OFF AIRCRAFT MAINTENANCE WITH ILLUSTRATED PARTS BREAKDOWN

HELMET DISPLAY UNIT (HDU) PART NUMBER 620520-01-05

Reference Material

Alphabetical Index

Record of Applicable Technical Directives

None

1. REMOVAL.

Support Equipment Required

None

Materials Required

None

CAUTION

Be careful not to scratch or damage helmet visor when removing from HDU.

a. Remove visor from helmet display unit (HDU), figure 2, per substeps below.

(1) Gently rotate both visor knobs backward.

(2) Pull visor knobs away from HDU.

(3) Lift visor away from HDU.

CAUTION

Be sure correct maintenance practices are followed when working with electrostatic sensitive devices (ESD) (WP002200).

b. ESD Remove Helmet Display Unit (HDU) from helmet assembly by releasing visor snaps and unlatching universal connector with HDU latch.

2. ESD DISASSEMBLY.

Support Equipment Required

None

Materials Required

None

a. Remove two hex screws (3, figure 2, sheet 2) and washers (4, sheet 2) from the characterization CCA.

NOTE

CRT characterization CCA is attached to the microcontroller CCA board. Some jiggling may be required to separate the two boards.

b. Remove characterization CCA from microcontroller CCA.

c. Remove two screws (7, sheet 1).

WARNING

Do not remove the puppers from the HDU when removing the CRT assembly. This will cause misalignment.

NOTE

CRT Assembly Screw/Washer Set 620592-01-00 is made up of a socket head set screw, hexagon socket button head cap screws, wave washers, and button head cap screws.

d. Move the CRT assembly (1, sheet 2) and relay optics assembly (11, sheet 2) to access set screw (2, sheet 2).

e. Remove two captive screws from high voltage connector.

f. Remove four screws (5, sheet 1) and four washers (6, sheet 1).

g. Loosen universal connector on HDU assembly.

h. Remove tie-wrap from high voltage connector wiring.

i. Remove high voltage connector.

j. Remove set screw (2, sheet 2).

CAUTION

Do not use CRT cable assembly to turn CRT.

k. Rotate the CRT assembly (1, sheet 2) ccw 1/4 turn and carefully remove the CRT assembly (1, sheet 2) from the relay optics assembly (11, sheet 2).

l. Remove left or right strap (8, sheet 1) by removing attaching hardware, as required.

CAUTION

Removing purge valves and preformed packings will cause moisture to enter relay optics assembly. Remove purge valves and preformed packings only if purging of relay optics assembly is required.

m. Remove purge valve screw (9) and preformed packing (10) from relay optics assembly (11) only if purging of relay optics assembly (11) is required. Refer to WP012 00 for relay optics assembly purging.

3. CLEANING.

Support Equipment Required

None

Materials Required

None

CAUTION

CRT assembly is fragile and can be damaged easily. Be careful in handling CRT to prevent scratching. Do not use abrasive cleaners or polish on CRT assembly.

a. Refer to WP005 00 for cleaning.

4. INSPECTION.

Support Equipment Required

None

Materials Required

None

a. Refer to WP005 00 for inspection.

5. ESD ASSEMBLY.

Support Equipment Required

Nomenclature	Type Designation/ Part Number	CAGE
* Adapter	GTMBS8A	55719
* Tip, Hex .035	.5H.035-.5	32652
* Tip, Hex .050	120003	32652
* Tip, Hex .050 (Tip Extended)	.75H050-.865	32652

Support Equipment Required (Continued)

Nomenclature	Type Designation/ Part Number	CAGE
* Tip, Hex 1/16	120116	32652
* Torque Screwdriver Preset 2 Inch-Ounce	020074	32652
* Torque Screwdriver 2 - 100 Inch-Ounce	6C486	25795

* Part of JHMCS Torque Tool Kit 3829AS110

Materials Required

Nomenclature	Specification or Part Number
Primer, Sealing Compound	MIL-S-22473, GRADE T, FORM R, AEROSOL CAN, NIIN 00-181-8372
Sealing Compound	MIL-S-46163, TYPE 2, GRADE N, COLOR BLUE, NIIN 01-014-5869, NIIN 01-025-1692, NIIN 01-104-5392

a. Install right or left strap (8, figure 2, sheet 1) on HDU and secure with attaching hardware.

