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Chapter 8

ELECTRONIC COUNTERMEASURES INSTALLATION

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Introduction

1. This chapter describes the electronic countermeasures (ECM) installation, ARI 23234, on this aircraft. Wiring and location diagrams and a List of Components with part numbers and associated publication references are in AP 101B-1202-10B.

Modification standard

2. This Chapter includes Mod 1515, 1626, 1633, 1724, 1757, 1794, 1800, 5322, 5323, 5364, 5366 and 5383.

WARNING...

(1) *EMISSION OF MICROWAVE RADIATION FROM THE ARI 23234 POD CONSTITUTES A HAZARD TO PERSONNEL. SAFE APPROACH DISTANCE IS 6FT WHEN TRANSMITTING. SHOULD IT BE NECESSARY TO OPERATE ARI 23234 WITHIN THE HANGAR, PRECAUTIONS MUST BE TAKEN TO ELIMINATE ANY RISK OF DAMAGE TO LOCAL RADAR EQUIPMENT.*

(2) *WITH THE INTRODUCTION OF MOD 1626, CONTROL INDICATOR TYPE NO. C9492/ALQ IS INSTALLED. THE ATTENTION OF ALL PERSONNEL MUST BE DRAWN TO THE FACT THAT THE SAFETY*

PROVISIONS PREVIOUSLY PROVIDED BY THE CIRCUIT PROTECTION RELAY AND ARMAMENT MASTER SAFETY BREAK NO LONGER EXIST. THE ECM EQUIPMENT IS DIRECTLY CONTROLLED BY THE ECM MAIN CONTROL AND TRANSMIT SWITCHES.

General

3. The principal components of the ECM installation are housed in an ARI 23234 pod mounted on a suitably-adapted multipurpose or universal pylon fitted at either one or both outer wing stations (3 and 4). When twin pods are carried they can be operated simultaneously. The remainder of the equipment consists of a control indicator in the navigator's cockpit, associated wiring and connectors in the fuselage, wings and pylons, together with a relay panel in the radio bay.

4. A brief description of the components and of their operation when interconnected by the aircraft wiring is included in the following paragraphs. Detailed information and maintenance instructions on the ECM system are in T.O. 12P3-2ALQ101-22-1, -2 and -3. Instructions for installing ARI 23234 are in Sect. 12, Chap. 5 of this publication.

Description*Control indicator*

5. On pre-Mod 1800 aircraft, this unit, C-KP, is installed above the ground position indicator at the forward starboard side of the navigator's cockpit. On embodiment of Mod 1800 the unit is relocated in the navigator's port console and re-identified C-K/I-AF. Marked ECM the unit embodies two pull-to-unlock, three-position toggle switches for the main control and transmission functions of the ECM installation. The two switches are respectively marked OFF - STBY - OPR (operate) and XMIT, 1 - 2 - 3. Two push-switches are included, a red one marked RESET, and the other marked BIT for performing the built-in-test operation. A rotary DIM control completes the switch/control assembly in the left face of the unit.

6. At the right face are eight push-switch/status display lamp assemblies, arranged in a 4 x 2 array with a square-shaped clear plastic faceplate on each assembly. Each assembly is divided into four quadrants with each quadrant having a letter or symbol illuminated by a lamp. A rotary two-position switch at the rear of the unit is marked S13, C6631 - C9492, and must be turned fully clockwise to the C9492 position prior to installation of the unit.

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7. The controls and indicators on the unit function as follows:-

| Control/indicator | Function |
|--|--|
| (1) Main control switch OFF | ECM indications and pod main systems inoperative. Power to pod VCO heaters only. |
| STBY | Power connected to the ECM control circuits. After 200 seconds (warm up period) an amber S lamp is illuminated in S8 push-switch display. Equipment is now in a state of readiness. |
| OPR | Enables the ECM equipment to be controlled by the transmit switch (2) and/or the push-switches of the status display (6) for the appropriate transmission command selection. |
| (2) Transmit switch XMIT, 1-2-3 | With the main control switch set to OPR, the three selections of the transmit switch are used with the selections made on the status display assembly (6) to effect the appropriate transmission command mode as detailed in the Buccaneer Tactics Manual. |
| (3) Push-switch RESET | When depressed the ECM equipment is returned to a standby condition. Disconnects all control data signals including transmission commands; status information will continue to be displayed. |
| (4) Push-switch BIT | When depressed checks 80 per cent of the digital circuitry and the power supply. All status display lamps should illuminate. Failure of a status display |
| (5) Rotary control DIM | Controls the illumination intensity of all status display lamps. |
| (6) Push-switch/status display assembly | With the main control switch (1) set to OPR, depressing a push-switch will transmit the appropriate command signal to the ECM pod. Seven of the indicators (S1 to S7) have green illuminated symbols in their respective quadrants depicting the appropriate modes while S8 has three red and one amber illuminated symbols. The three red symbols, L (low band), M (mid band), and H (high band) when illuminated, indicate a fault in the appropriate band. The amber S symbol is illuminated to indicate the standby condition ((1) refers) of the ECM equipment. Green dots in the quadrants represent unused circuits and are only illuminated during the built-in-test (4) operation. Those symbols shown with a diagonal line through the quadrant are not applicable to this installation. |
| (7) Rotary control S13, C6631 - C9492 | Selects for the appropriate ECM equipment. Prior to installation of the unit the control must be turned fully clockwise to the C9492 selection. |
| | Two integral lamps are provided on the left face of the unit for the illumination of the controls and are controlled by the observer's instrument lighting circuit (Sect. 16, Chap. 9B). |

lamp to illuminate indicates faulty lamp or faulty driver unit. A multiple of lamp failures could indicate a malfunction of the digital logic circuitry.

