CHAPTER 6

RADAR DISPLAY EQUIPMENT

LEARNING OBJECTIVES

After you finish this chapter, you should be able to do the following:

1. Identify the AN/SPA-25 G repeater controls and state their uses.

2. Recognize the various NTDS display consoles.

INTRODUCTION

When radar was first used by the military, the information it provided was displayed on a single-unit console. The console included a radar indicator ("scope") and its associated controls, and a number of receiver and transmitter controls. As the development of radar progressed, ships were furnished with more than one type of radar (air search, surface search, etc.). The displaying of radar information began to get complicated.

It soon became apparent that information from several different radars had to be available at each of several physically separated consoles. Also, in some cases, information from the *same* radar needed to be displayed in more than one way at the same time. For example, the information from an air-search radar might be needed for both air search and air control at the same time, requiring two different types of display.

The device used to display radar information is known as a *radar indicator*. Since indicators can be located at a point away from the other radar equipment, they are frequently referred to as *remote* indicators. Remote indicators are sometimes referred to as *repeaters*. The present-day remote indicator can operate with any of the search radars in use today.

Since modern naval ships are equipped with several radars and many indicators for displaying target information, the problem of getting the information from any radar to any radar repeater can be quite a problem. The obvious solution is to run a cable from each radar to every indicator, but this requires a large amount of space for the cables and adds too much weight to be practical. The accepted solution is a centralized distribution system, consisting of a distribution panel with a single input cable from each radar and a single output cable to each indicator. The system operates automatically. When an operator selects a particular radar, the switchboard connects the operator's console to the desired radar. Although the change occurs rapidly, it is complicated, in that several electronic connections are required for the inputs (timing, or trigger, pulses from the modulator; video signals from the receiver; and antenna synchronization signals for PPI sweeps).

The two most common types of displays (indicators) are as follows:

- PPI (plan position indicator) scope (range-azimuth indicator)

- NTDS scope (range-azimuth indicator)

The **PPI scope** is by far the most used radar display. It is a polar-coordinate display of the surrounding area, with own ship represented by the origin of the sweep (normally located in the center of the scope). The PPI uses a radial sweep pivoting about the center of the presentation in synchronization with the antenna to provide a map-like picture of the area covered by the radar beam. A relatively long persistence screen is used so that targets remain visible until the sweep passes again.

Bearing is indicated by the target's angular position in relation to an imaginary line extending vertically from the sweep origin to the top of the scope. The top of the scope represents either true north (when the radar is operating in true bearing) or ship's head (when the radar is operating in relative bearing).

The basic PPI screen presentation results from raw (unprocessed) video. Raw video provides only a "blip" on the indicator screen, leaving target interpretation entirely to the operator.

The **NTDS scope** is a repeater (PPI) used with Naval Tactical Data System computer-oriented equipment. It provides the operator with a processed radar display (symbology and other information), as opposed to the raw video display on the basic PPI scope. We will discuss the NTDS console in detail later in this chapter.

AN/SPA-25G

The AN/SPA-25G is an advanced navigation, air search, and tactical situation solid-state radar indicator designed for both CIC and bridge environments. It increases the operator's capabilities while decreasing his work load through a unique information display and efficient man-machine interface.

The AN/SPA-25G solves all the range, bearing and plotting problems associated with target tracking, navigation, Estimated Point of Arrival (EPA), and air traffic control. Operators can perform formerly manual plotting and range and bearing calculating tasks through the AN/SPA-25G by pushing buttons, moving its stiff stick control, and reading and viewing the solution(s) on its indicator screen.

