Chapter 9
AIR MONITORING SYSTEM

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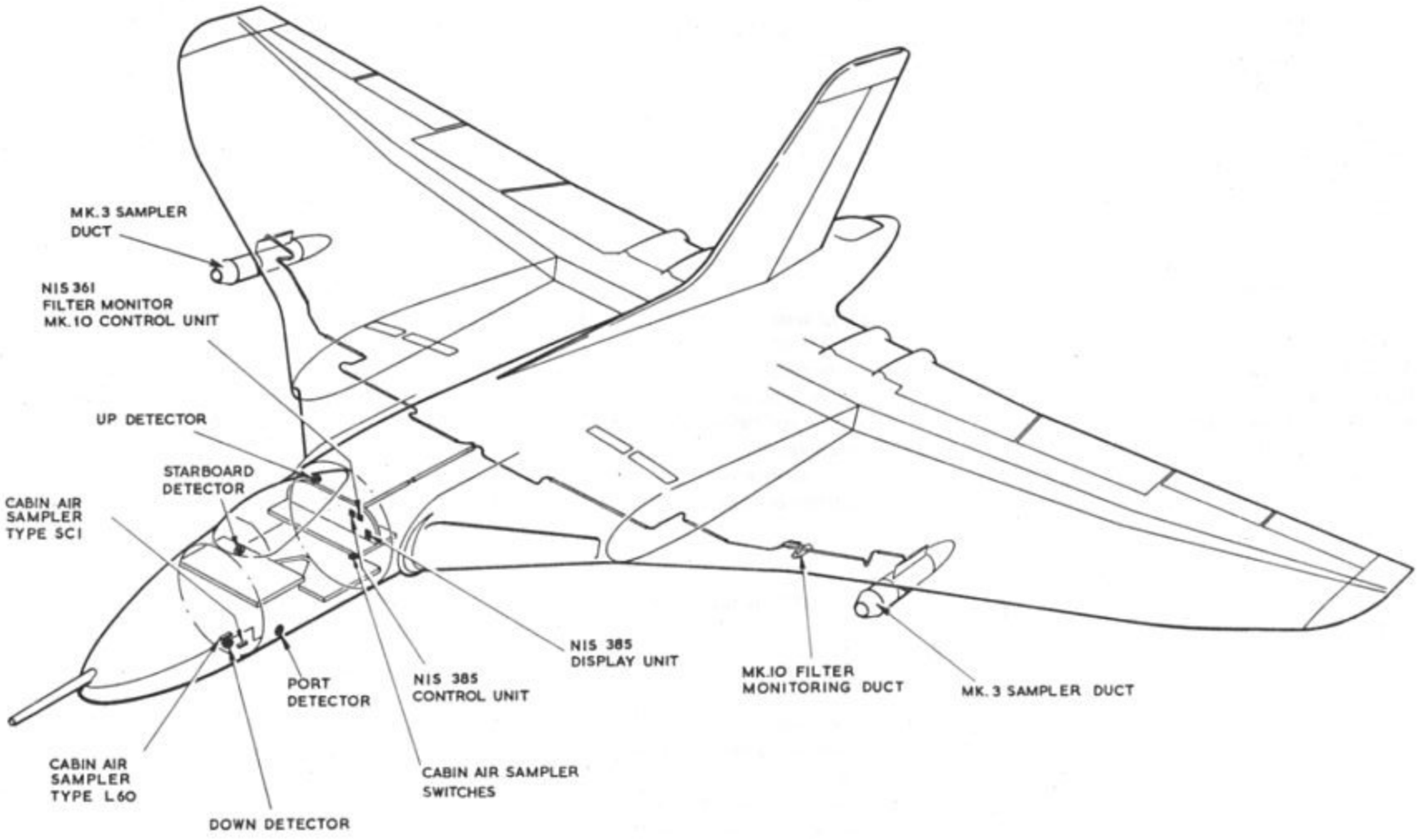


Fig.1 Location of equipment

Introduction

1. The air monitoring system is used for the detection and collection of radio-active particles from the upper atmosphere and is installed by Mods.2390 and 2392, Part A (fixed fittings) and Part B (removable fittings) in each case. The main items of equipment are listed in Table 1 and the mechanical aspects of the system are described in Sect.3, Chap.19. Information on aircraft conversion to the air monitoring role is provided in Sect.2, Chap.5B.

NOTE . . .
With Mod.2392, Part B embodied, it is not possible to fit the F195, Mk.9 camera (Mod.2072).

2. The system combines four separate functions, viz:-

(1) Radiation detection (NIS 385)

(2) Collection and density monitoring (NIS 361)

(3) Sample collection of radio-active particles

(4) Cabin air sampling

DESCRIPTION AND OPERATION

CONTROLS AND POWER SUPPLIES

3. Controls for the system are located at the A.E.O's station and comprise the following three units:-

NIS 385 control unit

NIS 385 display unit

NIS 361 filter monitor Mk.10 control unit

These units are fitted in the positions previously taken by the two Window control units (Sect.6, Chap.24) and the A.R.I.18076 control unit (Sect.10, Chap.4). In addition, two control switches for cabin air sampling are mounted on an adjacent hinged panel.

4. Power supplies of 28-volt d.c. are fed from fuses 1313, 1400, 1401 and 1402 in 4P for the detection, monitoring and sample collection circuits, and from fuses 664 and 937 in 3P for the cabin air sampling units.

RADIATION DETECTION

NIS 385 detectors

5. A system of 4-channel detection of radio-active particles is employed with four detectors positioned as follows:-

Detector UP (Channel 1) in the roof of the crew compartment between formers 260F and 274F

Detector DOWN (Channel 2) at the bomb aimer's position

Detector PORT (Channel 3) under the 1st pilot's floor between formers 316F and 330F

Detector STBD. (Channel 4) adjacent to the 6th crew seat

The detectors each contain a plastic scintillator to receive the radiation, the resultant signal outputs being fed to the NIS 385 control unit and NIS 385 display unit.