Controls the illumination intensity of all status display lamps.

With the main control switch (1) set to OPR, depressing a push-switch will transmit the appropriate command signal to the ECM pod. Seven of the indicators (S1 to S7) have green illuminated symbols in their respective quadrants depicting the appropriate modes while S8 has three red and one amber illuminated symbols. The three red symbols, L (low band), M (mid band), and H (high band) when illuminated, indicate a fault in the appropriate band. The amber S symbol is illuminated to indicate the standby condition ((1) refers) of the ECM equipment. Green dots in the quadrants represent unused circuits and are only illuminated during the built-in-test (4) operation. Those symbols shown with a diagonal line through the quadrant are not applicable to this installation.

Selects for the appropriate ECM equipment. Prior to installation of the unit the control must be turned fully clockwise to the C9492 selection.

Two integral lamps are provided on the left face of the unit for the illumination of the controls and are controlled by the observer's instrument lighting circuit (Sect. 16, Chap. 9B).

Relay panel

8. Relay panel R-KG, at the port side of the radio bay adjacent to stn. 520, incorporates two relays C and D and two terminal blocks A and B which, together with associated wiring, facilitate the interconnection of the control indicator power supplies and wing stations 3 and 4. Relays D and C are used to switch separate 200 V, 3 phase 400 Hz a.c. supplies to wing stations 3 and 4 respectively, the appropriate relay coil circuit being completed only when an ECM pod and pylon are installed and electrically connected to the aircraft; no other switching is involved in providing the power supply to the ECM pod.

ECM pod

9. This unit, of cylindrical shape, is 10 in. in diameter and about 13 ft long, with a 5 in. deep gondola type housing attached underneath. The unit is suspended via a suitably-equipped pylon (Sect 20, Chap 2) fitted at either one or both outer wing stations (3 and 4). The pod is directly secured to the pylon by a No.120 ERU while an umbilical cable assembly connects the circuitry of the pod to the pylon. The pod incorporates six major sub-assemblies consisting of forward and aft antenna assemblies, module sections, programme selectors, noise jammer assemblies and control circuitry. A self-contained cooling system is incorporated and the forward section contains the electrical connections which form the pod end of the umbilical cable.

10. Three programmes are selected within the unit prior to flight, the required programme being selected by the observer at the control indicator when airborne. Information from the passive warning system (*Chap 7, this Section*) or other sources is used in deciding on the programme selections determined prior to flight.

11. Power requirements for the pod are detailed in para 14. With the pod installed on the aircraft no maintenance is required other than replenishing the coolant in the two heat sinks of the unit.

Note ...

Provision is made for the routing of search and fire control radar suppression pulses from the Martel AR blanker interference unit (Sect. 20, Chap. 5) for suppressing the pod transmission. This particular function, however, is inoperative pending the introduction of a modified blanker unit.

Role changeover panels

12. Provision is made for the carriage at the outer wing stations 3 and 4 of either the ECM pod or a Martel missile (*Sect. 20, Chap. 5*), by two role changeover panels, WP-CS and WS-CS, fitted in the port and starboard wheel bays respectively. Each panel incorporates two 128-pole receptacles A and B marked ARI 23234 and MARTEL respectively, together with a co-axial connector C. For operating in the ECM role, the 128-pole plug of the aircraft cable assembly from the changeover panel to the wing stations port or starboard - depending upon which side of the aircraft the pod is installed - must be connected to the receptacle marked ARI 23234.

13. The co-axial connector on each panel is provided for routing suppression signals from the Martel blanker unit (*para 11, Note*) to the wing stations 3 and 4 for the ECM pod only. The connectors remain mated on the panel at all times.

Power supplies

14. The 200 V, 3 phase 400 Hz a.c. supplies provide for the ECM operating requirements and a 28 V d.c. supply provides for power relays and controls. The a.c. supply is provided from panel R-A fuses 1A9, 1B9 and 1C9 for the starboard pod and fuses 2A10, 2B4 and 2C4 for the port pod. The d.c. supply is via fuse F3 on panel C-Q.

*Operation (Fig 1)**Note ...*

In the following paragraphs it is assumed that one ECM pod is installed at station 3 (port outer wing station).

