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BAE SYSTEMS

**BAE Systems Generation 2 Keyboard, Video, Mouse Switch
(KVM) User's Guide
(P/N: 8560943-2)**

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1 INTRODUCTION

This document provides Common Criteria user operational guidance for the BAE Systems Generation 2 KVM, part number 8560943-2. The Generation 2 KVM, hereafter referred to as the KVM, is intended for use on an airborne military platform. The KVM, which resides inside a workstation console, facilitates the switching of the console's local keyboard, trackball and two Flat Panel Display (FPD) monitors (one with a touch panel) to one of four host computers, two within the console (PC1 and PC2) and two external to the console (PC3 and PC4).

The purpose of this document is to instruct KVM users in the proper operation of the KVM with respect to its Common Criteria evaluated configuration. The Target of Evaluation (TOE) for the Common Criteria evaluated configuration of the KVM is the KVM chassis and the modules contained within it, listed in Table 1 below. Note that the transmitter for PC4 is not contained within the KVM chassis because its use is optional. It is outside the evaluated configuration of the KVM but considered to be non-interfering with respect to the security of the KVM.

Because the KVM resides inside the closed console, it is not normally visible to the user. A power supply also inside the console provides +5VDC power to the KVM. The user controls the KVM and receives status from the KVM via custom keyboard on the console. A Power Control Panel (PCP) on the console contains a power switch and power indicator for the console, individual power switches and power indicators for PC1 and PC2, and fault indicators for PC1 and PC2. Refer to Table 1 and Figure 1 for the physical locations of the KVM modules. The same power supply that provides +5VDC power to the KVM also provides +5VDC power to the keyboard.

Table 1. KVM Module Slot Locations

Module Name	KVM Chassis Slot Location
Optical Switch	B1
PC1 Transmitter	B2
PC2 Transmitter	B3
PC3 Transmitter	B4
Receiver	B5