The AN/SPA-25G's operating controls and status indicators are located on the front control panel around the CRT as shown in figure 6-1. Table 6-1 lists their
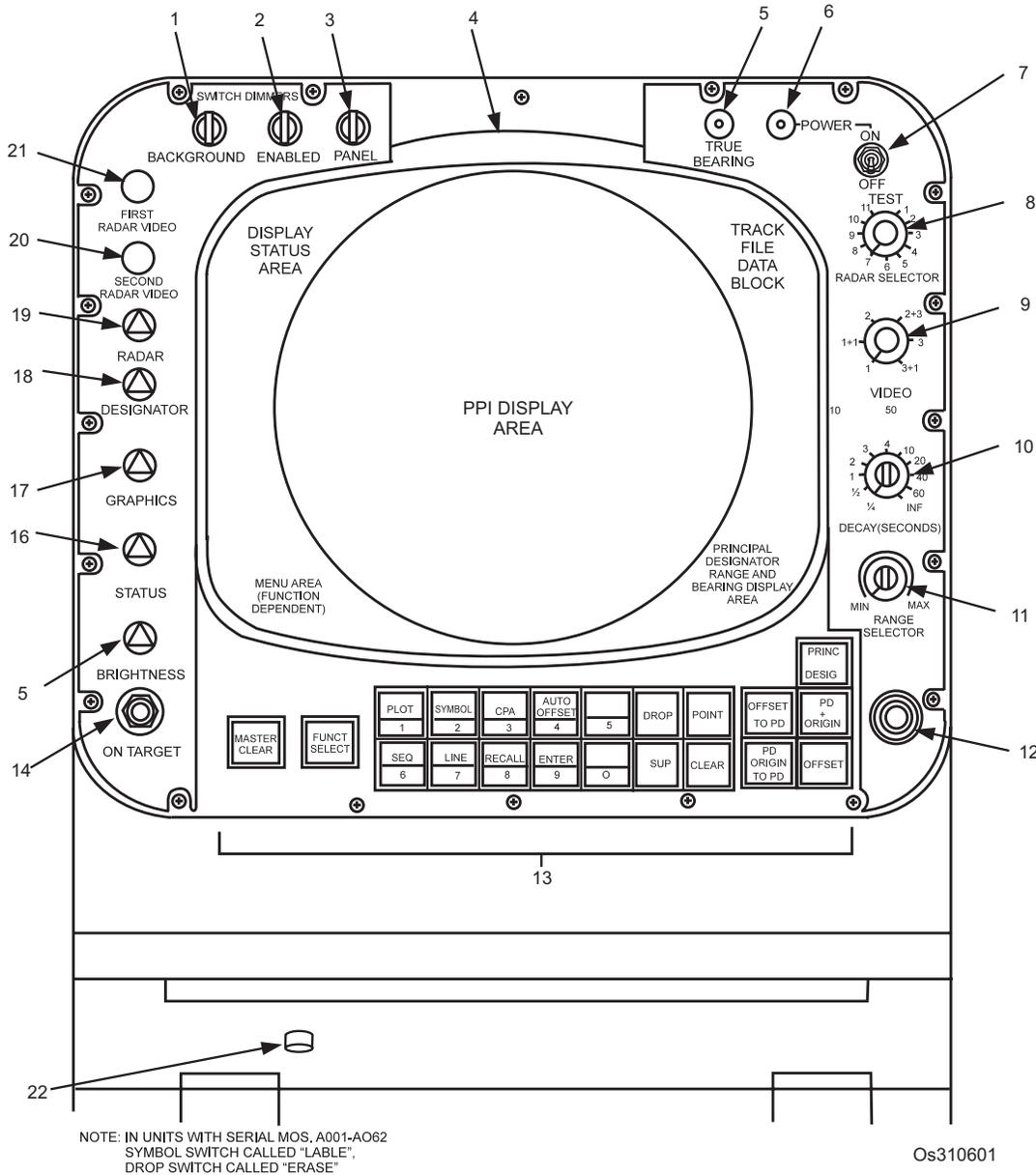

NOTE: IN UNITS WITH SERIAL NOS. A001-AO62
SYMBOL SWITCH CALLED "LABLE",
DROP SWITCH CALLED "ERASE"

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Figure 6-1.—Radar Indicator Control Panel 1A2A5 controls and indicators.

INDEX NO.	PANEL DESIG	FUNCTION
1	BACKGROUND SWITCH	Adjusts brightness of function switch legends when not activiated (backlit contition)
2	ENABLED SWITCH	Adjust brightness of function switch legends when actuated
3	PANEL control	Adjusts overall panel illumination (red)[1]
4	CRT display	Provides PPI and four alphanumeric status displays
5	TRUE BEARING lamp	When lit, indicates that display is present in true bearing: when not lit, display is in relative bearing. Knurled body adjusts brightness
6	POWER LAMP	Indicates that power is applied to radar indicator
7	POWER switch ON	Controls 115-volt operating power to radar indicator
8	RADAR SELECTOR	Controls external switchboard. Selects one of 11 shipboard radars and TEST function
9	VIDEO switch	Selects one of three video sources or mixed video from any two sources
10	DECAY (SECONDS)	Adjusts video signal decay time in seconds. Continuously variable from 1/4 SECOND to 60 SECONDS and INF (infinity)
11	RANGE SELECTOR	Adjusts range scale of displayed data. Continuously variable for range from 1/4 nmi to 250 nmi (1/2 nmi to 500 nmi in extended range)
12	Stiffstick control	Dedicated to adjacent function switches as activated. Controls movement and/or position of principle designator (PD) symbol, PD origin symbol, or PPI OFFSET
13	MASTER CLEAR switch	Returns display to initialization conditions
	FUNC SELECT	Enables selection or de-selection of specialized modes and conditions of operation from menus. If not active, indicator remains in general (default) node or operation
	PLOT/1 switch	Dual function. Marks position of any designated point (PLOT); numeric entry(1)
	SYMBOL/2 switch[2]	Dual function. Assigns tactical symbols; numeric entry (2)
	CPA/3 SWITCH	Dual function. Accesses predicted closest point approach between target and ownship as derived from ownship and target speed and course; numeric entry (3); in Air intercept mode it is the Forward Quarter Intercept (FQI) mode function key