15. The 28 V d.c. supply from fuse F3 on panel C-Q is routed direct to the coils of relays D and C on panel R-KG (*para 8*), while an earth return circuit completed via the ECM pod causes only relay D to be energized. The 200 V a.c. from fuses 2A10, 2B4 and 2C4 is switched via contacts A1-A2, B1-B2 and C1-C2 of relay D and fed via the pylon to the ECM pod for its operational requirements. With the control indicator main control switch selected to OFF, power is supplied to the pod VCO heaters.

16. With the control indicator main control switch selected to STBY the 28 V d.c. supply at pin R of the indicator is connected via the unit interface to pin S. The supply is then routed to terminal B6 on panel R-KG and via pins 17 and 18 of the wing station connector to the operating relay in the pod.

17. On completion of the warm up period of 200 seconds, indicated by the illumination of the amber S symbol in the status display (*para 7 (6)*), the ECM transmission facilities are then available.

18. Selection of the main control switch to OPR then enables the ECM equipment transmission modes to be determined using the transmit (XMIT) switch and/or the push-switches of the status display for the appropriate transmission command selection.

19. Returning the main control switch to OFF disconnects the 28 V d.c. supply to the ECM control circuitry. The supply to the pod VCO heaters remains connected.

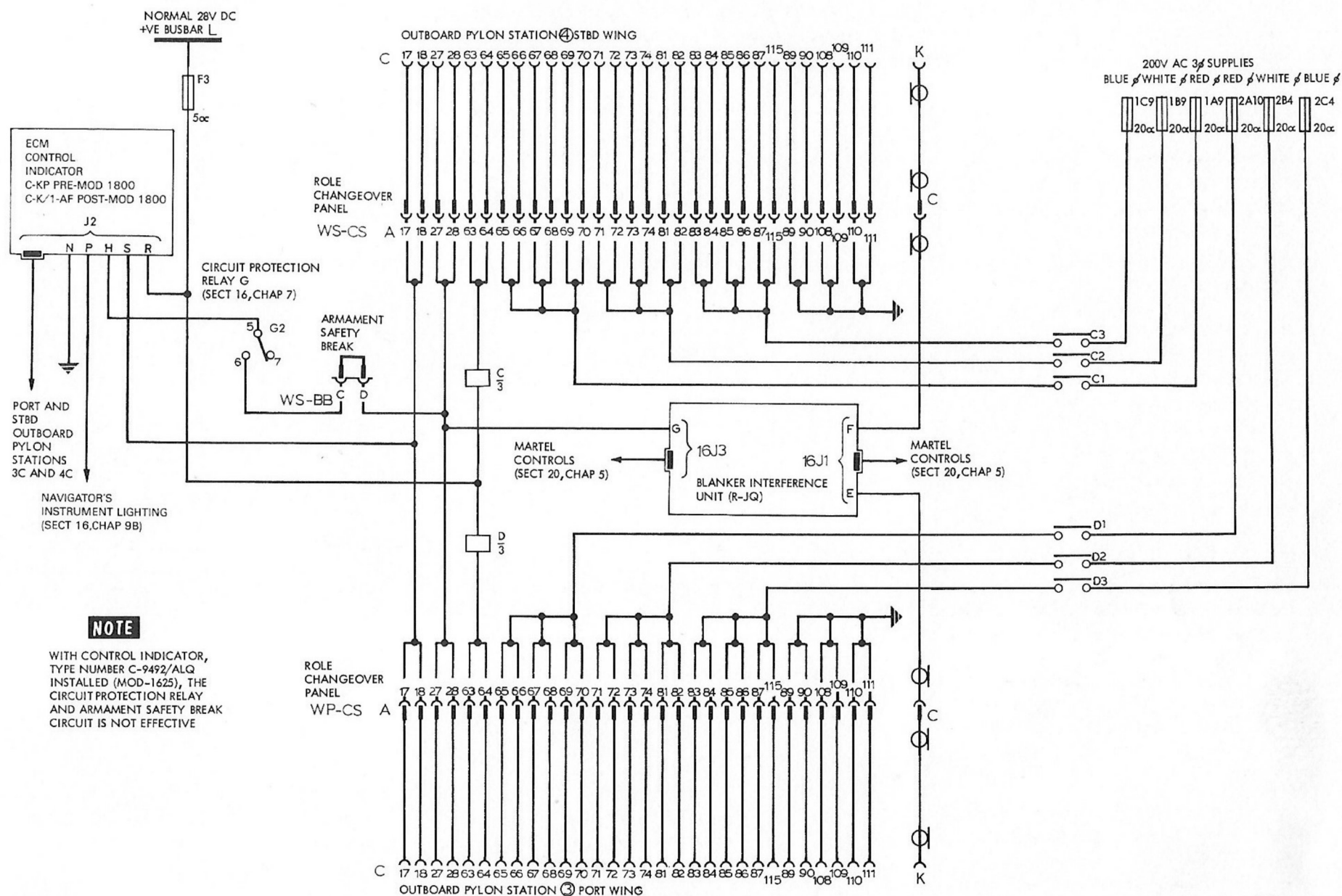


Fig.1 Electronic countermeasures installation – theoretical
(Mod 1800 incorporated)