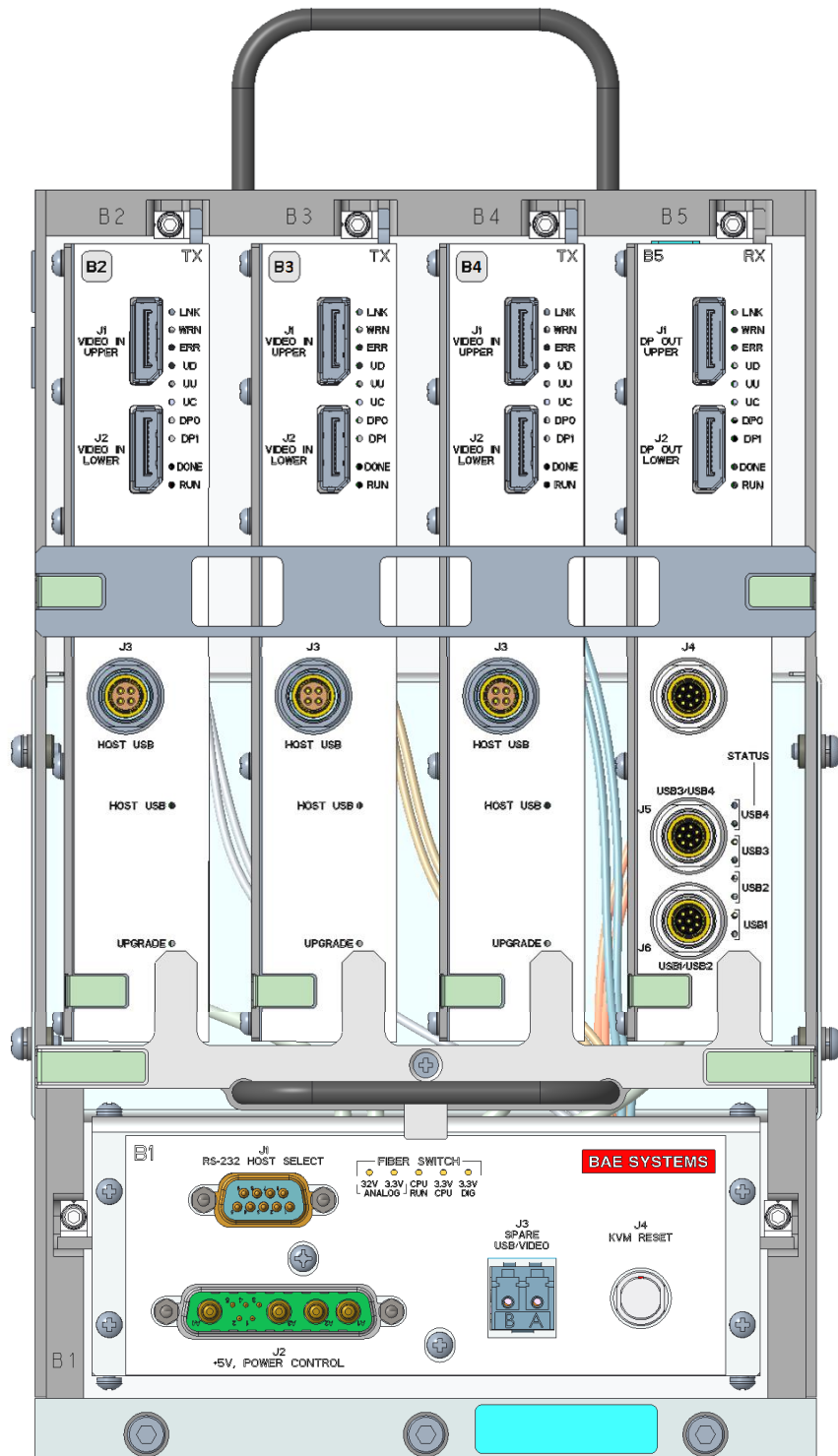


Figure 1. KVM Front View

2 SETUP

2.1 KVM

The KVM, keyboard and all associated components are installed in the console at the factory, so there is no installation or configuration action required by the user. The installed USB peripheral devices are the only ones allowed to be used with the KVM. If any other USB device is connected to the KVM, it will disable the associated USB port. KVM memory is pre-loaded with the EDID information of the monitors that are included within the console. Figure 1 shows the front of the KVM. Table 2 lists the KVM connectors, their functions, and the mating cable connectors. All connections to other equipment are made from the front of the KVM. In the event the user needs to remove and replace the KVM, the connectors on the mating cables all have labels that indicate the KVM connector to which they mate.

Table 2. KVM Connectors and Mating Connectors

KVM Connector	Description	Mating Cable Connector
B1J1	Optical Switch RS232 Input From Keyboard	W415 P4
B1J2	+5VDC Input Power	W12 P12
B1J3	PC4 Tx Video/USB Fiber Optic Interface	W403 P2
B1J4	KVM Reset Input From PCP	W417 P2
B2J1	PC1 Computer Upper FPD Video Input	W406 P2
B2J2	PC1 Computer Lower FPD Video Input	W407 P2
B2J3	PC1 Computer USB Interface	W413 P3
B3J1	PC2 Computer Upper FPD Video Input	W408 P2
B3J2	PC2 Computer Lower FPD Video Input	W409 P2
B3J3	PC2 Computer USB Interface	W414 P2
B4J1	PC3 Computer Upper FPD Video Input	W410 P2
B4J2	PC3 Lower FPD Video Input	W411 P2
B4J3	PC3 Computer USB Interface	W412 P1
B5J1	FPD Upper Display FPD Output	W404 P1
B5J2	FPD Lower FPD Video Output	W405 P1
B5J4	Rx RS232 To/From Keyboard	W415 P3
B5J5	Keyboard and Trackball USB Interfaces	W415 P2
B5J6	Upper and Lower FPD USB Interfaces	W416 P1

Figure 2, provided for reference only, shows the rear of the KVM. The KVM's rear side has internal connections only; the user should not disturb any of these connections.