NIS 385 control unit

6. This unit incorporates a Total Count Rate meter, a Meter Range switch selective to X1, X10 and X100, a power supply switch and indicator lamp, and two end-on 1A fuses. The Total Count Rate meter shows the sum total of the signals from the four detectors in divisions of 0-40 kcounts/s.

7. Also fitted are two control switches and magnetic indicators for the wing pod actuators used for sample collection (para.14).

NIS 385 display unit

8. The display unit contains an Approach meter and two directional meters marked UP–DOWN and PORT–STBD. Two rotary balance controls and two range switches selective to X1 and X10 are also provided.

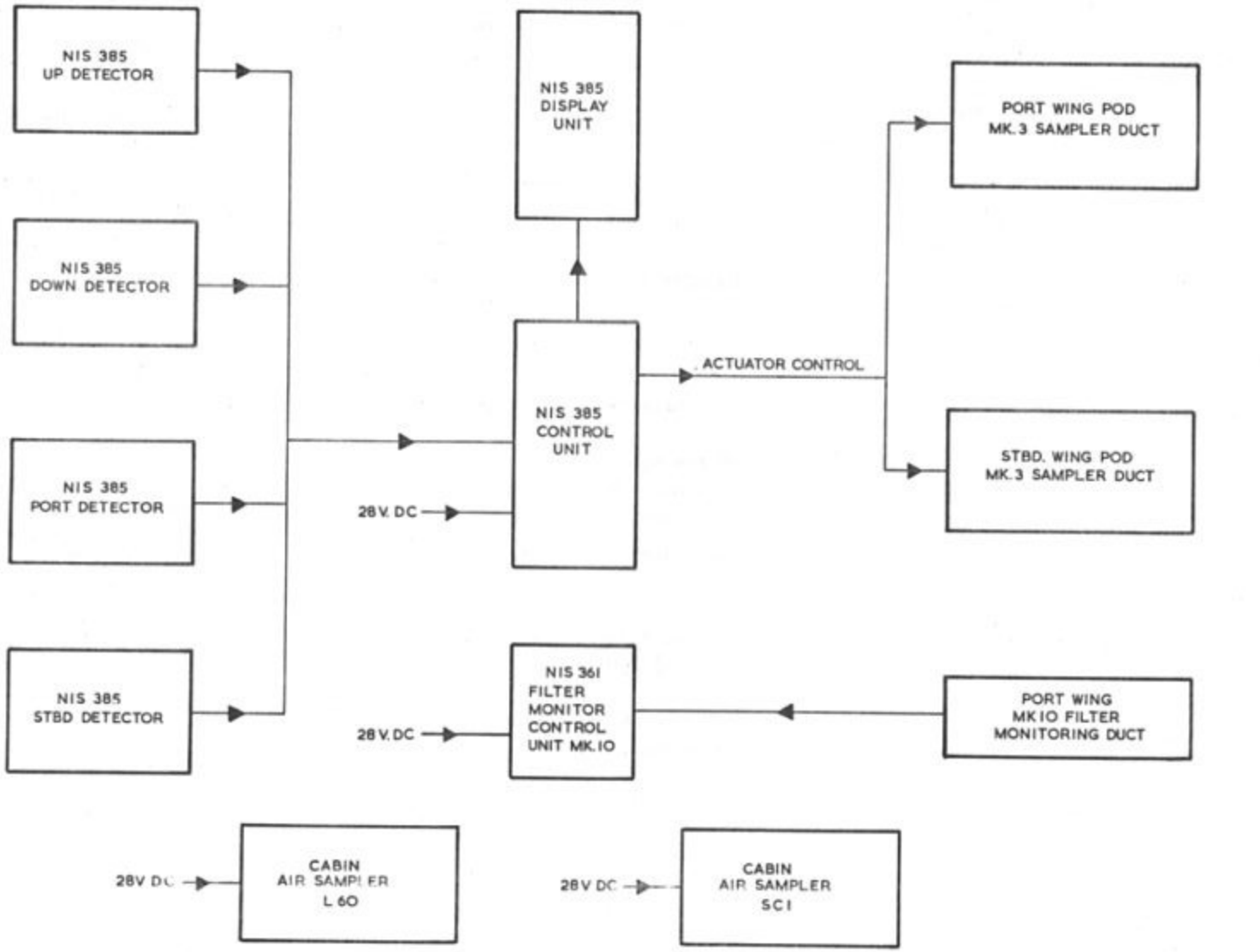


Fig. 2 Air monitoring system block diagram

9. The Approach meter shows the rate at which the total signal strength is changing in expanding divisions (quasi-logarithmic) of 0-20 kcounts/min. This rate is positive when the total signal is increasing, zero when the total signal is constant (even at a high intensity level) and negative when the total signal is decreasing. The instrument scale is calibrated on the positive side only.

10. The directional meters enable the detector signals to be balanced in opposite pairs, UP–DOWN and PORT–STBD. to give directional indications of the radio-active source. Both meters are calibrated from centre zero up to 100 units in each direction, one unit being equivalent to 10 counts/s on the X1 range.

COLLECTION AND DENSITY MONITORING

Mk.10 filter monitoring duct

11. This duct is fitted under the port wing and consists of an open-ended cylindrical filter on which radio-active dust accumulates. A geiger tube inside the filter measures the activity of the collection, which is proportional to the sample collection in the Mk.3 duct (para.14), and provides the signal to the NS 361 filter monitor Mk.10 control unit. The duct is permanently open to atmosphere.

