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GSCU PREVENTIVE MAINTENANCE

THIS TCP CONTAINS HAZARDOUS OPERATIONS NASA BY PREPARED BY: XAME LAWY IBM System Engineer KSC Safety Off 1966

APPROVED BY

Section Chief

APPROVED BY:

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APPROVED BY: A. D. N'enality IBM Quality Engineering 12-3-60

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| AB-LC 34/37/39 N/A | 2 MEN - 10 HOURS |
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| INTERSTAGE REQUIREMENTS: N/A | |
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DECEMBER 9, 1968 SATURN/APOLLO 002 LAUNCH OPERATIONS PAGE TEST NO. VEHICLE

IV-26163 GSE

LIST OF EFFECTIVE PAGES

Insert latest changes; destroy superseded pages.

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| | THE RESP STANDING TEST COP | ONSIBLE SYSTEM PROCEDURE CHAI Y TO ALL PERSON | ENGINEER WILL ANNOUNCE THE REVIN NGE REQUESTS (PCR) OF THE PROCEDU NNEL INVOLVED IN THE TEST. | SION LEVEL AND ALL OUT- URE USED AS THE OFFICIAL |
| | | G | SCU PREVENTIVE MAINTENANCE SECT | ION I |
| | A. EQU | IPMENT REQUIREN | MENTS | |
| | 1. | TORQUE WRENCH CATION. | HES AND TORQUE ANALYZER WITH CURF | RENT CALIBRATION CERTIFI- |
| | 2. | GSCU CONTROL, SKLVO-22-0382 | MONITOR TEST SET SKLVO-22-004 AM 2. | ND POWER SUPPLY |
| | 3. | DOW CORNING N | NO. 4, OR EQUIVALENT. | |
| | 4. | LEAK DETECTOR | R SOLUTION. | t de la contra de la |
| | 5. | SUN OIL CO SU | UNISO 36 COMPRESSOR OIL, (OR EQUI | VALENT). |
| | 6. | ENGINEER OIL | SAE NO. 10. | |
| | 7. | ENGINEER OIL | SAE NO. 10-30. | |
| | 8. | CRC-556 SURFA | ACE SHIELD, OR EQUIVALENT. | |
| | 9. | WATER/METHANC | DL F1LTER P/N 8C00-00644. | |
| | 10. | ONE SET OF ME | CHANICS GENERAL PURPOSE TOOLS. | |
| | 11. | REFRIGERANT R | 2-12. | |
| | 12. | SIMPSON MODEL | . 388 THERM-O-METER OR EQUIVALENT | • |
| | 13. | DOW CORNING N | O. 55, OR EQUIVALENT. | |
| | 1 | GSCU HEAT LOA | D SIMULATOR. | |
| | 15. | 2-1" DIAMETER | FLEX HOSES 8' OR MORE IN LENGTH | |
| | 16. | 2-1" FEMALE Q | UICK DISCONNECTS. | |
| | 17. | AIR LINE WITH | SHOP NOZZLE. | |
| | 18. | FACE SHIELDS | OR GOGGLES. | |
| | - 19. | COMPARTMENT GI | N ₂ PURGE SWITCH JUMPER. | |
| | 20. | 1/4" FLEX LIN | E 10' OR MORE IN LENGTH. | |
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IV-26163 GSE

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QV----

APOLLO/SATURN

- 21. REFRIGERATION SERVICE MANIFOLD WITH GAUGES.
- 22. VACUUM CLEANER.
- 23. 0-150 PSIG PNEUMATIC TEST PANEL, GAUGE ACCURACY 1/2% OF FULL SCALE MIN.
- 24. FLEX LINES 3/8" DIA. WITH MS28760-6 END FITTINGS, 1700 PSIG WORKING PRESS.
- 25. GSCU REFRIGERANT CHARING STAND.
- 26. CALIBRATION PROBE, JAMES POND AND CLARK P/N P25-425.
- 27. CALIBRATION PROBE FUTURECRAFT P/N 90626-3 (3 REQUIRED).
- 28. GSCU REFRIGERATION GAUGE CALIBRATION TEST PANEL.
- 29. K-BOTTLE FILLED WITH GN PER MSFC-SPEC-234 AND EQUIPPED WITH A HARRIS P/N 92HE125 OR EQUAL PRESSURE REGULATOR.
- 30. HALOGEN LEAK DETECTOR GENERAL ELECTRIC TYPE H2 OR EQUAL.
- B. SPECIAL REQUIREMENTS
 - 1. STEPS F AND G SECTION I, STEP C, SECTION II OF THIS PROCEDURE ARE I-7 THE ONLY SECTIONS THAT CONTAIN HAZARDOUS OPERATIONS.
 - 2. ONCE W/M LINES ARE IN PLACE AND THE SYSTEM 1S TO BE OPERATED AS A CLOSED LOOP, FIRE AND SAFETY SUPPORT CAN BE DISMISSED UNTIL IT IS NECESSARY TO BREAK THE SYSTEM AGAIN.
 - 3. IF THE GSCU HAS NOT BEEN RUN DURING ANY ONE WEEK INTERVAL, IT SHALL I-7 BE OPERATED FOR A ONE HALF HOUR PERIOD.
 - 4. ALL DEFICIENCIES NOTED DURING PERFORMANCE OF THIS PROCEDURE SHALL BE DOCUMENTED USING A DEFECT CAP.

NOTE

WHEN MAKING OR BREAKING CONNECTIONS IN THE WATER/METHANOL SYSTEM, EXERCISE CAUTION TO INSURE CLEANLINESS IS NOT COMPROMISED.

| DATE: REVISION | DECEMBER | 9, 19 | O68 APOLLO SATURN PAGE LAUNCH OPERATIONS TEST NO. VEHICLE | | 3 1V-26163 GSE |
|-------------------|----------|---|---|---|--------------------------|
| | 5. | WATE FLAM TO W RECE ING BE (| R/METHANOL IS POTENTIALLY HAZARDOUS DUE TO ITS TOXICITY AND MABILITY. PERSONNEL INVOLVED IN OPERATIONS IN WHICH EXPOSURE VATER/METHANOL MIGHT BE REASONABLY ANTICIPATED MUST HAVE IVED INSTRUCTION IN EMERGENCY PROCEDURES PRIOR TO PARTICIPAT- IN THOSE OPERATIONS. THE FOLLOWING MINIMUM PRECAUTIONS SHALL DBSERVED. | | |
| | | (A) | PERSONNEL SHALL WEAR COTTON COVERALLS, GOGGLES OR EYESHIELDS AND IMPERMEABLE GLOVES. | | |
| | | (B) | IN THE EVENT WATER-METHANOL IS SPILLED AND COMES IN CONTACT WITH THE SKIN, IMMEDIATELY RINSE WITH WATER. | | |
| | | (C) | IN THE EVENT WATER-METHANOL COMES IN CONTACT WITH ANYONE'S EYES, IMMEDIATELY RINSE WITH COPIOUS AMOUNTS OF WATER AND ESCORT TO THE MEDICAL FACILITY FOR TREATMENT. | | |
| | | (D) | AVOID EXCESSIVE INHALATION OF FUMES, | | |
| | | (E) | BE AWARE OF THE LOCATION OF FIRE EXTINGUISHERS AND HOW TO US THEM. | E | neverit, Yadaa huddo een |
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NOTE

OPERATIONS WHICH ARE POTENTIALLY HAZARDOUS WILL COMMENCE ONLY WITH CONCURRENCE OF THE SYSTEMS SAFETY SUPERVISOR.

- 6. PERSONNEL REQUIREMENTS
 - (A) TECHNICAL
 - (1) 2 TECHNICIANS
 - (2) 1 ENGINEER
 - (3) QUALITY INSPECTOR

NOTE

THE ABOVE TECHNICAL PER-SONNEL REQUIREMENTS MAY BE VARIED BY THE ENGINEER IN CHARGE. DECEMBER 9, 1968 DATE: REVISION 002

APOLLO/SATURN

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(B) SUPPORT

(1) SYSTEM SAFETY SUPERVISOR OR HIS DESIGNEE.

(2) FIREMAN

NOTE

THE ABOVE SUPPORT PERSONNEL REQUIRE-MENTS MAY BE VARIED BY THE SYSTEM SAFETY SUPERVISOR.

- 7. IN ADDITION TO THE REQUIREMENTS OF T.O. 00-25-223, ALL FLEX HOSES INSTALLED FOR THIS TEST PRESSURIZED TO 150 PSIG OR GREATER MUST BE RESTRAINED WITH APPROVED CLAMPS OR CHAINS AT EACH END, ACROSS EACH UNION AND MUST BE SECURED EACH SIX FEET OF RUN.
- 8. PRESSURIZED EQUIPMENT MUST BE DEPRESSURIZED BEFORE ATTEMPTING ANY REPAIRS OR DISCONNECTING.
- 9. FACE SHIELDS OR SAFETY GOGGLES MUST BE WORN BY PERSONNEL PERFORM-ING LEAK CHECKS, DISCONNECTING OR VENTING LINES, DURING VALIDATION OF PRESSURIZED SYSTEMS, OR AS DIRECTED BY SUPERVISION.
- 10. A CONTROLLED AREA WILL BE ESTABLISHED AROUND THE TEST AREA DURING THE PERFORMANCE OF THIS PROCEDURE, ALLOWING ONLY PERSONNEL DIRECTLY INVOLVED IN THE OPERATION TO ENTER THE AREA.
- PRIOR TO APPLYING POWER OR GAS, THE TEST UNITS MUST BE BONDED TO DESIGNATED FACILITY GROUNDS.
- 12. THE REQUIRED FIRE AND SAFETY SUPPORT SHALL BE SCHEDULED PRIOR TO I-7 THE START OF SECTION F OR SECTION G SECTION I, OR SECTION C SECTION II, THROUGH THE COMPLEX SUPPORT OFFICE.
- 13. SUPERVISION SHALL INSURE THAT THE AREA IS CLEARED OF ALL FLAMMABLE MATERIAL AND THAT THE SAFETY SHOWER/EYE BATH AND FIRE WATER SYSTEMS ARE OPERATIONAL.
 - (A) IN THE EVENT THE SAFETY SHOWER/EYE BATH IS NOT OPERATIONAL, THE FIREMAN WILL STANDBY WITH A CHARGED HAND HOSE.
- 14. THIS PROCEDURE IS GOVERNED FROM A SAFETY STANDPOINT BY THE KSC SAFETY OFFICER. IN NO CASE WILL SAFETY REQUIREMENTS BE CHANGED, MODIFIED, OR WAIVED WITHOUT APPROVAL OF THE KSC SAFETY OFFICE. WHEN OPERATIONS ARE TO BE PERFORMED ON CKAFS, DEVIATIONS MUST BE COORDINATED WITH THE PAA PAD SAFETY OFFICE AND FINAL APPROVAL SHALL REST WITH THE RANGE SAFETY OFFICE (ETDM).

KSC FORM 23-81C (6/64)

15. TEST PANELS, FLEX HOSES, FITTINGS, CALIBRATION PROBES, ETC. USED I-3 IN CALIBRATION OF GAUGES TO BE CLEAN HER MARK FEC-164 WITH THE EXCEPTION THAT THE PARTICLE SIZE LIMITATION SHALL BE 175 MICRONS MAXIMUM.

C. PROCEDURE PREPARATIONS

25

NOTE

PERFORM THE FOLLOWING ONLY FOR THE MONTHLY MAINTENANCE, SECTION F AND SPECIAL MAINTENANCE.

- 1. VERIFY THE MAIN CIRCUIT BREAKERS IN THE 440 VAC (CB1), 28 VDC (CB3) AND 5 VDC (CB4) POWER SOURCES ARE OFF.
- 2. 1F THE 28 VDC AND 5 VDC GROUND POWER IS NOT AVAILABLE, DISCONNECT THE CONNECTOR (J2) FROM THE GSCU AND INSTALL THE GSCU TEST SET AND POWER SUPPLY (REF. APPENDIX A OF IV-31108).
- 3. REMOVE THE COVER FROM THE PRESSURIZED COMPARIMENT.
- 4. DISCONNECT THE CABLE FROM THE COMPARTMENT GN₂ PRESSURE LOW SWITCH AND INSTALL THE COMPARTMENT GN₂ FURGE SWITCH JUMPER.
- 5. REMOVE THE SIDE COVERS FROM THE DERIGERATION COMPARTMENT.