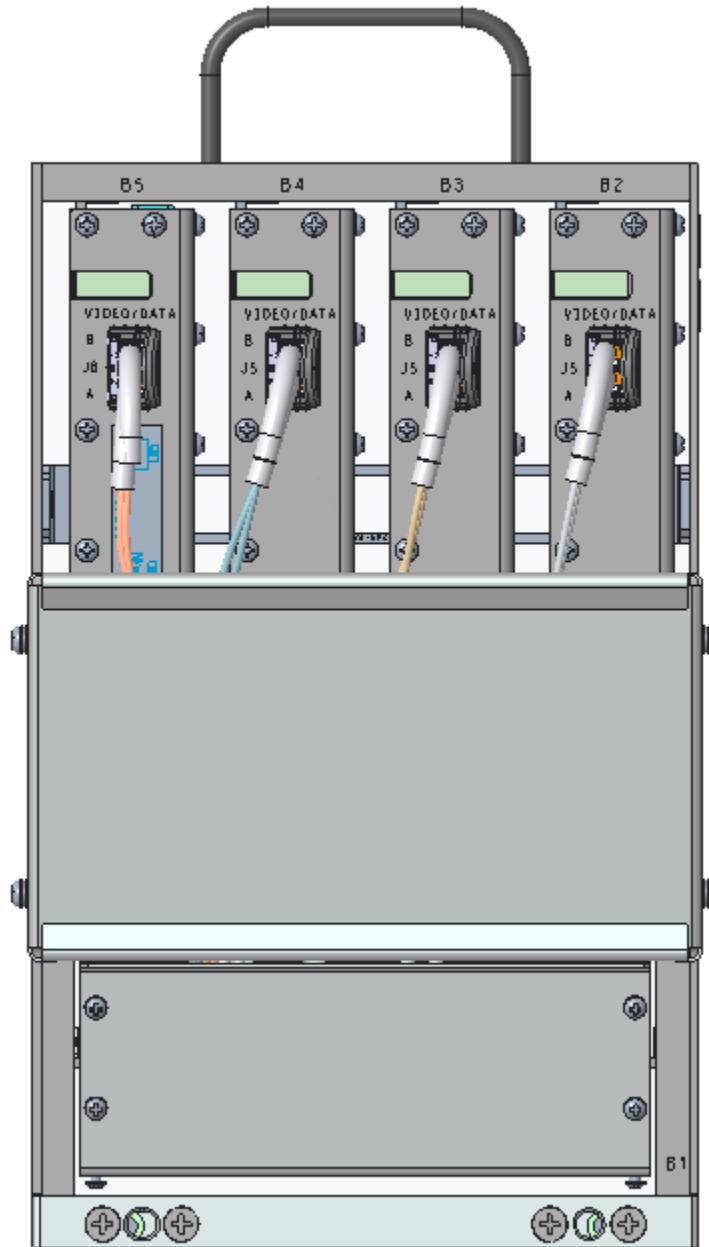


Figure 2. KVM Rear View

2.2 Keyboard

Table 3 lists the keyboard connectors, their functions, and mating cable connectors. In the event the user needs to remove and replace the keyboard, the connectors on the mating cables all have labels that indicate the keyboard connector to which they mate. The connectors are also color-coded.

Table 3. Keyboard Connectors and Mating Connectors

Keyboard Connector	Description	Mating Cable Connector
J1 (Red)	+5VDC Input Power	W12 P8
J2 (Green)	PC1 and PC2 Power On and PCP LED Brightness Signals	W12 P13
J3 (Blue)	Keyboard USB, Trackball USB and RS232 to KVM	W415 P1
J4 (Yellow)	Handgrip Laser Fire and LED Brightness Signals	W413 P2

Additionally, the keyboard has a pair of umbilical cables on both sides to connect a trackball and handgrip. The user can place the trackball and handgrip on the left or right side of the keyboard, according to the user's preference. The trackball connects to umbilical cable P3 (right side) or P4 (left side). The handgrip connects to umbilical cable P3 and umbilical cable P5 (right side) or umbilical cable P4 and umbilical cable P6 (left side). P5 and P6 are not used with the trackball.

