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MAGNETIC POWER SUPPLY ASSEMBLY OF M509A2E1 FUZE(U)
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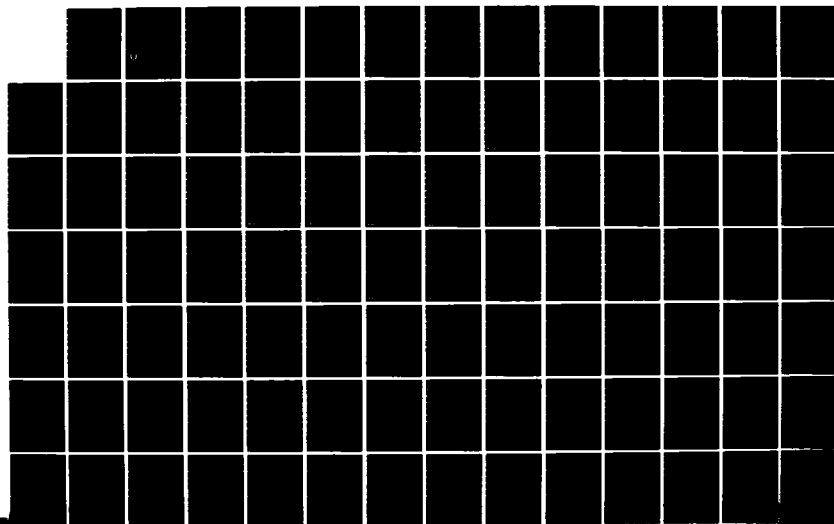
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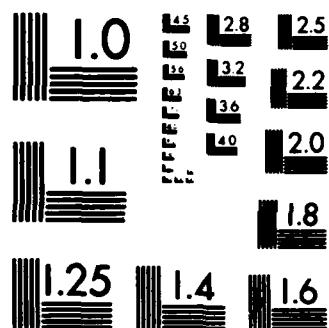
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CONTRACTOR REPORT ARLCD-CR-83047

MAGNETIC POWER SUPPLY ASSEMBLY OF M509A2E1 FUZE

AD-A142 816

M. MOSKOWITZ
BULOVA SYSTEMS & INSTRUMENTS CORP
VALLEY STREAM, NEW YORK

May 1984



U.S. ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER

LARGE CALIBER WEAPON SYSTEMS LABORATORY

DOVER, NEW JERSEY

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Magnetic power supply MMT-process improvement Encapsulation VIPER fuze Setback generator Fuze Centrifugal timing Wave flow soldering Sonic welding Test console Electrical test console Printed circuit board Release mechanism Lead-forming system M509A2E1 fuze Computer controlled		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The objective of this study was to develop the technology of manufacturing the M509A2E1 fuze used in the 105-mm heat round. In Phase I the detailed design of the assembly stations was completed and a functional layout of the line was established. In phase II the fabrication and procurement of the hardware necessary to set up the critical stations were investigated. It provided for installation and debugging of the equipment which displayed increased reliability and producibility of the setback generator, magnetic power supply assembly, and printed wiring board assembly.		

SUMMARY

The efforts of Bulova Systems and Instruments Corporation (BSIC) involved in launching and successfully completing the manufacturing, methods, and technology (MM&T) program relating to the facilitization of the magnetic power supply assembly (MPSA) of the M509A2E1 PIBD Fuze are described in this report. The report reviews the tasks undertaken, problems encountered, and solutions which were developed. It shows that the assembly tooling, inspection, and test equipment met or surpassed, in almost every instance, the production rate of 63 units per hour (500 units per day in an 8-hour shift). The maintainability, reliability, and safety requirements were equally satisfied.

FOREWORD

Certain Bulova Systems and Instruments Corporation documents that are included in the Appendix were previously submitted to, and accepted by, ARRADCOM. To avoid possible confusion, those approved documents herein reproduced have not been revised in content or format. Only signatures have been deleted. Therefore, when referring to the test demonstration, any reference in these documents to "Phase A" or "Phase B" shall be understood to mean "Part A" and "Part B" respectively.

Certain documents in the Appendix are noted as a sample. The balance of the material is included in the Continuation volume of this report and is available on request.



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INTRODUCTION

The program was divided into two phases. Each phase took approximately 18 months to complete. Phase I included the assembly tooling, inspection, and test equipment for high volume production and improved producibility of the setback generator (10,000 per month) and the magnetic power supply assembly (MPSA) (printed wiring board assembly). It also included inspection and test of the MPSA and its encapsulation in the rotor housing.