[1] In serial numbers A001 through A062, panel illumination is white.
[2] In serial numbers A001 through A062, switch nomenclature is LABLE/2.

INDEX NO.	PANEL DESIG	FUNCTION
	AUTO OFFSET/4	Dual function. Changes PPI display from an ownship stabilized presentation (fixed center or offset) to an offset dead reckoning presentation (ownship position automatically offset at a selected rate); numeric entry (4)
	*/5 SWITCH	Dual function. Used in Air Intercept Mode to engage air targets for intercept operations; numeric entry (5)
	SEQ/6 switch	Dual function. Allows rapid sequencing through active track files; numeric entry (6)
	Line/7 switch	Dual function. Allows lines to be drawn on PPI, for example, boat lanes or helo corridors; numeric entry (7)
	RECALL/8 switch	Dual function. Returns PD to a specific plot point in a track history file; numeric entry (8)
	ENTER/9 switch	Dual function. Allows parameters used in operations or calculation, such as date, time, magnetic correction, ownship course and speed, to be entered or corrected; numeric entry (9)
	**/0 switch	Dual function. Used to request automatic assignment of numbers or deletion of number; numeric entry (0)
	DROP switch[3]	Used to delete items (plot points, track history files, lines) from storage in memory and to delete associated graphics from PPI display
	POINT switch	Designates specific items or location where actions may be performed
	SUP switch	Allows selective suppression of display information from PPI (without erasing from memory)
	CLEAR switch	Used in conjunction with other function switches to abort a procedure or to clear a process. When used with menu selection switches causes program to return to menu selection level
	OFFSET TO PD switch	Causes a PD centered PPI display
	DP ORIGIN TO PD switch	Causes PD ORIGIN symbol to move to location of PD on display
	PRING DESIG switch	Places positioning/movement of principal designator (PD) symbol under stiffstick control
	PD ORIGIN	Places positioning/movement of PD origin symbol under stiffstick control
	OFFSET switch	Causes PPI display to be offset by stiffstick control

[3] In serial numbers A001 through A062, switch nomenclature is ERASE.

INDEX NO.	PANEL DESIG	FUNCTION
14	ON TARGET switch	Provides switch closure to external equipment via rear panel connector (not used)
15	BRIGHTNESS control	Adjusts overall brightness of CRT display
16	STATUS control	Adjusts intensity of alphanumerics and symbols within status displays (outside PPI area)
17	GRAPHICS control	Adjusts intensity of all symbols within PPI area except PD, PD origin, BL (bearing line)
18	DESIGNATOR control	Adjusts intensity of PD symbol, PD origin symbol and BL
19	RADAR control	Adjusts intensity of radar video signals
20	SECOND RADAR VIDEO	Functions with VIDEO switch. When mixed video is selected, adjusts input level of second video source
21	FIRST RADAR VIDEO	Functions with VIDEO switch. Adjusts input level of first video source when mixed video is selected; otherwise adjusts single video source selected
22	INTENSITY[4]	Illuminates right hand portion of illuminated shelf

[4] No panel marking

reference and panel designations and describes their operating functions.

For more in-depth operating information on the AN/SPA-25G, refer to NAVSEA SE251-DG-MMO, *Technical Manual for Indicator Group AN/SPA-25G Volume I.*

Q1. What function switch should you press to return the AN/SPA-25G display to its initialization condition?