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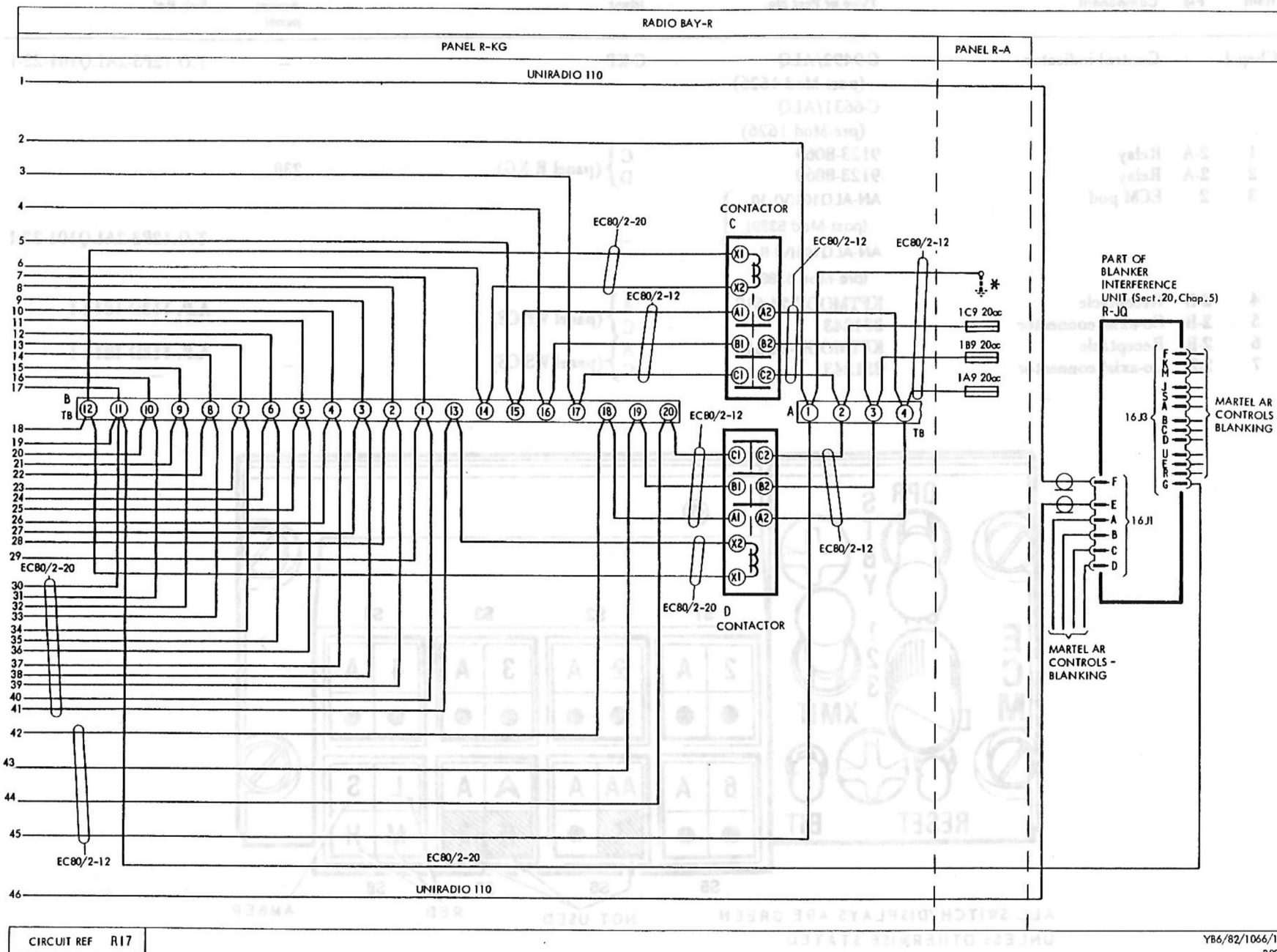
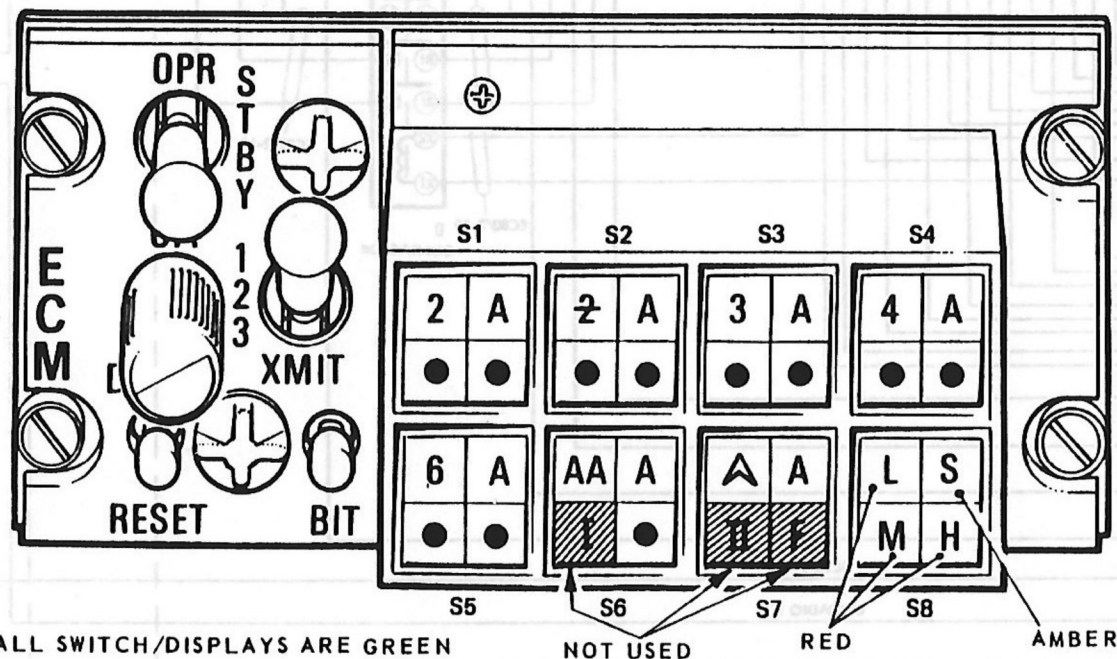