CAUTION

Be careful not to touch end of CRT assembly. Do not apply lubricant to CRT assembly.

b. Insert CRT assembly (1, sheet 2) in the relay optics assembly (11, sheet 2).

c. Rotate the CRT assembly (1, sheet 2) clockwise 1/4 turn.

CAUTION

Do not over tighten set screw (2, sheet 2).

NOTE

CRT Assembly Screw/Washer Set 620592-01-00 is made up of a socket head set screw, hexagon socket button head cap screws, wave washers, and button head cap screws.

d. Using hex .035 tip and 020074 torque screwdriver, torque set screw (2, sheet 2) on CRT assembly (1, sheet 2) to 1-3 inch-ounce. (QA)

e. Install high voltage connector using two captive screws.

f. Using hex .050 tip, adapter, and 6C486 torque screwdriver, torque two captive screws to 31 - 33 inch-ounce. (QA)

g. Apply sealing compound primer and sealing compound on top of captive screws.

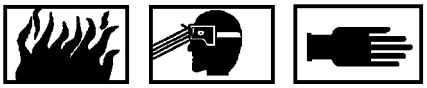
h. Attach characterization CCA to microcontroller CCA using two washers (4, sheet 2) and two hex screws (3, sheet 2).

CAUTION

Do not over tighten hex screws (3, sheet 2).

i. Using hex .050 tip, adapter, and 6C486 torque screwdriver, torque hex screws (3, sheet 2) to 15 - 17 inch-ounce. (QA)

j. Install universal connector using four screws (5, sheet 1) and four washers (6, sheet 1).



PRIMER, SEALING COMP, MIL-S-22473, GRADE T, FORM R, AEROSOL CAN **696**

SEALING COMPOUND, MIL-S-46163, TYPE 2, GRADE N, COLOR BLUE **223**

k. Apply sealing compound primer and sealing compound to screws (5, sheet 1).

l. Using hex .050 (tip extended) tip, adapter, and 6C486 torque screwdriver, torque screws (5, sheet 1) to 47 - 49 inch-ounce. (QA)

m. Install two screws (7, sheet 1) securing relay optics assembly (11, sheet 2).

n. Using hex 1/16 tip, adapter, and 6C486 torque screwdriver, torque screws (7, sheet 1) to 31 - 33 inch-ounce. (QA)

o. Document per OPNAVINST 4790.2 series. (QA)

6. INSTALLATION.

Support Equipment Required

None

Materials Required

None

a. Inspect HDU for obstructions and pinched wires.

b. ESD Attach HDU to helmet with HDU latch and visor fastener snaps.

c. Install visor on HDU per substeps below.

(1) Pull visor knobs apart from each other by 1/2 inch.

(2) Position visor knobs over visor bushing receivers on HDU.

(3) Press visor knobs together until visor bushings are firmly seated.

(4) Gently rotate both visor knobs forward until visor knobs lock in position.

d. Test using HMDTS per WP004 00.

7. CONTROLS OF THE HMDTS USED FOR CAMERA OFFSET ADJUSTMENT WINDOW.

Support Equipment Required

None

Materials Required

None

8. ABORT. The ABORT control button is available both on the main window used for HMD testing and on the main window used for Camera Offset Adjustments. The ABORT [Esc] control button is also part of the two warning windows. Selecting ABORT ends testing or camera alignment and shuts down the high voltages to the HMD. At completion

of the ABORT sequence, the PC monitor shows the desktop display under the Windows operating system.

9. SHOW LIMITS. Checking the box (clicking with the PC mouse) causes the maximum allowable camera offsets to appear as an overlay on the PICTORIAL REPRESENTATION OF OVERLAY OFFSET display of the main window. The allowable offsets range is displayed as a rectangular outline, or part thereof, red in color, on the display. Unchecking the box (clicking with the PC mouse to remove the check mark) causes the maximum allowable camera offsets to not be displayed.

10. RESET TO FACTORY. Selecting RESET TO FACTORY is the first step in a process that modifies the HMD's Display Unit microcontroller Electronically Erasable Programmable Read-Only Memory (EEPROM). At the completion of the RESET TO FACTORY sequence, the initial factory values for camera offset are stored in the HDU as the current camera offset values.

11. COMMIT. Selecting COMMIT is the first step in a process that stores new values for current azimuth and elevation offset in the HMD'S DU EEPROM. At the completion of the COMMIT initiated sequence, the offset values entered by the operator are stored in the HDU as the current camera offsets.

