

BRITTAI N INDUSTRIES
BRITTAI N MODEL B-6 FLIGHT CONTROL SYSTEM
INSTALLATION INSTRUCTIONS 11971-9

FOR
MOONEY MODELS M20C AND M20E

LOG OF REVISIONS

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3	C	Sh. 3	A
4	B	Sh. 4	B
		Sh. 5	A
		Sh. 6	C
		Sh. 7	A
		Sh. 8	B
		Sh. 9	C
		Sh. 10	A
		Sh. 11	A
		Sh. 12	A
		Sh. 13	A
		Sh. 14	A
		Sh. 15	A
		Sh. 16	(-)

Approved:

O.G. Klingman, Chief
Systems Application

REVISION: C

1. INTRODUCTION

- 1.1 THE FOLLOWING INSTALLATION INSTRUCTIONS COVER THE INSTALLATION OF THE BRITTAIN MODEL B-6 FLIGHT CONTROL SYSTEM, INCLUDING PITCH CONTROL WITH ALTITUDE HOLD AND NAVIGATION COUPLER, IN MOONEY MODELS M20C AND M20E WHICH ARE EQUIPPED WITH THE BRITTAIN MODEL LSA-2 LATERAL STABILITY AUGMENTATION SYSTEM.
- 1.2 THIS INSTALLATION MANUAL INCLUDES ALL SPECIFIC DATA AND DRAWINGS TO COMPLETE THE INSTALLATION. IF, AFTER COMPLETING INSTALLATION, THE SYSTEM DOES NOT FUNCTION PROPERLY, REFER TO THE ACCOMPANYING OPERATION AND SERVICE MANUAL.
- 1.3 READ THIS MANUAL THOROUGHLY BEFORE BEGINNING INSTALLATION. PARTICULAR ATTENTION SHOULD BE PAID TO THE FOLLOWING ITEMS:
- A. INSPECT AIRCRAFT TO INSURE THAT THE CONTROL SYSTEMS ARE FUNCTIONING SMOOTHLY.
 - B. DO NOT ROUTE PLASTIC TUBING NEAR HEATER DUCTS OR OTHER HEAT SOURCES.
 - C. MAKE CERTAIN THAT ALL PLASTIC TUBING CONNECTIONS ARE SECURED WITH CLAMPS. PURGE ALL TUBING WITH AIR BEFORE CONNECTIONS ARE MADE.

1.4 SPECIFICATIONS

- A. TYPE: ELECTRO-PNEUMATIC THREE-AXIS CONTROL WITH ALTITUDE HOLD, NAVIGATION COUPLING AND MAGNETIC HEADING LOCK CAPABILITIES.
- B. POWER REQUIREMENTS: 12 VOLTS DC; 1 AMPERES (MAXIMUM)
4.5" + .25 - 0 IN. Hg AT TEST BIB #1
- C. WEIGHT AND BALANCE: 10.7 LBS. AT STATION 56.9"
(COMPLETE SYSTEM) AFT OF DATUM
- D. APPROVAL BASIS: S.T.C. SA992WE

DRAWINGS REQUIRED: 1703, SHEET 1 THROUGH 16

DATED:

2-11-66
3/12-70

APPROVED:

A. Robinson

Revision: C

2. CONTROLLER INSTALLATION

- 2.1 INSTALL CONTROLLER, MODEL BI-600, AS SHOWN ON DRAWING 1703, SHEETS 1 THROUGH 3. MAKE CUTOUT IN INSTRUMENT PANEL TO DIMENSIONS SHOWN AND SECURE THE CONTROLLER TO EXISTING CHANNELS WITH HARDWARE PROVIDED. SECURE BRACE, PART NUMBER 1893, TO EXISTING CHANNEL AS SHOWN WITH HARDWARE PROVIDED.

3. PITCH/ALTITUDE SENSOR INSTALLATION

- 3.1 INSTALL PITCH/ALTITUDE SENSOR ASSEMBLY AS SHOWN ON DRAWING 1703, SHT. 4. SECURE ASSEMBLY WITH HARDWARE PROVIDED.

4. PITCH ON-OFF VALVE INSTALLATION

- 4.1 INSTALL PITCH ON-OFF VALVE ASSEMBLY AS SHOWN ON DRAWING 1703, SHEET 5. SECURE VALVE WITH HARDWARE PROVIDED.

5. SHUNT VALVE INSTALLATION

- 5.1 INSTALL SHUNT VALVE ASSEMBLY AS SHOWN ON DRAWING 1703, SH. 6 AND SECURE WITH HARDWARE PROVIDED.

6. AILERON SERVO INSTALLATION MODIFICATION

NOTE: FOR AIRCRAFT PRIOR TO M20C SERIAL NUMBER 3348 AND M20E SERIAL NUMBER 1044, PARAGRAPH 6.1 APPLIES. FOR ALL OTHER AIRCRAFT, PARAGRAPH 6.2 APPLIES.

- 6.1 INSTALL AILERON BELLCRANK EXTENSIONS AS SHOWN ON DRAWING 1703 SHT. 7. SECURE AS SHOWN WITH HARDWARE PROVIDED.

- 6.2 RELOCATE THE EXISTING AILERON SERVO'S AND CHAIN ATTACHMENT BOLTS AS SHOWN ON DRAWING 1703 SH. 16.

7. SENSOR INSTALLATION

- 7.1 INSTALL SENSOR AS SHOWN ON DRAWING 1703, SHEET 8. SECURE TO EXISTING BRACKET WITH HARDWARE PROVIDED.

- 7.2 NOTE: INSPECT THE INSTALLATION TO INSURE THAT THE SENSOR IS FREE TO PIVOT FORE AND AFT. THE SENSOR MUST PIVOT DIRECTLY ALONG THE AIRCRAFT CENTERLINE. ANY MISALIGNMENT WILL CAUSE SYSTEM ERROR.

8. ELEVATOR SERVO INSTALLATION

- 8.1 INSTALL ELEVATOR SERVO ASSEMBLY AS SHOWN ON DRAWING 1703, SHEET 9. SECURE TO EXISTING BRACKETS WITH HARDWARE PROVIDED. INSTALL ELEVATOR CABLE ASSEMBLY ON EXISTING PUSHROD BELLCRANK AS SHOWN. SECURE CABLES TO SERVO PISTON AS SHOWN.

9. ALTITUDE HOLD CHAMBER INSTALLATION

- 9.1 INSTALL ALTITUDE HOLD CHAMBER ASSEMBLY AS SHOWN ON DRAWING 1703, SHEET 10 AND SECURE WITH HARDWARE PROVIDED.

10. VACUUM PLUMBING

10.1 ARRANGE AND INSTALL VACUUM PLUMBING AS SHOWN ON THE DRAWINGS CONTAINED IN THIS MANUAL. MAKE CERTAIN THAT ALL TUBING CONNECTIONS ARE SECURED WITH TUBING CLAMPS PROVIDED AND THAT NO LEAKS OR KINKS EXIST. COMPARE TUBING CONNECTIONS WITH THOSE SHOWN ON DRAWING 1703, SHEET 13, TO INSURE PROPER SYSTEM FUNCTION.

11. ELECTRICAL CONNECTION

11.1 COMPLETE THE ELECTRICAL INTERCONNECTION AS SHOWN ON DRAWING 1703, SHEET 14. REFER TO DRAWING 1703, SHEET 15, FOR THE CONNECTIONS OF WIRES #3 AND #4.

12. VACUUM ADJUSTMENT

12.1 ADJUST THE AIRCRAFT VACUUM REGULATOR TO PRODUCE $4.50 \pm .25$ - 0 IN. Hg. AT TEST BIB #1. THIS ADJUSTMENT MUST BE MADE WITH SUFFICIENT ENGINE R.P.M. TO STABILIZE VACUUM PUMP OUTPUT.

13. FLIGHT TEST

13.1 UPON COMPLETION OF THE FLIGHT CONTROL INSTALLATION THE AIRCRAFT MUST BE TEST FLOWN BY AN APPROPRIATELY RATED PILOT (WITH AT LEAST A PRIVATE PILOT CERTIFICATE) AND THE RESULTS OF THIS TEST FLIGHT MUST BE RECORDED IN THE AIRCRAFT RECORDS. (REF: FAR PART 91.167 (A).)