D. WEEKLY OPERATING PROCEDURE

- 1. POWER UP THE GSCU PER PROCEDURE IV-31108, SECTION A, B, AND D.
- 2. VERIFY 20 ± 0.1 PSIG INDICATED ON PNEUMATIC CONTROLLER GN₂ SUPPLY PRESSURE GAUGE (A13578).

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| | | 3. | VERIFY ILLUN | INATION | OF FOLLOWING | INDICATORS" | | |
| | | | (A) "PUMP (| N ¹¹ | | | | |
| | | | (B) "CONDEN | ISOR FAN | ON" | | | |
| | | • • | (C) "COMPRE | SSOR ON | 1 | | | |
| | | 4. | VERIFY "MOTO | R HEATER | RS ON" INDICAT | OR IS EXTINGU | ISHED. | |
| | | 5. | ADJUST THE W VALVE (A1348 PRESSURE GAU | VATER/MET 36) UNTIL UGE (A134 | HANOL FLOW COL 50 PSIG IS II 180). | NTROL VALVE (A NDICATED ON WA | A13537) AND THE BY ATER/METHANOL SUPP | PASS LY |
| | | 6. | ALLOW THE UN | NIT TO OP | PERATE FOR A PI | ERIOD OF ONE H | HALF HOUR. | |
| | | | (A) OPERATE OBSERVE TO STAE AND SET | E W/M INC E CHANGE BILIZE POINT 2 | REASE/DECREAS IN GSCU COOLA RECORD TEMPER 0 PSI | E TEMPERATURE NT TEMPERATURE ATURES AT SET | SWITCH (S16) AND E AND THE CAPABILI POINT 0 PS1 | TY |

(B) OBSERVE REFRIGERANT LIQUID LINE SIGHT GLASS FOR BUBBLES WHILE TEMPERATURE IS DECREASING.

NOTE

THE TIME TO STABILIZE VARIES FROM 2 TO 30 MINUTES WITH THE DIF-FERENT GSCU'S. IF TEMPERATURE DOES NOT STABILIZE IT WILL BE NECESSARY TO PERFORM SECTION F OF THIS PRO-CEDURE.

(C) OBSERVE FOR EVIDENCE OF W/M LEAKS.

- 7. SHUT DOWN THE GSCU BY DEPRESSING THE SYSTEM STOP SWITCH (S2).
- 8. SECURE THE GSCU PER PROCEDURE IV-31108, SECTION E.

E. MONTHLY MAINTENANCE PROCEDURE

- 1. VISUALLY INSPECT THE ASSEMBLIES AND COMPONENTS FOR DEFECTS RESULTING FROM WEAR, AGE, OR ENVIRONMENT.
 - (A) TIGHTEN ALL LOOSENED BRACKETS, CLAMPS, ATTACHMENT HARDWARE, COMPONENTS, ETC.

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|-------------------|-----------------|--|---|---|---------------|
| T | | (B) | INSPECT AIR LOUVRES, VALVES, PN VERIFY THEY OPERATE FREELY. | EUMATIC OPERATORS, ETC. TO | |
| | | (C) | CLEAN THE ENTIRETY OF THE TWO C WITH SOFT BRISTLE BRUSHES. VAC REQUIRED. | OMPARTMENTS AND ALL ASSEMBLIES UUM CLEANER AND RAGS AS | |
| | | (D) | INSPECT COVER SEALS AND/OR SWIT | CH BOOTS. | |
| | 2. | OPER | ATE THE GSCU AS OUTLINED IN PARA | GRAPHS D.1, THROUGH D.7. | |
| | | (A) | REPLACE ANY INDICATOR LIGHTS TH | AT ARE INOPERATIVE. | |
| | | (B) | REPLACE ANY PANEL LIGHTS THAT A | RE INOPERATIVE. | |
| | | (C) | OBSERVE THE OPERATION OF THE RE FAN AND MOTOR, AND THE COOLANT | FRIGERANT COMPRESSOR CONDENSER PUMP AND MOTOR. | |
| | | | IF ANY EXCESSIVE NOISE OR "INSTRUMENT UNIT GROUND SU MSFC-MAN-008 FOR CORRECTIV | /IBRATION IS NOTED, CONSULT THE PPORT COOLING UNIT MANUAL". E ACTION. | |
| | | (D) | SAMPLE THE GSCU W/M PER TEST PRO | DCEDURE IV-24211, "WATER/METHAN | OL |
| | 3. | PERF | ORM THE FOLLOWING LUBRICATION OPE | ERATIONS AS REQUIRED. | |
| | | (A) | ADD SAE 10-30 ENGINE OIL TO THE SIGHT GLASS INDICATES THE LEVEL | PROPER LEVEL IF THE COOLANT PUT | MP |
| | | (B) | AFTER BRUSHING CLEAN THE DAMPER OIL BETWEEN THE BLADES AND FRAME WIPE OFF ALL EXCESS OIL. | BLADE BEARINGS, ADD SAE 10 ENG ALLOW 30 MIN FOR PENETRATION | INE N. |
| | 4. | VER I AS R | EY THAT ALL GAUGES ARE IN CURRENT EQUIRED. | CALIBRATION, IF NOT CALIBRATE | |
| | 5. | AFTEI COMP/ PREVI | R CLEANING ALL LINES, COMPONENTS ARTMENT; SPRAY THOROUGHLY WITH CR ENTION. | AND ASSEMBLIES IN THE REFRIGERA C 556 SURFACE SHIELD FOR CORROS | ATION SION |
| | б. - | INSPI COMP(CONNE CONT/ OR 0 | ECT ALL ACCESSABLE ELECTRICAL CON DNENTS PARTS AT TERMINAL BOARDS F ECTIONS ARE TIGHT. INSPECT ACCES ACTS AND ALL ACCESSABLE CABLES FO HER DEFECTS. | NECTIONS WITHOUT REMOVING MAJOR OR CORROSION AND ASSURE THAT SABLE CONTACTORS FOR PITTER R DETERIATION OF INSULATION | ₹ I-2 |
| | | | | | |

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NOTE

THE ELECTRICAL CONNECTOR, TER-MINAL BOARDS, AND CONTACTORS THAT ARE NOT INSPECTED ON REGULAR MONTHLY PM WILL BE IN-SPECTED AFTER EACH LAUNCH OR WHENEVER THE GSCU IS DIS-ASSEMBLED FOR MAINTENANCE.

- 7. CLEAN GUIDES AND SEALS OF RELIEF VALVE A13546 TO INSURE PROPER OPERATION.
- 8. REMOVE COMPARTMENT ${\rm GN}_2$ PURGE SWITCH JUMPER AND RECONNECT CABLE TO ${\rm GN}_2$ PRESSURE LOW SWITCH.
- 9. REINSTALL THE COVERS ON THE PRESSURIZED COMPARTMENT AND THE REFRIGE-RATION COMPARTMENT. TORQUE PRESSURIZED COMPARTMENT COVER ATTACHING HARDWARE TO 50 ± 5 INCH POUNDS.
- 10. VERIFY COMPARTMENT GN2 LOW INDICATOR IS EXTINGUISHED.
- 11. SECURE THE GSCU PER PROCEDURE IV-31108, SECTION E.
- 12. THE INSULATION RESISTANCE OF THE MOTOR WINDINGS SHALL BE CHECKED AT LEAST ONCE EACH YEAR IN ACCORDANCE WITH MSFC-MAN-008.

TEMPERATURE STABILIZATION AND RANGE ADJUSTMENT.

(VOID IF INITIALED BY ENGINEER IN CHARGE ...)

1. IF OTHER GSCU IS REQUIRED FOR EXTERNAL CIRCULATION OR POWER SUPPORT, CONNECT HEAT LOAD SIMULATOR IN SERIES WITH W/M RETURN LINE (A13506) PER A.B.C. BELOW.

IF OTHER GSCU IS NOT REQUIRED FOR EXTERNAL CIRCULATION OR POWER SUPPORT, CONNECT HEAT LOAD SIMULATOR TO AUXILIARY W/M SUPPLY AND RETURN LINES AT END OF SWING ARM #7, AND CONNECT GN₂ PURGE LINE TO HEAT LOAD SIMULATOR PER C. BELOW.

- (A) USING THE NECESSARY FITTINGS AND FLEX LINES CONNECT THE HEAT LOAD SIMULATOR BETWEEN W/M RETURN LINE A13506 AND THE W/M TANK.
- (B) VERIFY ALL CIRCUIT BREAKERS ARE IN THE OFF POSITION, THEN CONNECT 440 VAC FACILITY POWER TO THE HEAT LOAD SIMULATOR.

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(C) CONNECT A 1/4" FLEXLINE TO THE 750-50 PANEL (260 FT. LEVEL OF LUT) VENT PORT AND TORQUE FITTING TO 135-150 INCH POUNDS; CON-NECT OTHER END OF FLEXLINE TO HEAT LOAD SIMULATOR (Q.D. CON-NECTION).

NOTE

POWER CANNOT BE APPLIED TO THE HEAT LOAD SIMU-LATOR UNLESS THE GN₂ PURGE IS APPLIED AND WILL BE INTERRUPTED IF THE PURGE IS DISCON-NECTED OR THE W/M TEM-PERATURE WITHIN THE SIMULATOR EXCEEDS 90° F.

- 2. INSTALL THERMOCOUPLE PROBES AND INSULATE AS NECESSARY ON THE SUCTION LINE, EVAPORATOR OUTLET AND WATER METHANOL RETURN FITTING ON THE TANK.
- 3. DEPRESS SYSTEM START SWITCH (S1).

NOTE

ALLOW W/M TO CIRCULATE FOR AT LEAST 5 MINUTES PRIOR TO APPLYING ANY HEAT LOAD TO INSURE THAT SIMULATOR IS FILLED.

- 4. DECREASE SET POINT TO "O" PSI BY DEPRESSING (S16).
- 5. APPLY 10 KW HEAT LOAD.
- 6. OBSERVE THE REFRIGERANT LINE SIGHT GLASS TO DETERMINE IF THE CHARGE OF R-12 IS ADEQUATE.
- 7. IF NECESSARY REPLENISH THE REFRIGERANT CHARGE USING PROCEDURE IBM-906-004.
- 8. IF REFRIGERANT REPLENISHMENT WAS NECESSARY DETERMINE IF INSTABILITY PROBLEM STILL EXISTS.

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- 9.
- DETERMINE IF INSTABILITY IS CAUSED BY THE PNEUMATIC CONTROLLER OR REFRIGERATION SYSTEM. REFERENCE PARAGRAPH 3-9A PAGE 3-16 OF MSFC-MAN-008.

NOTE

IF INSTABILITY IS ATTRI-BUTED TO THE PNEUMATIC CONTROL SYSTEM PERFORM STEPS 10 THROUGH 12. IF INSTABILITY IS ATTRIBUTED TO THE REFRIGERATION SYS-TEM PERFORM STEPS 13 THROUGH 18.

- 10. INSURE, BY OBSERVATION OF THE SET POINT GAUGE A13580, THAT THE SET POINT REGULATOR OUTPUT IS STABLE.
- 11. REMOVE COVER FROM PNEUMATIC CONTROLLER AND VISUALLY INSPECT COMPLETE CONTROLLER.
- 12. CLEAN, ADJUST AND OR LUBRICATE PIVOTS AND ADJUST SETTINGS AS NECESSARY TO ATTAIN STABILITY WITHIN THE CONTROLLER. REFERENCE PARAGRAPH 3-216 PAGE 3-132 OF MSFC-MAN-008.

NOTE

IT MAY BE NECESSARY TO REMOVE THE PNEUMATIC CONTROLLER FROM THE GSCU TO ACCOMPLISH STEP 12.

NOTE

OBSERVE GAUGES FOR SURG-ING OF REFRIGERATION SYSTEM. DURING REFRIGER-ATION ADJUSTMENTS SET POINT AND HEAT LOAD MAY BE VARIED TO ESTABLISH THE CONDITIONS REQUIRED.