NIS 361 filter monitor Mk.10 control unit

12. This unit contains the Collection and Density meters, a power supply switch and indicator lamp, and two end-on 500 mA fuses.

13. The Collection meter shows the measurement of activity from the monitoring duct in divisions of 0-5 kcounts/s. The Density meter shows the rate at which the signal is increasing in divisions of 0-500 counts/s/min on a quasi-logarithmic scale. This rate is proportional to the rate at which radio-active dust is accumulating on the dust filter, which in turn is proportional to the density of contamination in the atmosphere around the aircraft.

SAMPLE COLLECTION

Mk.3 sampler ducts

14. Sample collection of radio-active dust particles is made by two Mk.3 ducts housed in pod assemblies, which are mounted on pylons one under each wing. The dust is collected in eight tetrahedral filter baskets within each duct, the baskets being removed after flight by ground-handling personnel for examination.

15. The ducts are opened and closed by linear actuators controlled by the switches on the NIS 385 control unit. The associated magnetic indicators show OPEN and SHUT as selected, and cross-hatch de-energized.

CABIN AIR SAMPLING

Air samplers

16. Provision is made for sampling airborne contamination within the aircraft cabin by two air samplers, one a Type L60 and the other, a Type SC1. Both units, which are located at the bomb aimer's position, contain an electrically operated pump controlled from the A.E.O's station. The control switches are labelled DUST SAMPLER for the L60 sampler and VAC/AIR PUMP for the SC1 sampler. When operated, air is drawn into the samplers through replaceable filter papers.

SERVICING

FUNCTIONAL TESTS

CAUTION . . .
To ensure accurate results during the following tests, it is essential that the following areas are kept clear of non-essential personnel and ground equipment:-

(1) Crew compartment

(2) External area beneath crew compartment

Test equipment

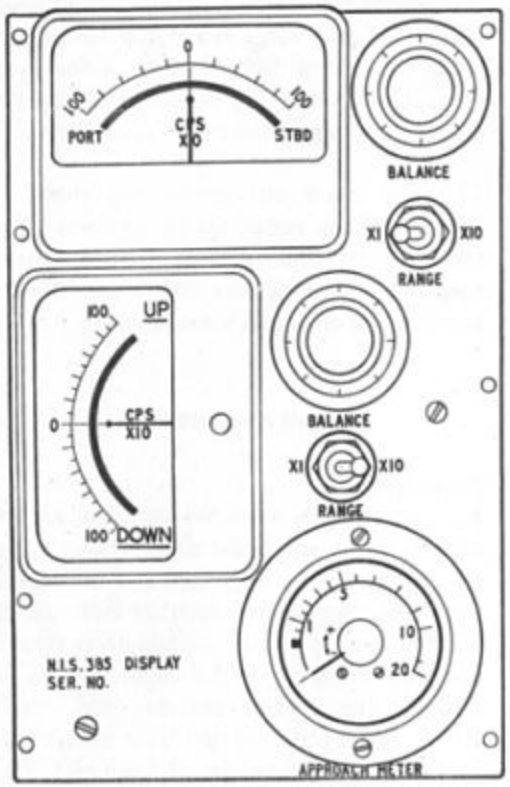
17. For functional test purposes, two items of test equipment are required:-

Radio-active source Ref. No. 12Z/21

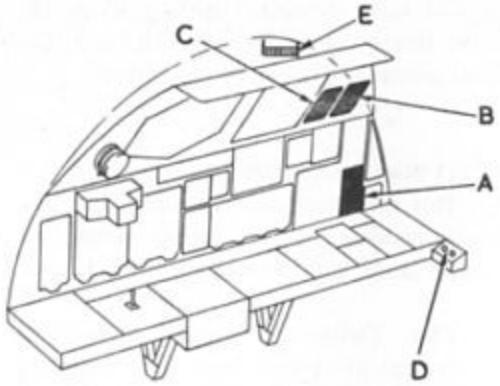
Jig radio-active source Ref. No. 12Z/NIV

Testing the system

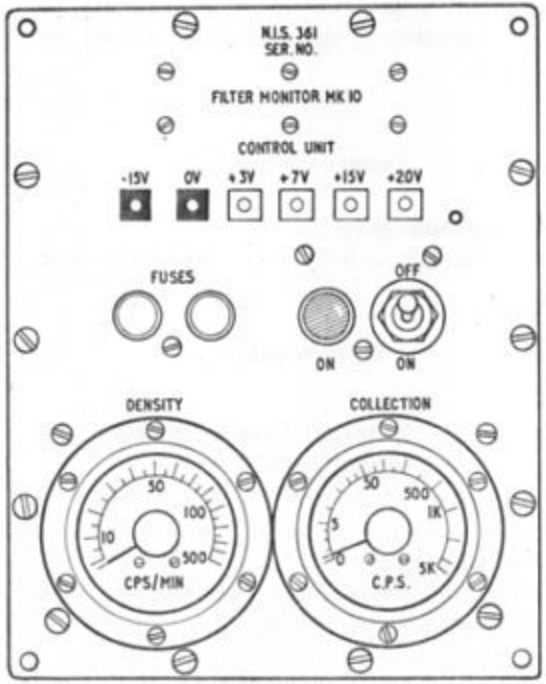
18. The tests are described under the four separate functions of the system indicated in para.2 and may be performed individually or as one complete check. An external 28-volt d.c. power supply must first be connected and switched on.