A
CHANGE

APPROVED BY: *NR*

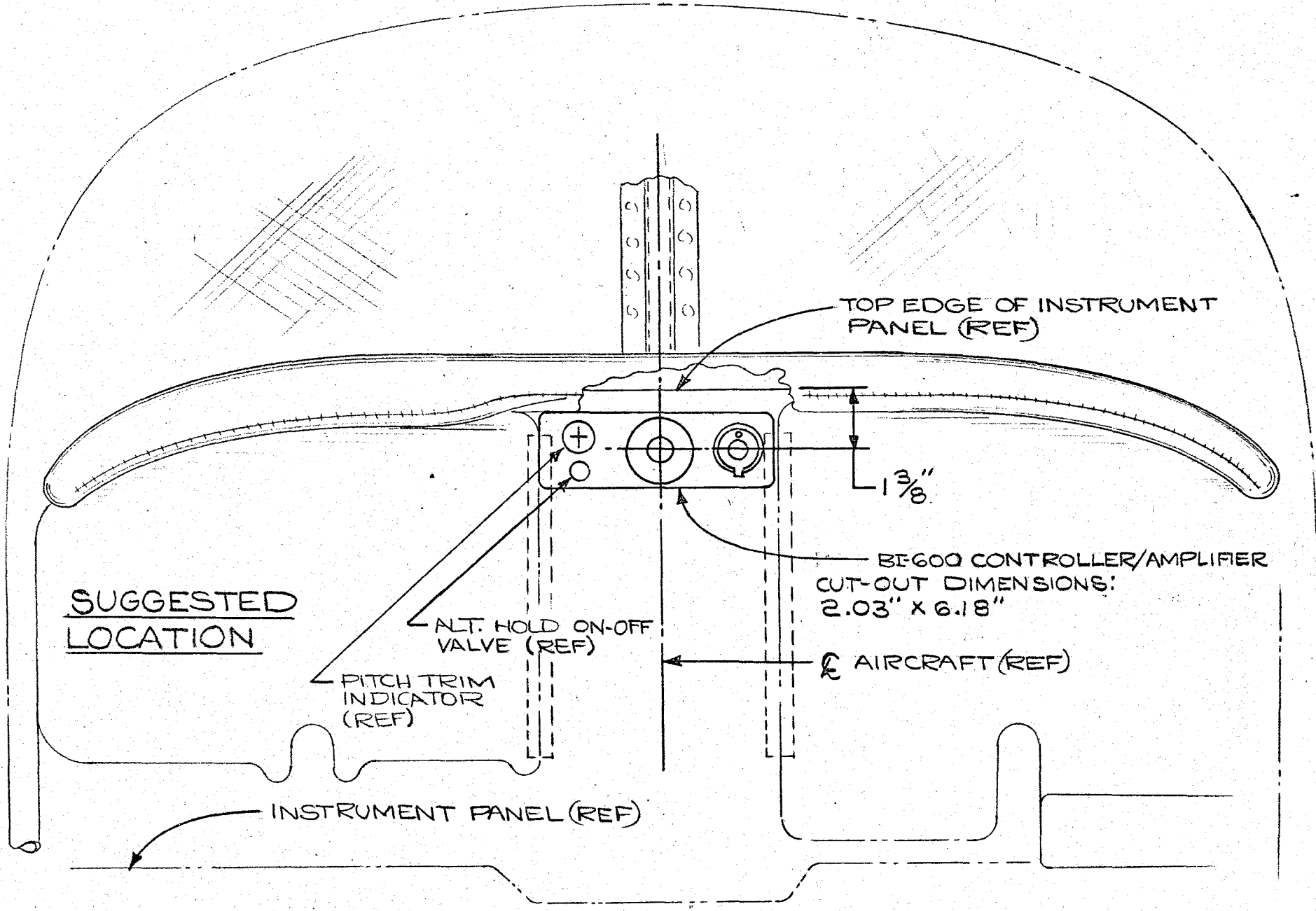
DATE: 7-28-66

APPROVED BY: *J. M. Donaldson*
CHECKED BY: *[Signature]*
DRAWN BY: J.M. DONALDSON