Phase II of the program was concerned with:

1. Upgrading the setback generator to a plug-in type
2. Converting the MPSA to a thicker printed wiring board (PWB) and multiple array panel assembly
3. Upgrading the MPSA acceptance test console
4. Procuring a four-nest centrifuge and arming time test console
5. Upgrading of existing tooling, inspection, and test equipment
6. Completing all other remaining contractual requirements

SETBACK GENERATOR AND RELATED EQUIPMENT

Generator Design

The fundamental functioning of the fuze required that the setback generator (SG) provide electrical energy to a capacitor which would store it and, under proper conditions, reliably function the detonator. It was established that an output of 100 volts minimum into a 0.56 ufd capacitor load would fulfill all requirements. Several different designs were evaluated. The ARRADCOM configuration, with the addition of a shear disc, was selected for development. It was designated as the Mark I generator.

Assembly of prototype units revealed much difficulty in properly securing and bringing out lead wires through the terminals. Another problem area was in maintaining a satisfactory seal around the terminals to prevent the infiltration of potting into the SG. A matter of serious concern was that the jamming of the multipiece magnetic train could, and in certain units did, occur during setback.

Several designs were evaluated in the development phase. They included: a longer stroke, a different magnetic train, and an alternate coil winding. As predicted, higher voltages were obtained

using a longer stroke and also a single magnet. The one-piece magnet proved to be more reliable.

The SG was then completely redesigned to eliminate the aforementioned problems and to develop a component that was more easily produced and more reliable. This design was designated the Mark II generator. It included replacement of the existing magnet and two-core piece assembly with a longer single magnet of the same diameter. Tests indicated two benefits:

1. A generator output voltage higher than previously available was obtained.
2. A possible hang-up of the magnet/two core pieces on the inside of the generator coil assembly was overcome.

This new model required the design and fabrication of new manufacturing tooling such as a set of progressive dies for the armature body, a new bobbin mold, and a new mold for the plastic bottom cover. Because of the long lead time for the new tooling and parts, Mark II generators were not readily available for evaluation by ARRADCOM. A parallel testing program was pursued until May 1982 when ARRADCOM directed the sole use of the Mark II SG in the M509A2E1 base detonating element.

Regarding the Mark II SG, testing indicated that the bobbin flanges had to be made thicker and the bosses seating the terminal posts be stronger. It also was necessary to change the coil wire size from 41 AWG to 38 AWG, to reduce the form factor of the coil winding, and also reduce the number of turns to lower the output voltage. Outputs in excess of 200 volts had been obtained causing concern that the 0.56 ufd capacitor would be overstressed.

As a result of laboratory testing it became evident that delrin would not provide a reliable seal against potting infiltration. When soldering the SG to the printed wiring board (PWB), the heat from the soldering iron tip on the terminal post produced local distortion of the plastic bottom cover and occasional loss of seal integrity.

To replace the delrin, an ultra high temperature plastic was found: Ultem 1000, an unfilled polyetherimide resin that had recently been marketed by General Electric Company. It was chosen over teflon for two reasons. It was a thermoplastic and could be formed in the existing mold. Secondly, its heat deflection temperature of 200° C was considered satisfactory for this application.

Further investigations were carried out to define several test parameters. It became evident that the use of a helium leak detector was unduly conservative and expensive. A vacuum leak test with air

proved sufficient to assure proper seal integrity. A lower value of magnetic leakage flux was also established. Recognizing that there were technical limitations in using leakage flux as a measure of magnetic charge, a minimum value of 95 gauss was selected.

The final improvement to the SG was accomplished by conversion to a plug-in generator (PIG). Longer terminal posts were provided to engage with mating receptacles on the PWB. It eliminated soldering of the posts to the PWB circuitry simplifying assembly of the MPSA.

Related Equipment

Analysis and evaluation showed that certain assembly processes used in the development program were not fully suitable for high volume production. The following examples show advances that have been made.

The original design for the setback generator, although functionally adequate, had some production shortcomings. An average time of 23 minutes was needed to wind the coil assembly. It took 17 of those 23 minutes to attach external leads to the coil's leads via a soldering process. In order to overcome this problem, and strengthen the bobbin, the coil assembly was redesigned. External leads were replaced by resistance welding the coil leads to pins installed in the bobbin. The resistance welding process also eliminated the need to clean up the flux residue left by the hand soldering process and further reduced the time to establish and test the coil connections to under one minute total.

BSIC recommends that, when additional funding becomes available, studies be made to eliminate the existing method of chemical stripping of the bobbin coil leads prior to welding. Among the possible alternatives are:

1. A new method of mechanically stripping the polyurethane insulation.

2. Replacing the present resistance welding with a different process such as ultrasonic welding or laser welding. (Note that laser welding might involve the use of another wire insulation.)

A Bulova owned coil winding machine was modified to accept the bobbin and to wind two coils at a time, rather than one at a time. The modified machine was thus able to produce bobbin assemblies at twice the rate compared to the older, less sophisticated winder.

A new type magnetic charger and special gaussmeter were purchased and modified by Bulova. Utilizing these in conjunction with additional special fixtures, as many as 30 setback generator assemblies could be magnetized and validated in a single charging cycle.