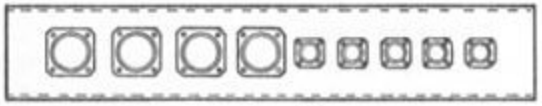


DETAIL 'A'
N.I.S. 385 DISPLAY UNIT

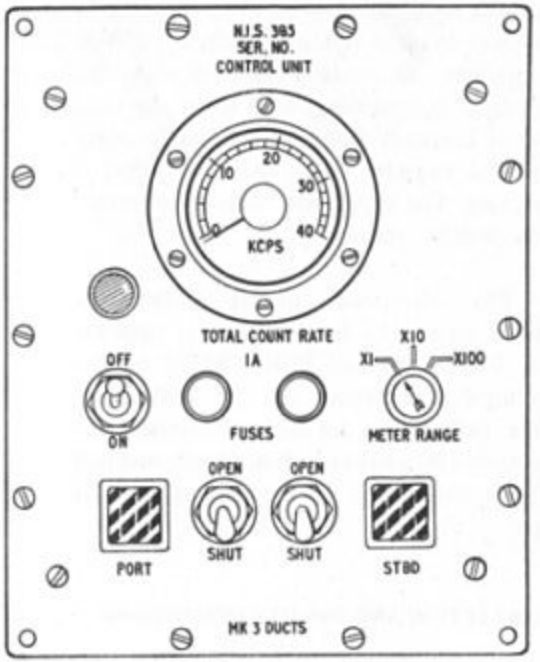


DETAIL 'B'
N.I.S. 361 FILTER MONITOR CONTROL UNIT

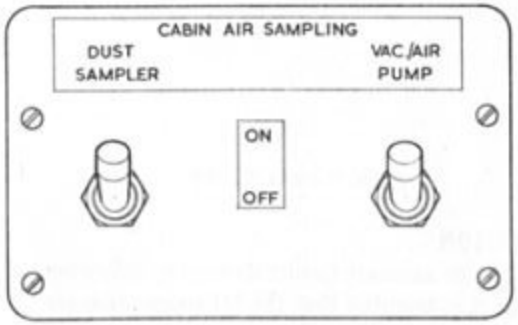




DETAIL 'E'
CONNECTOR STOWAGE BEHIND PANEL FOR CONTROL UNITS



DETAIL 'C'
N.I.S. 385 CONTROL UNIT



DETAIL 'D'
CABIN AIR SAMPLER SWITCHES

Fig. 3 Equipment at A.E.O'S. station.

Radiation detection

19. The NIS 385 is tested as follows:-

Zero balance test

(1) At the NIS 385 control unit, select the power supply switch to ON and check that the power indicator lamp is lit. Set the range switch to X1, allow the Total Count Rate meter to stabilize and note the background reading.

(2) At the NIS 385 display unit:-

(a) Check that the Approach meter has settled in the black band.

(b) Set the range switches to X10.

(c) Set the port/stbd. balance control fully anti-clockwise and check that the meter reading is not less than 2 000 c.p.s. PORT. Set the balance control fully clockwise and check that the meter reading is not less than 2 000 c.p.s. STBD.

(d) Set the up/down balance control fully anti-clockwise and check that the meter reading is not less than 2 000 c.p.s. DOWN. Set the balance control fully clockwise and check that the meter reading is not less than 2 000 c.p.s. UP.

(e) Zero the port/stbd. meter using the balance control and finally with the range switch at X1.

(f) Zero the up/down meter using the balance control and finally with the range switch at X1.

Radio-active source test

(3) Remove cap from radio-active source (12Z/21). Fit source to jig (12Z/NIV) and proceed as follows:-

(a) Place the jig on the DOWN detector ensuring source is in contact with the scintillator.

(b) Check that the Approach meter shows a positive reading and falls to zero (time elapse may be five minutes).

(c) Check that the up/down meter indicates 2 500 c.p.s. DOWN ± 500 and note reading.

(d) Check that the Total Count Rate meter indicates background reading plus reading at (c).

(e) Remove the radio-active source from the scintillator and the immediate vicinity of all detectors.

(f) Check that the Approach meter reading falls to background before continuing test.

(g) Repeat (a) to (f) for the UP detector reading UP for DOWN.

(h) Repeat (a) to (f) for the STBD. detector reading STBD. for DOWN.

(i) Repeat (a) to (f) for the PORT detector reading PORT for DOWN.

(j) Remove radio-active source from jig and fit cap.

(4) At the NIS 385 display unit, check that the range switches are set to X1 and that the Balance and Approach meters are at zero. At the NIS 385 control unit, check that the Total Count Rate meter indicates background; switch the unit to OFF and check that the power indicator lamp is out.

Collection and density monitoring

20. The NIS 361 is tested as follows:-

(1) At the NIS 361 filter monitor Mk.10 control unit, select the power supply switch to ON and check that the power indicator lamp is lit.