DATE: 6-18-65
DATE: 6-14-65
DATE: 5-11-65

1703 SH 1 OF 16
DRAWING NUMBER

A
CHANGE



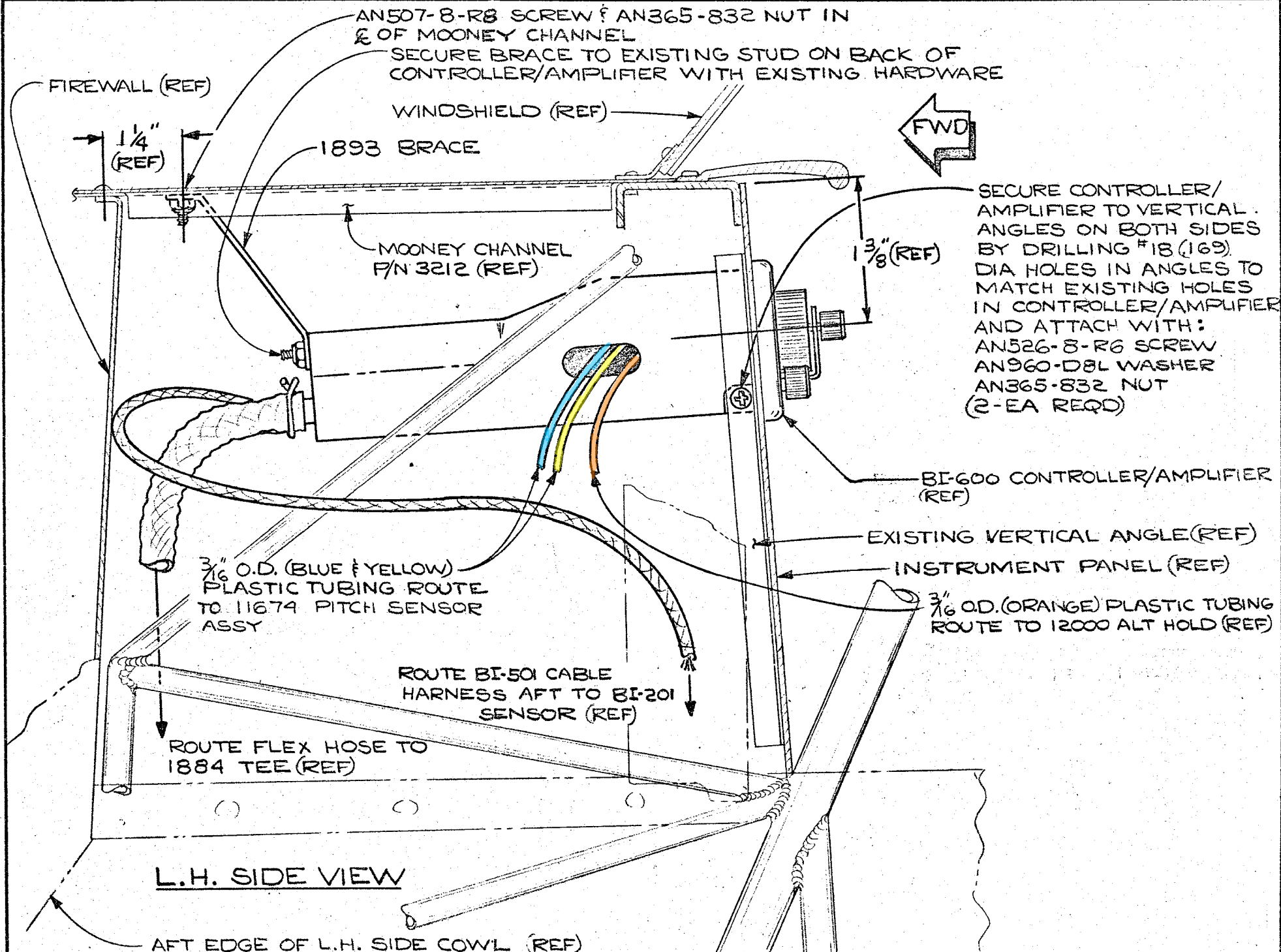
VIEW LOOKING FORWARD

BRITAIN INDUSTRIES, INC.
HAWTHORNE, CALIFORNIA

CONTROLLER INSTALLATION
MOONEY

1703 SH 1 OF 16
DRAWING NUMBER

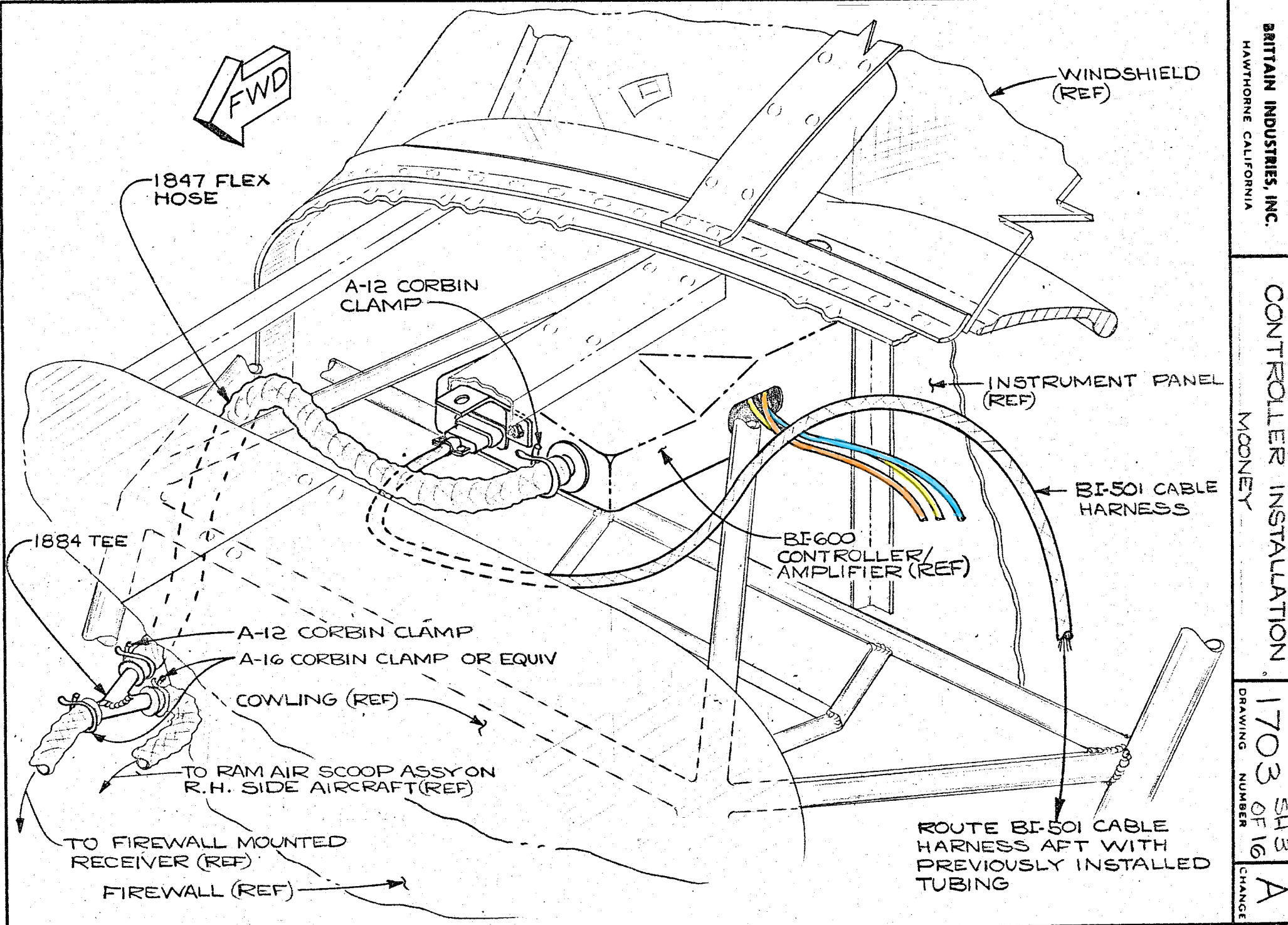
A
CHAN



BRITAIN INDUSTRIES, INC.
 HAWTHORNE CALIFORNIA

MOONEY
 CONTROLLER INSTALLATION

DRAWING NUMBER
 1703 SH 2
 OF 16
 CHANGE
 B



BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

CONTROLLER INSTALLATION
MOONEY

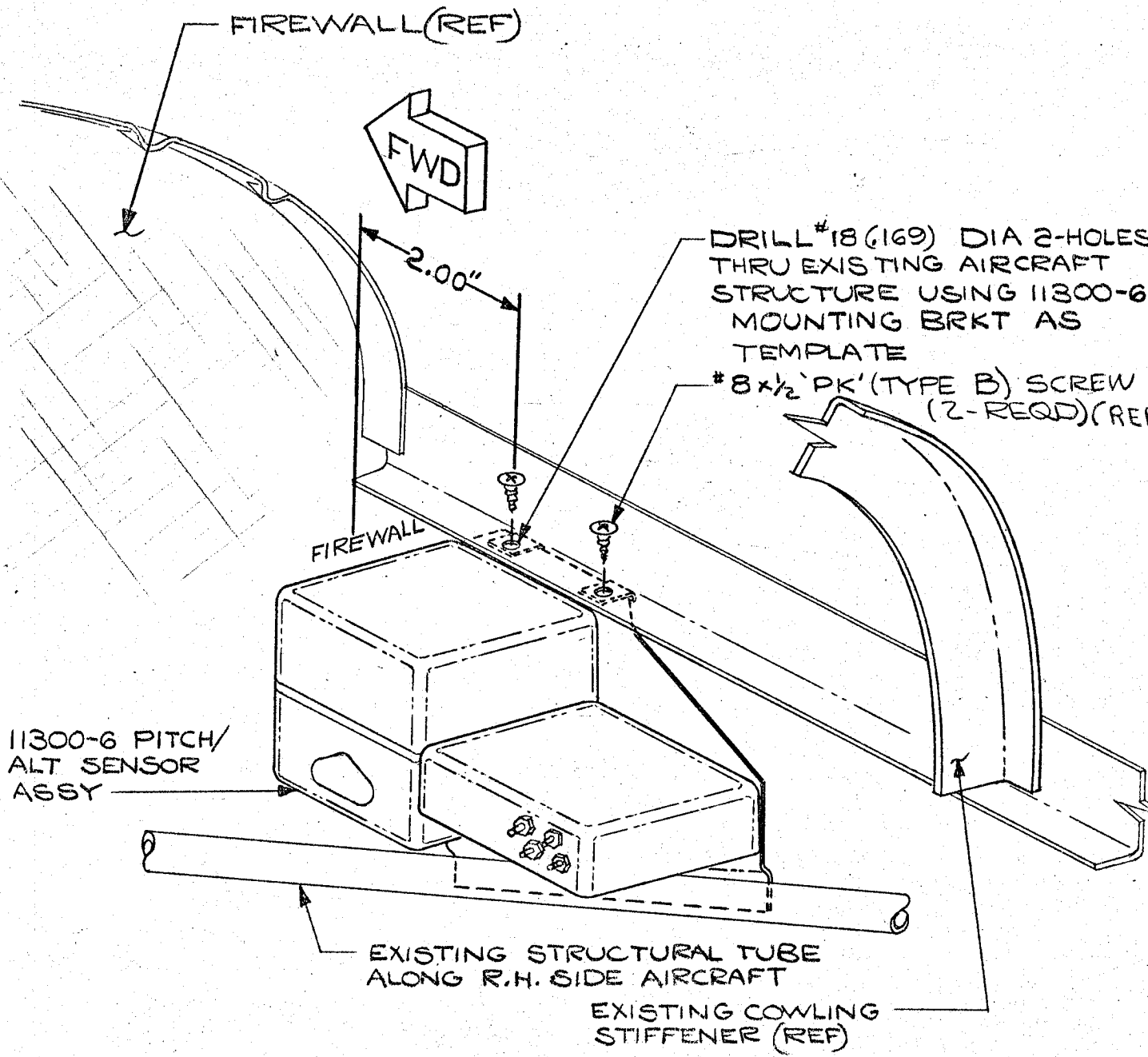
DRAWING NUMBER
1703 SH3
OF 16
CHANGE

SH 4
1703 OF 16
DRAWING NUMBER

APPROVED BY: [Signature]
CHECKED BY: [Signature]
DATE: 6-14-65
DRAWN BY: J.M. DONALDSON
DATE: 5-3-65

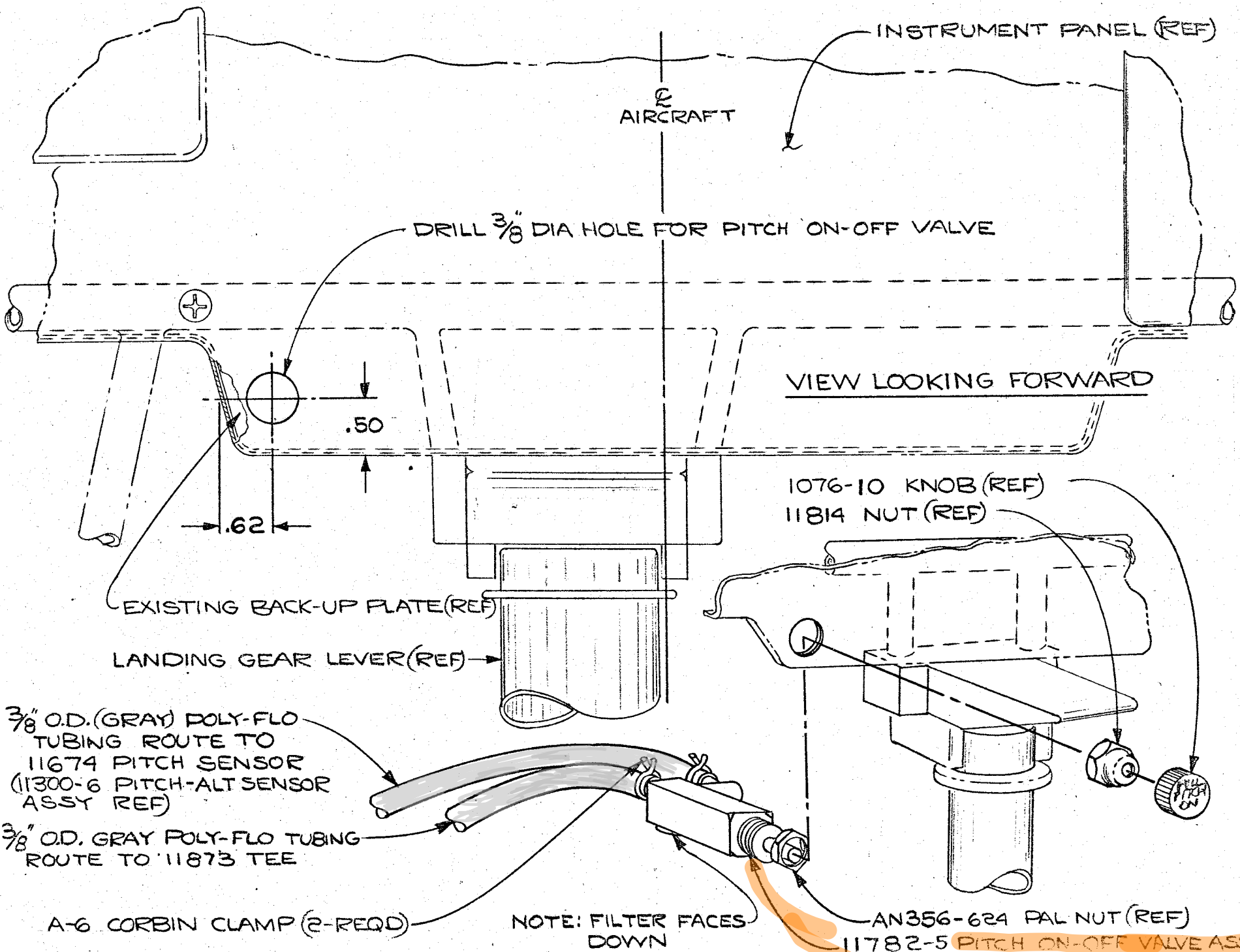
2-28-66
DATE:

APPROVED BY: [Signature]
B
CHANGE

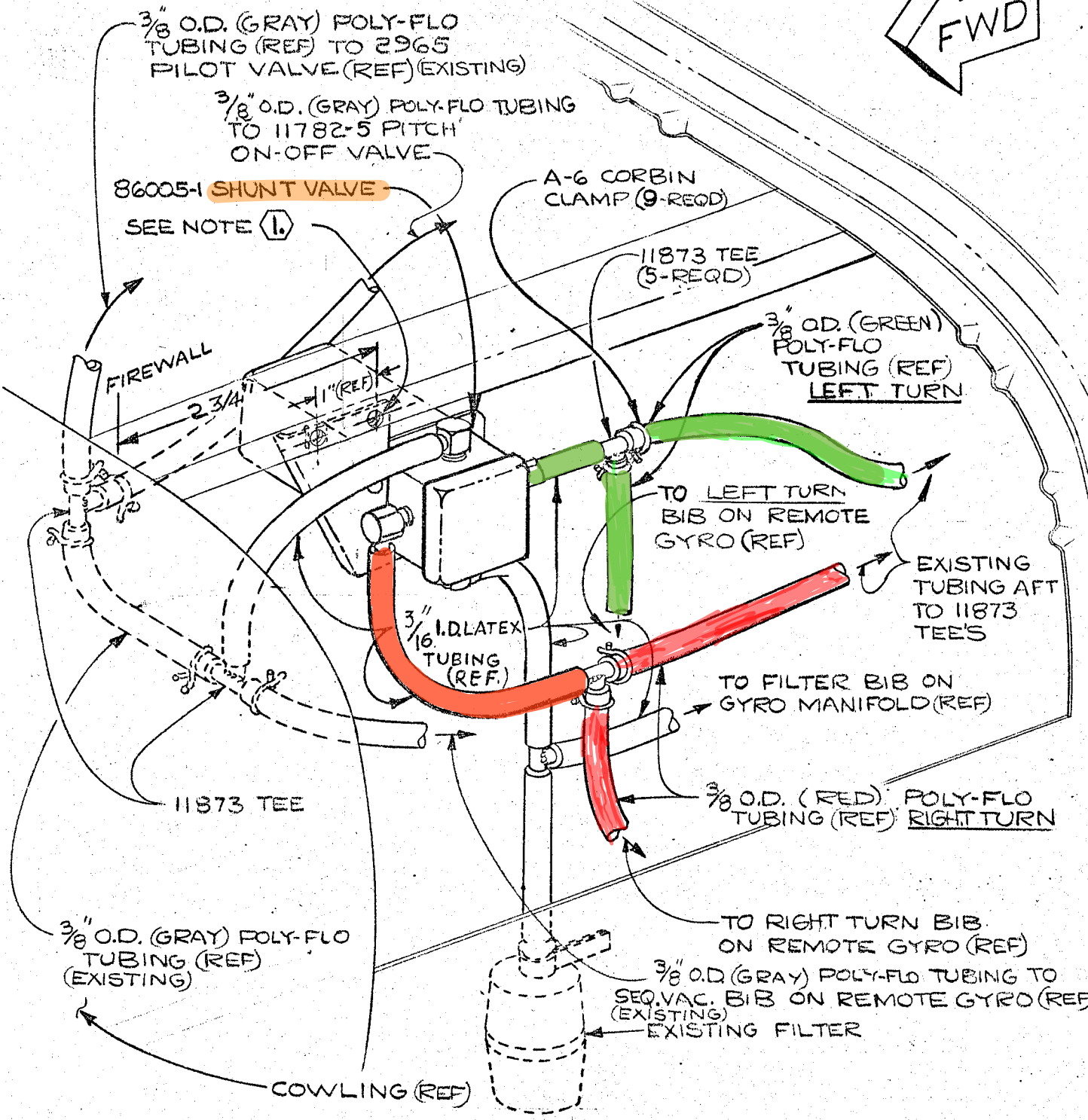
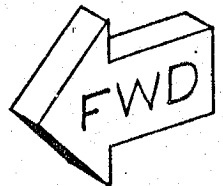


