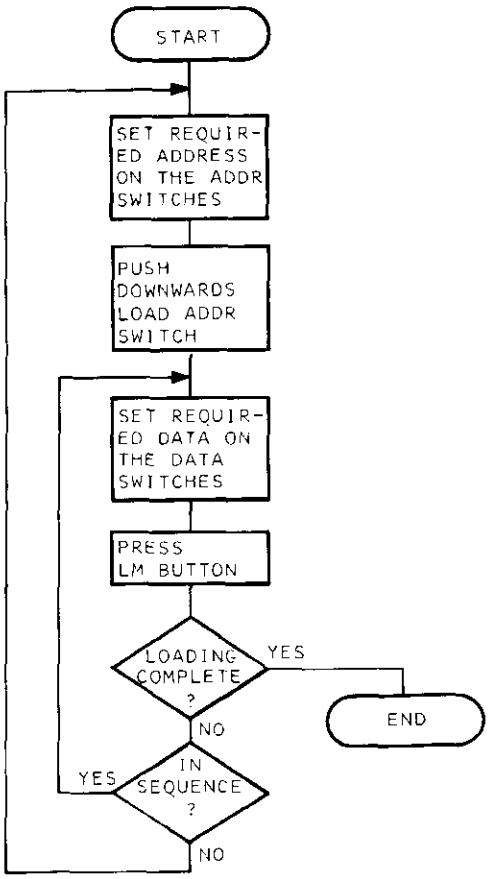
READ REGISTER



READ MEMORY (EXTENDED CONTROL PANEL)



LOAD MEMORY (EXTENDED CONTROL PANEL)



Panel Lock and RTC Switches

The slide switch LOCK operates in conjunction with the LOCK function on the system operator's panel, SOP. If both panels are set in position LOCK (on FRCP; righthand switch position), all panel functions except for the INT actions are inhibited.

The slide switch RTCE (Real Time Clock Enable) operates in conjunction with the RTC switching on the SOP. If both panels are in enable mode (on FRCP; righthand switch position), the real time clock interrupts are enabled.

Hexadecimal Key Array

The hexadecimal key array (0-F) enables the operator to enter hexadecimal address and data characters. The characters of a certain category are sequentially entered, starting with the most significant digit. Entered characters are shifted from right to left into the righthand display section.

Before entered characters are made effective, by operating a function key, it is possible to cancel the characters by operating the key CLD (Clear Data).

Program Load & Control Functions

MCL Master Clear. Before starting any operation it is recommended to press the key MCL. This will clear or reset most hardware logic.

IPL Initial Program Loading. The bootstrap, contained in ROM, is read into the memory.

INT Interrupt. Generates a control panel interrupt, not recognized by ordinary application programs, but accepted by certain test programs.

INST Instruction Step. Stops a running program and switches the CPU into the idle mode. The program can now be stepped instruction-by-instruction by repeated operations of the INST key. After each key operation the address and contents of the next instruction are shown on the lefthand and righthand displays respectively.

RUN Switches the CPU into run mode, starting with the instruction defined by register 0 (program counter). The word 'run' is shown on the righthand disp' .y.

Stop On Preset Address

With the CPU in idle mode; enter the wanted stop address from the hexadecimal key array. Then press either of:

PACC Preset Access Stop. The program is prepared to stop for <u>any</u> memory access to the entered address.

PWR Preset Write Stop. The program is prepared to stop only on write access to the entered address.

The program is then started by operating the RUN key (possibly after a new address loading into register 0, the program counter). During run time the righthand display indicates a preset address by the letter 'P', and the address itself is shown on the lefthand display.

When the stop address is met, the CPU switches into the idle mode and the displays show the address (left) and contents (right) of the next instruction. For recalling the stop address; just press the key RPA (Read Preset Address).

A prepared stop action can be inhibited by operating the key POFF (Preset Address Stop Off).

Read Register

- With CPU in idle mode; enter the wanted register number from the hexadecimal key array.
- Operate the key RR (Read Register).

The register number is now shown on the lefthand display, and its contents on the righthand display.

Read Memory

- With CPU in idle mode; enter the wanted memory address from the hexadecimal key array.
- Operate the key LA (Load Address), and the chosen address is shown on the lefthand display.
- Read addressed memory location by operating the key RM (Read Memory).

The read information is now shown on the righthand display, and the address on the lefthand display is increased by 2 (note that the contents of the program counter is not changed).

For reading sequential memory locations, just repeat the RM operations.

Read Status

With CPU in idle mode; operate the key RST (Read Status). The CPU status word is now shown on the righthand display.

Load Register

- With CPU in idle mode; enter the register number from the hexadecimal key array.
- Operate the key RR (Read Register), and the displays show the number (left) and contents (right).
- Enter wanted data from the hexadecimal key array.
- Operate the key LR (Load Register).

The lefthand display still shows the register number, and the righthand display shows the entered data, now also loaded into the register.