2.3 Power Control Panel

Table 4 lists the PCP connectors, their functions, and mating cable connections. In the event the user needs to remove and replace the PCP, the connectors on the mating cables all have labels that indicate the PCP connector to which they mate.

Table 4. PCP Connectors and Mating Connectors

PCP Connector	Description	Mating Cable Connector
J1	+5VDC Input Power	W12 P9
J2	PC1 Computer +5VDC Input and I2C Bus Interface	W12 P10
J3	PC2 Computer +5VDC Input and I2C Bus Interface	W12 P11
J4	KVM Reset Output to KVM	W417 P1

2.4 Console Power Supply

Table 5 lists the power supply connectors, their functions, and mating cable connectors. In the event the user needs to remove and replace the power supply, the connectors on the mating cables all have labels that indicate the power supply connector to which they mate.

Table 5. Console Power Supply Connectors and Mating Connectors

Power Supply Connector	Description	Mating Cable Connector
J1	115VAC 400 Hz 3-Phase Power Input	W11 P1

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Power Supply Connector	Description	Mating Cable Connector
J2	48VDC and +5VDC Outputs to PC1 Computer	W12 P1
J3	48VDC and +5VDC Outputs to PC2 Computer	W12 P2
J4	IPMI Interfaces to PC1 and PC2 Computers	W12 P3

3 OPERATION

The user turns power on to the console via the console's POWER pull-to-engage power switch located on the Power Control Panel (PCP). See Figure 3. Upon application of power, POWER LED illuminates, the console boots up and performs self-testing. The red fault indicators on the keyboard (see Figure 4) show when the keyboard or KVM experience a self-test failure. See section 4 for a description of self-tests performed by the KVM, keyboard, PCP, console power supply, and their associated fault indications. As noted in section 2A above, the installed USB peripheral devices are the only ones allowed to be used with the KVM. If any other USB device is connected to the KVM, it will disable the associated USB port.