The various assembly stations (numbers one through eight) are described in the Demonstration Test Report, Part A.¹ Additional details may be found by consulting that document.

MAGNETIC POWER SUPPLY ASSEMBLY (MPSA)

The printed wiring board (PWB) assembly known as the MPSA was basically a difficult task in packaging and in component selection. The functional components included in this section are described in Table 1 below.

Table 1. Component function

<u>Component designation</u>	<u>Function</u>
Resistor, R1	It provides a charging path for the stray capacitance in the wiring and in both normally open switches (the crush switch, S1, and the impact switch, S4). This would prevent functioning of the detonator, F1, at the 90° contact position causing an unnecessary dud.
Resistor, R2	To slowly bleed any accumulated charge from capacitor C1, maintaining safety during storage and handling.
Impact switch, S4	When closed on graze impact, it provides a discharge path allowing the capacitor to fire the detonator, F1.
Diode, D1	To prevent discharge of capacitor, C1, through the SG.
Capacitor, C1	To store the energy produced by the SG.

The PWB of the MPSA was originally designed as a round single-sided circuitry board 1.187 in. O.D. X 0.03 in. thick. With the passage of time and many tests of the base detonating element (BDE), component locations were changed as well as horizontal/vertical installation on the PWB.

In the fall of 1982, the PWB of the MPSA was redesigned to provide a two-sided board with plated through holes, the same O.D., the thickness increased by 50% to 0.048 in., and with revised

¹ Included in this report as Appendix D.

component locations. This new design of the individual PWB was further improved for high volume production by ordering them in a panel configuration (approximately 5.8 in. long X 2.8 in. wide) array of two rows of four each. The individual PWB would also be screened (component configuration) and pre-punched with a die.²

The PWB assemblies supplied in the panel configuration described above were mounted in holding fixtures. All components and parts required were installed (after "preforming") on a group basis taking advantage of a learning curve as compared to assembling one MPSA completely at a time. All masking, dressing, and the like was accomplished on eight boards at a time.

In the fall of 1980, a component lead forming system was purchased from Heller Industries. This system consisted of one Heller axial component lead former, model H-116, with different feed options, and two custom die sets. Also procured was one radial lead component former, model RD-70C, and one custom die set. The custom dies for both machines were predicated on the existing MPSA configuration at that time.³ The axial component lead forming machine setup accepts components supplied in a tape and reel configuration. It can produce up to 18,000 formed components per hour under optimum conditions. The radial component forming machine can produce up to 1,500 formed components per hour under optimum conditions.

These component lead forming machines are used to preform all the axial and radial lead components required for the MPSA. This permits full utilization of the high volume assembly technique of "group stuffing" with the PWB supplied in the "8-up" panel array.

In May, 1983, BSIC purchased from Hollis Engineering a wave soldering system model TDL with an adjustable 10-inch-wide finger conveyor and other options and accessories. Also procured was a Hollis ultra-clean vapor degreaser with certain options and accessories for cleaning the wave soldered MPSA. The hourly production rate of the wave soldering system under optimum conditions with the current panel configuration of two rows of four PWB's is approximately 425 panels (3400 PWB's) per hour. It will yield up to about 20,000 MPSA's in any 8-hour shift. The panels could easily be increased in size by a factor of eight. Then eight times as many MPSA's per hour could be processed with this system. In the case of the ultra-clean vapor degreaser for cleaning the wave soldered PWB,

² The vendor refers to this pre-punching process as "return to web".

³ This was a PWB with a 1.187 in. O.D., 0.03 in. thickness, single-sided circuitry. The component leads were clinched over and hand soldered.

the hourly production rate under optimum conditions is up to approximately 1,000 MPSA's per hour. A new "in-line" type cleaner with greater capacity would be required should the need arise to have more than 8,000 MPSA's cleaned in a given 8-hour shift.

SPECIAL SEMI-AUTOMATIC COMPUTER-CONTROLLED TEST EQUIPMENT

Magnetic Power Supply Assembly Acceptance Test Console

During Phase I of the MM&T program, a semi-automatic acceptance test console was developed. It tested the assembled MPSA as installed in a rotor housing assembly before and after encapsulation. A total of 10 different tests were sequenced and their data displayed on a digital voltmeter. The data was then evaluated by comparison with a table of values reflecting the required accept/reject limits. Results were then manually recorded on a data sheet. This acceptance test console thus required an operator of technician caliber rather than inspector caliber. The hourly production rate for this version of the acceptance test console under optimum conditions was 15 assemblies per hour.

In Phase II of the program, this MPSA acceptance test console was upgraded by using a computerized control center with a printout for each of the 10 tests. This printout includes upper and lower limits, the test measurement, an evaluation of the data, and an accept or reject decision for each unit tested. Furthermore, a new dual nest with additional associated electronics was added to obtain more efficient utilization of the tester. While one unit is under test and the printer processing the data, the previously tested unit can be removed and replaced with a new unit to be tested. The current hourly production rate with a paper tape printout is 42 units per hour.