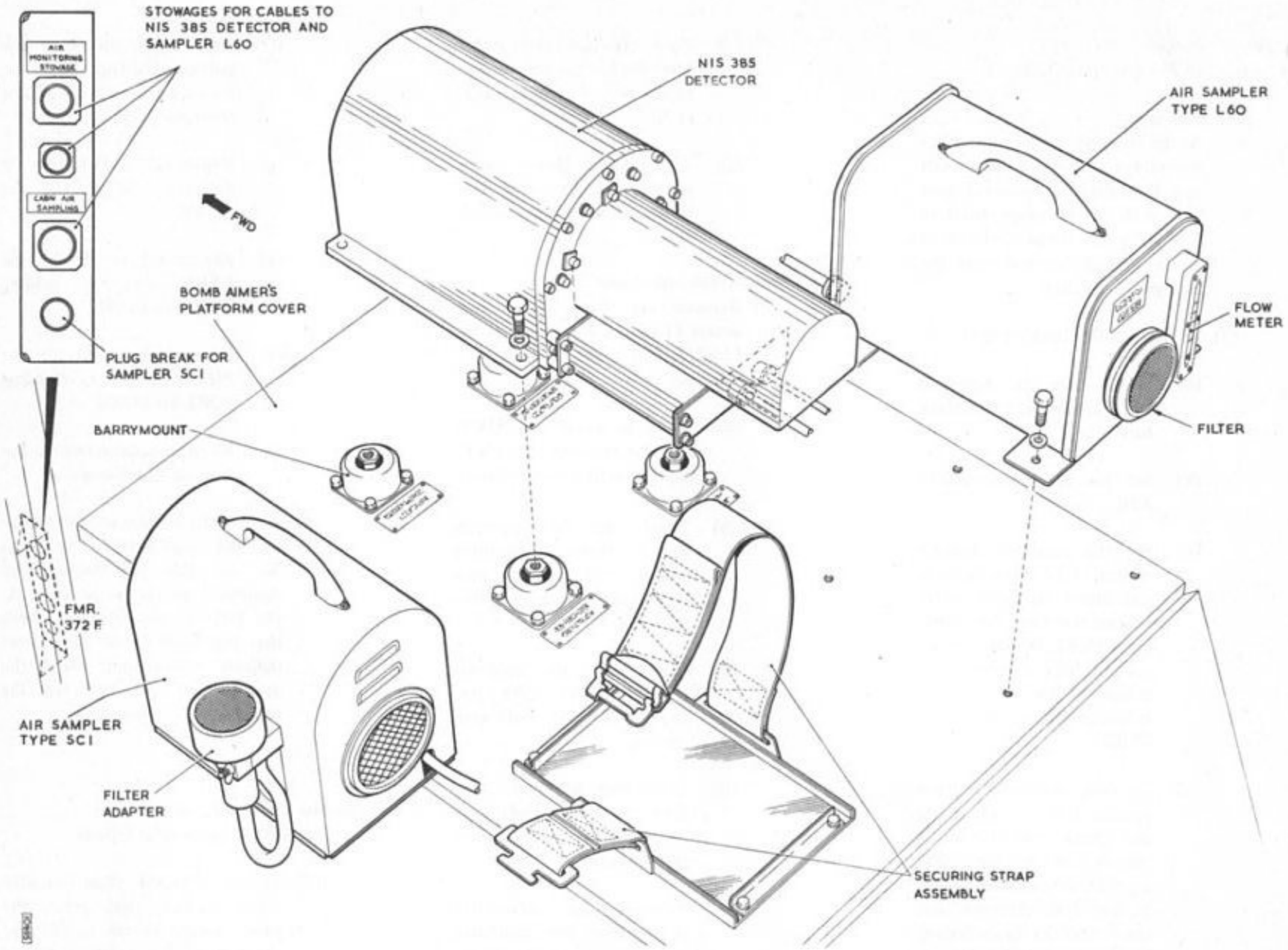


Fig. 4 Location of units at the bomb aimer's position

(2) Check that the Collection meter reads between zero and 1 c.p.s. and the Density meter reads zero ± 2 c.p.s. Allow five minutes for the readings to stabilize.

(3) Remove the nose cone from the Mk.10 filter monitoring duct as outlined in Sect.3, Chap.19.

(4) Remove cap from radio-active source (12Z/21) and place the source centrally against the side of the Mk.10 duct detector head.

(5) Check that the Density meter reading increases, then falls and fluctuates about the zero mark. This may take up to five minutes.

(6) Check that the Collection meter reading is 125 c.p.s. ± 20%.

(7) Remove the radio-active source from the Mk.10 duct detector head and fit cap.

(8) Refit the Mk.10 duct nose cone.

(9) After five minutes check that both meters read zero.

(10) Switch the Mk.10 control unit to OFF and check that the power indicator lamp is out.

Sample collection

21. The Mk.3 sampler ducts are tested as follows:-

Port duct

(1) At the NIS 385 control unit, select the port duct switch to OPEN.

(2) Check that the port duct magnetic indicator shows OPEN not more than 30 seconds after selection.

(3) Physically check that the port wing duct is fully open.

(4) Select the port duct switch to SHUT.

(5) Check that the indicator shows SHUT not more than 30 seconds after selection.

(6) Physically check that the port wing duct is fully closed.

(7) Return the port duct switch to the centre position. Indicator should now show cross-hatch (de-energized).

Stbd. duct

(8) Repeat (1) to (7) reading stbd. for port.

Cabin air sampling

22. To test the air samplers, select both control switches in turn to ON, and check that each pump is operating without vibration and undue noise. Return the switches to OFF.

Completion of tests

23. On completion of the foregoing tests:-

(1) Switch off and disconnect the ground power supply.

(2) Return the radio-active source and jig to the radiation source store.

REMOVAL AND INSTALLATION

General

24. Information for the installation and removal of the air monitoring equipment is given in the aircraft conversion role described in Sect.2, Chap.5B, to which reference should be made for details. The Mk.3 duct actuators, however, are dealt with in this chapter since the ducts and wing pods are fitted as complete assemblies. For all removals, the aircraft power supplies should first be disconnected and, during the removal operations, care should be exercised when handling units to prevent damage from shock or jarring.

Connector stowages

25. Dummy stowages are provided for the connectors of the A.E.O's control units, the DOWN detector and cabin air sampler L60 when these items are removed. The stowages are located behind the Nav/Plotter's panel (fig.3) and at former 372F (fig.4).