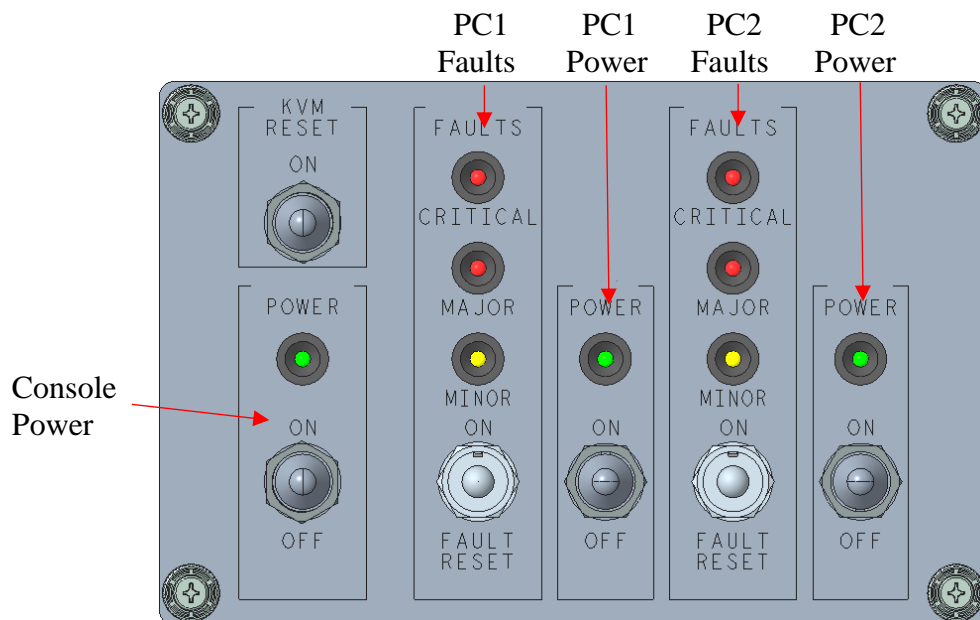


Figure 3. Power Control Panel

It should be noted that after power up, the KVM Rx Fault LED will illuminate on the keyboard while the KVM is booting up. This is because the keyboard is not able to communicate with the KVM during this time. Once the KVM completes booting up, the KVM Rx Fault LED will extinguish. After booting up, the keyboard automatically commands the KVM to select the default host computer. PC1 is the default host computer, if it is powered on. If PC1 is powered off, then PC2 is the default computer. If both the PC1 and PC2 are powered off, then the PC3 is the default computer. This is always the case because PC3 is remote to the console and powered separately, so its power status is not provided to the KVM and keyboard. The user can selectively turn power off and on to the PC1 and PC2 host computers via the pull-to-engage PC1 and PC2 POWER ON/OFF switches on the PCP. See Figure 3. The keyboard does not allow the PC1 or PC2 host computers to be selected when they are powered off. If the user attempts to switch to PC1 or PC2 when they are powered off, nothing happens; the KVM does not switch and there is no change to the indicators on the keyboard. If the user switches to PC3 when it is powered off, the KVM will switch to PC3, the blue PC3 indicator on the keyboard will illuminate, but no video will be displayed and the peripherals will not function. If the user switches to PC4 but PC4 is powered off

or not present, the PC4 Tx fault LED will illuminate. (The Tx module for PC4 is considered to be part of PC4.)

The momentary pull-to-engage KVM RESET switch on the PCP power cycles the KVM only. After actuating the KVM RESET switch, the KVM selects the host computer currently selected by the user. Initiating a KVM reset will cause the KVM Rx Fault LED to illuminate on the keyboard while the KVM is powered off and booting up. This is because the keyboard is not able to communicate with the KVM during this time. After the KVM boots up, the KVM Rx Fault LED will extinguish as communication between the keyboard and KVM resumes.

The PC1 and PC2 fault LEDs on the PCP show the fault status of the PC1 and PC2 host computers only; they do not show the fault status of the KVM. The user can try to reset the PC1 and PC2 host computer faults via PC1 and PC2 momentary toggle FAULT RESET switches. This resets the fault codes in the host computer; if the fault persists the fault LED will turn on again.

The user controls switching the KVM via the keyboard. See Figure 4. In order to switch the KVM, the user simultaneously depresses the FN key and the desired KVM selection key. The FN key is located on the bottom row to the right of the space bar and ALT key and the KVM selection keys are the blue keys located in the upper right. Blue LEDs in the upper left corner of the KVM selection keys indicate which host computer is currently selected. Upon switching the KVM, the blue LED for the newly selected host computer illuminates only after the keyboard receives confirmation from the KVM that it switched correctly. The KVM switches the video, keyboard USB, trackball USB and touch panel USB all together to the selected host computer. As noted above, if the user attempts to switch to PC1 or PC2 when they are powered off, nothing happens. The KVM does not switch and there is no change to the indicators on the keyboard. If the user switches to PC3 when it is powered off, the KVM will switch to PC3 but no video will be displayed and the peripherals will not function. If the user switches to PC4 but PC4 is powered off or not present, the PC4 Tx fault LED will illuminate. (The Tx module for PC4 is considered to be part of PC4.)

Each individual Tx has its own status light that illuminates if the link to that Tx is active (identified as 'LNK' in Figure 1). This information corresponds with the selected channel on the keyboard. Since the KVM itself is located inside the console workstation, this information will not be visible during typical use, and the keyboard should be used as the indicator for the selected channel.