Centrifuge Arming Time Acceptance Test Console

A new centrifuge arming time tester was made for Phase II of the MM&T program. It incorporated many improvements over other existing equipment. The GFE centrifuge was fitted with four nests to support the sequential testing of four M509A2E1 PIBD fuzes. The centrifuge was wired with the necessary electronics to interface with the new acceptance test console. The new acceptance test console is computer controlled with computer evaluation of the data on a printout (same model computer as in the MPSA acceptance test console).

The new arming time test console contains a storage oscilloscope with provisions for playback of data from previously tested or current units. Its design also permits manual or automatic sequence

⁴ Test cycle time: 1 minute; printout time: 29 seconds; load and unload time for each nest of fixture: 6 to 10 seconds.

testing of units. The arming time test system can easily be adapted for many different fuze types and variations by reprogramming the computer and providing new test probe interfacing. The hourly production rate of this acceptance test console operated under optimum conditions is 40 units per hour.

ENCAPSULATION OF THE MAGNETIC POWER SUPPLY ASSEMBLY

Encapsulation method and materials used the MM&T Part B demonstration was the result of many investigations and studies conducted during the M509A2E1 product improvement program (PIP) and the MM&T program. Among the parameters evaluated were:

1. Encapsulation materials
2. Curing temperatures
3. Loading pressures
4. Delivery techniques
5. Size and location of filler holes, vent holes, and tubing

A more definitive treatment of this evaluation is included in the Final Technical⁵ Report of the Product Improvement Program for the M509A2E1 PIBD Fuze.

The method selected to be used for demonstration fulfilled the technical and functional requirements of protecting the MPSA during setback. The process required conformally coating the diode, D1, and capacitor, C1, prior to installing the MPSA in the rotor housing. The material used was a Dow Corning silicone resin 1-2577 with 176 catalyst conforming to MIL-I-46058. It also required several prepotting steps: sealing the 90° contact assembly to the rotor housing; sealing the port of the rotor housing and the S2 switch housing at their juncture; and sealing the hollow plastic screw to the rotor housing at their juncture.

These steps must be completed at least 18 hours prior to final potting. The potting material used was Hysol RE 2039 resin and HD 3561 catalyst. It was allowed to air cure for 24 hours before handling. Although the current method provided good units, the production rate was considered too low.

⁵ This document, BSIC number 316-171 was previously submitted to ARRADCOM, Dover as CDRL Item A029 under Contract DAAK10-79-C-0331. See BSIC letter CA-AGS-2400, Att:DRDAR-LCN-T, dated 27 June, 1983.

DELIVERED AND DELIVERABLE HARDWARE

As part of the Part B demonstration, 50 base detonating elements were manufactured in an air gun configuration. These units had the following features:

1. Inert heat indicator
2. Gold plated contacts on the heat indicator assy
3. Disabled drag (flush drag weight pin)
4. 0.047 in. thick PWB
5. Condition "B" leaf pins
6. Rotor shaft tang removed
7. Bleed resistor, R2, omitted (680 megohms)
8. Trembler switch, S4, omitted

For details relating to other deliverable parts and assemblies fabricated and tested in stations 9 through 23, refer to the Demonstration Test Report, Part B.⁶

CONCLUSION

Setback Generator

Future studies should be made to replace or eliminate the existing method of chemically stripping the wire leads of the bobbin coil assembly (setback generator) prior to welding. Possible alternatives are:

1. A new non-destructive method of mechanically stripping the polyurethane insulation.
2. Ultrasonic welding or laser welding as a suitable replacement for the present resistance welding process. (Note that this alternate process might involve the substitution of a different type of wire insulation).

Solderability

A review of the PWB of the MPSA for improved solderability using the wave soldering process and the state of the art assembly techniques suggests the following:

⁶ Included in this report in Appendix J.

1. Reduce the plated through hole diameters to improve capillary action.

2. Increase the thickness of the PWB to 0.062 in.

3. Improve the component layout so that diode, D1, can be mounted horizontally and flush against the PWB.

4. Reduce the mounting hole diameter for the four pin jacks to obtain a press fit condition. This will ensure they remain in place during soldering.

A review of the switch assembly, S2, suggests the following to alleviate certain assembly problems which became evident when using the wave soldering process at assembly:

1. Terminal Switch. This is the tinned brass termination on the end of the movable S2 contact installed in the PWB. Even though the equivalent of the type currently used for the XM763 fuze was employed for the MM&T demonstration MPSA, it is too massive and should be reduced—in geometry and dimension. Installation in the MPSA should be a light press fit rather than by staking.

2. Contact Wire. This is the "L" shaped gold plated brass contact. It should be reduced in cross-section to about half its present size of improve solderability.