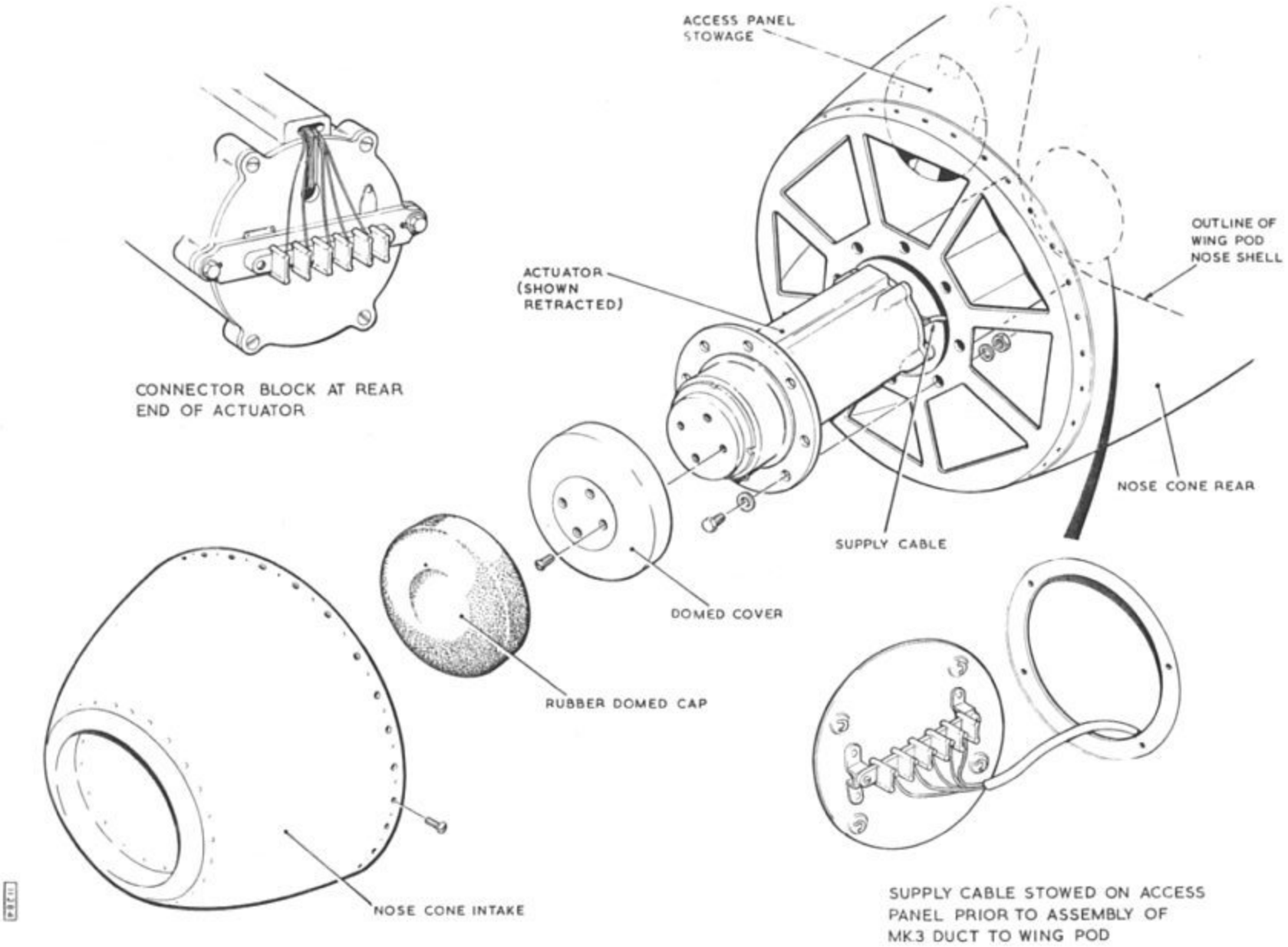


Fig. 5 Removal of Mk.3 duct actuator

Mk.3 duct actuators

26. The actuators are normally removed in the extended position, but can also be removed when retracted should failure occur. The installation procedure is the reverse of the removal.

CAUTION...
Before the removal of an actuator, ensure that:-

(1) All sampler bags have been removed

(2) The sampler unit and surround have been decontaminated in accordance with A.P.4687A, Vol.2, leaflet E1 and declared safe for handling.

Actuator extended

27. Remove as follows:-

(1) Remove the 24 bolts securing the nose cone and detach cone.

(2) Remove the 8 bolts securing the actuator to the nose cone rear.

(3) Withdraw the actuator from the mounting tube until the supply cable is exposed.

(4) Disconnect the supply cable and remove actuator.

(5) Insulate and stow supply cable.

Actuator retracted

28. Remove as follows:-

(1) Remove the nose cone as in 27 (1).

(2) Remove the rubber domed cap to expose the end cap securing screws (fig.5).

(3) Remove the end cap by releasing the 4 securing screws.

(4) Proceed as in operation 27 (2) to (5).

TABLE 1

Main items of equipment

Equipment	Quantity	Type	Part No.	A.P. Reference
Detector unit	4	ADAM NIS 385	AWRE HP/1/598045	–
Control unit	1	ADAM NIS 385	AWRE HR/1/598046	–
Display unit	1	ADAM NIS 385	AWRE HR/1/598047	–
Filter monitor Mk.10 control unit	1	ADAM NIS 361	AWRE HR/1/598049	–
Mk.10 filter monitoring duct	1	ADAM NIS 361	AWRE HP/1/598048	–
Actuator	2	LUCAS EXP 5440-1	–	113E-0188-1
Air sampler	1	L60	–	–
Air sampler	1	SC1	–	–