VIEW SHOWING ACCESS PANEL FWD OF PASSENGERS WINDSHIELD REMOVED

BRITAIN INDUSTRIES, INC.
 HAWTHORNE CALIFORNIA
 PITCH ON-OFF VALVE
 INSTALLATION
 MOONEY
 1703 SH 5
 OF 16
 DRAWING NUMBER
 CHANGE



CHANGE 1703 SH 6 OF 16 DRAWING NUMBER
APPROVED BY: DATE: 2-28-66
CHECKED BY: DATE: 2-28-66
DRAWN BY: J.M. DONALDSON DATE: 5-12-65
APPROVED BY: DATE: 2-28-66
CHANGE 1703 SH 6 OF 16 DRAWING NUMBER



① DRILL #22 (.157) DIA 2-HOLES THRU EXISTING AIRCRAFT STRUCTURE & ATTACH 86005-1 WITH EXISTING HARDWARE

NOTE:

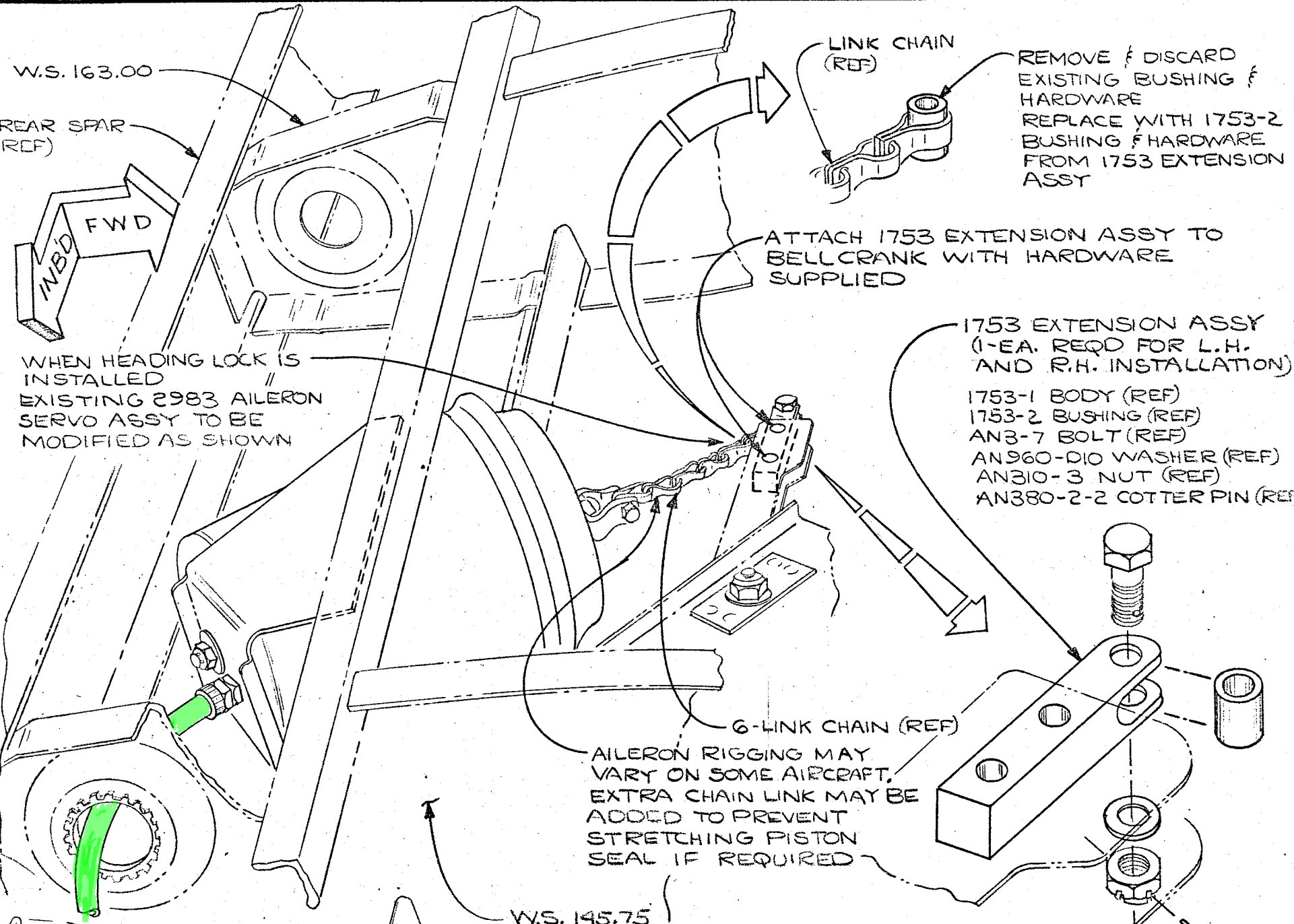
BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

BELLCRANK EXTENSION
INSTALLATION

MOONEY

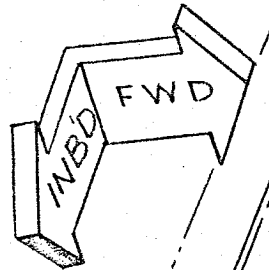
1703 SH 7
OF 16

CHANGE



W.S. 163.00

REAR SPAR (REF)



WHEN HEADING LOCK IS INSTALLED EXISTING 2983 AILERON SERVO ASSY TO BE MODIFIED AS SHOWN

LINK CHAIN (REF)

REMOVE & DISCARD EXISTING BUSHING & HARDWARE
REPLACE WITH 1753-2 BUSHING & HARDWARE FROM 1753 EXTENSION ASSY

ATTACH 1753 EXTENSION ASSY TO BELLCRANK WITH HARDWARE SUPPLIED

1753 EXTENSION ASSY (1-EA. REQD FOR L.H. AND R.H. INSTALLATION)

- 1753-1 BODY (REF)
- 1753-2 BUSHING (REF)
- AN3-7 BOLT (REF)
- AN960-D10 WASHER (REF)
- AN310-3 NUT (REF)
- AN380-2-2 COTTER PIN (REF)

6-LINK CHAIN (REF)

AILERON RIGGING MAY VARY ON SOME AIRCRAFT. EXTRA CHAIN LINK MAY BE ADDED TO PREVENT STRETCHING PISTON SEAL IF REQUIRED

W.S. 145.75

L.H. INSTALLATION SHOWN

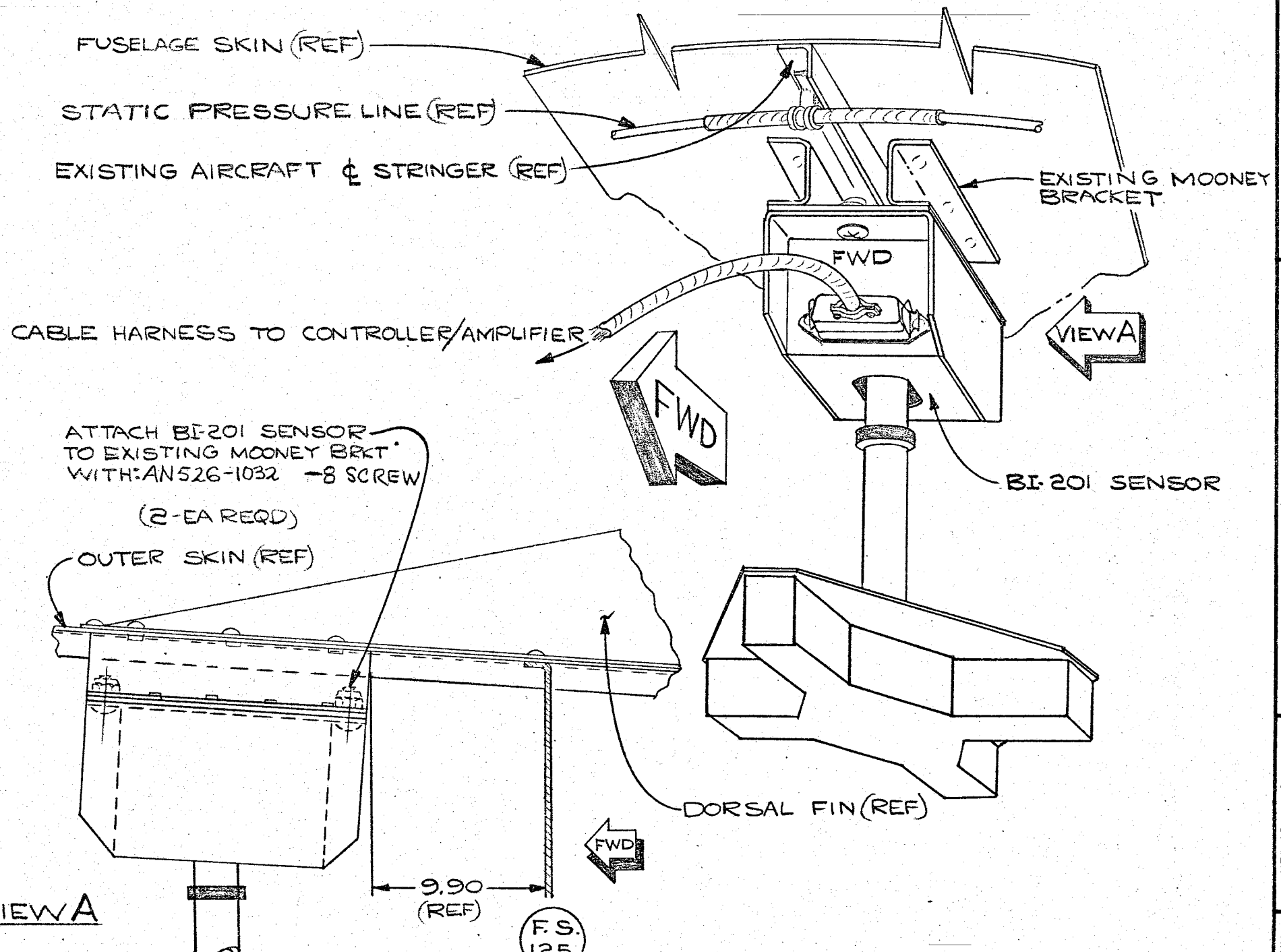
R.H. INSTALLATION (REF)