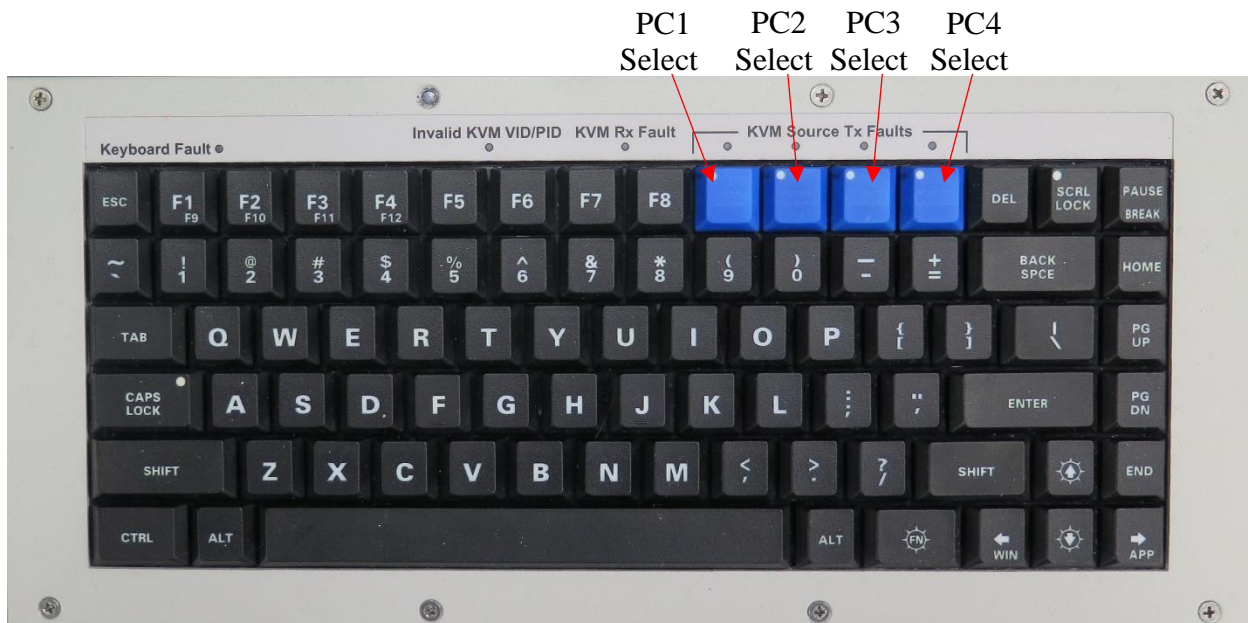


Figure 4. Keyboard

The KVM provides two video interfaces for two DisplayPort Flat Panel Display (FPD) monitors. The FPDs are custom-built for use in the console and are mounted in a vertical orientation so that one monitor is the upper monitor and the other is the lower monitor. The lower monitor has a touch panel interface.

A trackball connects to the keyboard and can be installed on either the left or right side of the keyboard. The trackball provides the point-and-click mouse function. A handgrip connects to the keyboard on the opposite side of the trackball. The user can swap the positions of the trackball and handgrip using a screwdriver. The trackball USB interface passes through the keyboard and goes to the KVM. The handgrip USB interface also passes through the keyboard, but it bypasses the KVM and goes directly to the PC1 host computer.

The KVM contains a whitelist that is set at the factory; it is not user configurable. The KVM accepts only USB devices whose USB Vendor ID (VID) and Product ID (PID) are in the whitelist. When the KVM detects a connected USB device that has a VID/PID combination not in its whitelist, it disables the associated USB port, illuminates the VID/PID fault indicator on the keyboard and displays an “Invalid USB Device Detected” message on both monitors. The KVM provides four USB ports for the peripherals, one each for the upper and lower FPDs, one for the keyboard and one for the trackball.