Fig.1a Electronic countermeasures installation

TABLE 1 List of components

| Item | Fig. | Component | Type or Part No. | Ident | Access panel | Pub Ref |
|--------|------|--------------------|--|--------------------------|--------------|-----------------------|
| Chap 1 | | Control indicator | C-9492/ALQ (post-Mod 1626) C-6631/ALQ (pre-Mod 1626) | C-KP | — | T.O.12P3-2ALQ101-22-1 |
| 1 | 2-A | Relay | 9123-8069 | C } (panel R-KG) D } | 238 | — |
| 2 | 2-A | Relay | 9123-8069 | | | |
| 3 | 2 | ECM pod | AN-ALQ101(V)-10 (post-Mod 5389) AN-ALQ101(V)-8 (pre-Mod 5389) | | | |
| 4 | 2-B | Receptacle | KPTMOOE-24-61S | A } (panel WP-CS) C } | — | A.P. 113D-1814-1 |
| 5 | 2-B | Co-axial connector | 331243 | | | |
| 6 | 2-B | Receptacle | KPTMOOE-24-61S | A } (panel WS-CS) C } | — | A.P. 113D-1814-1 |
| 7 | 2-B | Co-axial connector | 331243 | | | |



ALL SWITCH/DISPLAYS ARE GREEN
UNLESS OTHERWISE STATED

NOT USED

RED

AMBER

Fig.1A Control indication-push-switch/status display assembly
Mod 5389 incorporated

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Appendix 1 ELECTRONIC COUNTERMEASURES INSTALLATION (pre-Mod 1626 and 1633)

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Introduction

1. Prior to the embodiment of Mod 1626, a different type control indicator is installed in the electronic countermeasures (ECM) installation from that described in the main Chapter. On pre-Mod 1633 aircraft the unit is at the forward port side of the observer's cockpit, while on post-Mod 1633 aircraft the unit is installed above the ground position indicator at the forward starboard side of the observer's cockpit.

2. With the exception of the differences described, the operation of the ECM installation is as described in the main Chapter. For wiring details refer to AP 101B-1202-10B.

Control indicator

3. The control indicator, C-KP, is marked ECM and embodies a press-to-turn rotary selector switch inscribed OFF-STBY-XMIT 1-XMIT 2-BOTH on the unit face. Two white indicating lamps, 1 and 2, are associated with the STBY selection while a further two green indicating lamps, 1 and 2, are associated with the two positions of the XMIT selections.

A push-switch marked RESET and an associated red indicating lamp are incorporated, with finally a red indicating lamp, A1, providing indication of part programme failures.

4. The rotary control switching functions are as follows:-

- (1) OFF. ECM pod main systems inoperative, power to pod VCO heaters only.
- (2) STBY. Standby lamps 1 and 2 illuminated after 200 seconds (warm up period), power connected to the control circuit and the equipment in a state of readiness.
- (3) XMIT 1. The standby lamp 1 only is extinguished and the equipment operates at the pre-selected first ECM programme. The green lamp 1 is illuminated during the transmit period.
- (4) XMIT 2. The standby lamp 1 is illuminated and the standby lamp 2 is extinguished with the equipment operating at the pre-

selected second ECM programme. The green lamp 2 is illuminated during the transmit period.

- (5) BOTH. The standby lamps 1 and 2 are extinguished and the equipment operates at the pre-selected third ECM programme. The green lamps 1 and 2 are both illuminated during the transmit period.
- (6) RESET. The associated reset red lamp is illuminated when an overload is detected in the power distribution circuits and simultaneously the power within the pod is disconnected. With the overload removed and the RESET push-switch depressed the reset lamp is extinguished and power restored. If an r.f. fault or a modulation fault is detected the lamp will flash at 1 Hz or 4 Hz respectively.
- (7) A1. The A1 red lamp is illuminated continuously when an overload is detected in a selected programme; if an r.f. fault or modulation fault is detected in that circuit the lamp will flash at 1 Hz or 4 Hz respectively.