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|-------------------|-----------------|------|--|--|---|-----------------------|
| | 13. | ADJU | ST HOT GAS PILOT OPERATOR VAL | VE. | | |
| | | (A) | INITIALLY THE VALVE ADJUSTIN COUNTERCLOCKWISE SO NO SPRIN ASSEMBLY DIAPHRAGM. | G STEM SHOULD BE F G TENSION IS EXERT | ULLY BACKED OFF ED ON THE POWER | |
| | | (B) | IN A COMPARATIVELY SHORT TIM WHEN THIS OCCURS, ROTATE THE THEN WAIT APPROXIMATELY 15 SI STARTS AGAIN. | E THE C <mark>OM</mark> PRESSOR W ADJUSTING STEM CL ECONDS TO SEE IF T | ILL CUT OFF. OCKWISE 1/4 TURN HE COMPRESSOR | |
| | | (C) | IF THE COMPRESSOR FAILS TO STADUSTMENT AND WAIT ANOTHER | TART, MAKE ANOTHER 15 SECONDS. | 1/4 TURN CLOCKW | ISE |
| | | (D) | AT SOME POINT IN THIS ADJUST START. WHEN THIS OCCURS, ALL UTES TO DETERMINE THAT SYSTE BILIZED. | MENT SEQUENCE, THE LOW THE SYSTEM TO (M PRESSURE AND TEM) | COMPRESSOR WILL OPERATE FOR 15 MI PERATURE HAVE ST/ | IN- 4- |
| | | (E) | IF THE COMPRESSOR SHUTS DOWN TURN THE ADJUSTING STEM 1/4 (SECONDS. IF THE COMPRESSOR S SYSTEM STABILIZATION. | BEFORE EXPIRATION CLOCKWISE REVOLUAT STARTS ALLOW ANOTH | OF THE 15 MINUTE ION AND WAIT 15 ER 15 MINUTES FOR | ES, R |
| | | | | | | |
| | | | NOTE | | | |

NOTE

THE PILOT OPERATOR VALVE IS PROPERLY ADJUSTED IF THE COMPRESSOR OPERATES CONTINUALLY. MAKE MINOR ADJUSTMENTS AS DESCRIBED UNTIL THIS IS ACCOMPLISHED.

14. ADJUST EVAPORATOR PRESSURE REGULATOR.

(A) TURN THE ADJUSTING STEP UNTIL THERE IS A DIFFERENTIAL PRESSURE OF APPROXIMATELY 3 PSIG BETWEEN SUCTION AND EVAPORATOR PRESSURES.

NOTE

CLOCKWISE ADJUSTMENT INCREASES AND COUNTER CLOCKWISE ADJUSTMENT DECREASES EVAPORATOR PRESSURE.

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NOTE

ADJUSTMENT OF THE MAIN OR AUX. EXPANSION VALVES WILL INTERACT ON EACH OTHER AND ALSO ON THE ADJUSTMENTS PREVIOUSLY COMPLETED IN STEPS 14 AND 15. THEREFORE AD-JUSTMENTS WILL NOT NEC-ESSARILY BE PERFORMED IN SEQUENCE AND IT MAY BE NECESSARY TO READJUST THE HOT GAS PILOT VALVE OR THE EPR TO ATTAIN THE OPTIMUM REFRIGERATION SYS-TEM.

15. ADJUSTMENT OF THE AUX. THERMAL EXPANSION VALVE.

NOTE

TURNING THE ADJUSTING STEM CLOCKWISE DECREASES FLOW AND RAISES SUPERHEAT. TURN-ING THE STEM COUNTERCLOCKWISE INCREASES FLOW AND LOWERS SUPERHEAT.

- (A) MAKE THIS ADJUSTMENT BY ROTATING THE ADJUSTING STEM ONE TURN AT A TIME. THIS WILL RESULT IN A SUCTION LINE TEMPERATURE CHANGE OF APPRXOIMATELY 1° F. WAIT BETWEEN EACH INCREMENT OF ADJUSTMENT AND OBSERVE THE RESULTS.
- (B) ADJUST VALVE TO CONTROL SUCTION LINE TEMPERATURE TO A MAXIMUM OF 60° F.
- 16. ADJUSTMENT OF MAIN THERMAL EXPANSION VALVE.

NOTE

TURNING THE ADJUSTING STEM CLOCKWISE DECREASES FLOW AND RAISES SUPER-HEAT. TURNING THE STEM COUNTERCLOCKWISE INCREASES FLOW AND LOWERS SUPERHEAT.

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- (A) MAKE THIS ADJUSTMENT BY ROTATING THE ADJUSTING STEM ONE TURN AT A TIME. THIS WILL RESULT IN A SUPERHEAT TEMPERATURE CHANGE OF APPROXIMATELY 1/2° F. WAIT BETWEEN EACH INCREMENT OF ADJUST-MENT AND OBSERVE THE RESULTS.
- (B) ADJUST VALVE TO CONTROL SUPERHEAT TEMPERATURE TO 8° TO 12° F.
- 17. OPERATE THE UNIT AT VARIOUS TEMPERATURES AND HEAT LOADS AND OBSERVE THAT NO FROSTING OCCURS BEYOND THE MOTOR END BELL.
- 18. RECORD TEMPERATURES ATTAINED AT THE FOLLOWING SET POINTS AND HEAT LOADS.

O KW HEAT LOAD

10 KW HEAT LOAD

SET POINT "O" PSI

SET POINT "20" PSI

NOTE

OPTIMUM REFRIGERATION SYSTEM PERFORMANCE WILL ALLOW THE UNIT TO PRODUCE W/M TEMPERA-TURES OF 14° MAX WITH 10 KW LOAD AT "0" PSI SET POINT AND 60° MIN WITH "0" KW LOAD AT "20" PSI SET POINT. FAILURE TO ACHIEVE THESE UPPER AND LOWER LIMITS OR IF TEMPERATURE OSCILLATIONS OF 2° OR GREATER OCCUR FURTHER ADJUSTMENT OF THE REFRIGERATION SYSTEM WILL BE REQUIRED.

19. SECURING STEPS

- (A) DEPRESS EMERGENCY TRIP BUTTON ON GSCU HEAT LOAD SIMULATOR.
- (B) SET SELECTOR SWITCH (S15) TO STANDBY.
- (C) OPEN GN₂ FLOW CONTROL VALVE (A13544) ONE-HALF TURN.
- (D) OPEN AND ADJUST (CW) GN₂ PRESSURE REGULATOR (A13552) TO OBTAIN A READING OF 30 PSIG ON GN₂ SUPPLY PRESSURE GAUGE (A13530).

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(E) POSITION THREE-WAY VALVE (A13491) TO GN2 POSITION.

NOTE

VALVE HANDLE IS PARALLEL TO VALVE BODY IN GN₂ POSITION.

- (F) ADJUST FLOW CONTROL VALVE (A13544) TO OBTAIN A READING OF 40 SCFM ON GN₂ FLOW RATE METER (A13550). FLOW FOR 5 MIN.
- (G) ADJUST GN₂ PRESSURE REGULATOR (A13552) TO 5 PSIG AS INDICATED ON PRESSURE GAUGE (A13530) AND POSITION THREE-WAY VALVE (A13491) TO THE W/M POSITION.
- (H) REVERSE THE SUPPLY AND RETURN LINE QUICK DISCONNECTS ON THE HEAT LOAD SIMULATOR.
- (1) REPEAT STEPS 19(D), (E), (F), (G) TO COMPLETELY DRAIN THE HEAT LOAD SIMULATOR TANK.
- (J) ADJUST GN_2 PRESSURE REGULATOR (A13552) FULLY CCW AND CLOSE THE GN_2 FLOW CONTROL VALVE (A13544).
- (K) DISCONNECT FLEX LINES FROM HEAT LOAD SIMULATOR AND GSCU AND RECONNECT LINE A13506 TO THE W/M TANK RETURN PART AND TORQUE TO 1200-1450 IN.LBS.
- (L) DISCONNECT THE 1/4" GN2 PURGE LINE FROM THE GSCU ORIFICE A13590.
- (M) REMOVE THERMOCOUPLE PROBES FROM RETURN FITTING, EVAPORATOR OUTLET AND SUCTION LINE.
- (N) DISCONNECT 440 VAC PLUG ON GSCU HEAT LOAD SIMULATOR FROM FACILITY POWER OUTLET AND PREPARE SIMULATOR FOR STORAGE.
- (O) REMOVE GSCU CONTROL/MONITOR TEST SET PER APPENDIX A OF IV-31108.
- (P) INSTALL SIDE PANELS ON REFRIGERATION COMPARTMENT.
- (Q) REMOVE COMPARTMENT GN_2 PURGE SWITCH JUMPER AND RECONNECT CABLE TO GN_2 PRESSURE LOW SWITCH.
- (R) INSTALL PURGE COMPARTMENT COVER ON UNIT. TORQUE BOLTS TO 50 ± 5 INCH POUNDS.
- (S) VERIFY THAT COMPARTMENT GN2 LOW FLIGHT EXTINGUISHES.
- (T) RETURN ALL TOOLS AND TEST EQUIPMENT TO STORAGE.

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|-------------------|-----------------|-------|------------|---|---|-----------------------|
| | 20. | GAUGI | E CAI | LIBRATION | | |
| | | (A) | THE 180 | PRESSURE GAUGES LISTED IN TABLE I SHAN DAYS IN ACCORDANCE WITH THE FOLLOWING | LL BE CALIBRATED EACH PROCEDURE. | |
| | | | | (VOID IF INITIALED BY ENGINEER IN CH. | ARGE) | |
| | É | | (1) | CONNECT THE 0-150 PSIG TEST PANEL (RE PORT TO THE "K" BOTTLE REGULATOR OUT FLEXLINE. TORQUE FITTINGS TO 270-30 | EF. PARA. A.12) INLET LET USING A 3/8" DIA 0 INCH POUNDS. | |
| | | | (2) | CONNECT THE TEST PANEL OUTLET PORT TO USING A MC247-C6-4 REDUCER TORQUE THE 270-300 INCH POUNDS AND THE 1/4" FIT POUNDS. | O A 1/4" DIA FLEXLINE E 3/8 FITTING TO TING TO 135-150 INCH | |
| | | | (3) | CONNECT A CALIBRATION PROBE, "A" OR ' OF THE FLEXLINE INSTALLED IN STEP 200 FITTING TO 135-150 INCH POUNDS. | "B" TO THE OTHER END (A)(2) TORQUE THE | |
| | | | (4) | VERIFY ALL VALVES ARE CLOSED AND THE ADJUSTED FULLY COUNTERCLOCKWISE ON TH | PRESSURE REGULATOR IS HE TEST PANEL. | |
| | | | (5) | OPEN THE "K" BOTTLE SHUTOFF VALVE. | | |
| - | | | (6) | ADJUST THE "K" BOTTLE REGULATOR FOR A MATELY 500 PSIG. | AN INDICATION OF APPROXI | - |
| | | | (7) | REMOVE THE CAP FROM THE CALIBRATION F CALIBRATED AND CONNECT THE CALIBRATIC HAND TIGHT. | PORT OF THE GAUGE TO BE ON PROBE TO THE PORT | |
| | | | (8) | OPEN THE TEST PANEL OUTLET VALVE. | | |
| | | | (9) | VERIFY THE TEST PANEL PRESSURE GAUGE | INDICATES ZERO PSIG. | |
| | | | | | | |
| | | | | NOTE | | |
| | | | | IF THE GAUGE INDICATES MORE THAN ZERO PSIG, OPEN THE TEST PANEL VENT VALVE UNTIL VENTING CEASES. THEN CLOSE THE VENT VALVE. | | |

- (10) OPEN THE TEST PANEL INLET VALVE.
- (11) ADJUST THE TEST PANEL PRESSURE REGULATOR CLOCKWISE TO EXER-CISE THE GAUGE BEING TESTED OVER ITS FULL RANGE, STOPPING AT EACH INCREMENT SPECIFIED IN TABLE I TO RECORD THE INDI-CATION OF THE TEST PANEL PRESSURE GAUGE BEING TESTED.