3. Switch Housing, S2. This exhibited a tendency to lift-off from the PWB surface (component side).

It was noted that during wave soldering, a temperature of approximately 500°F was experienced. An investigation should be pursued to determine if a design change (geometric - dimension) or new material would provide the solution. Modification of the existing mold or a new mold may be required.

Encapsulation

The current encapsulation process consists of two parts:

1. Prepotting; rate: 5 units per hour

Juncture of S2 switch housing and rotor housing

Juncture of hollow plastic screw and rotor housing

Juncture of 90° contact and rotor housing

Three hours cure at 60°C

2. Final encapsulation of MPSA; rate: 20 units per hour

In order to improve the hourly production rate for the prepotting operations, it is recommended the S2 switch housing, the hollow plastic screw, the 90° contact assembly, and the rotor housing be redesigned. It is also recommended that replication of this station be accomplished.

In order to improve the hourly production rate for the final encapsulation, an automatic mixing and dispensing machine should be procured. It should be designed with sufficient daughter stations to meet the required rate.

Testing

The hourly test rate of approximately 40 MPSA's at the dual nest MPSA semi-automatic acceptance test console could be improved. Currently averaging about 1.5 minutes per unit, it could be easily reduced to 1.0 minute per unit by changing the computer print out. The details of each of the 10 tests could be eliminated and replaced by a simple accept/reject. Considering recent advances in computer and electronic technology, it is also possible to design and fabricate an additional test console to insure a minimum hourly test rate of 63 units (molded housing assembly level).

The hourly test rate of approximately 40 housing and mechanism assemblies on the centrifuge arming time acceptance test console could be improved as follows:

1. Reduce the data sampled per unit from 4,000 to 2,000 points.
2. Add an additional data line and slip ring to handle sampling (and evaluation) of two units simultaneously.
3. Modify the computer program as required.

It would then be possible to upgrade the hourly test rate to almost double its present level. But until an arming time acceptance test console attains a level of approximately 65 units per hour, a replication of the current type would insure the goal of 500 units per 8-hour-shift day.

Summary

An analysis of the data from the MM&T demonstration Parts A and B indicates the following:

1. Eliminate, or replace with an alternate method, the current insulation stripping method for the Mark II SG coil assembly (prior to welding). It will provide an assembly line production rate which will equal or exceed in all operations the program goal of 10,000 per month (500 per day) with one 8-hour shift.

2. The hourly production rates of the assembly tooling and inspection/test equipment demonstrated in Part B was satisfactory for the program goal of 10,000 units per month (500 per day) with one 8-hour shift except for the operations and equipment listed below. These will require appropriate replication to meet the hourly rate of 63 per hour.

Installation of the S2 contact on the PWB

Installation of electronic components on the PWB

Preliminary and final encapsulation of the MPSA

MPSA acceptance test console station

Centrifuge arming time acceptance test console

EXPANSION RECOMMENDATIONS

Under the provisions of the contract, this project provided the tools, equipment, and techniques needed to manufacture the M509A2E1 fuze. Presently, there are no projected requirements for the M509A2E1 fuze. There are, however, requirements for the XM763 and XM764 fuzes, both of which bear significant similarities with the M509A2E1 fuze.

It is therefore recommended that this equipment be modified so that it can accommodate the XM763 and XM764 fuze. This modifying action, if properly executed, can be performed with the funding still remaining in the project.

APPENDIX A
SAMPLE DATA SHEET
FOR
MAGNETIC POWER SUPPLY ASSEMBLY
ACCEPTANCE TEST CONSOLE

M500 A2E1 BDE DATA SHEET
DATE 09.20.83
TIME 9 21 AM
SERIAL NO 1000

I R (R21101)
MIN = 460 MOHMS
MAX = 620 MOHMS
ACTUAL = 4932.6 MOHMS
*** ABOVE MAXIMUM VALUE ***

I R (OPEN)
MIN = 60 MOHMS
MAX = 320 MOHMS
ACTUAL = 7682.7 MOHMS
*** ABOVE MAXIMUM VALUE ***

CONT (R1)
MIN = 90 KOHMS
MAX = 114 KOHMS
ACTUAL = 99.716 KOHMS
WITHIN SPEC

CONT (D1 FWD)
MIN = 250 OHMS
MAX = 730 OHMS
ACTUAL = 336.45 OHMS
WITHIN SPEC

CONT (D1 REV)
MIN = 4000 MOHMS
MAX = 9 9E99 MOHMS
ACTUAL = 5379.6 MOHMS
WITHIN SPEC

CONT (L1)
MIN = 40 OHMS
MAX = 50 OHMS
ACTUAL = 42.54 OHMS
WITHIN SPEC

XELD (L102000Hz)

CAP (C1)
MIN = .5 MFD
MAX = .7 MFD
ACTUAL = .57562 MFD
WITHIN SPEC

CONT (CONTACT)
MIN = 0 OHMS
MAX = .1 OHMS
ACTUAL = .0301 OHMS
WITHIN SPEC

-TEST 1 ABOVE SPEC
-TEST 2 ABOVE SPEC

PROJECT 330

DATE 09/21/83

MAGNETIC POWER SUPPLY ASSY

TEST DATA SHEET

S/N ^{EM} 1000 LOT# 1

ASSY# KD 90852-3
Rev B

REMARKS

Note: This is a sample sheet. Results of units EM 1001 through EM 1102 are available on request.