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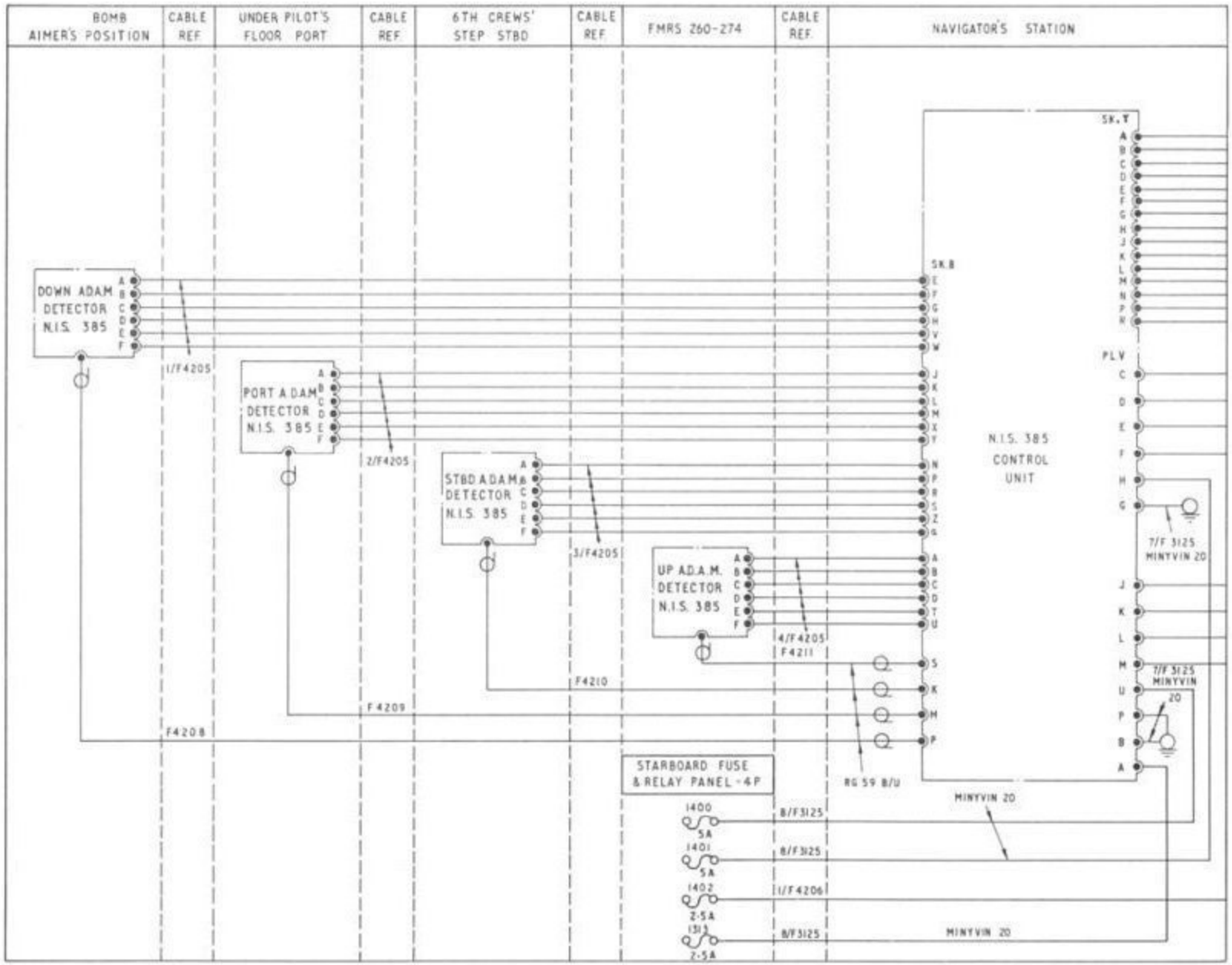