12. OK. The OK control button is used on multiple windows. Selecting the OK button using the mouse or typing RETURN closes the current window and takes the operator to the next step in the camera alignment sequence.

13. PROCEED. The PROCEED [F8] control button is used on two different warning windows. Selecting PROCEED or typing the F8 function key while either of these windows are displayed causes the software to go to the next step in the camera alignment process.

14. DIRECTION CONTROLS. Two direction control windows, one for cross offset in elevation and one for cross offset in azimuth, are part of the main window. By clicking on the direction window for ″Cross Offset Azimuth″ the operator can select between adjusting the offset in the LEFT or the RIGHT direction. By clicking on the direction window for CROSS OFFSET AZIMUTH the operator can select between adjusting the offset in the UP or DOWN direction.

Also, the operator may position the current aiming cross by clicking on and dragging the aiming cross symbol. The direction control windows automatically updates, as required, as the aiming cross is moved.

15. MAGNITUDE CONTROLS. Two sets of magnitude controls, one for cross offset in elevation and one for cross offset in azimuth, are part of the main window. Clicking on the increment (top) arrow increases the value displayed in the magnitude window by one milliradian for each click. Each click will also change the position of the current aiming cross on the PICTORIAL REPRESENTATION OF OVERLAY OFFSET window by one milliradian in the direction indicated by the direction control

The cross offset values are constrained to zero and positive whole numbers. For that reason, the decrement (bottom) arrow will decrease the offset, by one milliradian for each click, provided a positive value is currently displayed. The decrement arrow has no effect if the relative offset magnitude displayed is zero.

The HMD EEPROM is not updated as the offset magnitude values are manipulated. Either the RESET TO FACTORY or the COMMIT control buttons must be selected to start an update to the EEPROM stored offset values.

The value in a magnitude window may be changed by clicking in the window using the PC mouse and typing in a new value using the keyboard.

The value in a magnitude window may be changed by clicking in the window using the PC mouse and using the main keyboard LEFT and RIGHT (for azimuth) or UP and DOWN (for elevation) arrows to increase and decrease the error values.

16. PICTORIAL REPRESENTATION OF OVERLAY OFFSET. The PICTORIAL REPRESENTATION OF OVERLAY OFFSET is located in the upper right side of the Camera Offset Adjustment Window. This window provides the operator with a graphic representation of offset, in milliradians, between an outside world reference (yellow) and the current aiming cross (green). When the Camera Offset Adjustment Window is first displayed, the Outside World Reference and the Current Aiming Cross are superimposed. When

superimposed the Outside World Reference is visible and the Current Aiming Cross is hidden form view.

The maximum valid offset range may be displayed as a red rectangular outline on the PICTORIAL REPRESENTATION OF OVERLAY OFFSET, by checking the SHOW LIMITS checkbox.

17. OFFSETS RELATIVE TO PREVIOUS SETTINGS WINDOW. The magnitude in milliradians and direction for the OFFSETS RELATIVE TO PREVIOUS SETTINGS are displayed in the upper left section of the Camera Offset Adjustment Window.

The magnitude windows, one for CROSS OFFSET AZIMUTH and one for CROSS OFFSET ELEVATION display the value, in milliradians, of the offset error entered by the operator.

One direction window indicates whether the current aiming cross offset for Azimuth is in the RIGHT or the LEFT direction. One direction window indicates whether the current aiming cross offset for Elevation is in the UP or the DOWN direction.

18. SOFTWARE CONTROL/VERSION NUMBER. The HMDTS software version for the camera alignment capability is shown at the top of the Camera Offset Adjustment Window. The operator should refer to this number in any reports issued.

19. OPERATION FOR CAMERA ALIGNMENT. This section gives the step-by-step instructions to adjust camera alignment offsets using the HMDTS.

Support Equipment Required

Nomenclature	Part Number or Type Designation	CAGE
Computer	COMMERCIAL	N/A
Helmet Display Unit Test Set Cable	620992-01-00	06VL3
Helmet Mounted Display Test Set	620900-02-01	06VL3
QMB	178-5936	99747

Materials Required

None

NOTE

The HMDTS is operated in either helmet mounted display test or camera alignment mode. The HMDTS is not designed to do both functions simultaneously. Before launching the helmet test software, close the camera alignment software on the PC. Before launching the camera alignment software, close the helmet test software on the PC.