B *JR* 2-28-66
 CHANGE APPROVED BY: DATE:

APPROVED BY: *H. Johnson* DATE: 1-14-61
 CHECKED BY: *(Signature)* DATE: 1-14-65
 DRAWN BY: J.M. DONALDSON DATE: 5-7-65

1703 SH 8 OF 16
 DRAWING NUMBER

B
 CHANGE



BRITAIN INDUSTRIES, INC.
 HAWTHORNE CALIFORNIA

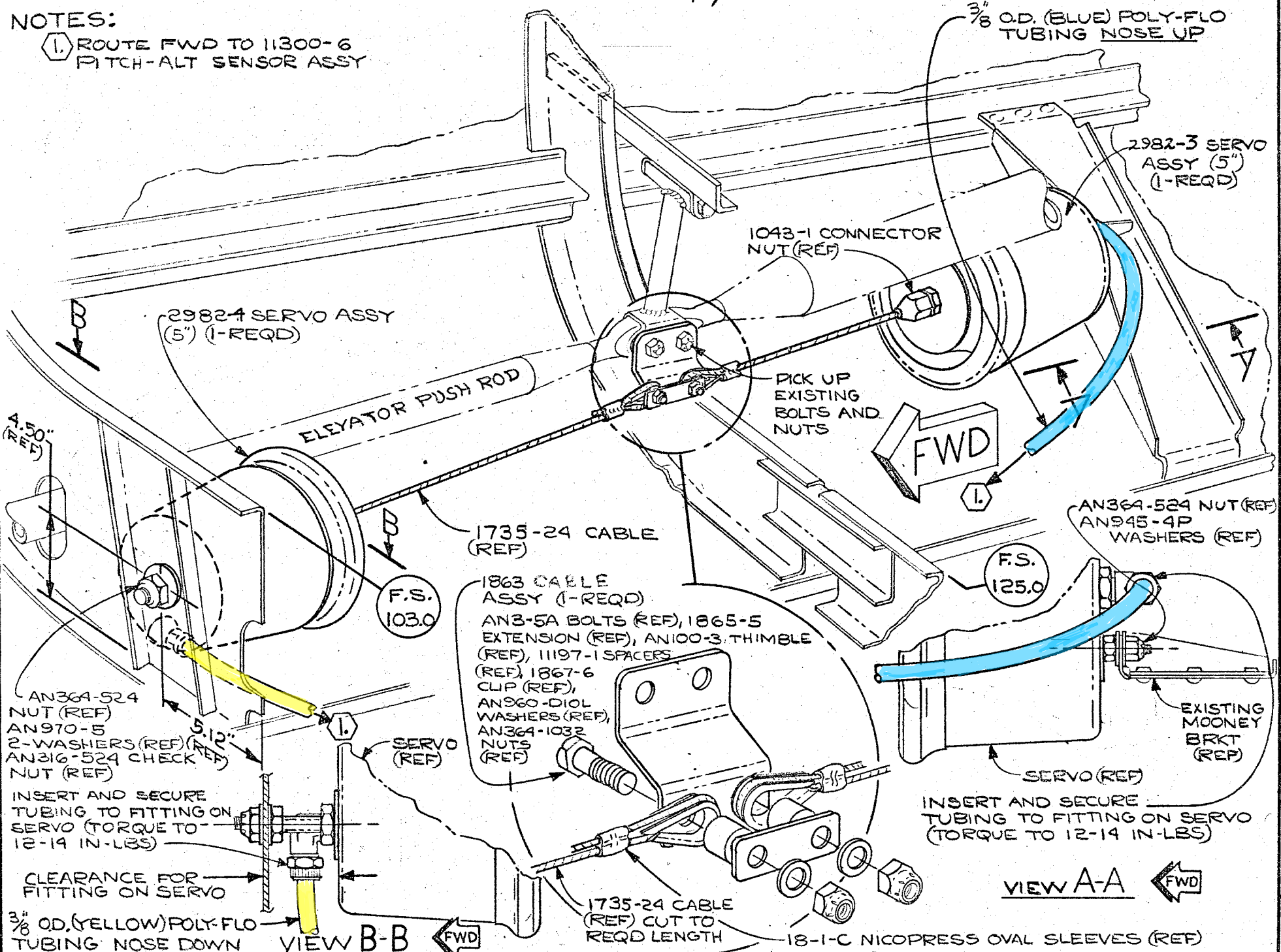
SENSOR INSTALLATION
 MOONEY

1703 SH 8 OF 16
 DRAWING NUMBER
B
 CHANGE

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA
ELEVATOR SERVO INSTALLATION
MOONEY
DRAWING NUMBER 1703 SH9 OF 16
C
CHANGE

NOTES:

① ROUTE FWD TO 11300-6 PITCH-ALT SENSOR ASSY



3/8" O.D. (BLUE) POLY-FLO TUBING NOSE UP

2982-3 SERVO ASSY (5") (1-REQD)

1043-1 CONNECTOR NUT (REF)

PICK UP EXISTING BOLTS AND NUTS

FWD

2982-4 SERVO ASSY (5") (1-REQD)

ELEVATOR PUSH ROD

1735-24 CABLE (REF)

AN364-524 NUT (REF)
AN945-4P WASHERS (REF)

F.S. 125.0

1863 CABLE ASSY (1-REQD)
AN3-5A BOLTS (REF), 1865-5 EXTENSION (REF), AN100-3 THIMBLE (REF), 11197-1 SPACERS (REF), 1867-6 CLIP (REF), AN960-DIOL WASHERS (REF), AN364-1032 NUTS (REF)

EXISTING MOONEY BRKT (REF)

INSERT AND SECURE TUBING TO FITTING ON SERVO (TORQUE TO 12-14 IN-LBS)

VIEW A-A

AN364-524 NUT (REF)
AN970-5 2-WASHERS (REF)
AN316-524 CHECKER NUT (REF)

INSERT AND SECURE TUBING TO FITTING ON SERVO (TORQUE TO 12-14 IN-LBS)

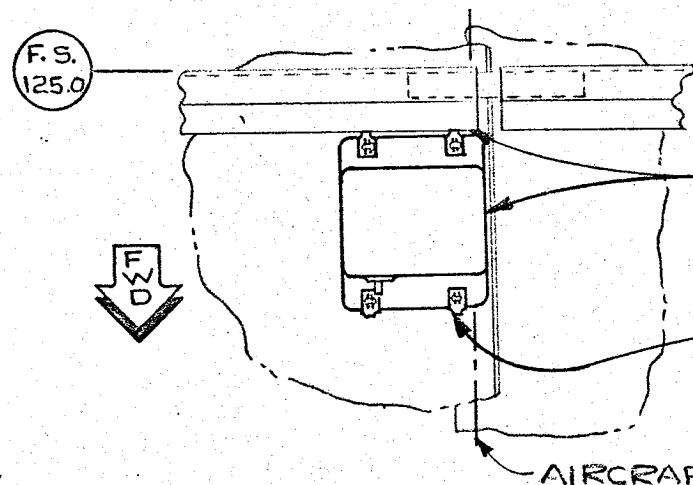
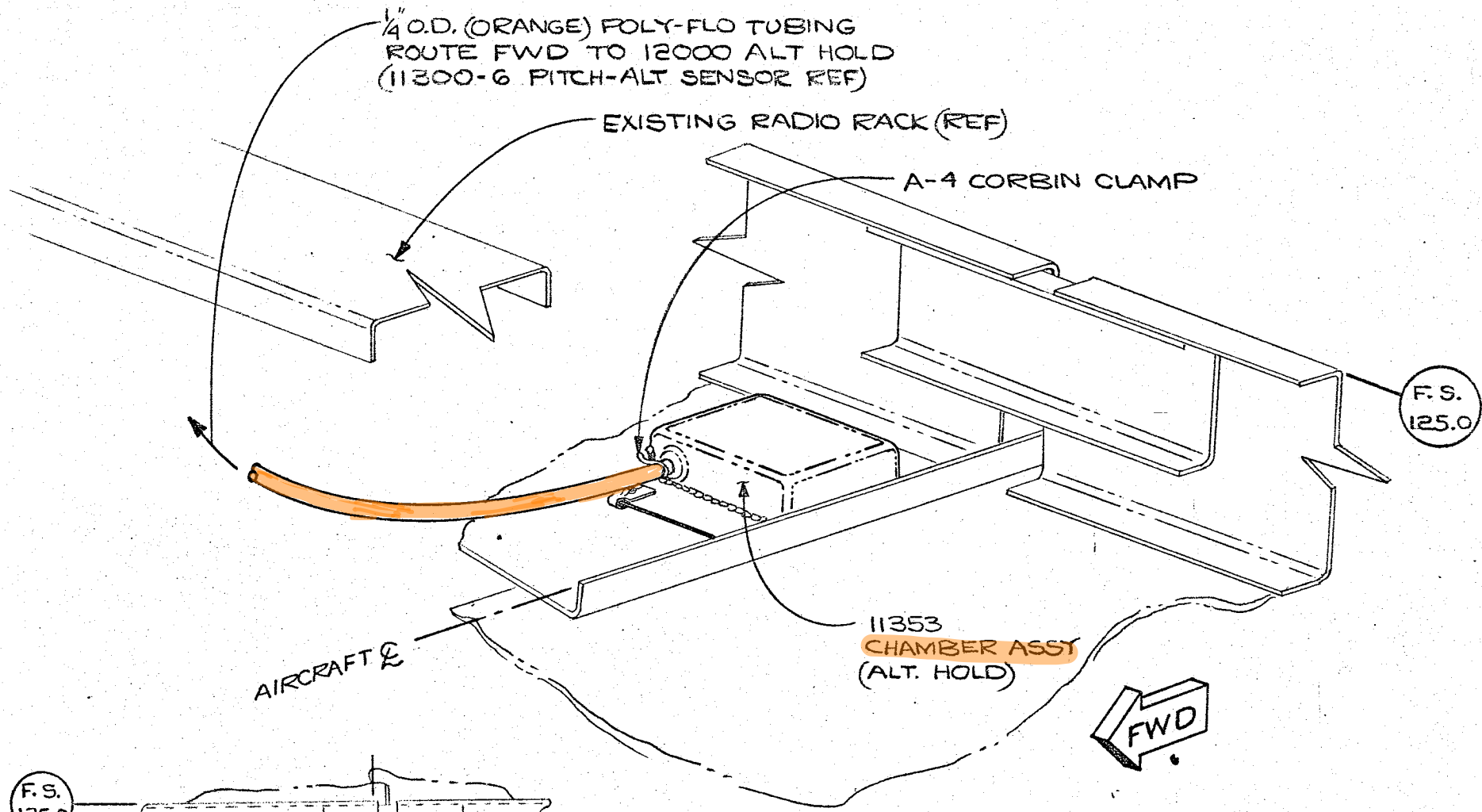
3/8" OD. (YELLOW) POLY-FLO TUBING NOSE DOWN