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APPENDIX B
SAMPLE DATA SHEET
FOR
CENTRIFUGE ARMING TIME
ACCEPTANCE TEST CONSOLE

PROJECT 330

DATE 9/22/83CENTRIFUGE ARMING TIME
ACCEPTANCE TEST
DATA SHEETS/N EM 1001 thru 1003 LOT# 1ASSY# KF 90853-2
Rev. A

REMARKS

M509A2E1 Detonator Lot No NA 1-2M509 ~~Det~~ Detonator Installed By:

Sig: _____ Date: _____

Ball Staked By:

Sig: _____ Date: _____

Arm Time Tested By:

Sig: _____ Date: _____

Res ~~Off~~ 'Safe' By:

Sig: _____ Date: _____

X-Ray To Verify Safe By/ NA

Sig: _____ Date: _____

Note: This is a sample sheet. Results of units EM 1004 through EM 1162 are available on request.

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APPENDIX C
TOOL LIST
OF
MANUFACTURING, ASSEMBLY, AND INSPECTION
TEST EQUIPMENT

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
1	273-19006	Air Press W/Sl'd'g Anvil Fixt.	Install (2) Terminal in Bobbin
1	273-60009	Pin Pull Out Tester	Pull Test (2) Terminals Installed in Bobbin
2	BW-157349 273-19002 273-19003	Modified Bulova Production Type Coil Winding Machine & Wire Tensioning Devices	Wind Coil Assembly of Setback Generator Assy Control Wire Feed to Winding Machine
2	273-19008	Tray Peg Board	Storage Tray for Coil Assy
2	273-19007	Holding Fixture	Support and Rotate Coil Assy During Application of Tape
3	BW-158862	Bulova-Resistance Welding Machine	Power Pack, Remote Control and Welding Head
3	273-19010	Modified Electrodes	Special Welding Electrodes
3	273-19011	Welding Fixture Indexing -2 Positions	Fixture to Position Assy for Welding
3	273-60007	Weld Test Fixture	To Measure Weld Strength
3	273-60004	Continuity Tester	V.O.M. and Interface Fixt.
3	273-60010	Polarization Tester	Validates Direction of Coil Winding & Start Lead of Winding
4	273-19013	Air Cylr. and Press-In Fixt.	Press Fit Armature Plate into Armature Body
4	273-19014	Tray, Storage	For Armature Sub Assy
5	273-19015	Air Cylr and Press-In Fixt.	Press Fit Shearing Plt. into Generator Cover
6	273-19016	Air Cylr and Press-In Fixt.	Press Fit Cover Sub Assy into Arm. Sub Assy
6	273-19017	Air Press and Tooling	Swage Body of Armature 360° Around Cover Sub-Assy

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
7	273-60006 273-60002 273-60003 273-60008	Setback Generator Final Assy Tester	Measures Generator R, L and Insulation Resistance. Contains Tools 273-60002, 60003, 60008 and Interface Fixture.
8	273-19001	Magnetic Charger Charging Flxt. and Charging Tray	Charge Magnet of Setback Generator Assy
8	273-60001	Gaussmeter and Holding Fixture W/ Probe Built In	Measures Leakage Flux of Magnetically Charged Generator Assy
9	273-19009	Crimping Tool- "Automator"	Crimp Contact Wire in Switch Terminal
9	273-19018	Tray Storage	Storage Tray
11	273-19019	Press-In Fixture W/Horizontal Slide Lever	Press-In (1) S2 Switch Contact in S2 Housing
10	273-19020	Staking Tool Automator	Stake Movable S2 Switch Contact to P. C. Board
10	273-19022	Press-In Fixture "Potence"	Press-In Connector Jack to P. C. Board
12A	273-19004	Axial Lead Component Forming System	Heller Leadmaster H-116A and Custom Dies. Forming Component Leads of R1, R2, D1 and S4
12B	273-19005	Radial Lead Component Forming System	Heller Radial Component Former RD-70C and Custom Die For Capacitor C1
13	331-19005	Assembly Holding Fixture	Holder P. C. Board Carrier during Assy
14	331-19006	Assembly Fixture P. C. Board Carrier	Fixture to Hold P. C. Board Carrier while Applying Spot Mask & Dress Leads