Q2. What switch should you use to adjust the intensity of all symbols within the PPI area?
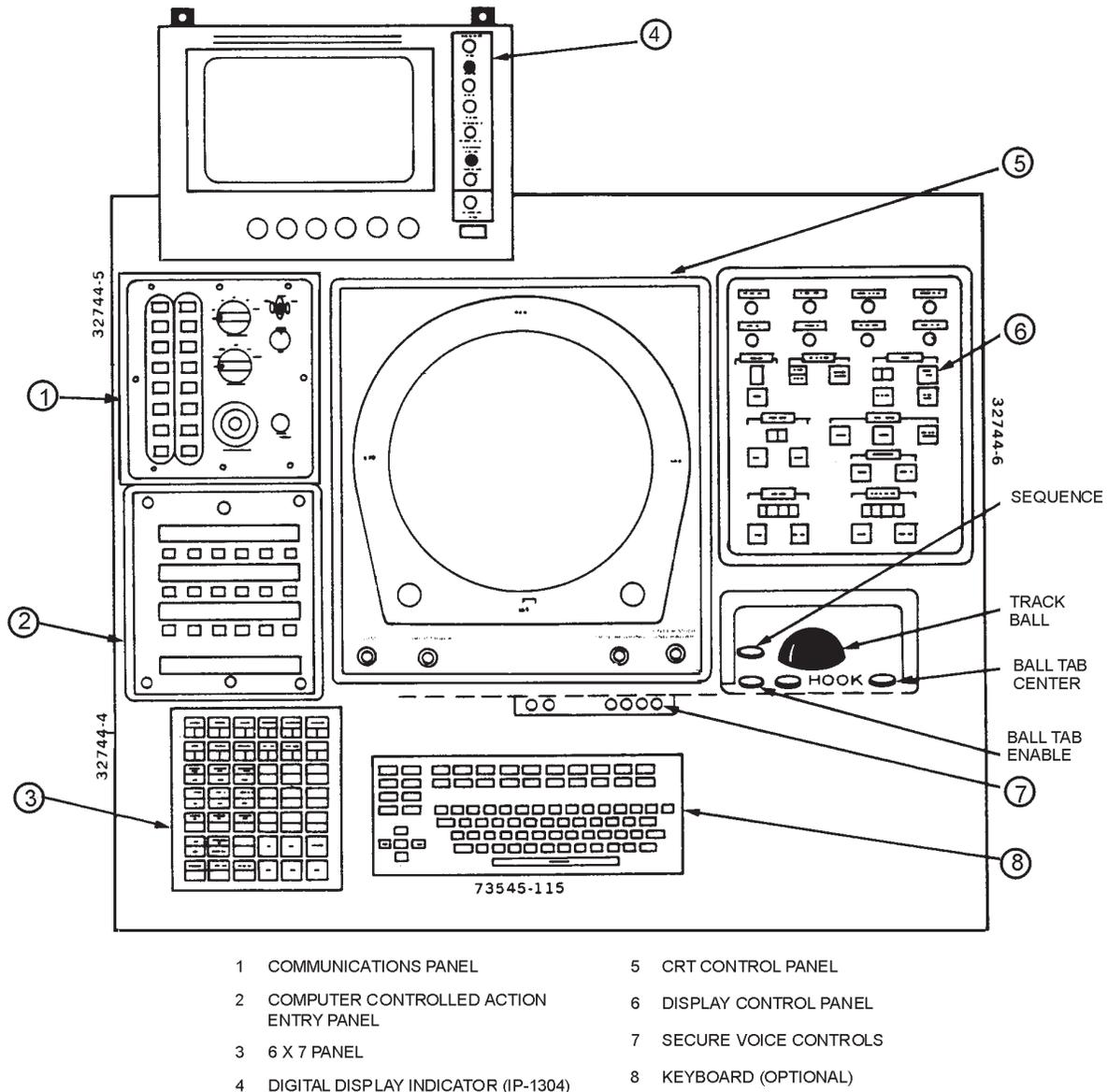
NTDS CONSOLES

Depending on what class of ship you are on, you will be using different types of Naval Tactical Data System (NTDS) display consoles. There are two basic types of display consoles, the AN/UYA-4 consoles and the AN/UYQ-21 display consoles. The NTDS PPI display consoles can display both conventional radar data and symbols denoting tactical information about the radar contacts. Symbology helps the command

structure to completely and rapidly define the current tactical situation. It also is a means of communicating data and orders to, and receiving processed information from, the computer program.

AN/UYA-4 DISPLAY CONSOLES

Aside from the computer, the console is the principal hardware component of the NTDS. There are two basic AN/UYA-4 display consoles. The first is the OJ-194 console. (See figure 6-2.) There are several versions of the OJ-194 console, so refer to your ship's equipment System Operations Manuals (SOMs) for specific operating instructions.