Load Memory

- With CPU in idle mode; enter the wanted memory address from the hexadecimal key array.
- Operate the key LA (Load Address), and the chosen address is shown on the lefthand display.
- Enter wanted data from the hexadecimal key array.
- Operate the key LM (Load Memory)

The address on the lefthand display is now increased by 2 (without affecting the program counter), and the righthand display shows the entered data, now also loaded into the addressed memory location.

For loading sequential memory locations, just repeat the last two steps.

Calculator Mode

The FRCP also provides a calculation facility for hexadecimal operands with a maximum length of 8 digits. The calculation mode is entered by operating the keys INST and 0 at the same time. The lefthand display will then indicate calculator mode by presenting the letter 'C' in its leftmost position.

The panel is now ready for calculations. To cope with 8-digit numbers, the righthand display (6 positions) is now extended with the two rightmost positions of the lefthand display. Five function keys may be used in the calculator mode:

```
MLC:  Clear all (display dark)
CLD:  Clear entry (display = 00 000000)
 RR:  +
 RM:  -
INT:  =
```

Consecutive operations are allowed and the last operand is memorized, see following example:

Operation	Display
A - 5 + C - B + 3 +	9
+	C
+	F
+	12
=	15
+	15
FC	FC
=	111

To leave the calculator mode; just press the INST key.

Test Functions

By operating the key TEST you can check the displays; all segments should now be illuminated. If the keys TEST and 0 are operated at the same time, you will start a microdiagnostic routine. See chapter 4, Manintenance.

FULL REFRESHED CONTROL PANEL, FRCP 6981

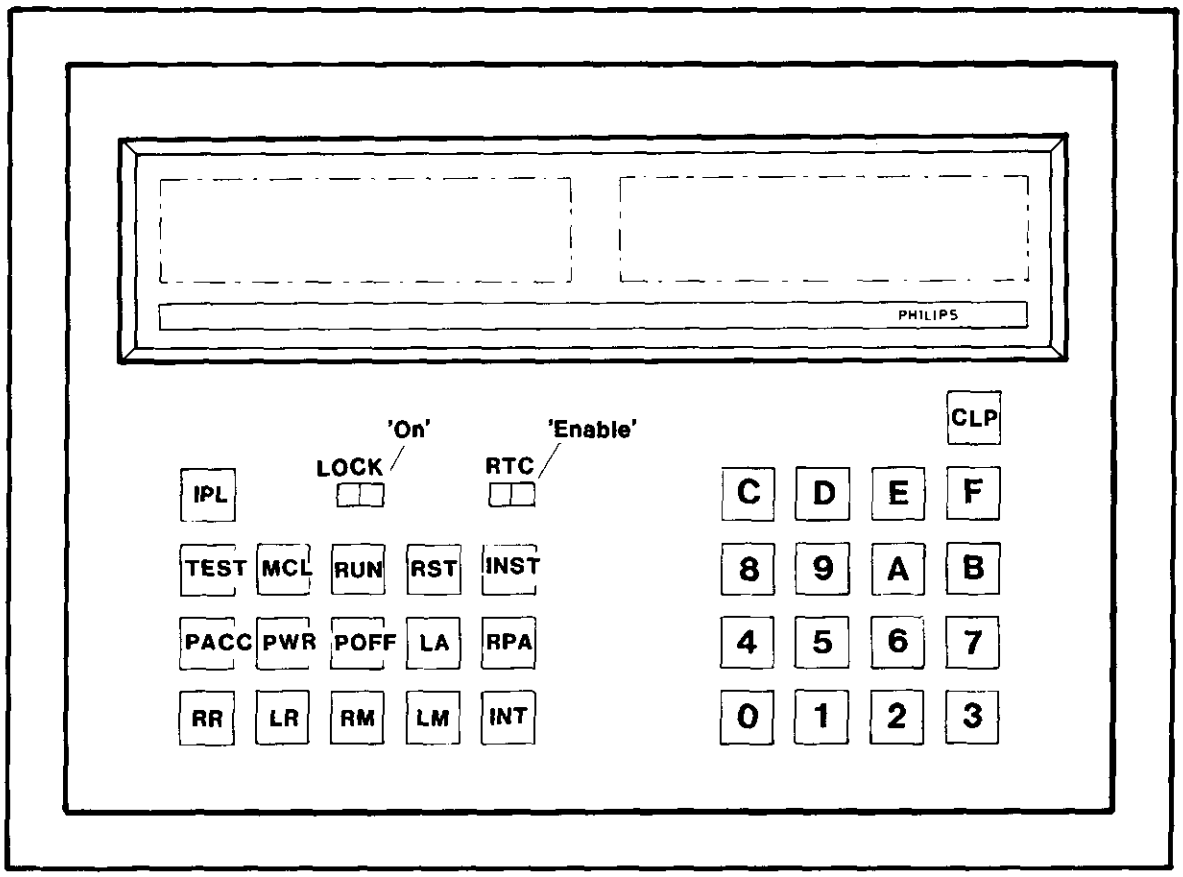


Figure 3.3-2 Full Refreshed Control Panel, FRCP