This procedure assumes that the HMDTS and HMD have been connected and started as described in WP004 00 before the beginning of this sequence.

To produce and use new camera offset values, the operator must complete two tasks. One before and one after using the camera alignment procedure away from the HMDTS. Before entering the offset error (in milliradians), this error must be determined using the camera video playback capability. This is not a HMDTS function. After entering new camera offset values, the operator must force the system to read and use the new values by rotating a different HMD through the system.

a. Connect HMD to HMDTS. (WP004 00)

b. Select the JHMCS Camera Alignment icon for the desktop window of the PC.

c. The JHMCS Camera Alignment Program Window will be displayed. Select OK to continue.

d. A warning Window automatically appears. Select the PROCEED [F8] control button to continue. If the operator does not have the values desired for updated camera offsets, select the ABORT control button or ESC key to exit the camera alignment software and remove power from the HMD.

e. A window automatically appears and then closes on the PC monitor asking the operator to "Please Wait While DU Memory is Being Read...".

f. The Camera Offset Adjustment Screen appears on the PC monitor.

g. The operator may take one of three actions:

(1) Enter new camera offset values and program them into the HDU.

(2) Restore the camera offset values to the initial factory settings.

(3) Terminate the camera alignment software without updating the HDU memory.

20. ENTERING NEW CAMERA OFFSET VALUES.

NOTE

The operator should enter the camera offset error as it appeared in the debrief camera video. For example, if the camera registration (symbology) appeared up and left of the outside world reference, the aiming cross (green) in the PICTORIAL REPRESENTATION OF OVERLAY OFFSET should be placed in the upper left quadrant.

a. Refer to table 1 to determine the offset direction required (upper left) to move the current aiming cross into the desired quadrant.

Table 1. Quadrant Desired Versus Offset Direction

Quadrant Desired	Cross Offset Azimuth Direction	Cross Offset Elevation Direction
Upper Right	RIGHT	UP
Lower Right	RIGHT	DOWN
Lower Left	LEFT	DOWN
Upper Left	LEFT	UP

b. Click on the CROSS OFFSET AZIMUTH DIRECTION window to toggle between RIGHT and LEFT directions.

c. Click on the CROSS OFFSET ELEVATION DIRECTION window to toggle between UP and DOWN.

d. Enter the Azimuth and Elevation Cross Offset Values. There are four ways to do this:

(1) The first method is to click on the increment (top) arrow to the left of the azimuth magnitude window or the elevation magnitude window. Each click increases the offset magnitude value by one and moves the aiming cross by one milliradian on the PICTORIAL REPRESENTATION OF OVERLAY OFFSET. If too large a number is entered, use the decrement (bottom) arrow to decrease the magnitude by one milliradian per click.

(2) The second method is to drag the current aiming cross to a new location on the PICTORIAL REPRESENTATION OF OVERLAY OFFSET. This method updates both Azimuth and Elevation offset values simultaneously.

(3) The third method is to double click in a magnitude window (azimuth or elevation) and type a value on the keyboard followed by the enter key.

(4) The fourth method is to select the contents a magnitude window and use the main keyboard arrow keys (left and right arrows for azimuth; up and down arrows for elevation) to increase and decrease the error value.

NOTE

The cross offset values are constrained to zero and positive whole numbers. The decrement (bottom) arrow will decrease the magnitude value as long as a positive

value is displayed. The decrement arrow has no effect if the magnitude displayed is zero.

e. Verify that the correct offset values are entered and that the offsets are in the desired direction.

f. If the offset adjustment limits are not shown, inspect the SHOW LIMITS box on the Camera Offset Adjustment Window. The offset limits are displayed as a red rectangular outline. Verify that the entered offset values are within the limits (inside the rectangle).

g. Select the COMMIT control button. If ″Error - Cannot Proceed: New Offset Location Resides Outside Limit Region!″ appears, the HDU memory has not been updated. Select OK [Return]. Go to paragraph 19, step e.