VIEW B-B

1735-24 CABLE (REF) CUT TO REQD LENGTH

18-1-C NICOPRESS OVAL SLEEVES (REF)

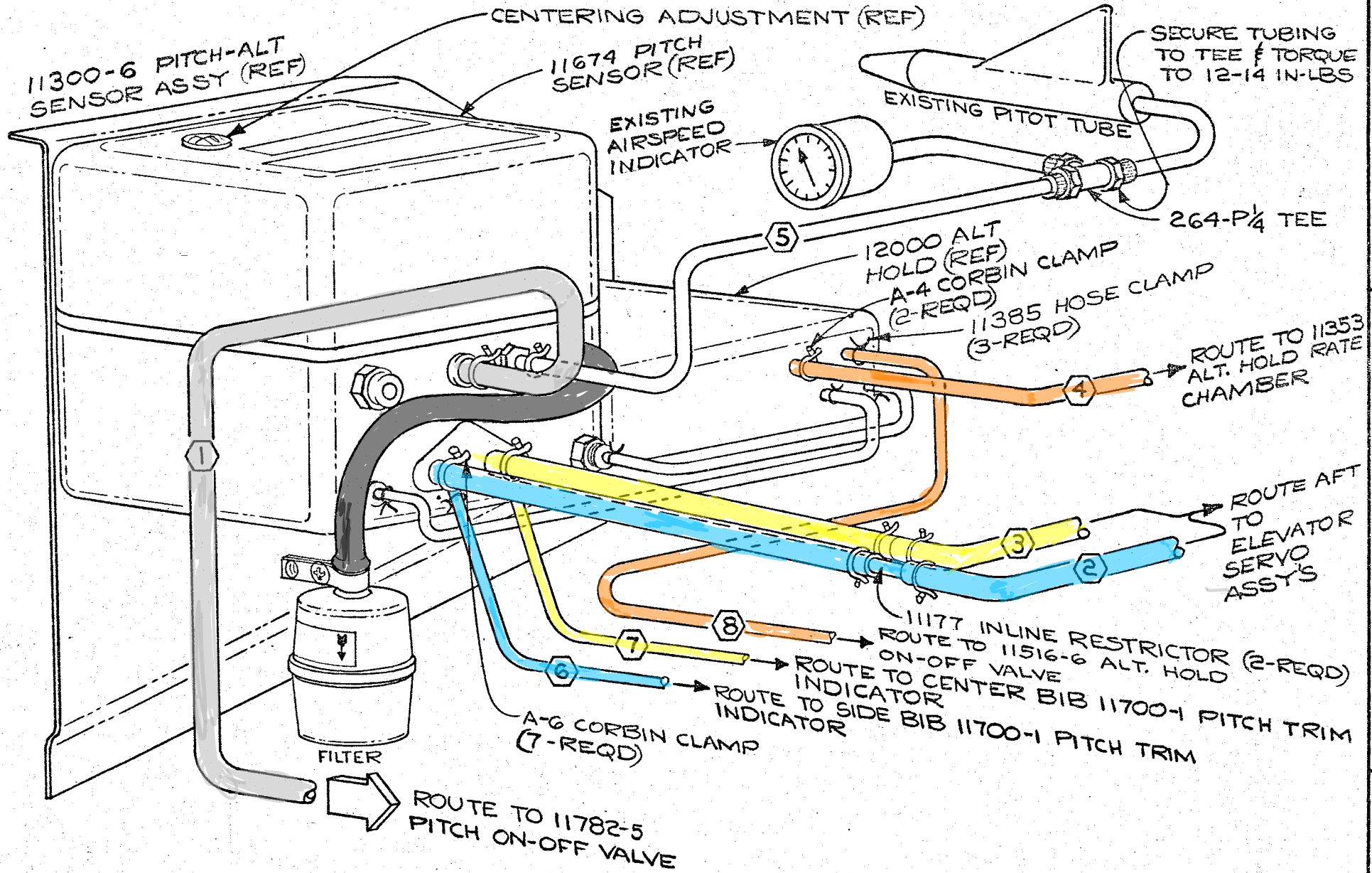
CLEARANCE FOR FITTING ON SERVO



BUTT 11353 ASSY AGAINST LWR SKIN FLG & F.S. 125.0 FORMER FLG

DRILL #36 (106) DIA 4-HOLES THRU FUS. SKIN USING 11353 AS TEMPLATE & ATTACH WITH SUPPLIED HARDWARE

NOTE: SCREW HEADS TO BE ON OUTSIDE FUS. SKIN



BRITAIN INDUSTRIES, INC.
HAYTHORNE CALIFORNIA

PITCH-ALT HOLD SENSOR
VACUUM PLUMBING
MOONEY

1703 SH 11
OF 16
DRAWING NUMBER
A

11300-6 PITCH-ALT
SENSOR ASSY (REF)

CENTERING ADJUSTMENT (REF)

11674 PITCH
SENSOR (REF)

EXISTING
AIRSPEED
INDICATOR

EXISTING PITOT TUBE

SECURE TUBING
TO TEE & TORQUE
TO 12-14 IN-LBS

264-P¹/₄ TEE

12000 ALT
HOLD (REF)
A-4 CORBIN CLAMP
(2-REQD)

11385 HOSE CLAMP
(3-REQD)

ROUTE TO 11353
ALT. HOLD RATE
CHAMBER

ROUTE AFT
TO
ELEVATOR
SERVO
ASSY'S

11177 INLINE RESTRICTOR
ROUTE TO 11516-6 ALT. HOLD
ON-OFF VALVE (2-REQD)

ROUTE TO CENTER BIB 11700-1 PITCH TRIM
INDICATOR

A-6 CORBIN CLAMP
(7-REQD)

ROUTE TO 11782-5
PITCH ON-OFF VALVE

FILTER

- TUBING CODE
- ① 3/8 O.D. (GRAY) POLY-FLO
 - ② 3/8 O.D. (BLUE) POLY-FLO NOSE UP
 - ③ 3/8 O.D. (YELLOW) POLY-FLO NOSE DN
 - ④ 1/4 O.D. (ORANGE) POLY-FLO

- ⑤ 1/4 O.D. (CLEAR) POLY-FLO
- ⑥ 3/16 O.D. (BLUE) PLASTIC
- ⑦ 3/16 O.D. (YELLOW) PLASTIC
- ⑧ 3/16 O.D. (ORANGE) PLASTIC

A
CHANGE

APPROVED BY: *J.R.*
DATE: 2-88-66

APPROVED BY: *J.M. Donaldson*
CHECKED BY: *J.M. Donaldson*
DRAWN BY: J.M. DONALDSON