5. A two-way switch at the rear of the control unit, marked RF DET-XMIT, must be selected to RF DET prior to installation of the unit. An integral lamp provides illumination of the front face and is controlled by the observer's instrument lighting circuit (Sect. 16, Chap. 9B).

Note...

Prior to the embodiment of Mod 1633 the control indicator is fitted on removal of, and in lieu of, the radar signal simulator (Mod 1302) in the wide-band homer installation.

Operation

6. With the control indicator function switch selected to OFF, power is supplied to

the pod VCO heaters. With the aircraft airborne, selection of the control indicator function switch to STBY completes the earth return circuit of an operating relay in the pod via pin PP of the wing station connector, terminal B11 on panel R-KG, pins D-C of the armament master safety break WS-BB (Sect. 20, Chap. 2) and contacts 6-5 of circuit protection relay G on panel C-R (Sect. 16, Chap. 7).

7. On completion of the 'warm up' period of 200 seconds, indicated by the illumination of standby lamps 1 and 2, the ECM transmission facilities are then available.

8. An 'ECM on' earth signal is tapped off terminal B11 (panel R-KG) and routed to the blanker unit via pin G of connector 16J3. The signal is terminated in the blanker unit pending the fitting of a modified unit (main Chapter, para 11, Note).

9. The 28 V d.c. supply from fuse F3 is also fed to pin R of the control indicator for illumination of the red RESET lamp, and when an overload is detected in the power distribution circuits an earth circuit is provided for the lamp at pin A of the control indicator. Returning the function switch to OFF disconnects the earth signal to the control circuitry. The supply to the pod VCO heaters remains connected.

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Appendix 2 ELECTRONIC COUNTERMEASURES INSTALLATION (pre-Mod 1724 and 1757)

ILLUSTRATION

Fig.

Electronic countermeasures installation pre-Mod
1724 and 1757 - theoretical 1*Pre-Mod 1724*

1. Prior to embodiment of Mod 1724, the receptacles and connectors at the ECM/MARTEL role changeover panels, WP-CS and WS-CS, and connector C at each outer wing station (3 and 4) are 61-pole with alphabetical pin identification.

Pre-Mod 1757

2. Prior to embodiment of Mod 1757, the a.c. supplies from panel R-A are via fuses 1A9, 1B9 and 1C9 to both wing stations 3 and 4. On these aircraft only one pod is carried at any time.

Operation (Fig.1)

3. With the exception of the differences outlined and wiring and routing changes shown in the accompanying diagram, the description in the main chapter is also applicable to this installation. For further routing details refer to the corresponding diagram in AP 101B-1202-10B.