NOTE

Select ABORT [Esc] key on the keyboard to terminate camera alignment without modifying the contents of the HDU memory.

h. The ″Warning: Display Unit Settings WILL be Modified!″ window automatically appears. Select PROCEED [F8] function key on the keyboard to program new camera offset values into the HMD.

i. The ″Camera Offset Location Modified Successfully″ window automatically appears on the PC monitor. Select OK [Return] to continue.

j. A ″Program will now terminate, Goodbye.″ message window will automatically appear. Select OK.

k. The message window will automatically close. The camera alignment software automatically removes power to the HMD and exits.

l. The PC Windows desktop is displayed on the PC monitor.

m. If HDU memory has been updated go to the next step. If HDU memory has not been modified, remove the HMD from the test set-up and restore to normal system use or update camera offset values. (paragraph 20)

NOTE

The EU (Electronic Unit) holds in non-volatile memory characterization data, including camera offsets, for the last HMD used. The EU will read characterization data only when a different HMD is put in the system, or it uses the previously stored data. The HMD has no way to tell the EU that characterization data. For that reason, to make sure of update, a second HMD must be rotated through the aircraft system.

On the aircraft, the technician/pilot must wait approximately one minute for the EU to complete reading and updating the characterization data from the second HMD. The system should then be powered down and the second HMD removed. When the first HMD is installed, the system will read the updated characterization data.

n. Disconnect the HMD from the test cable. The HMDTS may be left in the powered on state if more HMDs are to be cycled through the camera alignment procedure or it is to be used for helmet functional testing: otherwise the HMDTS should be powered off.

21. RESTORING THE CAMERA OFFSET VALUES TO THE ORIGINAL FACTORY SETTINGS.

a. To program or restore the initial factory offset values, select the RESET TO FACTORY control button on the Camera Offset Adjustment Screen.

b. The ″Warning: Display Unit Settings WILL be modified!″ window automatically appears on the PC monitor.

NOTE

Select ABORT [Esc] key on the keyboard to terminate camera alignment without modifying the contents of the HDU memory.

c. Select PROCEED [F8] function key on the keyboard to set current offset values to the initial factory settings.

d. The "Camera Offset Location Modified Successfully!" window automatically appears on the PC monitor. Select OK [Return] to continue.

e. A "Program will now terminate, Goodbye." message window will automatically appear. Select OK.

f. The message window will automatically close. The camera alignment software automatically removes power to the HMD and exits.

g. The PC Windows desktop is displayed on the PC monitor.

h. If HDU memory has been updated go to the next step. If HDU memory has not been modified, remove the HMD from the test set-up and restore to normal system use or update camera offset values (paragraph 20).

NOTE

The EU (Electronic Unit) holds in non-volatile memory characterization data, including camera offsets, for the last HMD used. The EU will read characterization data only when a different HMD is placed in the system, otherwise it uses the previously stored data. The HMD has no way to tell the EU that characterization data. For that reason, to make sure update, a second HMD must be rotated through the system.

On the aircraft, the technician/pilot must wait approximately one minute for the EU to complete reading and updating the characterization data from the second HMD. The system should then be powered down and the second HMD removed. When the first HMD is installed, the system will read the updated characterization data.

i. Disconnect the HMD from the test cable. The HMDTS may be left in the powered on state if more HMD's are to be cycled through the camera alignment procedure or it is to be used for helmet functional testing; if not, the HMDTS should be powered off.

22. TERMINATING THE CAMERA ALIGNMENT SOFTWARE WITHOUT UPDATING THE DU MEMORY.

a. To terminate the camera alignment software and remove power for the HDU, select the ABORT button in the lower left-hand corner of the Camera Offset Adjustment Screen. A "Program will now terminate, Goodbye," message window will automatically appear. Select OK.

b. The message window will automatically close. The camera alignment software automatically removes power to the HMD and exits.

c. The PC Windows desktop is displayed on the PC monitor.

d. Disconnect the HMD from the test cable. The HMDTS may be left in the powered on state if more HMD's are to be cycled through the camera alignment procedure or it is to be used for helmet functional testing; otherwise the HMDTS should be powered off.

22A. SQUADRON JHMCS HELMET DISPLAY UNIT (HDU) USAGE LOG.

a. The Helmet Display Unit (HDU) Usage Log (refer to figure 1) should be utilized by each squadron to record monthly and yearly HDU information.

b. Make a copy of the log to record HDU information or go to the https://pma202.navair.navy.mil/ website to download a digital copy. Login capability is required to access this website. The file is located under the Research Development Team Section, Joint Helmet Mounted Cueing System, documents, folder JHMCS HDU Log, and download disc JHMCS HDU.xls. If problems occur, please e-mail craig_l@crane.navy.mil.