4 SELF-TEST AND FAILURE INDICATIONS

4.1 KVM

The causes of a KVM failure and the resulting failure indication are as follows.

- Memory test failure. The KVM becomes inoperable and the keyboard illuminates the KVM Rx Fault LED. The user is not able to switch the KVM.
- Internal processor to support chip communication failure. When detected, the KVM becomes inoperable and the keyboard illuminates the appropriate KVM Source Tx Fault LED and/or the KVM Rx Fault LED. The user is not able to switch the KVM.
- VID/PID check failure. Caused by the KVM detecting an attached USB device with a VID/PID combination that is not in its whitelist. The keyboard illuminates the Invalid KVM VID/PID LED and displays a message on the monitors indicating that an invalid USB device was detected. The KVM disables the USB port connected to the invalid USB device.
- KVM Tx-Rx link down. Caused by total lack of communication between the Tx and Rx. The keyboard illuminates the appropriate KVM Source Tx Fault LED.
- KVM Tx-Rx communication failure while Tx-Rx link is up. Caused by communication error between the selected Tx and Rx. The KVM becomes inoperable and the keyboard illuminates the KVM Rx Fault LED. The user is not able to switch the KVM.
- KVM Tx fiber optic transceiver presence failure. When detected, the KVM becomes inoperable and the keyboard illuminates the appropriate KVM Source Tx Fault LED. The user is not able to switch the KVM.

The user can recover from a VID/PID check failure by removing the invalid USB device and then toggling the console power switch to recycle console power, or toggling the KVM Reset switch to recycle power on the KVM only. The user can try to recover from the other KVM test failures listed above by toggling the console power switch to recycle console power or by toggling the KVM Reset switch to recycle power on the KVM only. Remove and replace the KVM if the KVM does not recover. Send the failed KVM to BAE Systems for repair.

4.2 Keyboard

The keyboard is not part of the KVM. It is a separate component of the console but it contains the KVM remote control. Therefore, a failure in the keyboard is considered a potential KVM failure.

The causes of a keyboard failure and the resulting failure indication are as follows.

- Memory test failure. The keyboard illuminates the Keyboard Fault LED and the keyboard becomes inoperable. The user is not able to switch the KVM.

- Processor not resetting watchdog timer. The keyboard continually reboots indicated by the keyboard LEDs repeatedly illuminating and extinguishing. The keyboard becomes inoperable and the user is not able to switch the KVM.
- Stuck KVM selection key. The keyboard illuminates the Keyboard Fault LED and causes the KVM to shut itself down. The keyboard and KVM both become inoperable.
- Stuck QWERTY key. The keyboard illuminates the Keyboard Fault LED.

The user can try to recover from any of the above failures by toggling the console power switch to recycle console power. Remove and replace the keyboard if the keyboard does not recover. Send the failed keyboard to BAE Systems for repair.