DATE: 5-7-65

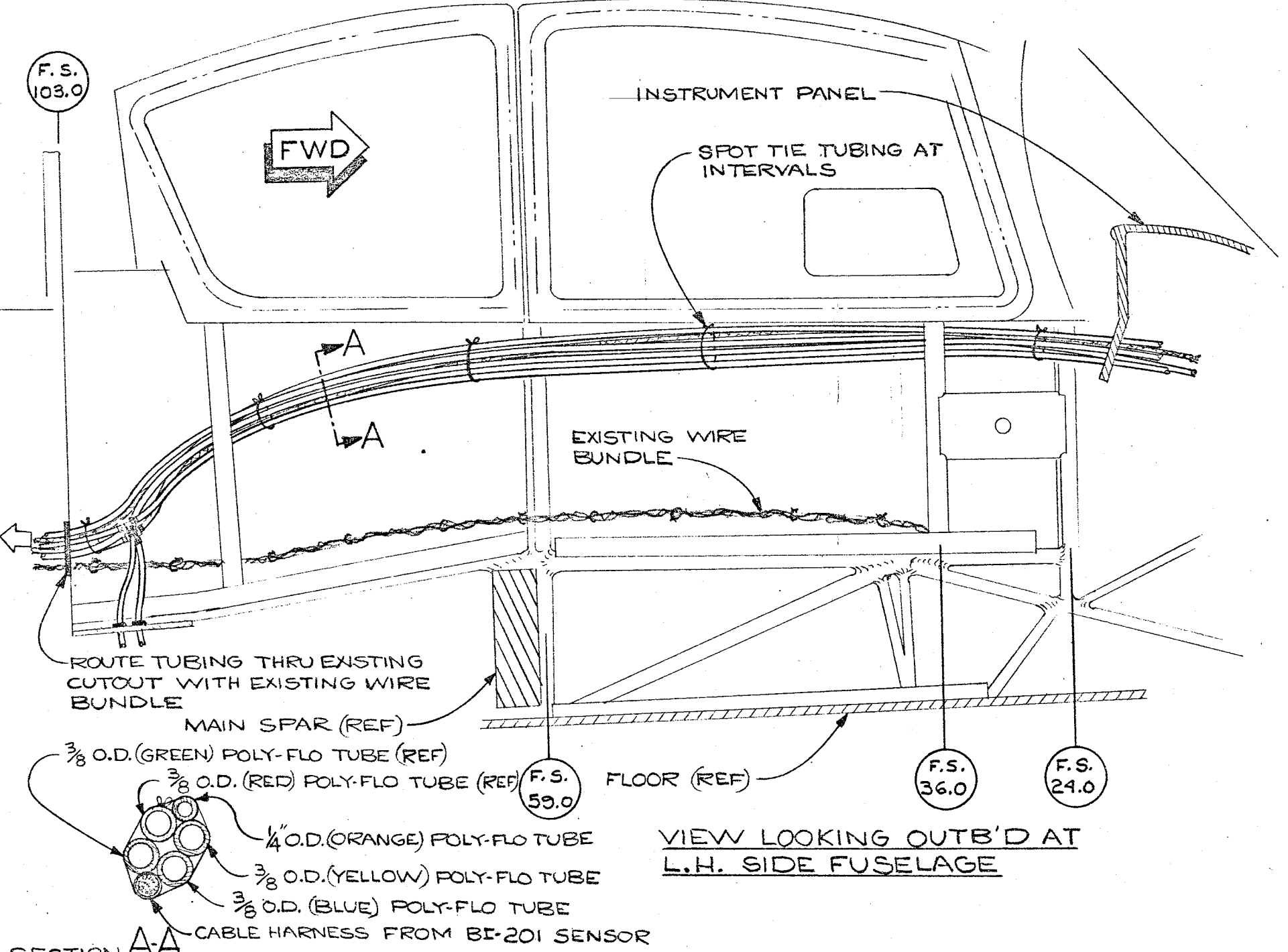
1703 SH12
OF 16
DRAWING NUMBER

A
CHANGE

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

TUBE ROUTING
MOONEY

1703 SH12
OF 16
DRAWING NUMBER
A
CHANGE



F.S. 103.0

FWD

INSTRUMENT PANEL

SPOT TIE TUBING AT INTERVALS

EXISTING WIRE BUNDLE

ROUTE TUBING THRU EXISTING CUTOUT WITH EXISTING WIRE BUNDLE

MAIN SPAR (REF)

FLOOR (REF)

F.S. 59.0

F.S. 36.0

F.S. 24.0

VIEW LOOKING OUTB'D AT L.H. SIDE FUSELAGE

SECTION A-A

CABLE HARNESS FROM BE-201 SENSOR

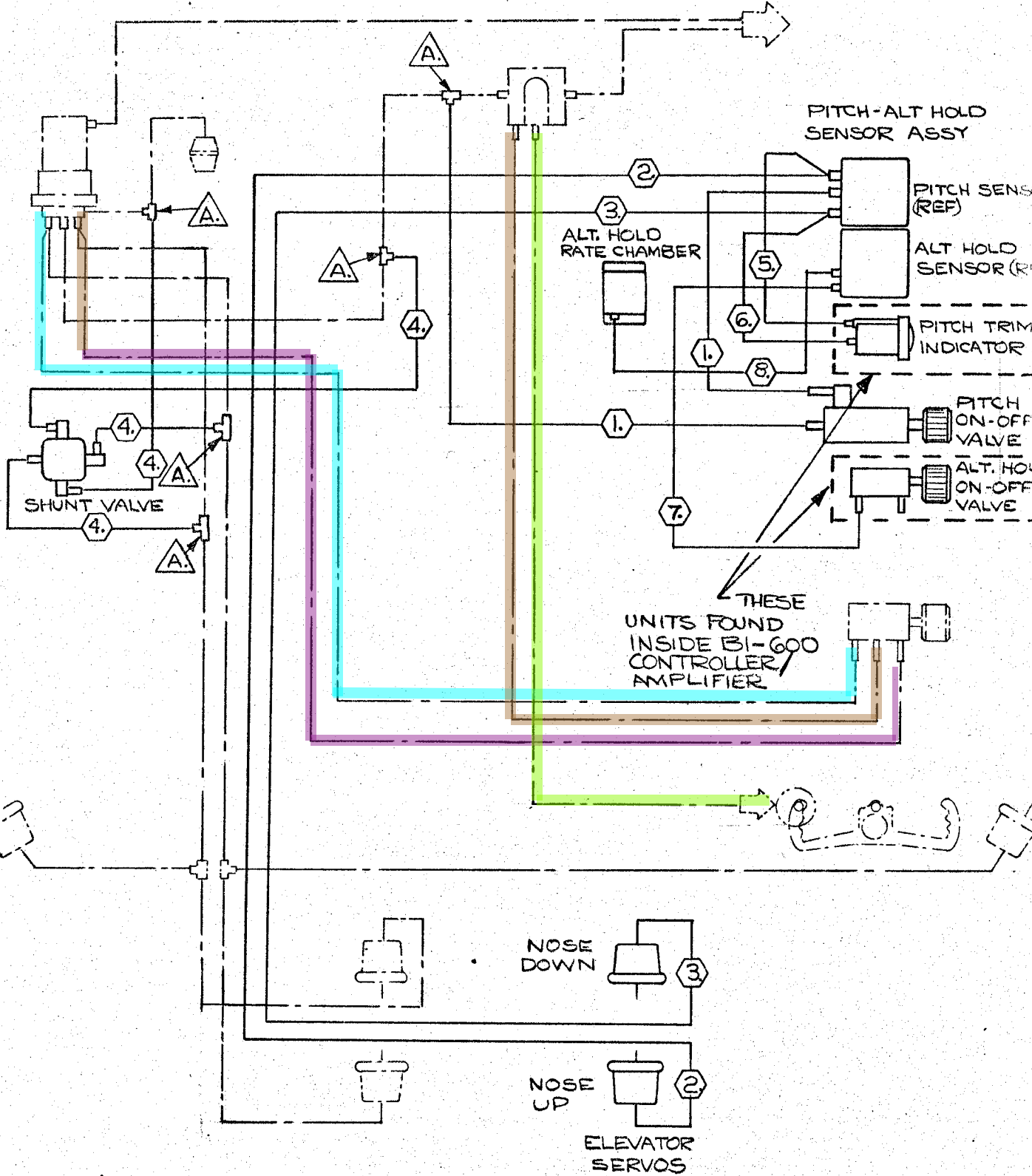
SH 13
1703 OF 16
DRAWING NUMBER

APPROVED BY: *[Signature]* DATE: 1/16/66
CHECKED BY: *[Signature]* DATE: 6/17/65
DRAWN BY: J.M. DONALDSON DATE: 5-13-65

DATE: 2/18/66

APPROVED BY: *[Signature]*

A
CHANGE



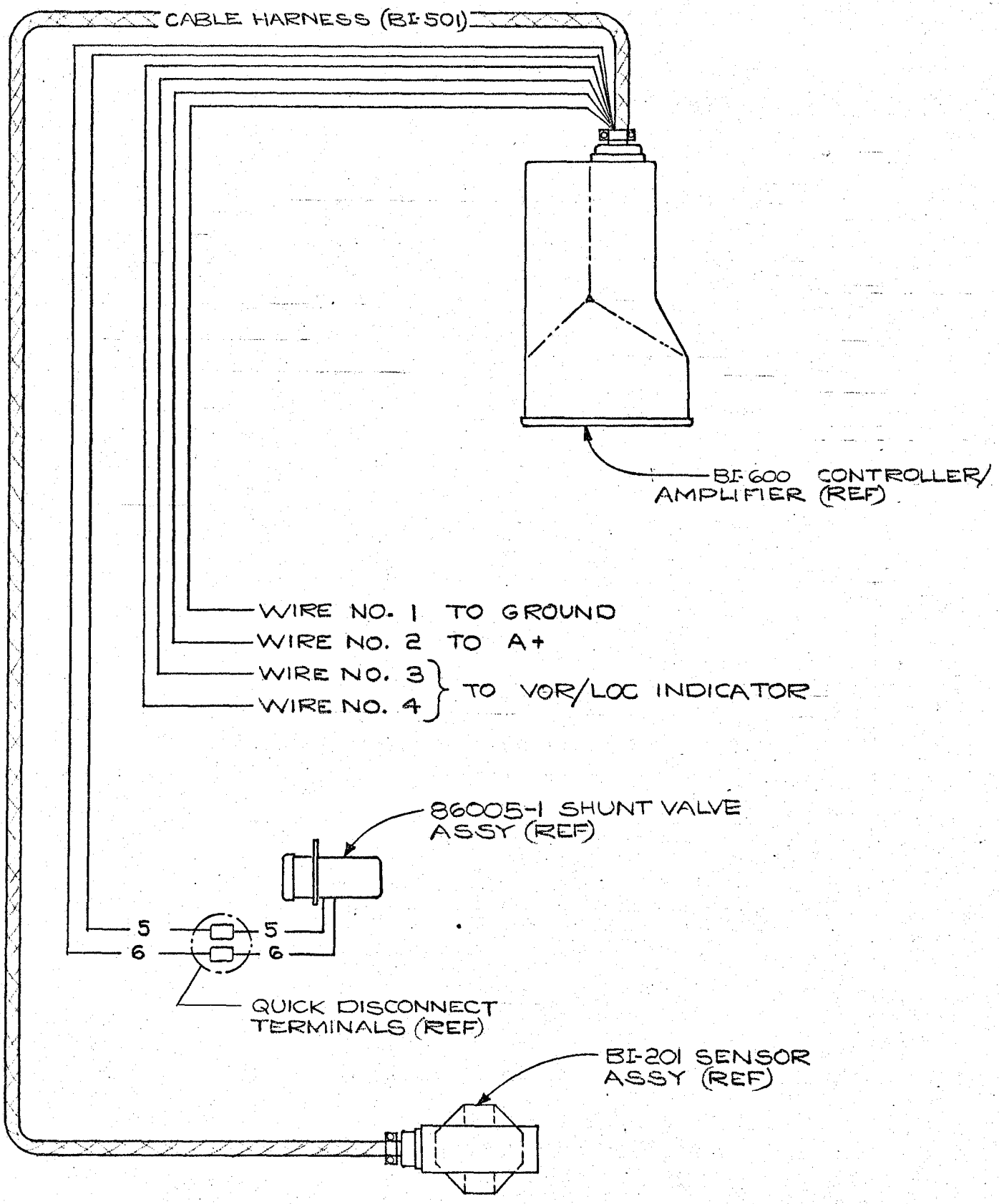
TEE CODING **A. 11873**

- TUBING CODE
- ① GRAY 3/8" O.D. POLY-FLO
 - ② BLUE 3/8" O.D. POLY-FLO
 - ③ YELLOW 3/8" O.D. POLY-FLO
 - ④ BLACK 3/16" I.D. LATEX
 - ⑤ BLUE 3/16" O.D. PLASTIC
 - ⑥ YELLOW 3/16" O.D. PLASTIC
 - ⑦ ORANGE 3/16" O.D. PLASTIC
 - ⑧ ORANGE 1/4" O.D. POLY-FLO