The other AN/UYA-4 console is the OJ-197 Operations Summary Control (OSC) Console (figure 6-3). This is a stand-up Command Decision display console for all information presented on the PPI. The OSC is similar to the OJ-194, with the following additional features: (1) track history memory, (2) ship's motion converter, (3) range bearing strobe and (4) large 20-inch CRT for group viewing.

Figure 6-2.—OJ-194A(V)3/AN/UYA-4 PPI console control panels.

1	COMMUNICATIONS PANEL	5	CRT CONTROL PANEL
2	COMPUTER CONTROLLED ACTION ENTRY PANEL	6	DISPLAY CONTROL PANEL
3	6 X 7 PANEL	7	SECURE VOICE CONTROLS
4	DIGITAL DISPLAY INDICATOR (IP-1304)	8	KEYBOARD (OPTIONAL)

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AN/UYQ-21 DISPLAY CONSOLE

The OJ-451(V)/UYQ-21 TDS display console (fig. 6-4) is the basic operator interface with the operational program. The TDS console can display symbology, graphics, and sensor sweep and video. It consists of the computer display console, a basic display unit (BDU), a TV monitor (CRO), and a communications station.
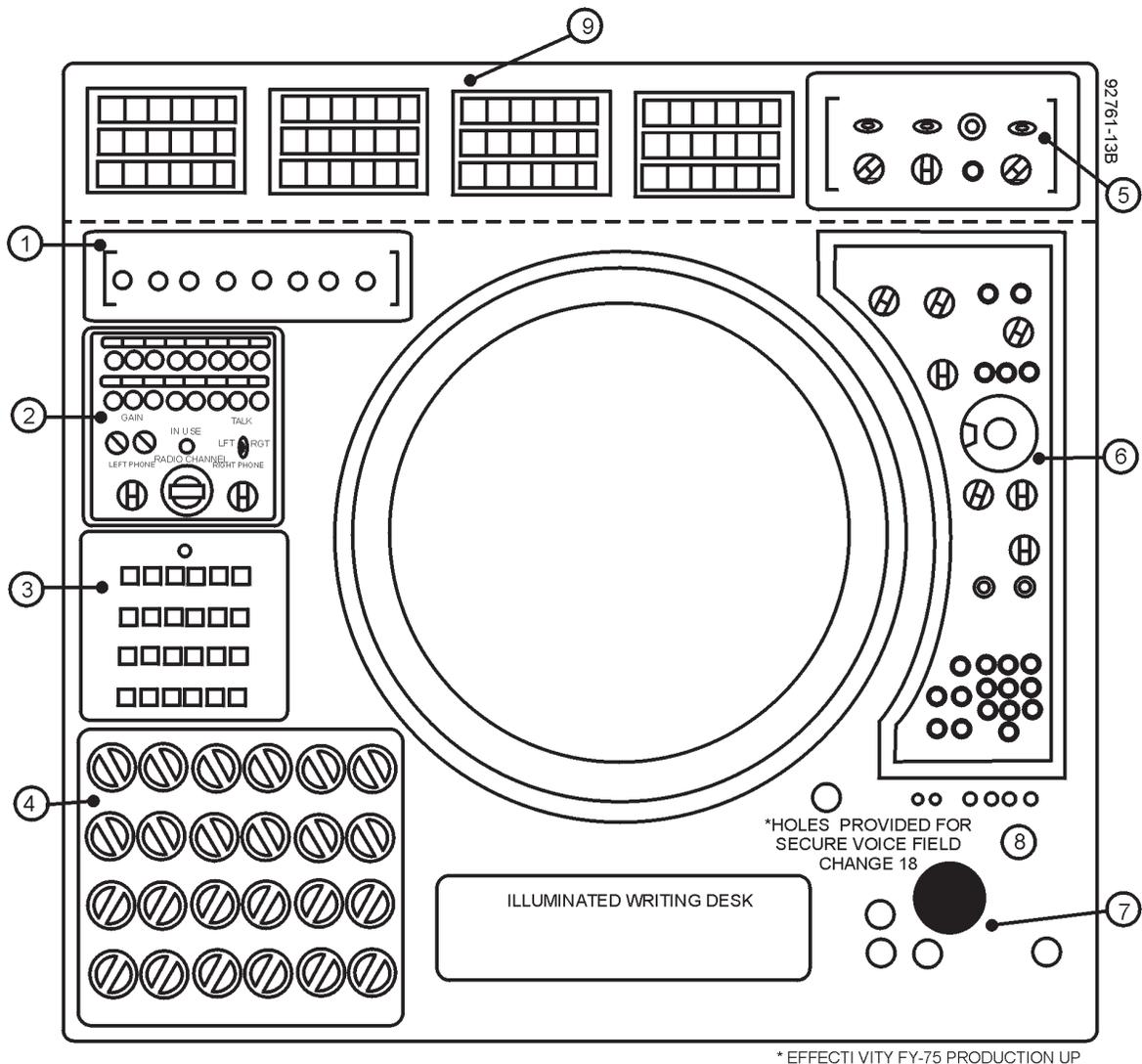
In addition to the PPI and its normal controls, the console displays symbology to completely and rapidly define the current tactical situation, and is a means of communicating data and orders to, and receiving processed information from, the computer program. Since there are several different versions of the TDS display console, refer to your ship's SOMs for operating instructions.