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
15	331-19004	P. C. Board Carrier Rack	Hold P. C. Board Carrier Before/After Wave - Soldering and Cleaning Process.
15	331-19002	P. C. Board Cleaning Machine	Hollis Ultra-Clean Cleans PC Board Carriers after Soldering
15	331-19003	Wavesoldering Machine	Hollis Wavesoldering Machine TDL 10" Wide for Soldering P. C. Board Carriers.
15	331-19007	Slide-Wavesoldering Machine	Soldered P. C. Carrier Slide From Soldering Machine Output End to Work Table
15	331-19008	Storage Container -Stiffeners	Storage container for P. C. Carrier Stiffeners
15	331-19009	P. C. Board Removal Tool	Remove Individual P. C. Boards from P. C. Board Carriers
15	331-19010	Soldering Fixture for S2 Switch	Fixture for Hand Soldering S2 Switch Assy
15	331-19011	Alignment Fixt. for S4 Impact Switch	Perpendicularity Alignment Fixt. for S4 Impact Switch
15	331-19012	Modified Cleaning Machine P. C. Board Basket	Modified Cleaning Machine Basket to Hold P. C. Board Carriers during Cleaning Operation
15	273-19021	Tray Storage	Storage Tray for Individual P. C. Board Assemblies
16	273-19027	Staking Tool "Automator"	Stake GND Wire in Rotor Housing
17	273-19028	Staking Tool Air Press	Stake P. C. Board (M. P. S.) in Housing Assy
18	273-19030	Press-In Fixture Probe Gromm ²⁵	Install (4) Grommets in Power Supply Cover
18	273-19031	Press-In Fixture Shell Receptacle	Installed Shell Receptacle in Power Supply Cover

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
19	273-19032	Swaging Tool P. S. Cover to Rotor Housing	Swage P. S. Cover to Rotor Housing
19	273-19034	Tray-Storage	Storage Tray
20	331-19013	Encapsulation Holding Fixt. for Rotor Housing	Holding Fixture for Rotor Housing during Encapsulation of Magnetic Power Supply
20	331-19001	Encapsulant Dispensing Device	Dispenses predetermined qty of Encapsulating Material Repeatedly
21	273-60005-002	Acceptance Test Console - Magnetic Power Supply Assy	Electrical Check Out of Magnetic Power Supply Assembly after Encapsulation Computer Evaluated W/Print Out
22	273-19035 273-19036	Radial Riveting Machine and Fixture	Install (2) Leaf Pins in Rear Bearing Bridge Plate Assembly
23	331-60001	Acceptance Test Console Arming Time Test	Arming Time Test Computer Evaluated W/Print Out - Housing and Mechanism Assy.
Freeport	273-90001	<u>MOLDS</u> Bobbin-KD90204	Next Higher Assy Bobbin Assy KC90325/KC90207
	273-90002	Cover, Generator (Bottom) KD90198	Next Higher Assy Setback Generator Assembly KD90830/KD90200
	273-50003	<u>DIES</u> Progressive Armature Body KC90203	Next Higher Assy Setback Generator Assembly KD90830/KD90200
	273-50004	Bumping Die KC90203	Same as 273-50003
	273-70001	<u>PROJECTION CHARTS</u> Projection Chart KC90205	Used for Inspection of Shear Disc.

APPENDIX D
DEMONSTRATION TEST REPORT
PART A

BULOVASYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

TO:

UNITED STATES ARMY ARMAMENT
R & D COMMAND

DOCUMENT NO.

330-043-1

DATE 29 SEPTEMBER 1983

PROGRAM

M509A2E1 M.M. & T.

PURCHASE ORDER

PRIME CONTRACT

DAAK10-80-C-0183

SUBJECT

DEMONSTRATION TEST REPORT PHASE A
FACILITIZATION OF THE MAGNETIC
POWER SUPPLY ASSEMBLY OF THE
M509A2E1 PIBD FUZE

P/O CDRL ITEM: A014

PREPARED BY:

Irwin Podbielak
Reliability Engineer

APPROVED BY:

A. Koul
Quality Control Manager

APPROVED BY:

M. Moskowitz
Project Engineer

APPROVED BY:

B. Garfinkel
Director of Quality

APPROVED BY:

S. B. Schulman
Mgr. Special Devices Dept.

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DATE	APVL	1	2	3	4	5	6	7	8	9	10	11	1	30	14	15	16	17	18	19	21	22	23	24	25	26	27	28	29
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BULOVA

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

SHEET

330-043-1

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1.0 SCOPE

1.1 THIS DOCUMENT IS THE BULOVA SYSTEMS AND INSTRUMENTS CORPORATION (BSIC) DEMONSTRATION TEST REPORT, CDRL ITEM A014, PREPARED FOR THE M.M.& T. PROGRAM OF THE M509A2E1 BASE DETONATING ELEMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT DAAK10-80-C-0183. THIS REPORT MEETS THE REQUIREMENTS OF DATA ITEM DI-T-1906.