4.3 Power Control Panel

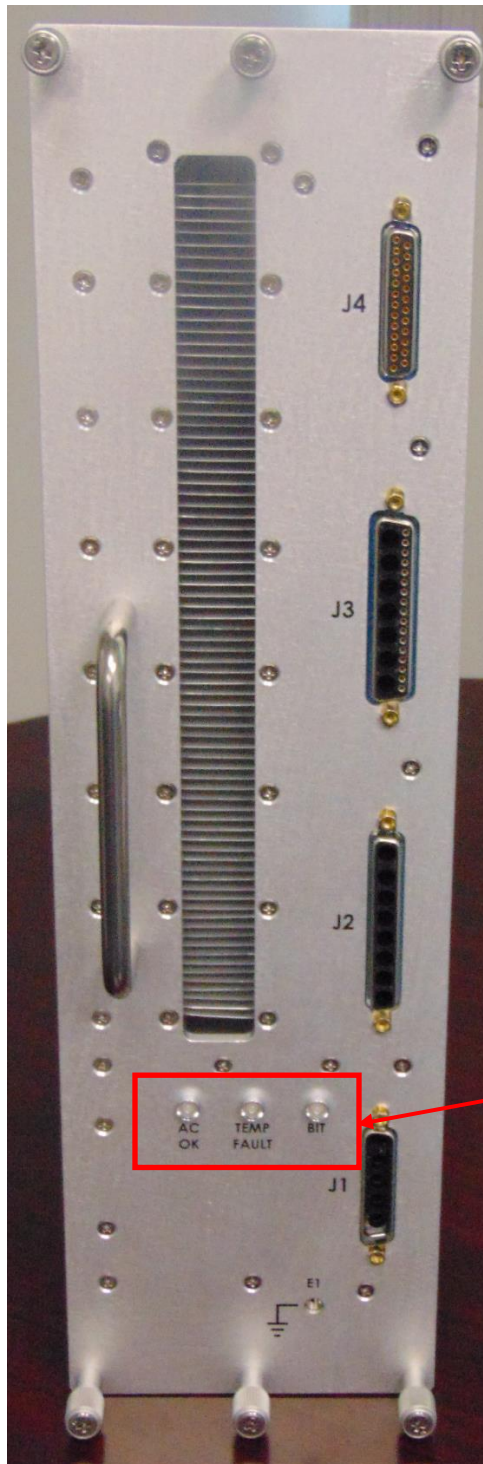
The PCP does not perform any self-tests. The user will detect a failure of any of the power switches by the inability to control power to the associated assembly. When the console boots up, the PC1 and PC2 fault LEDs illuminate briefly. A failure occurs if one or more fault LEDs fail to illuminate. Remove and replace the PCP in the event of a failure.

4.4 Console Power Supply

The console power supply performs the following self-tests:

- AC input voltage out of tolerance
 - The “AC OK” LED on the front of the power supply turns red.
 - The power supply output is not disabled.
 - One or more fault LEDs on the PCP illuminate. The fault LED(s) that illuminate on the PCP is determined by the severity of the out of tolerance condition. (Management power may be present to illuminate the PCP fault LEDs but load power (+5VDC) may be missing or out of tolerance.)
- DC output voltage out of tolerance
 - The “BIT” LED on the front of the power supply turns red.
 - The power supply output is not disabled
 - One or more fault LEDs on the PCP illuminate. The fault LED(s) that illuminate on the PCP is determined by the severity of the out of tolerance condition.
- One or more of the AC input phases is missing
 - All DC outputs are disabled, which shuts down the KVM and keyboard.
- Over Temperature
 - All DC outputs are disabled, which shuts down the KVM and keyboard.

The power supply is located within the console so it is not visible to the user unless the console front cover panel is removed. If a power supply fault is suspected because multiple console components appear to be unpowered or malfunctioning, remove the front cover to check the indicators on the power supply. Replace the power supply if it is faulty and return the failed power supply to BAE Systems for repair. Figure 5 below shows the location of the self-test indicators on the power supply.



Self-Test Indicators

Figure 5. Console Power Supply

5 TAMPER INDICATIONS

The KVM and keyboard have their own tamper-evident label(s) printed with a specific design and each with its own unique serial number. The user can detect a tampered state in two ways. If someone tampers with the unit and replaces a torn label with a new label, the replacement label will not have the same design and will have a different serial number. Additionally, the design of each label includes a hologram that when ripped is visually evident and cannot be re-assembled without it being obvious. The light green rectangles in Figure 1 and Figure 2 show the locations of the tamper-evident labels on the KVM. The user should inspect the tamper-evident labels to verify that no tampering occurred. The user should reference the KVM's as-built configuration to verify the label serial numbers. Take the KVM out of service immediately if tampering is detected. The keyboard has its own labels on the bottom of the keyboard, so that the keyboard cannot be opened without putting the labels into the tampered state. The user should inspect these labels to verify that no tampering occurred. Take the keyboard out of service immediately if tampering is detected.

No other console components have tamper-evident labels.