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- (12) CLOSE THE TEST PANEL INLET VALVE.
- (13) ADJUST THE TEST PANEL PRESSURE REGULATOR FULLY COUNTER-CLOCKWISE.
- (14) SLOWLY OPEN THE TEST PANEL VENT VALVE AND ALLOW THE GN, TO VENT TO ZERO PSIG, STOPPING AT EACH INCREMENT PRESCRIBED IN TABLE I TO RECORD THE INDICATION OF THE TEST PANEL GAUGE AND THE GAUGE BEING TESTED ON THE ATTACHED DATA SHEET.
- (15) DISCONNECT THE CALIBRATION PROBE FROM THE CALIBRATION PORT AND INSTALL THE CAP ON THE PORT HAND TIGHT.
- (16) TEST EACH GAUGE LISTED IN TABLE I BY PERFORMING STEPS 20(A)(9) THROUGH 20(A)(15) RECORDING DATA ON THE ATTACHED DATA SHEET.
- (17) CLOSE THE TEST PANEL OUTLET VALVE.
- (18) CLOSE THE "K" BOTTLE SHUTOFF VALVE.
- (19) OPEN THE TEST PANEL INLET AND VENT VALVES.
- (20) ADJUST THE TEST PANEL REGULATOR CLOCKWISE TO VENT THE LINE FROM THE "K" BOTTLE TO THE TEST PANEL.

 x
 x
 x

 x
 DO NOT PERMIT THE PRESSURE
 x

 x
 TO EXCEED 100 PSIG.
 x

 x
 x
 x

- (21) ADJUST THE "K" BOTTLE REGULATOR AND TEST PANEL REGULATOR FULLY COUNTERCLOCKWISE.
- (22) CLOSE ALL TEST PANEL VALVES.
- (23) DISCONNECT FLEX HOSES, WRAPPING ALL EXPOSED END FITTINGS WITH ALUMINUM FOIL AND TAPE TO PREVENT CONTAMINATION (QAI SEAL).
- (24) RETURN TEST EQUIPMENT TO STORAGE.

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| TARIE | T |
|-------|---|
| TADLL | 1 |

| CAL. PORT FIND NO. | RANGE (PSIG) | INCREMENT (PSI) | PROBE (SEE NOTE) | ACCEPT DEVIATION |
|-----------------------|---|---|--|---|
| A13484 | 0-100 | . 10 | В | ± 5 PSIG |
| A13498 | 0-60 | 10 | В | ± 3 PSIG |
| A13520 | 0-100 | 10 | В | ± 5 PSIG |
| A13581 | 0-30 | 5 | А | ± 1.5 PSIG |
| A13582 | 0-30 | 5 | A | ± 1.5 PSIG |
| A13583 | 0-30 | 5 | A | ± 1.5 PSIG |
| | CAL. PORT FIND NO. A13484 A13498 A13520 A13581 A13582 A13583 | CAL. PORT RANGE (PSIG) A13484 0-100 A13498 0-60 A13520 0-100 A13581 0-30 A13582 0-30 A13583 0-30 | CAL. PORT RANGE INCREMENT FIND NO. (PSIG) (PSI) A13484 0-100 10 A13498 0-60 10 A13520 0-100 10 A13581 0-30 5 A13582 0-30 5 A13583 0-30 5 | CAL. PORT RANGE (PSIG) INCREMENT (PSI) PROBE (SEE NOTE) A13484 0-100 10 B A13498 0-60 10 B A13520 0-100 10 B A13581 0-30 5 A A13582 0-30 5 A A13583 0-30 5 A |

NOTE

PROBE A IS A FUTURE-CRAFT P/N 90626-3. PROBE B IS A JAMES POND & CLARK P/N P25-425.

- (B) THE REFRIGERATION PRESSURE GAUGES (A13481, A13494, A13541) SHALL BE CALIBRATED ANNUALLY, EXCEPT IF THE VEHICLE IS WITHIN EIGHT WEEKS OF LAUNCH, CALIBRATION MAY BE DEFERRED UNTIL AFTER LAUNCH OR PRIOR TO USE OF THE GSCU ON THE NEXT VEHICLE. CALIBRATION WILL BE ACCOM-PLISHED IN ACCORDANCE WITH THE FOLLOWING PROCEDURE.
- (C) PREPARE THE CHARGING STAND. (REF. PAGE 47)
 - (1) POSITION THE CHARGING STAND AT THE GSCU.
 - (2) VERIFY ALL VALVES ON THE CHARGING STAND ARE CLOSED.
 - (3) VERIFY THERE IS APPROXIMATELY 100 OUNCES OF R-12 IN RESERVOIR A.
 - (4) VERIFY THE VACUUM PUMP SWITCH IS OFF.
 - (5) CONNECT THE VACUUM PUMP POWER CORD TO 115 VAC, 60 CPS, FACILITY POWER.

- (6) INSTALL A TEE ON THE OUTLET PORT OF THE CHARGING STAND. TORQUE TO 135-150 INCH POUNDS.
 - (7) CONNECT A 1/4" FLEX HOSE FROM THE STANDING LEG OF THE TEE CONNECTED IN STEP 20(C)(6) TO CHARGING STAND VALVE #7.
 - (D) SET UP THE TEST PANEL
 - (1) REMOVE THE REFRIGERATION COMPARTMENT SIDE PANELS AND CLOSE THE GAUGE SHUTOFF VALVES. (A13487, A13503, A13535.)
 - (2) CONNECT A 1/4" FLEX HOSE FROM THE TEE INSTALLED IN STEP 20(C)(6) TO THE FREON INLET PORT OF THE TEST PANEL. TORQUE TO 135-150 INCH POUNDS.
 - (3) CONNECT A 1/4" FLEX HOSE FROM THE "K" BOTTLE PRESSURE REGU-LATOR OUTLET PORT TO THE GN₂ PORT OF THE TEST PANEL. TORQUE TO 135-150 INCH POUNDS.
 - (4) CONNECT ONE 1/4" FLEX HOSES TO EACH OUTLET PORT OF THE TEST PANEL. TORQUE TO 135-150 INCH POUNDS.
 - (5) VERIFY ALL VALVES ON THE TEST PANEL ARE CLOSED.
 - (6) CONNECT CALIBRATION PROBES P/N P25-425 TO THE OTHER ENDS OF THE THREE FLEX HOSES CONNECTED IN STEP 20(D)(4). TORQUE TO 135-150 INCH POUNDS.
 - (7) CONNECT THE CALIBRATION PROBE FROM TEST PANEL VALVE 1 TO CALI-BRATION PORT (A13488).
 - (8) CONNECT THE CALIBRATION PROBE FROM TEST PANEL VALVE 2 TO CALI-BRATION PORT (A13493). TORQUE TO 50-60 INCH POUNDS.
 - (9) CONNECT THE CALIBRATION PROBE FROM TEST PANEL VALVE 3 TO CALI-BRATION PORT (A13540) TORQUE TO 50-60 INCH POUNDS.
 - (10) OPEN THE TEST PANEL VENT VALVE AND VALVES 1, 2, & 3 WHEN VENT-ING CEASES, CLOSE THE VENTVALVE.
- (E) OPEN THE "K" BOTTLE SHUTOFF VALVE.
- (F) ADJUST THE "K" BOTTLE PRESSURE REGULATOR CLOCKWISE FOR AN INDICATION OF 150 PSIG ON THE TEST PANEL PRESSURE GAUGE, STOPPING AT EACH 15 PSIG INCREMENT TO RECORD THE INDICATION OF THE TEST PANEL PRESSURE GAUGE AND THE REFRIGERATION GAUGES (A13481, A13494, A13541) ON THE ATTACHED DATA SHEET. (TABLE 3.)
- (G) CLOSE TEST PANEL VALVES 1 & 2.
- (H) ADJUST THE "K" BOTTLE PRESSURE REGULATOR CLOCKWISE FOR AN INDICATION OF 300 PSIG ON THE TEST PANEL PRESSURE GAUGE, STOPPING AT EACH 15 PSIG INCREMENT TO RECORD THE INDICATION OF THE TEST PANEL PRESSURE GAUGE AND THE CONDENSER PRESSURE GAUGE (A13541) ON THE ATTACHED DATA SHEET.

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(I) ADJUST THE "K" BOTTLE PRESSURE REGULATOR COUNTERCLOCKWISE FOR AN INDICATION OF 150 PSIG ON THE TEST PANEL PRESSURE GAUGE, STOPPING AT EACH 15 PSI INCREMENT TO RECORD THE INDICATION OF THE TEST PANEL PRESSURE GAUGE AND THE CONDENSER PRESSURE GAUGE (A13541) ON THE ATTACHED DATA SHEET. (TABLE 3.)

NOTE

IT MAY BE NECESSARY TO OPEN THE TEST PANEL VENT VALVE TO REDUCE THE PRESSURE.

- (J) OPEN VALVES "1" AND "2" ON THE TEST PANEL.
- (K) ADJUST THE "K" BOTTLE REGULATOR COUNTERCLOCKWISE FOR AN INDICATION OF ZERO PSIG ON THE TEST PANEL PRESSURE GAUGE, STOPPING AT EACH 15 PSI INCREMENT TO RECORD THE INDICATION OF THE TEST PANEL PRESSURE GAUGE AND THE REFRIGERATION GAUGES (A13481, A13494, A13541) ON THE ATTACHED DATA SHEET. (TABLE 3.)

NOTE

IT MAY BE NECESSARY TO OPEN THE TEST PANEL VENT VALVE TO REDUCE THE PRESSURE.

- (L) OPEN THE TEST PANEL VENT VALVE AND VALVE NO. 1 AND 2 ON THE CHARGING STAND.
- (M) START THE CHARGING STAND VACUUM PUMP.
- (N) GRADUALLY CLOSE THE TEST PANEL VENT VALVE UNTIL THE TEST PANEL PRES-SURE GAUGE INDICATES 25 INCHES HG VACUUM, STOPPING AT EACH 5 IN. HG INCREMENT TO RECORD THE INDICATION OF THE TEST PANEL PRESSURE GAUGE AND REFRIGERATION GAUGES (A13481, A13494).
- (O) FULLY CLOSE THE TEST PANEL VENT VALVE. AFTER 5 MINUTES, CLOSE VALVE NO. 1, THEN VALVE NO. 2 ON THE CHARGING STAND AND STOP THE VACUUM PUMP.
- (P) MONITOR THE TEST PANEL PRESSURE GAUGE AND OPEN VALVE NO. 7 UNTIL THE TEST PANEL GAUGE INDICATES 2-5 PSIG, THEN CLOSE VALVE NO. 7 ON THE CHARGING STAND.

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- (Q) CLOSE VALVES NO. 1, 2, & 3 ON THE TEST PANEL AND DISCONNECT THE CALIBRATION PROBES FROM PORTS (A13488, A13493 & A13540). INSTALL CAFS ON THE CALIBRATION PORTS AND TORQUE TO 50-60 INCH POUNDS.
- (R) OPEN GAUGE SHUTOFF VALVES (A13487, A13503, A13535).

NOTE

THE GAUGE SHUTOFF VALVES MUST BE LEFT PARTIALLY CLOSED TO REDUCE PRESSURE SURGING.

- (S) OPEN THE TEST PANEL VENT VALVE. WHEN THE TEST PANEL PRESSURE GAUGE INDICATES ZERO PSIG, CLOSE THE VENT VALVE.
- (T) CLOSE ALL TEST PANEL AND CHARGING STAND VALVES. CLOSE THE "K" BOTTLE SHUTOFF VALVE.
- (U) DISCONNECT ALL FLEXLINES AND COVER EXPOSED END FITTINGS WITH ALUMI-NUM FOIL AND TAPE. (QAI SEAL).
- (V) DISCONNECT THE VACUUM PUMP POWER CORD.
- (W) INSTALL THE REFRIGERATION COMPARTMENT SIDE PANELS.
- (X) RETURN TEST EQUIPMENT TO STORAGE.

125 35 * THE FLEX HOSES USED FOR THIS * * TEST MAY HAVE BEEN CONTAMI - * * NATED BY OIL DURING EVACUAT- * * ING AND MUST EITHER BE 35 * CLEANED OR RESERVED FOR USE * CONLY ON THE REFRIGERATION 35 * SYSTEM. 20 25 30

(Y) WATER METHANOL RETURN TEMPERATURE GAUGE A13521, WATER METHANOL SUPPLY TEMPERATURE MEASURING SYSTEM (M14 & Z1) AND GN₂ HIGH PRES-SURE PURGE SUPPLY TEMPERATURE GAUGE (A13533) SHALL BE CALIBRATED ANNUALLY IN ACCORDANCE WITH THE FOLLOWING.



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NOTE

IN ORDER TO ATTAIN TEMPERATURES IN EXCESS OF 110 DEGREES, IT MAY BE NECESSARY TO JUMPER OUT S-9 CONTROL THERMOSTAT. REF. IV-26281, P.14, STEP 12 (DIS-CONNECT P9 FROM THERMOSTAT S9 AND JUMPER PINS A & B ON CONNEC-TOR P9).