Fig. 6 (1) Air monitoring system

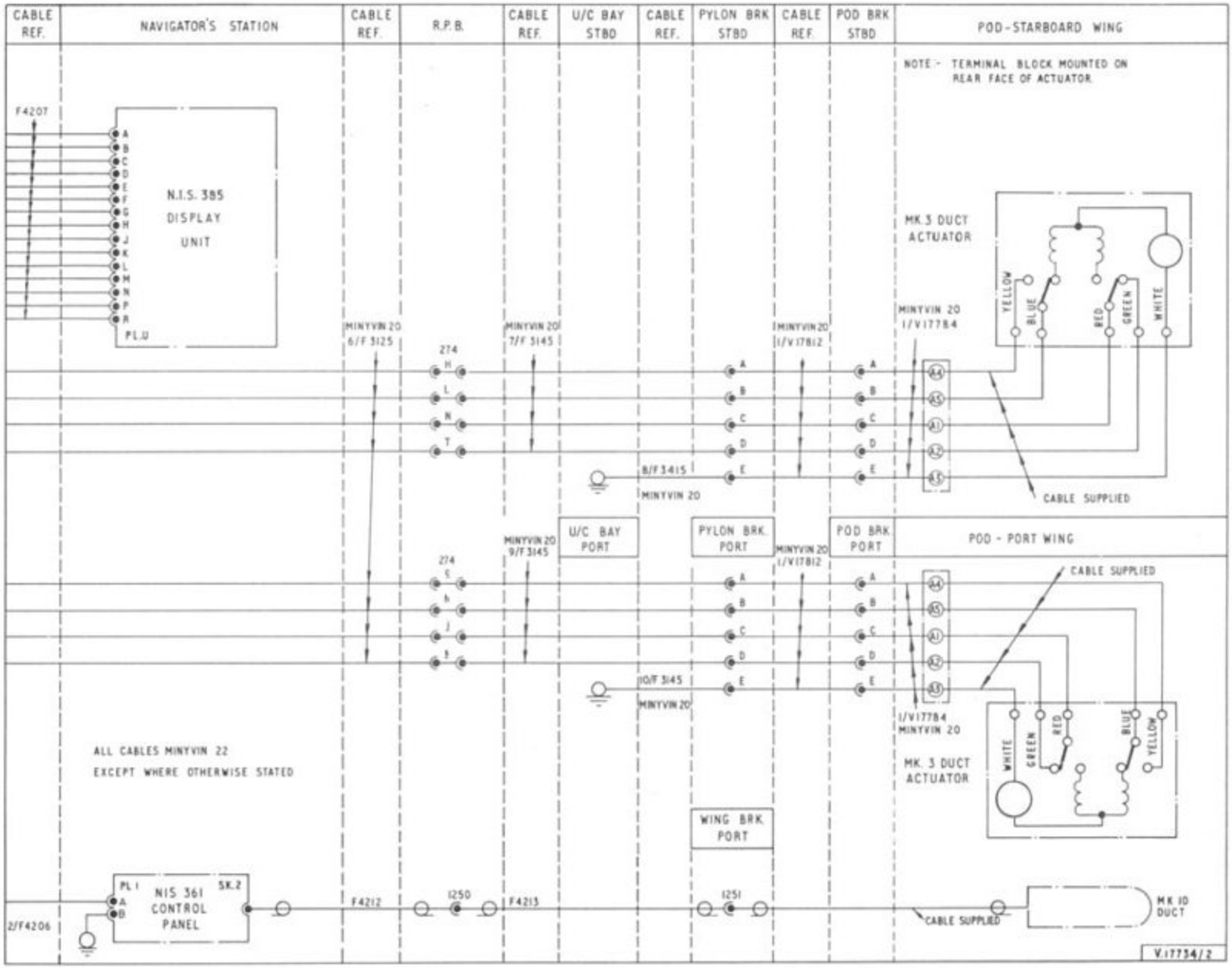

Fig. 6 (2) Air monitoring system

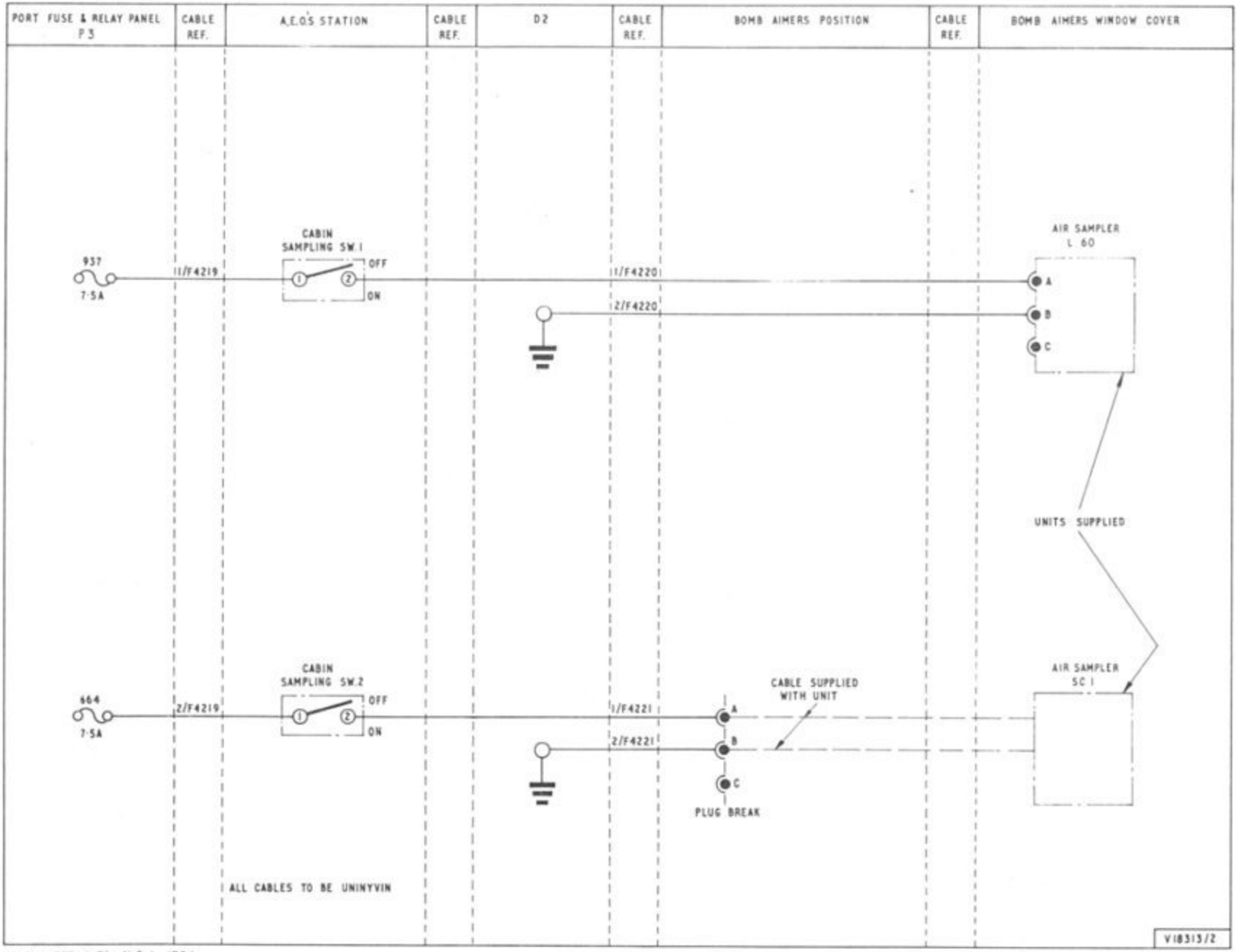

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Fig. 7 Cabin air sampling