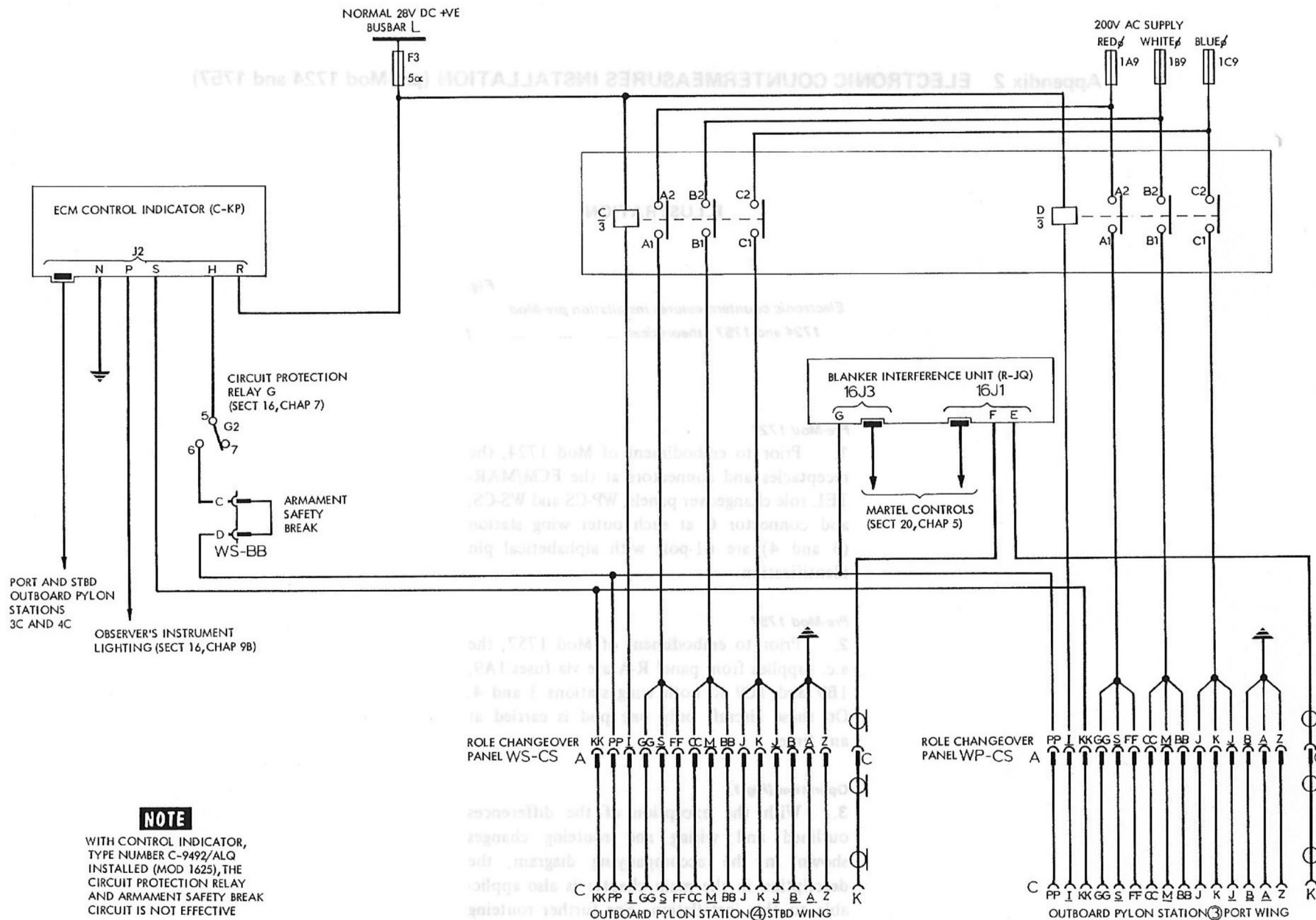
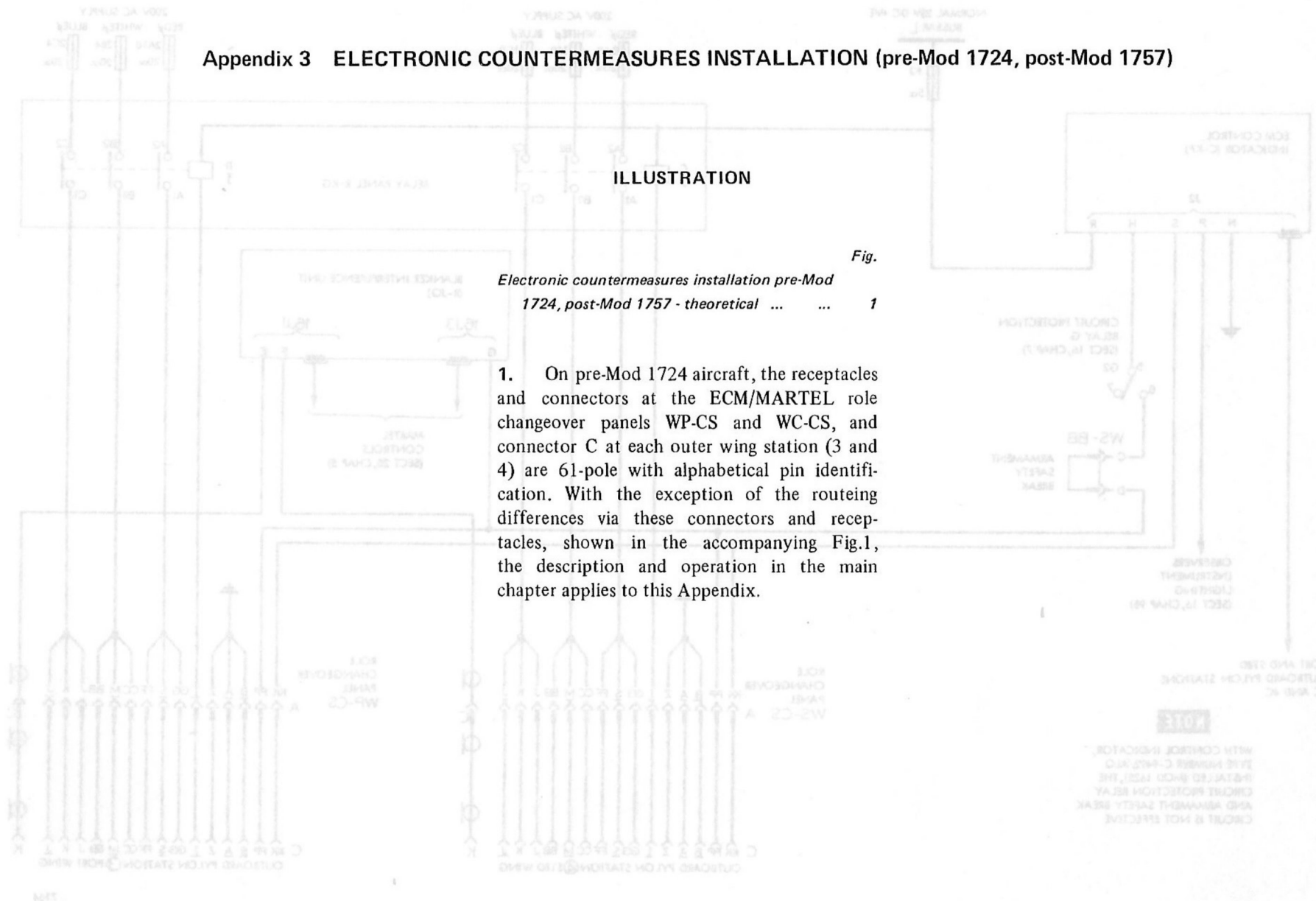