23. ILLUSTRATED PARTS BREAKDOWN.

a. For illustrated parts breakdown of the cathode ray tube assembly, refer to figure 2.

b. Refer to INTRODUCTION TO THE ILLUSTRATED PARTS BREAKDOWN, WP002 00.

Squadron JHMCS Helmet Display Unit (HDU) Usage Log								Squadron - VFA-						Date Submitted				
HDU Serial Number	HDU Placed in Service		HDU Taken out of Service		Beginning of Year Reading	End of the Month HDU Elapsed Time Indicator (ETI) Reading												End of Year Reading
	Service Reading	Service Date	Service Reading	Service Date		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	

Notes: 1. ETI readings can be read by powering up the HDU on the HMD Test Set. Please do the readings as close to the last day of the month and at the end of the year. HDU Serial Numbers should be read via the display on the Test Set vice any identification label.

2. At the end of each calendar year, please submit the full year completed log via email to craig_l@crane.navy.mil or fax to (812) 854-4375 (Attn: L. Craig) and keep a copy on hand for future reference.

010001

Figure 1. Squadron JHMCS Helmet Display Unit (HDU) Usage Log

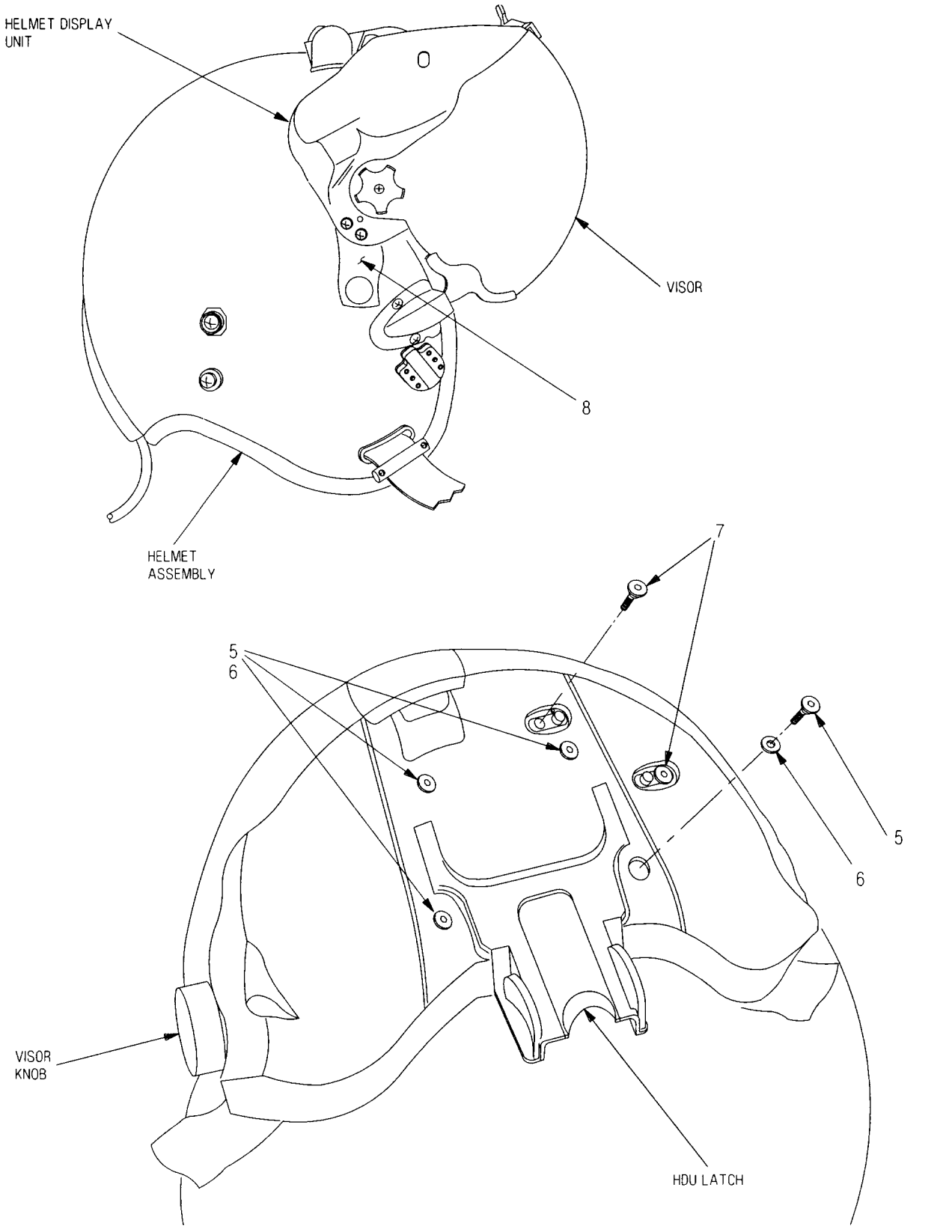
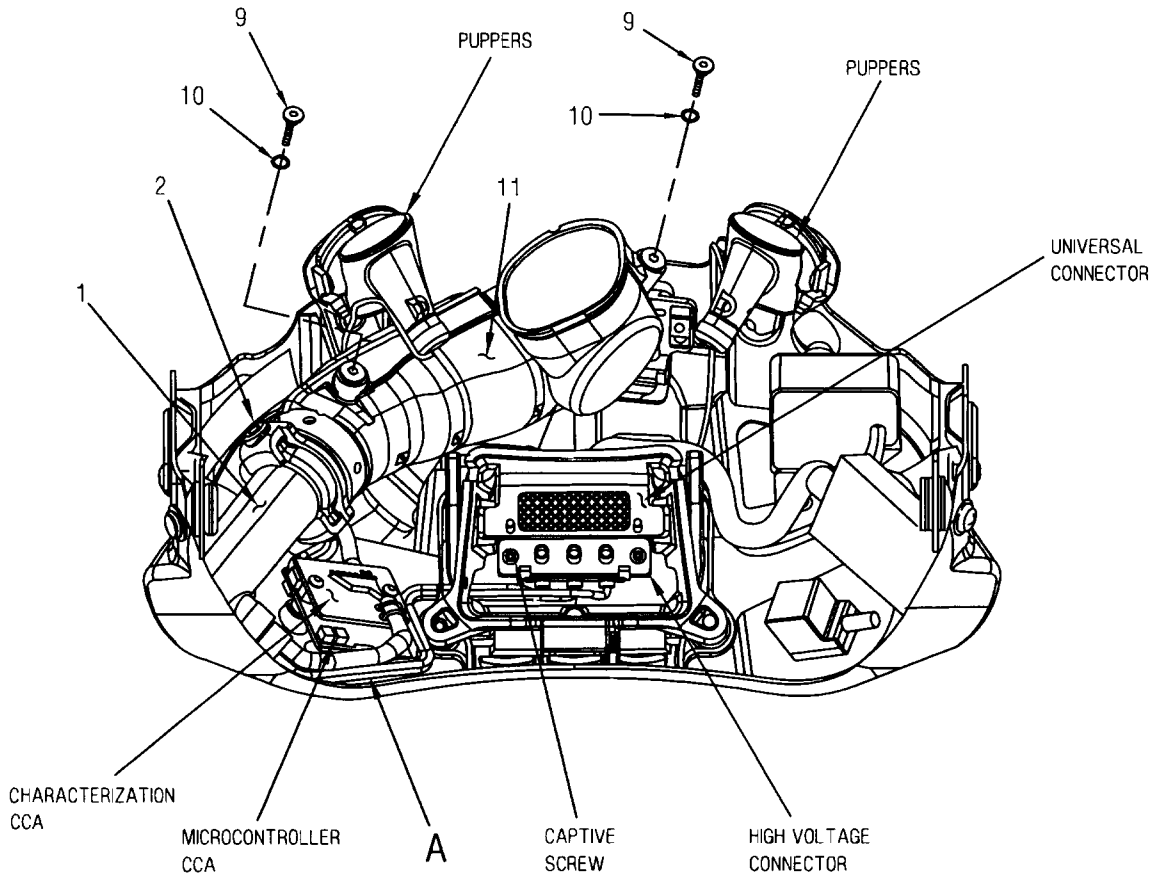
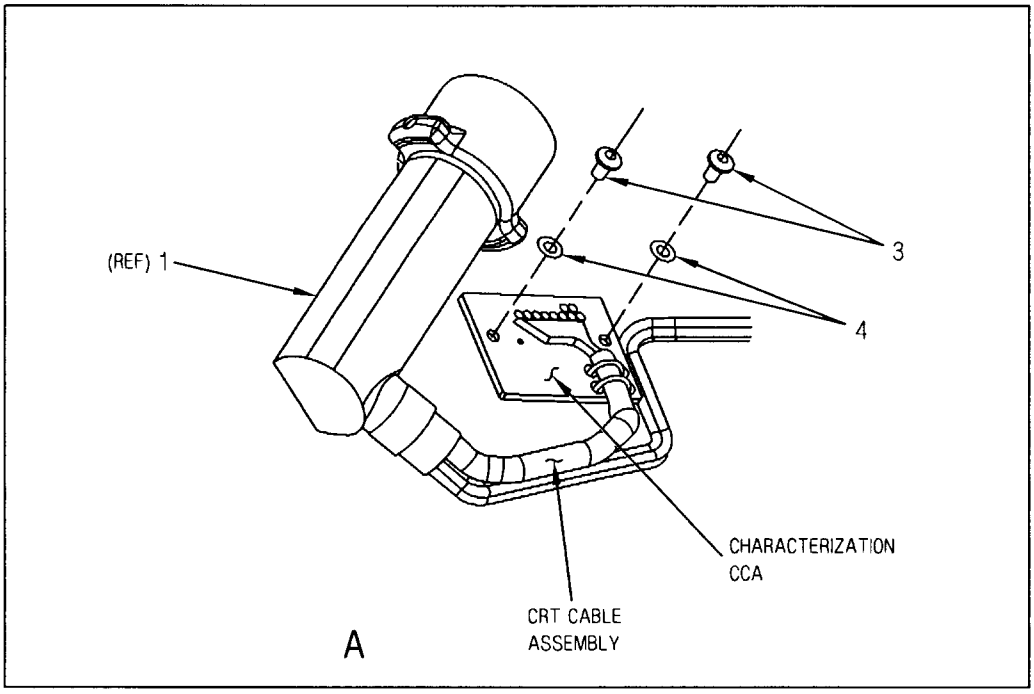