- (1) ATTACH THE THERMOCOUPLE PROBE, OF THE LEEDS & NORTHRUP TEMPERATURE POTENTIOMETER, TO THE APPROPRIATE LINE WITHIN 3" OF THE PROBE FOR THE MEASUREMENT BEING CALI-BRATED.
- (2) DURING OPERATION OF THE SYSTEM BEING CALIBRATED RECORD THE READINGS FROM THE TEMPERATURE POTENTIOMETER AND THE GAUGE BEING CALIBRATED IN TABLE 2, AND VERIFY P9 IS CON-NECTED AT COMPLETION OF GN, PURGE SUPPLY TEMP (A13533) RECORDINGS ON TABLE 2.

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|---|--------------------|--------------------|--------------------------|-------------------|-------------------------|-----------------------|
| | | | | 412 L | | |
| | | | | | | |
| | | | TABLE 2 | | | |
| | | | | | | |
| | GAUGE | CHECK POINTS | THERMOCOUPLE READINGS | GAUGE READINGS | ACCEPTABLE DEVIATION | |
| • | W/M SUPPLY | 16° TO 18° | | | ± 5% | |
| | TEMP. | 20° | | | ± 5% | |
| | M14 | 30° | | | ± 5% | |
| | | 40 ⁰ | | | ± 5% | |
| | | 50° | | | ± 5% | |
| | | 60° | | | ± 5% | |
| | W/M RETURN | 20° | | | ± 5% | |
| | TEMP. | 30° | | | ± 5% | Т |
| | A13521 | 4 <mark>0</mark> ° | | | ± 5% | |
| | | 50° | | | ± 5% | |
| | | 60° | | | ± 5% | |
| (| GN2 PURGE | 60° | | | | |
| | SUPPLY TEMP. | 70° | | | ± 5% | |
| 1 | A13533 | 80° | | | ± 5% | |
| | | 90° | | | ± 5% | (|
| | | 1000 | | | ± 5% | |
| | | 110° | | | ± 5% | |
| | | 120° | | | ± 5% | |
| | | 130° | | | ± 5% | |

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(Z) GN₂ FLOW RATE METER (A13550) SHALL NOT BE CALIBRATED AND SHALL BE LABELLED "INDICATING DEVICE ONLY. ACCURACY NOT CERTIFIED".

G. RECHARGING GSCU REFRIGERATION WITH FREON 12 (R-12).

REPLENISH R-12 LOST FROM SYSTEM DUE TO A LEAK OR DURING MAINTENANCE.

(VOID IF INITIALED BY ENGINEER IN CHARGE . . .)

NOTE

THE REFRIGERATION SYSTEM IS FIRST PRESSURIZED TO 25-40 PSIG WITH R-12 AND A STATIC LEAK CHECK ACCOM-PLISHED. FOLLOWING THIS, THE SYS-TEM IS CHARGED SUFFICIENTLY TO OBTAIN NORMAL OPERATING PRESSURES AND AGAIN LEAK CHECKED.

xxxxxxxxxxcautionxxxxxxxxxxxx 20 × * THIS PROCEDURE IS BASED ON × * THE PRESUMPTION THAT ALL 25 * R-12 HAS NOT BEEN LOST FROM * * THE SYSTEM AND A POSITIVE × * (ABOVE 0 PSIG) INTERNAL × * PRESSURE EXISTS. 30 20 20

1. PREPARATIONS

- (A) VERIFY GSCU FUNCTIONAL TEST V-26016-ML HAS BEEN ACCOMPLISHED.
- (B) VERIFY WATER/METHANOL SIGHT GLASS A13518 INDICATES AT LEAST 10 GALLONS.
- (C) VERIFY 440 VAC, 28 VDC AND 5 VDC POWER CONNECTED TO GSCU.
- (D) REMOVE PRESSURIZED COMPARTMENT COVER.
- (E) REMOVE REFRIGERATION COMPARTMENT SIDE PANELS.
- (F) CLOSE W/M SUPPLY VALVE A13492.
- (G) CLOSE W/M RETURN VALVE A13508.
- (H) CLOSE W/M PURGE BYPASS VALVE A13570.



(J) CLOSE LOAD ADJUSTING REGULATOR A13552.

(K) CLOSE GN2 MANUAL FLOW CONTROL VALVE A13544.

(L) POSITION GN2 HEATER SWITCH (S-5) - OFF.

(M) POSITION FOLLOWING SWITCHES & CB - ON.

S-25 - MAIN POWER SWITCH

CB3 - 28VDC CIRCUIT BREAKER

CB4 - 5VDC CIRCUIT BREAKER.

(N) VERIFY FOLLOWING PANEL INDICATOR LAMPS ARE - ON

AC POWER ON

28 VDC

5 VDC

MOTOR HEATERS ON.

- (O) REMOVE VALVE GUARD FROM FREON 12 CYLINDER.
- 2. OPERATIONAL STEPS:

NOTE

STEPS 2(A) THROUGH 2(Q) ARE REQUIRED ONLY IF THE TECHNI-CIAN DESIRES TO USE THE REFRIGERATION MANIFOLD. IF MANIFOLD IS NOT USED PROCEED TO STEP 2(R).

xxxxxxxxxxxxCAUTIONxxxxxxxxxxxxxxx 24 30 * PURGE ALL SYSTEM AND SERVICE × * LINES FOR 5-10 SECONDS PRIOR 25 * TO CONNECTING TO PREVENT AIR 25 * OR MOISTURE FROM ENTERING THE * * REFRIGERATION SYSTEM. MAKE 20 * OR BREAK ALL SYSTEM CONNEC-20 * TIONS WHILE UNDER A SLIGHT × 25 (APPROX 5 PSI) PRESSURE. * 35 ×

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|---|-----------------------|--------------------|---|-----------------------------|-----------------------------|-----------------------|
| | (A) | TURN MA | NIFOLD COMPOUND GA | GE VALVE TO M | ID-POSITION (UN-SEAT). | |
| | (В) | TURN MA SEAT). | NIFOLD PRESSURE GA | GE VALVE FULL | Y CLOCKWISE (FRONT | |
| | (C) | REMOVE | CAPS FROM COMPRESS | OR SUCTION & | DISCHARGE VALVE STEMS. | |
| | (D) | TURN CO (BACK-S | MPRESSOR SUCTION S | ERVICE VALVE | FULLY COUNTERCLOCKWISE | |
| | (E) | REMOVE | CAP FROM SUCTION S | ERVICE VALVE | GAGE FITTING. | |
| | (F) | CRACK S | UCTION SERVICE VAL | VE SLIGHTLY T | O PURGE GAGE FITTING. | |
| | (G) | CONNECT GAGE FI | MANIFOLD COMPOUND TTING & TIGHTEN FI | GAGE LINE TO NGER TIGHT. | COMPRESSOR SUCTION VALVE | |
| | (H) | ALLOW M | ANIFOLD COMPOUND G | AGE LINE TO P | URGE FOR 5-10 SECONDS. | |
| | (1) | FRONT-S | EAT MANIFOLD COMPO | UND GAGE VALV | Ε. | |
| | (J) | TURN CO | MPRESSOR SUCTION S | ERVICE VALVE | APPROX. 2 TURNS CLOCKWISE. | |
| | (K) | BACK-SE | AT COMPRESSOR DISC | HARGE VALVE. | | |
| | (L) | REMOVE | CAP FROM COMPRESSO | R DISCHARGE V | ALVE GAGE FITTING. | |
| T | (M) | CRACK C | OMPRESSOR DISCHARG | E VALVE SLIGH | TLY TO PURGE GAGE FITTING. | |
| | (N) | UN-SEAT | MANIFOLD PRESSURE | GAGE VALVE: | | |
| | (0) | CONNECT GAGE FI | MANIFOLD PRESSURE TTING & TIGHTEN FI | GAGE LINE TO NGER TIGHT. | COMPRESSOR DISCHARGE VALVE | |
| | (P) | ALLOW M | ANIFOLD PRESSURE G | AGE LINE TO P | URGE FOR 5-10 SECONDS. | |
| | (Q) | FRONT-S | EAT MANIFOLD PRESS | URE GAGE VALV | E | |
| - Mr. I. met | (R) | TURN CC | MPRESSOR DISCHARGE | VALVE APPROX | IMATELY 2 TURNS CLOCKWISE. | |
| | (5) | INSTALL | ADAPTER ON R-12 C | YLINDER OUTLE | т. | |
| Co. / Dev per sense | (T) | CONNECT | 1/4" FLEX-LINE TO | ADAPTER. | | |
| To Charles | · (U) | REMOVE | CAP FROM CHARGING | VALVE (A13489 |) STEM. | |
| | (V) | TURN CH | ARGING VALVE (A134 | 89) STEM FULL | Y CLOCKWISE. | |
| and the second se | (W) | REMOVE | CAP FROM CHARGING | VALVE (A13489 |) SERVICE FITTING. | |
| Second and | (X) | CRACK C | HARGING VALVE AND | ALLOW TO PURG | E. | |
| T | (Y) | CRACK R | -12 CYLINDER VALVE | & PURGE 1/4" | FLEXLINE. | |
| | | | | | | |



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- (Z) CONNECT FREE END OF 1/4" FLEXLINE TO CHARGING VALVE (A13489) SERVICE FITTING.
- (AA) TURN CHARGING VALVE (A13489) STEM FULLY COUNTERCLOCKWISE.
- (BB) CLOSE R-12 CYLINDER VALVE.

NOTE

IF MANIFOLD GAGES (OR GSCU SUCTION & DISCHARGE GAGES) BOTH INDICATE AT LEAST 30 PSIG OMIT STEP (CC).

(CC) OPEN R-12 CYLINDER VALVE & BLEED R-12 INTO THE SYSTEM UNTIL BOTH SUCTION & DISCHARGE PRESSURE GAGES INDICATE 30-40 PSIG. THEN CLOSE THE R-12 CYLINDER VALVE.

NOTE

IT MAY BE NECESSARY TO OPEN & CLOSE THE R-12 CYLINDER VALVE SEVERAL TIMES.

- (DD) CONNECT HALOGEN LEAK DETECTOR TO 110 VAC POWER SOURCE & TURN DETECTOR ON.
- (EE) ALLOW DETECTOR TO WARM UP FOR 15 MINUTES, THEN ADJUST IN ACCORD-ANCE WITH OPERATORS MANUAL.
- (FF) CAREFULLY LEAK CHECK ALL FREON LINES, VALVES AND COMPONENTS IN THE REFRIGERATION & PRESSURIZED COMPARTMENTS.
- (GG) ACCOMPLISH NECESSARY ACTION TO STOP ANY LEAKS DETECTED. FOLLOWING THIS REPEAT STEP (FF) PLUS ANY PRECEEDING STEPS REQUIRED TO OBTAIN 30-40 PSIG.
- (HH) REPEAT STEPS (FF) & (GG) UNTIL ALL LEAKS HAVE BEEN STOPPED.

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NOTE

THE FOLLOWING WARM UP TIME IS REQUIRED FOR AMBIENT TEMPERA-TURES NOTED PRIOR TO COMPRES-SOR OPERATION.

| ABOVE 60° F | 15 | MINUTES |
|--------------|----|---------|
| 50° TO 60° F | 30 | MINUTES |
| 40° TO 50° F | 45 | MINUTES |
| BELOW 40° F | 1 | HOUR |

PERFORM THE FOLLOWING STEPS WHILE GSCU WARMS UP

- (II) ACTUATE TEMPERATURE SELECTOR SWITCH (S16) TO INCREASE & HOLD UNTIL SET POINT PRESSURE GAGE (A13580) INDICATES 19-20 PSIG.
- (JJ) TURN SYSTEM SELECTOR SWITCH (S-15) TO LOCAL.
- (KK) · PRESS SYSTEM START SWITCH (S-1).
- (LL) OPEN AND ADJUST R-12 CYLINDER VALVE TO OBTAIN 20-25 PSIG ON COMPOUND (SUCTION) PRESSURE GAGE.
- (MM) REMOVE SIGHT GLASS (A13525) COVER AND OBSERVE SIGHT GLASS FOR BUBBLES. CONTINUE CHARGING SYSTEM UNTIL ALL BUBBLES DISAPPEAR FROM SIGHT GLASS (A13525).

- (NN) CLOSE R-12 CYLINDER VALVE.
- (00) CLOSE CHARGING VALVE (A13489).
- (PP) WITH UNIT RUNNING LEAK CHECK ALL R-12 LINES, VALVES AND COMPONENTS IN BOTH COMPARTMENTS.