Fig.1 Electronic countermeasures installation pre-Mod 1724 and 1757 - theoretical

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Appendix 3 ELECTRONIC COUNTERMEASURES INSTALLATION (pre-Mod 1724, post-Mod 1757)



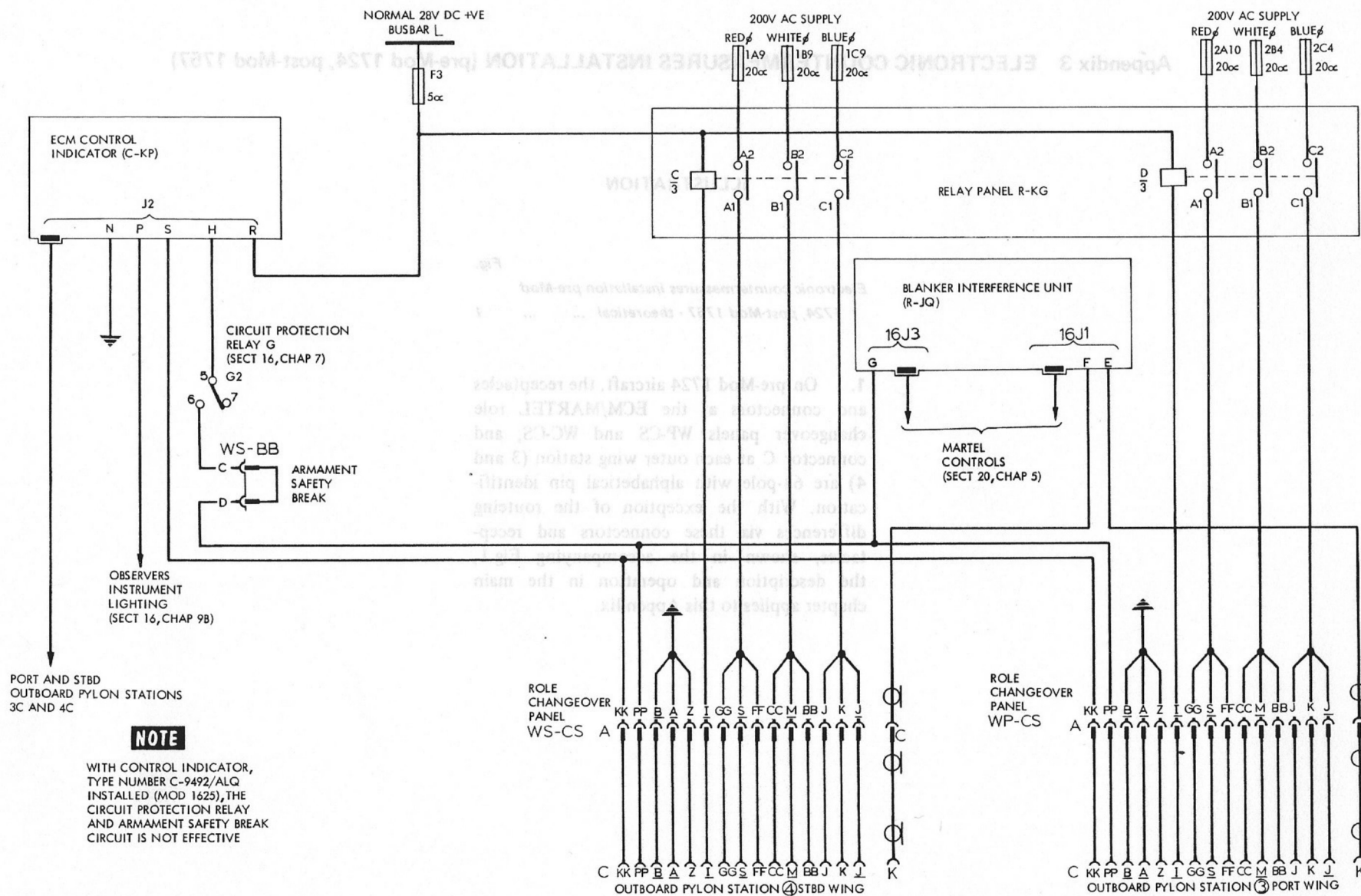


Fig.1 Electronic countermeasures installation pre-Mod 1724, post-Mod 1757 - theoretical