Figure 2. Helmet Display Unit (HDU), Part Number 620520-01-05 (Sheet 1 of 3)





01000202

Figure 2. Helmet Display Unit (HDU), Part Number 620520-01-05 (Sheet 2)

INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USE ON CODE	SM&R CODE
	620520-01-05	ESD HELMET DISPLAY UNIT (HDU) . . . . . /06VL3/ NHA, WP008 00/	REF		PAOOK
	135015-59	ESD HELMET DISPLAY UNIT (HDU) . . . . . /09344/ NHA, WP008 00/	REF	*	PAOOK
1	620590-01-03	. CRT ASSEMBLY	1		PAOZZ
	135100-29	. CRT ASSEMBLY /09344/	1	*	PAOZZ
2	8B01012	. SET SCREW, SOCKET HEAD /09344/	1		PAOZZ
	CS-24	. SET SCREW, SOCKET HEAD /00141/	1	*	PAOZZ
3	PC91047-1	. SCREW, CAP, HEX HEAD /09344/	2		PAOZZ
	DK02C177BHB	. SCREW, CAP, HEX HEAD /56563/	2	*	PAOZZ
4	8B02041	. WASHER /09344/	2		PAOZZ
	24987-9A	. WASHER /51506/	2	*	PAOZZ
5	PC91047-3	. SCREW, CAP, SKT BUTTONHEAD . . . . . /09344/	4		PAOZZ
6	8B02061	. WASHER, FLAT /09344/	4		PAOZZ
7	8B01101	. SCREW, CAP, BTNHD /09344/	2		PAOZZ
	X63728	. SCREW, CAP, BTNHD /09344/	2	*	PAOZZ
8	8B10173	. STRAP, RIGHT /09344/	1		PAOZZ
	8B10174	. STRAP, LEFT /09344/	1		PAOZZ
9	8B10131	. SCREW, PURGE VALVE /09344/	2		PAOZZ
	SM-C-806612	. SCREW, PURGE VALVE /13567/	2	*	PAOZZ
10	AS3578-002	. PACKING, PREFORMED /81349/	2		PAOZZ
11	135150-1	. RELAY OPTICS ASSEMBLY /09344/ . . . . /SEE WP012 00 FOR PURGING/	1		PADBZ
12	620592-01-00	CRT ASSEMBLY SCREW/WASHER . . . . . SET	1		PAOZZ

Figure 2. Helmet Display Unit (HDU), Part Number 620520-01-05 (Sheet 3)

THIS PAGE INTENTIONALLY LEFT BLANK.