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x x x x x EXERCISE CARE WHEN LEAK CHECK- * i ING IN VICINITY OF COMPRESSOR, * CONDENSOR FAN AND DAMPENER ASSY* TO PREVENT INJURY OR BURNS. *

- (QQ) MONITOR CONDENSER PRESSURE GAUGE (A13541). VERIFY PRESSURE IS 100-125 PSIG.
- (RR) PRESS SYSTEM STOP SWITCH (S-2).

×

- (SS) ACCOMPLISH NECESSARY ACTION TO STOP ANY LEAKS. FOLLOWING THIS REPEAT STEP 42 AND ANY PRECEEDING STEPS REQUIRED TO OBTAIN COR-RECT CONDITIONS FOR STEP (QQ).
- (TT) REPEAT STEPS (PP), (QQ), (RR), (SS) UNTIL ALL LEAKS HAVE BEEN STOPPED.
- (UU) ACTUATE TEMPERATURE SELECTOR SWITCH (S16) TO DECREASE AND HOLD UNTIL SET POINT PRESSURE GAGE (A13580) INDICATES ZERO PSIG.
- (VV) PRESS SYSTEM START SWITCH (S-1) AND OPEN CHARGING VALVE (A13489).
- (WW) OPEN AND ADJUST R-12 CYLINDER VALVE TO OBTAIN 20-25 PSIG ON COM-POUND (SUCTION) PRESSURE GAGE.
- (XX) OBSERVE SIGHT GLASS (A13525). WHEN ALL BUBBLES DISAPPEAR CLOSE R-12 CYLINDER VALVE.

 x
 x
 x

 x
 x
 x

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 x

(YY) ALLOW UNIT TO RUN FOR 15 MINUTES AND CONTINUE TO OBSERVE SIGHT GLASS. NO BUBBLES SHOULD APPEAR. IF BUBBLES APPEAR REPEAT STEPS (WW), (XX), (YY).

(ZZ) PRESS SYSTEM STOP SWITCH (S-2).

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|------------------------|----------|------|---------------------------|---|----------------------------------|---------------------------------------|-----------------------|
| another and the second | 3. | SECU | URING EQUIPM | ENT | | | |
| T | | (A) | CLOSE CHAR | GING VALVE (A1348 | 89). | | |
| | | (B) | CRACK 1/4" AND ALLOW | FLEXLINE B-NUT (PRESSURE TO BLEET | CONNECTED TO CHA | RGING VALVE (A13489) OVE FLEXLINE, | 2 |
| | | (0) | CRACK CHAR CAP ON CHA | GING VALVE STEM S RGING VALVE SERVI | SLIGHTLY TO OBTA ICE FITTING. | IN PURGE & INSTALL | |
| | | (D) | CLOSE CHAR | GING VALVE. | | | |
| | | (E) | REPLACE CH | ARGING VALVE STEN | P CAP & TIGHTEN | | |
| | | (F) | REMOVE FLEX OF LINE. | XLINE FROM R-12 C | YLINDER ADAPTER | & PLUG BOTH ENDS | |
| | | (G) | REMOVE R-1 | 2 CYLINDER ADAPTE | R & WRAP IN FOI | | |
| | | (H) | REPLACE VAL | LVE GUARD ON CYLI | NDER. | | |
| | | | | NOTE | | | |
| | | | l W T | IF REFRIGERATION WAS NOT INSTALLED TO STEP (T). | MANIFOLD PROCEED | | |
| | | | | | | | |
| na des suor generation | | (1) | BACK-SEAT C | COMPRESSOR SUCTIO | N SERVICE VALVE. | الشور فرتج | |
| | | (J) | CRACK MANIF ZERO PSIG. | OLE COMPOUND GAG | E VALVE & ALLOW | PRESSURE TO VENT TO | |
| | | (K) | REMOVE COMP | OUND GAGE LINE FI | ROM COMPRESSOR S | UCTION SERVICE VALVE | |

- FITTING.
- (L) CRACK COMPRESSOR SUCTION SERVICE VALVE TO OBTAIN A SLIGHT PURGE & INSTALL CAP ON VALVE FITTING.
- (M) BACK-SEAT SUCTION SERVICE VALVE.
- (N) BACK-SEAT COMPRESSOR DISCHARGE SERVICE VALVE.
- (O) CRACK MANIFOLD PRESSURE GAGE VALVE & ALLOW PRESSURE TO VENT TO ZERO PSIG.
- (P) DISCONNECT MANIFOLD PRESSURE GAGE LINE FROM COMPRESSOR DISCHARGE SERVICE VALVE.
- (Q) CRACK DISCHARGE SERVICE VALVE TO OBTAIN SLIGHT PURGE & INSTALL CAP ON VALVE SERVICE FITTING.

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| | | (R) | BACK-SEAT | COMPRESSOR DI | SCHARGE SERVIC | E VALVE. | | |
| | 1 | (S) | REPLACE CA | P ON DISCHARG | E SERVICE VALV | E STEM. | | |

- (T) REPLACE PRESSURIZED COMPARTMENT COVER.
- (U) REPLACE REFRIGERATION COMPARTMENT SIDE PANELS.



APOLLO SATURN

GSCU REFRIGERANT CHARGING SECTION 11

(VOID IF INITIALED BY ENGINEER IN CHARGE. . .)

- A. EQUIPMENT REQUIRED IN ADDITION TO STEP A, SECTION 1, 1V26163
 - 1. 0-300 PSIG TEST PANEL.
 - 2. FILTER-DRIER, 8A00-0155 (ALCO VALVE CO. ADK-165-S).
 - 3. OXY-ACETELENE WELDING SET.
 - 4. SILVER BRAZING ALLOY, MIK-B-15395, GRADE VII AND FLUX, 0-F-499.
 - 5. PORTABLE HEATER-BLOWER.
 - b. WELDING GOGGLES.
 - 7. ASBESTOS GLOVES.
- B. SPECIAL REQUIREMENTS
 - 1. SUPERVISION SHALL INSURE THAT ONLY PROPERLY TRAINED AND QUALIFIED PER-SONNEL PARTICIPATE IN THE OPERATION.
 - 2. WHEN PERFORMING TASKS INVOLVING USE OF AN OPEN FLAME (SILVER BRAZING) A FIREMAN MUST BE PRESENT AND PRIOR CONCURRENCE OF THE SAFETY SUPERVISOR IS MANDATORY. NOTIFY THE SAFETY OFFICE AND FIRE MARSHALL AT LEAST 24 HOURS PRIOR TO BEGINNING SUCH TASKS.
 - (A) WELDERS GOGGLES AND ASBESTOS GLOVES MUST BE WORN.
 - 3. SAFETY GOGGLES OR FACESHIELD MUST BE WORN WHILE LEAK TESTING OR VENTING.
- C. PRELIMINARY OPERATIONS
 - ... REMOVE PURGE COMPARTMENT COVER.
 - 2. REMOVE REFRIGERATION COMPARTMENT SIDE PANELS.
 - 3. VISUALLY INSPECT ALL REFRIGERATION SYSTEM LINES, COMPONENTS AND CONNEC-TIONS FOR EVIDENCE OF LEAKAGE.

NOTE

LARGE LEAKS MAY BE IDENTIFIED BY EVIDENCE OF OIL ACTUMULATION IN THE VICINITY OF LEAKS.

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- 4. MANUALLY OPEN THE EVAPORATOR PRESSURE REGULATOR (A13502) BY REMOVING THE VALVE STEM CAP AND TURNING THE VALVE STEM FULLY CLOCKWISE.
- 5. MANUALLY OPEN THE HOT GAS BYPASS VALVE (A13513) BY REMOVING THE VALVE STEM CAP AND TURNING THE VALVE STEM FULLY CLOCKWISE.
- 6. REMOVE THE OUTLET CAP AND VALVE STEMP CAP ON THE CHARGING VALVE (A13489) AND OPEN THE VALVE TO VENT ANY RESIDUAL REFRIGERANT (R-12) IN THE SYSTEM.
- 7. CHECK THE OIL LEVEL IN THE COMPRESSOR CRANKCASE.

NOTE

THE OIL LEVEL SHOULD BE AT THE CENTER OF THE OIL LEVEL GAUGE GLASS. IF ADDITIONAL OIL IS REQUIRED, USE SUN OIL CC., SUNISCO 3G OR EQUIVALENT.

- 8. CONNECT A FLEXLINE FROM THE OUTLET PORT OF THE CHARGING VALVE (A13489) TO THE OUTLET OF A 0-300 PSIG TEST PANEL.
- 9. CONNECT A FLEX HOSE FROM THE INLET PORT OF THE 0-300 PSIG TEST PANEL TO A GN₂ PRESSURE SOURCE. (1700 PSIG MAXIMUM).
- 10. VERIFY ALL VALVES ON 0-300 PSIG TEST PANEL ARE CLOSED AND THE REGULATOR IS ADJUSTED FULLY COUNTERCLOCKWISE.
- 11. APPLY GN2 TO THE 0-300 PSIG TEST PANEL.
- 12. OPEN INLET VALVE ON THE 0-300 PSIG TEST PANEL.
- 13. REMOVE THE FILTER-DRIER (A13524) AND REPLACE WITH A NEW FILTER-DRIER P/N 8A00-0155. SILVER BRAZE CONNECTIONS USING SILVER BRAZING ALLOY PER MIL-B-15395, GRADE VII AND FLUX PER O-F-499.

25 * A SLIGHT, POSITIVE GN2 PRESSURE * * (5 PSIG MAX) SHOULD BE MAINTAINED * * DURING REMOVAL AND INSTALLATION * * TO PREVENT INTRODUCTION OF CON- * * TAMINANTS INTO THE REFRIGERATION * SYSTEM LINES BY ADJUSTING THE × * REGULATOR ON THE 0-300 PSIG TEST * * PANEL. ALLOW BRAZED JOINTS TO 25 × RETURN TO AMBIENT TEMPERATURE 30 25 BEFORE CONTINUING OPERATION. 20 30 30

~ 21.m

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- 14. ADJUST PRESSURE REGULATOR ON THE 0-300 PSIG TEST PANEL TO 75 ± 10 PSIG. CHECK REFRIGERANT LINES, FITTINGS AND COMPONENTS FOR AUDIBLE LEAKS.
- 15. ADJUST PRESSURE REGULATOR ON THE 0-300 TEST PANEL TO 150 ± 10 PSIG, STOPPING AT EACH 20 PSI INCREMENT TO CHECK FOR AUDIBLE LEAKS. VERIFY GSCU REFRIGERATION SYSTEM CONDENSOR PRESSURE AND EVAPORATOR PRESSURE GAUGES READ THE SAME PRESSURE AS THE TEST PANEL.
- 16. WHEN THE PRESSSURE HAS BEEN INCREASED TO 150 PSIG, LEAK CHECK REFRIGERANT LINES, FITTINGS AND COMPONENTS USING LEAK DETECTOR SOLUTION.

NOTE

REPAIR ANY LEAKS DISCOVERED IN THE PRECEDING LEAK CHECK BY EITHER TIGHTENING CONNECTIONS UNTIL LEAKING STOPS, BY REPLAC-ING FLARED TUBING OR BY RESOLD-ERING THE CONNECTION USING HANDY HARMAN EZY-FLO NO. 45, AS REQUIRED.

* × * PRESSURE MUST BE REDUCED TO × * 5PSIG MAXIMUM. WHEN RESOLDER- * * ING BY ADJUSTING THE REGULATOR * * AND OPENING THE VENT VALVE AS * * REQUIRED ON THE 0-300 PSIG 24 * TEST PANEL. ALLOW SOLDERED 20 25 JOINTS TO RETURN TO AMBIENT 25 * TEMPERATURE BEFORE CONTINUING * " THE OPERATION. 20 24 34

- 17. AFTER ALL LEAKS HAVE BEEN REPAIRED AND THE GN, PRESSURE IS STABILIZED AT 150 ± 10 PSIG, CLOSE THE INLET VALVE AND ADJUST THE REGULATOR FULLY COUNTERCLOCKWISE ON THE 0-300 PSIG TEST PANEL.
- 18. RECORD THE PRESSURE INDICATION ON THE 0-300 PSIG TEST PANEL GAUGE AND THE AMBIENT TEMPERATURE.

PSIG

DEG. F

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19. AFTER ONE HOUR, RECORD THE PRESSURE INDICATION ON THE 0-300 PSIG TEST PANEL GAUGE AND THE AMBIENT TEMPERATURE.