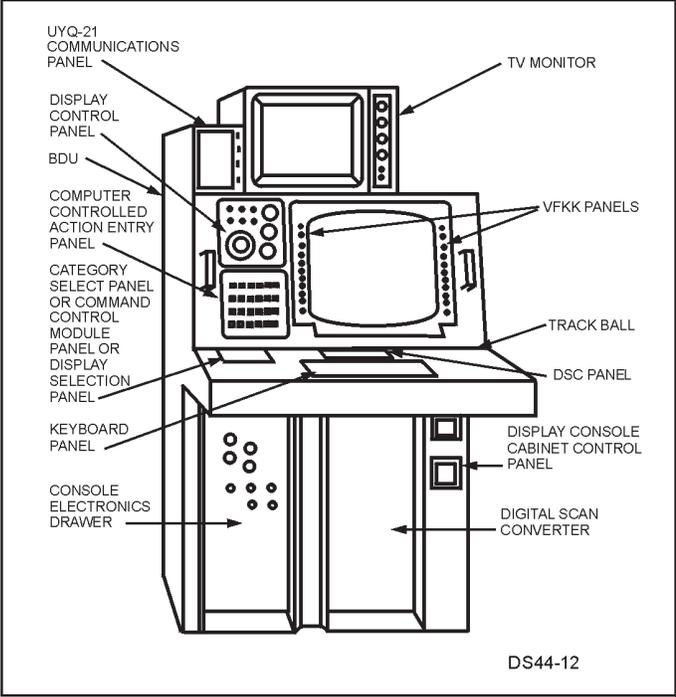Q3.   What are the two types of AN/UYA-4 consoles?

ANSWERS TO CHAPTER QUESTIONS

A1.   The MASTER CLEAR switch.

A2.   The GRAPHICS control switch.

A3.   The OJ-194 and OJ-197 consoles.

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*HOLES PROVIDED FOR
SECURE VOICE FIELD
CHANGE 18

ILLUMINATED WRITING DESK

* EFFECTIVITY FY-75 PRODUCTION UP

1 CRT CONTROL PANEL

2 COMMUNICATIONS PANEL

3 COMPUTER CONTROLLED ACTION ENTRY

4 CATEGORY SELECT PANEL

5 DISPLAY CONTROL PANEL

6 SYMBOL - TRACK CONTROL PANEL

7 TRACK BALL CONTROLS

8 SECURE VOICE CONTROLS

9 AUXILIARY READOUT PANEL

10 (NOT ILLUSTRATED) A DDI-IP-1304 MAY BE INSTALLED
    ON TOP OF THE 9 AREA BY FC-24/OJ-197 AS AN
    OPTIONAL CONTRACT ITEM.

Figure 6-3.—OJ-197(V)/AN/UYA-4 Operations Summary Console Control Panels.

UYQ-21
COMMUNICATIONS
PANEL

TV MONITOR

DISPLAY
CONTROL
PANEL

BDU

COMPUTER
CONTROLLED
ACTION ENTRY
PANEL

VFKK PANELS

CATEGORY
SELECT PANEL
OR COMMAND
CONTROL
MODULE
PANEL OR
DISPLAY
SELECTION
PANEL

TRACK BALL

DSC PANEL

KEYBOARD
PANEL

DISPLAY CONSOLE
CABINET CONTROL
PANEL

CONSOLE
ELECTRONICS
DRAWER

DIGITAL SCAN
CONVERTER

DS44-12

OS310604

Figure 6-4.—OJ-451(V)/UYQ-21 TDS display console.