A
SH 14
OF 16
1703
DRAWING NUMBER

APPROVED BY: *[Signature]* DATE: 1-19-66
CHECKED BY: *[Signature]* DATE: 6-1-65
DRAWN BY: J.M. DONALDSON DATE: 5-15-65

A
DATE: 7-28-66
APPROVED BY: *[Signature]*



B-6

1703
SHT. 15 OF 16
DRAWING NUMBER

APPROVED BY: *[Signature]* DATE: *[Blank]*

CHECKED BY: *[Signature]* DATE: *[Blank]*

COMPILED BY: M. FAUL DATE: 4-22-66

APPROVED BY: *[Signature]* DATE: 7-28-66

A
CHANGE

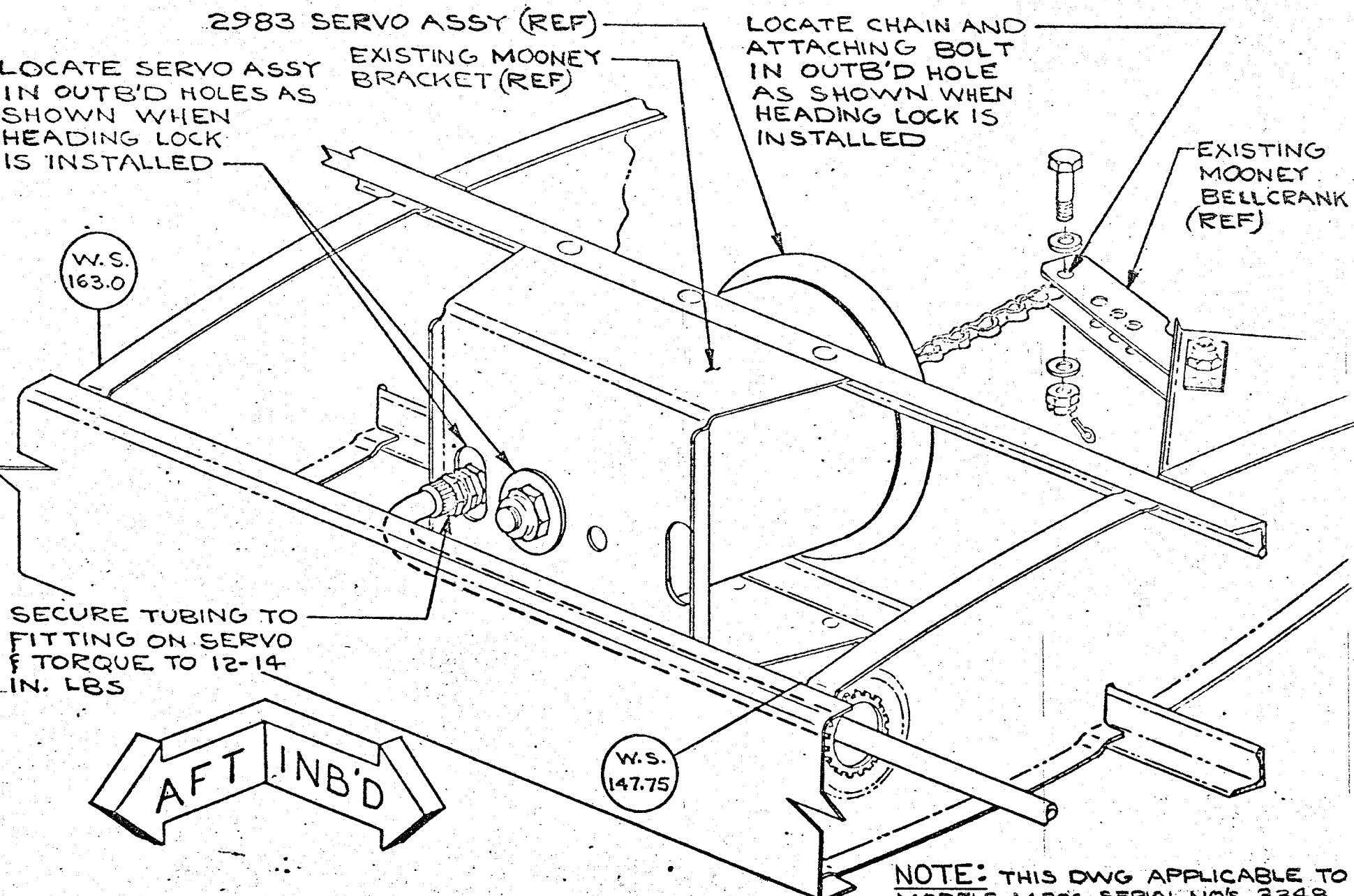
SYSTEM	UNIT	RECEPTACLE PINS
<u>ARC</u>		
TYPE 15B	E-13A RACK	J501 6 & 7
TYPE 15C	E-13B RACK	J301 A & B
TYPE 15D	E-14 RACK	J306 G & H
TYPE 15E	E-17 RACK	J406 G & H
TYPE 15F	E-14 RACK	J306 G & H
TYPE 15G	M-42A OR M-41A	J1 16 & 17
TYPE 300	B-317A	J401 6 & 7
TYPE 500	B-317A	J401 6 & 7
<u>BENDIX</u>		
M450	550A, B, C, D, E, F	J1 7 & 8
	552A, B	J1 7 & 8
<u>COLLINS</u>		
51R-1, -2, -3	P-1 REAR PLUG	PIN LEFT 7 PIN RIGHT 6
51R-6	P-3 BOTTOM PLUG	40 39
51RV-1	P-3 BOTTOM PLUG	40 39
344A, A1, A2	P-1 REAR PLUG	6 5
344B-1, -1A	P-1 REAR PLUG	6 5
344D, -D2	P-1 REAR PLUG	COMMON HOT PIN E COMMON GROUND PIN J
<u>KING</u>		
KX 150		
KX 150A, B		JONES CONNECTOR PINS 1 & 2
KI 200	KI 200	MC
KI 201		P301 J & K
KI 210	KI 210	P701 E & F
KI 211		P301 J & K
<u>MOTOROLA</u>		
MI 35	2374A THROUGH F	P1 3 & 4
LNC 100		
M400	550E & F	J1 7 & 8
<u>NARCO</u>		
MARK V	VOA3	J1 G & H
MARK X	VOA-4, -5	P101 1 & J
MARK XII	VOA-6	J101 3 & 4
MARK VI	CONNECTOR ASSY	P101 9 & 11
<u>TIBBETS</u>		
TNI-1, TNI-2		

- NOTE:
- 1 KX 150 MAY BE ORDERED FROM KING RADIO CORP. WITH PROVISION FOR AUTOPILOT COUPLER. EXISTING EQUIPMENT MAY BE MODIFIED IN THE FIELD IN ACCORDANCE WITH DRAWING 11265 (FURNISHED ON REQUEST).
 - 2 KI 200 CONVERTERS S/N 3266 AND KI 210 S/N 990 AND ABOVE PROVIDE AUTOPILOT OUTPUTS ON PINS E & F. KI 210 UNITS S/N 989 AND PRIOR MAY BE MODIFIED IN THE FIELD IN ACCORDANCE WITH DWG. 11255 (FURNISHED ON REQUEST) OR RETURNED TO THE RADIO MANUFACTURER FOR MODIFICATION. KI 200 S/N 3265 AND PRIOR MUST BE RETURNED TO THE RADIO MANUFACTURER FOR THE INSTALLATION OF APPROPRIATE 6-PIN CONNECTOR.
 - 3 REQUIRES AUTOPILOT ADAPTOR BENDIX #2V201-01 KIT.
 - 4 VOR LEFT-RIGHT INDICATOR IS FLOATING WITH RESPECT TO GROUND. LEAD #3 OF CABLE ASSEMBLY BI-501 MAY REQUIRE GROUNDING TO THE VOR CONVERTER CHASSIS TO PREVENT LOADING OF AUTOPILOT AMPLIFIER CIRCUITS.
 - 5 REQUIRES INDICATOR MODIFICATION DRAWING (FURNISHED ON REQUEST).

BRITAIN INDUSTRIES, INC.
HAWTHORNE CALIFORNIA

AILERON SERVO INSTALLATION
MOONEY

1703 SH 16 OF 16
DRAWING NUMBER



2983 SERVO ASSY (REF)

LOCATE CHAIN AND ATTACHING BOLT IN OUTB'D HOLE AS SHOWN WHEN HEADING LOCK IS INSTALLED

LOCATE SERVO ASSY IN OUTB'D HOLES AS SHOWN WHEN HEADING LOCK IS INSTALLED

EXISTING MOONEY BRACKET (REF)

EXISTING MOONEY BELLCRANK (REF)

W.S. 163.0

SECURE TUBING TO FITTING ON SERVO & TORQUE TO 12-14 IN. LBS

W.S. 147.75

AFT INB'D

NOTE: THIS DWG APPLICABLE TO MODELS M20C SERIAL NOS 3348 & SUB. & M20E SERIAL NOS 1044 & SUB. ONLY

L.H. INSTALLATION SHOWN
R.H. INSTALLATION OPPOSITE