PSIG

DEG. F

NOTE

THERE SHALL BE NO PRESSURE DECREASE, PROVIDING THE AMBIENT TEMPERATURE AT THE START OF THE PRESSURE TEST (STEP C.18) IS THE SAME AS THE END OF THE PRESSURE TEST.

- 20. SECURE THE GN₂ SOURCE. VENT THE SYSTEM AND TEST SETUP BY OPENING THE VENT VALVE AND INLET VALVE ON THE 0-300 PSIG TEST PANEL AND ADJUSTING THE REGULATOR FULLY CLOCKWISE.
- 21. VERIFY THE 0-300 PSIG TEST PANEL GAUGE INDICATES ZERO PSIG.
- 22. CLOSE ALL VALVES AND ADJUST THE REGULATOR FULLY COUNTERCLOCKWISE ON THE 0-300 PSIG TEST PANEL. CLOSE THE CHARGING VALVE (A13489). DISCONNECT THE FLEX LINE FROM THE GN₂ SOURCE TO THE INLET OF THE 0-300 PSIG TEST PANEL.
- 23. DISCONNECT THE FLEXLINE FROM THE OUTLET OF THE 0-300 PSIG TEST PANEL TO THE CHARGING VALVE (A13489).

NOTE

SINCE THE TEST PANEL AND FLEX-LINES HAVE BEEN EXPOSED TO POSSIBLE OIL CONTAMINATION IT IS NOT NECESSARY TO CAP OR SEAL CONNECTIONS AS THE EQUIP-MENT MUST BE EITHER CLEANED OR RESERVED ONLY FOR USE ON THE REFRIGERATION SYSTEM.

24. INSTALL THE CAPS ON THE CHARGING VALVE STEM AND OUTLET.

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D. FILLING THE CHARGING STAND

NOTE

THE CHARGING STAND MAY BE FILLED IN THE LABORATORY PRIOR TO TRANS-PORTING IT TO THE LUT AND THE REFRIGERANT "K" BOTTLE NEED NOT BE MOUNTED ON THE STAND IE FILL-ING IS ACCOMPLISHED IN THE LABO-RATORY.

- 1. INSTALL THE R-12 CYLINDER ON THE CHARGING STAND, IF DESIRED.
- 2. CONNECT THE OUTLET PORT OF THE R-12 CYLINDER TO THE INLET PORT OF THE CHARGING STAND.
- 3. VERIFY ALL VALVES ON THE CHARGING STAND ARE CLOSED.
- +. CRACK THE GAS VALVE ON THE R-12 CYLINDER.

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- 5. OPEN VALVES NO. 3, 4, 5, AND 6 ON THE CHARGING STAND.
- 6. OPEN VALVES NO. 1, 7, AND 8 ALTERNATELY FOR APPROXIMATELY ONE MINUTE EACH AND THEN SIMULTANEOUSLY FOR APPROXIMATELY ONE MINUTE TO PURGE AIR FROM THE CHARGING STAND. CLOSE VALVES 1. 7, AND 8.
- 7. CLOSE THE GAS VALVE ON THE R-12 CYLINDER.
- 8. CLOSE VALVES NO. 3, 4, AND 6 ON THE CHARGING STAND.
- 9. OPEN VALVE NO. 7 AND VENT RESERVOIR "A" UNTIL PRESSURE IS APPRXOIMATELY 5 PSIG. THEN CLOSE VALVE NO. 7.
- 10, OPEN THE LIQUID VALVE ON THE R-12 CYLINDER.

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11. MONITOR THE LIQUID LEVEL GAUGE ON RESERVOIR A AND FILL TO APPROXI-MATELY 275 OUNCES.

NOTE

READINGS MUST BE TAKEN ON THE R-12 SCALE. IT MAY BE NECESSARY TO HEAT THE R-12 CYLINDER TO FILL THE RESERVOIR. IF SO, PERFORM STEP D.12, OTHERWISE PROCEED TO STEP D.13.

GENTLY HEAT THE R-12 CYLINDER USING A PORTABLE HEATER-BLOWER. 12,

35 × * DO NOT USE AN OPEN FLAME MONITOR * * PRESSURE GAUGE OVER RESERVOIR A. * 20 DO NOT EXCEED 100 PSIG (90°F). 35 :: ×

- CLOSE VALVE NO. 5 ON THE CHARGING STAND. 12
- 14 OPEN VALVE NO. 8 ON THE CHARGING STAND AND VENT RESERVOIR "B" UNTIL PRESSURE IS APPROXIMATELY 5 PSIG, THEN CLOSE VALVE NO. 8.
- OPEN VALVE NO. 5 ON THE CHARGING STAND. 15
- MONITOR THE LIQUID LEVEL GAUGE ON RESERVOIR B AND FILL TO APPROXI-15. MATELY 275 OUNCES.

NOTE

READINGS MUST BE TAKEN ON THE R-12 SCALE. IT MAY BE NECESSARY TO HEAT THE R-12 CYLINDER TO FILL THE RESERVOIR. IF SO, PERFORM STEP D.17, OTHERWISE PROCEED TO STEP D.18.

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17. GENTLY HEAT THE F-12 CYLINDER USING A PORTABLE HEATER-BLOWER.

18. CLOSE VALVE NO. 6 ON CHARGING STAND.

Sec. al

19. CLOSE THE LIQUID VALVE ON THE R-12 CYLINDER.

NOTE

IF THE R-12 CYLINDER WAS MOUNTED ON THE CHARGING STAND AND IS TO BE TRANSPORTED TO THE LUT, OMIT STEPS D.20, D.21, AND D.22.

- 20. CRACK THE CONNECTION FROM THE R-12 CYLINDER TO THE CHARGING STAND AND ALLOW REFRIGERANT TO EXPAND AND VENT TO THE ATMOSPHERE. THEN DISCONNECT THE CYLINDER FROM THE CHARGING STAND.
- 21. CAP THE LINE WHICH WAS CONNECTED TO THE R-12 CYLINDER.
- 22. REPLACE THE PROTECTIVE CAP ON THE TOP OF THE R-12 CYLINDER.
- 25. TRANSPORT THE CHARGING STAND TO THE LUT,

E. EVACUATING THE SYSTEM

- 1. CONNECT THE VACUUM PUMP TO A 115 VAC FACILITY POWER OUTLET. DO NOT TURN ON THE PUMP.
- 2. REMOVE THE VALVE STEM CAP FROM THE COMPRESSOR DISCHARGE SERVICE VALVE.
- 3. VERIFY THE VALVE IS OPEN (FULLY CLOCKWISE).
- 4. REMOVE THE BACK SEAT PORT PLUG FROM THE COMPRESSOR DISCHARGE SERVICE VALVE AND ATTACH A FLEXLINE FROM THE PORT TO THE CHARGING STAND OUTLET PORT.

- 5. TURN ON THE VACUUM PUMP, OPEN VALVE NO. 2 AND OPERATE THE LEVER ON VALVE NO. 9 TO OPEN THE VALVE ON THE CHARGING STAND.
- 6. START THE VACUUM PUMP AND ALLOW IT TO OPERATE FOR APPROXIMATELY THREE MINUTES AND ZERO THE SCALE ON THE MANOMETER.
- 7. OPEN VALVE NO. 1 ON THE CHARGING STAND.
- 8. ADJUST THE COMPRESSOR DISCHARGE SERVICE VALVE COUNTERCLOCKWISE TO APPROXIMATELY THE MIDWAY POSITION (HALF-CLOSED).
- 9. CONTINUE OPERATING THE VACUUM PUMP FOR AT LEAST ONE HOUR OR UNTIL THE CHARGING STAND MANOMETER INDICATES NO MORE THAN ONE MILLIMETER OF MERCURY (MM HG), WHICHEVER IS GREATER.
- 10. CLOSE VALVE NO. 2 ON THE CHARGING STAND, THEN TURN OFF THE VACUUM PUMP AND MONITOR THE PRESSURE ON THE MANOMETER FOR 15 MINUTES FOR ANY INCREASE.

NOTE

AN INCREASE IN PRESSURE IS PROBABLY DUE TO SUB-LIMATION OF WATER IN THE SYSTEM OR UNDETECTED LEAKS.

- IF MOISTURE IN THE SYSTEM IS SUSPECTED, TURN ON THE VACUUM PUMP AND AFTER ONE MINUTE OPEN VALVE NO. 2 ON THE CHARGING STAND. OPERATE THE VACUUM PUMP FOR AN ADDITIONAL HOUR AND REPEAT STEP 10.
- 12. IF UNDETECTED LEAKS ARE SUSPECTED, CRACK VALVE NO. 4 INTERMITTANTLY UNTIL THE CONDENSER PRESSURE GAUGE (A13541) AND COMPRESSOR SUCTION PRESSURE GAUGE (A13481) INDICATE APPROXIMATELY THE SAME PRESSURE AS THE GAUGES OVER RESERVOIRS A AND B ON THE CHARGING STAND, ALLOWING TIME FOR THE REFRIGERANT TO EXPAND AND REACH AMBIENT TEMPERATURE. THEN LEAK CHECK REFRIGERATION LINES, FITTINGS AND COMPONENTS USING THE HALOGEN LEAK DETECTOR.

NOTE

IF LEAKS ARE DETECTED, VENT PRESSURE FROM THE SYSTEM THROUGH THE CHARGING VALVE (A13489), REPAIR LEAKS AND PER-FORM VACUUM TEST AGAIN BEGINNING WITH STEP 7.

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| T T | | 13. | AFTER ALL LEAKS HAVE BEEN REPAIRED AND A VAC OF MERCURY IS MAINTAINED ON THE SYSTEM, CLOS CHARGING STAND AND STOP THE VACUUM PUMP. | UUM OF ONE MILLIMETER E VALVE NO. 2 ON THE | |
| | | 14. | ALLOW THE SYSTEM TO STAND UNDER A VACUUM FOR IF THE PRESSURE AFTER 12 HOURS IS LESS THAN MERCURY PROCEED WITH CHARGING. | A MINIMUM OF 12 HOURS. 2.5 MILLIMETERS OF | |
| | F. | CHAR | JING THE SYSTEM | | |
| | | 1. | VERIFY VALVE NO. 1 ON THE CHARGING STAND IS CLOSE VALVE NO. 9. | OPENÉD. | |
| | | 2. | SET UPPER POINTERS AT LIQUID LEVEL IN SIGHT AND B. RECORD LEVELS | GLASSES ON RESERVOIRS A | |
| | | | AOUNCES | | |
| dian | | | BOUNCES | | |
| | | | TOTALOUNCES | | |
| and a second sec | | 3. | SET LOWER POINTERS 225 OUNCES BELOW THE LIQU AND B. | ID LEVEL IN RESERVOIRS A | |
| | | 4. | SIMULTANEOUSLY OPEN VALVES NO. 3 AND 4 ON TH | E CHARGING STAND. | |
| T | | 5. | MONITOR LIQUID LEVEL IN RESERVOIRS A AND B AND POINTERS POSITIONED IN STEP F.3 CLOSE VALVE N | ND WHEN IT REACHES THE NO. 3 AND 4 AS APPROPRIATE. | |
| | | | | | |
| | | | NOTE | | |

RESERVOIR A DISCHARGES THROUGH VALVE NO. 3. RESERVOIR B DISCHARGES THROUGH VALVE NO. 4. IT MAY BE NECESSARY TO HEAT THE RESERVOIRS TO TRANSFER THE DESIRED AMOUNT OF R-12. IF SO PERFORM STEPS F.6 AND F.7 OTHERWISE PROCEED TO STEP F.8.

CLOSE THE DISCHARGE VALVE ON ONE RESERVOIR AND GENTLY HEAT THE OTHER RESERVOIR, USING A PORTABLE HEATER-BLOWER. MONITOR THE RESERVOIR LIQUID LEVEL AND WHEN THE DESIRED AMOUNT OF R-12 HAS BEEN TRANSFERRED, CLOSE THE DISCHARGE VALVE ON THE RESERVOIR. APOLLO/SATURN PAGE 40 TEST NO. IV-26163 REVISION 002 GSE

7. OPEN THE DISCHARGE VALVE ON THE FIRST RESERVOIR AND GENTLY HEAT THE RESERVOIR USING A PORTABLE HEATER-BLOWER. MONITOR THE RESERVOIR LIQUID LEVEL AND WHEN THE DESIRED AMOUNT OF R-12 HAS BEEN TRANSFERRED, CLOSE THE DISCHARGE VALVE ON THE RESERVOIR.

ADJUST THE COMPRESSOR DISCHARGE SERVICE VALVE FULLY CLOCKWISE.

G. SYSTEM CHECKOUT

- 1. INSTALL PURGE COMPARTMENT COVER. TORQUE BOLTS TO 50 ± 5 INCH POUNDS. MANUALLY CLOSE THE EVAPORATOR PRESSURE REGULATOR (A13502) BY TURNING THE VALVE STEM FULLY COUNTERCLOCKWISE. REPLACE THE VALVE STEM CAP.
- 2. MANUALLY CLOSE THE HOT GAS BYPASS VALVE (A13513) BY TURNING THE VALVE STEM FULLY COUNTERCLOCKWISE. REPLACE THE VALVE STEM CAP.
- 3. VERIFY 50 PSIG GN₂ PURGE IS APPLIED.

NOTE

IF GROUND POWER (28VDC AND 5VDC) ARE NOT AVAIL-ABLE, AUXILIARY TEST SET AND POWER SUPPLIES MAY BE USED ON THE GSCU. REFER TO IBM 906-003 FOR HOOKUP.

4.

APOLLO/SATURN LAUNCH OPERATIONS

PAGE TEST NO. VEHICLE

POSITION CONTROLS ON THE GSCU AS FOLLOWS:

NOTE

CONTROLS MAY ALREADY BE POSITIONED TO THE SPECIFIED CONFIGURA-TION.

(A) 440 VAC POWER SWITCH-ON.

NOTE

THE FOLLOWING WARM UP TIME IS REQUIRED FOR AMBIENT TEMPERATURES NOTED PRIOR TO COMPRES-SOR OPERATION.

| ABOVE 60°F | 15 | MINUTES |
|-------------|----|---------|
| 50° TO 60°F | 30 | MINUTES |
| 40° TO 50°F | 45 | MINUTES |
| BELOW 40°F | 1 | HOUR |

- (B) PANEL LIGHT-ON.
- (C) 28 VDC CIRCUIT BREAKER-ON.
- (D) 5 VDC CIRCUIT BREAKER-ON.

NOTE

VERIFY AC POWER ON, 28 VDC ON, 5 VDC ON, AND MOTOR HEATERS ON LAMPS ARE ON. VERIFY ALL OTHER LAMPS ARE OFF.

- (E) SELECTOR SWITCH (S15)-LOCAL.
- (F) THREE WAY VALVE (A13491)-WATER/METHANOL.
- (G) MAIN SUPPLY VALVE (A13492) CLOSED.

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- (H) MAIN RETURN VALVE (A13508)-CLOSED.
- (I) BYPASSS VALVE (A13486) -OPENED.
- (J) W/M FLOW CONTROL VALVE (A13537)-OPENED.
- (K) LOAD ADJUSTING VALVE (A13552)-CLOSED.
- (L) GN2 FLOW CONTROL VALVE (A13544)-CLOSED.
- (M) W/M SAMPLING VALVE (A13485)-CLOSED.
- (N) GN2 PURGE BYPASS VALVE (A13570)-CLOSED.
- 5. DEPRESS SYSTEM START SWITCH. VERIFY SYSTEM START.
- ADJUST W/M FLOW CONTROL VALVE (A13537) FOR AN INDICATION OF 18 ± 2 GPM ON THE W/M FLOW RATE METER.
- 7. ADJUST W/M SUPPLY TEMPERATURE TO STABILIZE AT 40°F. ALLOW UNIT TO RUN FOR APPROXIMATELY FIVE MINUTES WHILE MONITORING THE FOLLOWING GAUGES FOR NORMAL INDICATIONS

CONDENSER PRESSURE-100-150 PSIG COMPRESSOR SUCTION PRESSURE-0-15 PSIG EVAPORATOR PRESSURE-AT LEAST 10 PSIG

8. CHECK THE REFRIGERANT LIQUID LINE SIGHT GLASS. THERE SHOULD NOT BE ANY BUBBLES.

NOTE

BUBBLES MAY APPEAR IN THE SIGHT GLASS IF THE HOT GAS BY-PASS VALVE IS OPENED. IF BUBBLES APPEAR, POSITION THE MAX COOLING SWITCH (S4) TO ON AND VERIFY BUBBLES NO LONGER APPEAR IN THE SIGHT GLASS. 9.

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DEPRESS SYSTEM STOP SWITCH.

NOTE

THE ABOVE FUNCTIONAL TEST REPRESENTS THE MIMIMUM REQUIREMENT. IT IS DESIRABLE TO FURTHER TEST THE UNIT BUT IF THE UNIT IS REQUIRED TO SUPPORT POWER, MORE RIGID TEST-ING SPECIFIED IN V-26016-ML MAY BE OMITTED. IF TIME PER-MITS, THOSE PARTS OF THE GSCU FUNCTIONAL TEST DEALING WITH THE REFRIGERATION SYSTEM SHOULD BE PERFORMED PRIOR TO DISCONNECTING FROM THE CHARGING STAND. IF DURING TESTING THERE IS EVIDENCE OF A LOW REFRIGERANT CHARGE, AN ADDITIONAL 32 OUNCES OF R-12 MAY BE ADDED TO THE SYSTEM IN ACCORDANCE WITH PARAGRAPH F.

H. SECURING STEPS

1. POSITION CONTROLS ON THE GSCU AS FOLLOWS:

NOTE

CONTROLS MAY ALREADY BE POSITIONED TO THE SPECI-FIED CONFIGURATION.

(A) 440 VAC POWER SWITCH-ON.

(B) PANEL LIGHT-OFF.

(C) 28 VAC CIRCUIT BREAKER-OFF.

(D) 5 VDC CIRCUIT BREAKER-OFF.

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| | I the product of the second seco | | ela losti di se g | | | |

(E) SELECTOR SWITCH (S15)-STANDBY.

(F) THREE WAY VALVE (A13491)-WATER/METHANOL.

- (G) MAIN SUPPLY VALVE (A13492)-CLOSED.
- (H) MAIN RETURN VALVE (A13508)-OPENED.
- (I) BYPASS VALVE (A13486)-OPENED.
- (J) W/M FLOW CONTROL VALVE (A13537)-OPENED.
- (K) LOAD ADJUSTING VALVE (A13552)-CLOSED.
- (L) GN2 FLOW CONTROL VALVE (A13544)-CLOSED.
- (M) W/M SAMPLING VALVE (A13485)-CLOSED.
- (N) GN₂ PURGE BYPASS VALVE (A13570)-CLOSED.
- LOOSEN THE LINE CONNECTED TO THE BACK SEAT PORT OF THE GSCU COMPRESSOR DISCHARGE SERVICE VALVE, ALLOWING THE R-12 IN THE LINE TO EVAPORATE AND VENT TO THE ATMOSPHERE.
- 3. WHEN VENTING CEASES, DISCONNECT THE LINE FROM THE COMPRESSOR DISCHARGE SERVICE VALVE AND INSTALL THE PLUG IN THE BACK SEAT PORT.

NOTE

A SLIGHT PURGE SHOULD BE APPLIED WHILE IN-STALLING THE PLUG, BY CRACKING THE VALVE (COUNTERCLOCKWISE). TURN THE VALVE STEM FULLY CLOCKWISE AFTER THE PLUG IS INSTALLED AND INSTALL THE COM-PRESSOR DISCHARGE SER-VICE VALVE STEM CAP.

- 4. DISCONNECT THE LINE FROM THE CHARGING STAND OUTLET PORT.
- 5. INSTALL THE REFRIGERATION COMPARTMENT SIDE PANELS.

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6. TRANSPORT THE CHARGING STAND TO THE LABORATORY.

NOTE

IF THE R-12 CYLINDER IS MOUNTED ON THE CHARGING STAND PER-FORM STEPS H.12 THROUGH H.18 OMITT-ING STEPS H.7 THROUGH H.11. IF NOT PERFORM STEPS H.7 THROUGH H.11.

- 7. OPEN VALVES NO. 1 AND 2 ON THE CHARGING STAND.
- 8. CRACK VALVES NO. 3 AND 4 ON THE CHARGING STAND AND WITH A SLIGHT PURGE FLOWING, CLOSE VALVE NO. 2 AND 1.
- 9. CLOSE VALVES NO. 3 AND 4 ON THE CHARGING STAND.
- 10. OPEN VALVES NO. 7 AND 8 ON THE CHARGING STAND AND WHEN VENTING CEASES, CLOSE VALVES NO. 7 AND 8.
- 11. OPEN VALVES NO. 3, 4, 5, AND 6 ON THE CHARGING STAND, THEN CLOSE ALL VALVES ON THE CHARGING STAND.
- 12. OPEN THE LIQUID VALVE ON THE R-12 CYLINDER.

- 13. OPEN VALVE NO. 5 ON THE CHARGING STAND.
- 14. GENTLY HEAT RESERVOIR A USING A PORTABLE HEATER-BLOWER.

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| | | | | nin und mander handlich oan de aante aan de ste s | GSE |
| | 15. | WHEN ALL R-12 | HAS BEEN TRANSFERRED TO THE CYLINE | DER CLOSE VALVE NO. 5. | |
| | 16 | OPEN VALVE NO | 5 ON THE CHARCING STAND | | |
| | | or en value no. | U ON THE CHARGING STAND. | | |
| | 17. | GENTLY HEAT RE | SERVOIR B USING A PORTABLE HEATER- | -BLOWER | |
| 10 a.A. | | | | ý and an | |
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| | | | * DO NOT USE AN OPEN FLAME. MON | ↓_ × | |
| | | | * ITOR PRESSURE GAUGE OVER RESER | 2_ 30 | |
| | | | * VOIR B. DO NOT EXCEED 100 PSI | G × | |
| | | | × (90°F). | × | |
| | | | × | × | |

18. WHEN ALL R-12 HAS BEEN TRANSFERRED TO THE CYLINDER CLOSE THE CYLINDER LIQUID VALVE AND VALVE NO. 6 ON THE CHARGING STAND.



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TABLE 3

ACCEPTABLE DEVIATION ± 5%

| GAGE | NO. | A13481 |
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| SUCT | [ON | PRESSURE |

GAGE NO. 13494 EVAPORATOR PRESSURE

| CHECK POINTS | PANEL READING | GSCU GAGE READING | PANEL READING | GSCU GAGE READIN <mark>G</mark> | |
|--------------|------------------|----------------------|------------------|------------------------------------|----|
| (PSIG) | | | | | |
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| 30 | | | | | |
| 45 | | | | | |
| 60 | | | | | |
| 75 | | | | | |
| 90 | | | | | |
| 105 | | | | | |
| 120 | 신 지 않는 | | | | |
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| 150 | | | | | |
| 175 | | | | | |
| 100 | | | | | |
| 120 | | | | | |
| 105 | | | | | |
| 90 | | | | | |
| 75 | | | | | |
| 60 | | | | | |
| 45 | | | | | |
| 30 | | | | | |
| 15 | | | | | |
| 0 | | | | | |
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| INCHES HG | | | | | |
| (VACUUM) | | | | | |
| 5 | | | | | |
| 10 | | | | | |
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| 25 | | | | | |
| 23 | | | | | |
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TABLE 3

ACCEPTABLE DEVIATION ± 5%

GAGE NO. A13541 CONDENSOR PRESSURE

| ECK POINTS | PANEL READING | GSCU GAGE READING | |
|------------|---------------|-------------------|----|
| 15 | | | |
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| 20 45 | | | |
| 60 | | | |
| 75 | | | |
| 90 | | | |
| 105 | | | |
| 120 | | | |
| 135 | | | |
| 150 | | | |
| 165 | | | |
| 180 | | | |
| 195 | | | |
| 210 | | | |
| 225 | | | |
| 240 | | | |
| 255 | | | |
| 270 | # | | |
| 200 | | | |
| 295 | | | |
| 200 | | | |
| 255 | | | |
| 240 | | | |
| 225 | | | |
| 210 | | | |
| 195 | | | |
| 180 | | | 1 |
| 165 | | | |
| 150 | | | |
| 135 | | | |
| 120 | | | |
| 105 | | | |
| 90 | | | |
| 75 | | | |
| 60 | | | |
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OPERATING PERSONNEL

TECHNICIAN(S)

QUALITY INSPECTOR(S)

PAD ENGINEER(S)

END OF TEST PROCEDURE IV-26163