2.0 GENERAL

2.1 THE TEST DEMONSTRATION (PHASE - A) WAS PERFORMED TO VERIFY THE CAPABILITY OF THE FIXTURES AND TEST EQUIPMENT TO MANUFACTURE SET-BACK GENERATORS FOR THE M509A2E1 BASE ELEMENT.

2.2 THE PHASE A TEST WAS DEMONSTRATED DURING JUNE 20TH THROUGH THE 22ND. PERSONNEL IN ATTENDANCE INCLUDED:

BSIC

M.MOSKOWITZ - PROJ. ENG.

R.KNIGHT - Q.C. ENGINEER

B.PATTERSON - PROJ.ENG.

I.PODBIELAK - REL.ENG.

T.HARGARTHER - IND.ENG.

* NUMEROUS INSP. PERSONNEL

ARRADCOM

R.NOBLE - PROJ. ENGINEER

J.BEDNARZ - PROD.ASSUR.ENG.

R.PITMAN - PROJ. ENGINEER

2.3 THE TEST SAMPLE WAS BUILT AND TESTED IN ACCORDANCE WITH BSIC DEMONSTRATION TEST PLAN, CDRL ITEM A013. THE SAMPLE QUANTITY PROCESSED WAS TWO LOTS OF (130) UNITS EACH, FOR A TOTAL OF (260) UNITS. BSIC STATIONS 1 THROUGH 8 WERE USED FOR PHASE A OF THE DEMONSTRATION PLAN.

3.0 APPLICABLE DOCUMENTS

3.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION.

BSIC

330-017	DEMONSTRATION TEST PLAN
330-028	S.B.G. ACCEPTANCE TEST PROCEDURE
330-029	S.B.G. CHARGE PROCEDURE
330-030	S.B.G. MAGNETIC LEAKAGE
330-037	CONTINUITY TEST PROCEDURE
330-036	WIRE WINDING PROCEDURE
330-039	PROCESS SPECIFICATION/WELDING TERMINALS
S.B.GEN	DATA SHEETS
S.B.GEN	TRAVELLER

4.0 SUMMARY

THE DEMONSTRATION TEST OF THE SET-BACK GENERATORS WHICH WERE BUILT USING M.M.&T. TEST FIXTURES WAS PERFORMED TO VERIFY THE CAPABILITY OF THE M.M.&T. FIXTURES AND TEST EQUIPMENT.

THE DEMONSTRATION TEST VERIFIED THAT THESE FIXTURES AND EQUIPMENT ARE CAPABLE OF MANUFACTURING SET-BACK GENERATORS TO THE LATEST REVISION OF THE M509A2E1 DRAWINGS.

THE TEST ALSO DEMONSTRATED THAT NOT ONLY ARE THE FIXTURES CAPABLE OF MANUFACTURING S.B. GENERATORS WHICH MEET BSIC SPECIFICATIONS, BUT ARE ALSO CAPABLE WITH ONE PROCESS CHANGE OF MEETING THE MANUFACTURING RATE OF 10,000 UNITS PER MONTH, SPECIFIED IN THE STATEMENT-OF-WORK AND CONTRACT DAAK-10-80-C-0183.

4.1 DESCRIPTION OF SAMPLES

THE DEMONSTRATION SAMPLES WERE MANUFACTURED ON THE PRODUCTION TOOLING AND EQUIPMENT DEVELOPED FOR THE M509A2E1 M.M.&T. PROGRAM.

THE (260) SAMPLES PRODUCED DURING THE PHASE "A" DEMONSTRATION CONSISTED OF THE LATEST REVISION OF SET-BACK GENERATORS PART NUMBER KD90830.

4.2 DISPOSITION OF TEST SPECIMENS

AT THE COMPLETION OF THE PHASE "A" DEMONSTRATION, THE (260) SAMPLES WERE PLACED UNDER THE CONTROL OF QUALITY CONTROL. THESE SAMPLES SHALL BE MAINTAINED BY QUALITY CONTROL UNTIL SUCH TIME AS THE PHASE "B" DEMONSTRATION COMMENCES. AT THAT TIME THE SET-BACK GENERATORS SHALL BE USED AS PART OF THE MANUFACTURE OF COMPLETE M509A2E1 BASE DETONATOR ELEMENTS.

4.3 CONCLUSIONS AND RECOMMENDATIONS

THE EQUIPMENT AND TOOLING DESIGNED FOR THE M509A2E1 B.D.E. PRODUCED (260) SET-BACK GENERATORS WHICH MET ALL REQUIRED PARAMETERS.

THE DESIGN OF THE EQUIPMENT FOR THIS CONTRACT REQUIRED THAT THE EQUIPMENT BE CAPABLE OF PRODUCING A MINIMUM OF 10,000 UNITS PER MONTH OR 63 UNITS PER HOUR. ALTHOUGH THE DESIGN OF THE FIXTURES AND TEST EQUIPMENT PRODUCED HIGH QUALITY UNITS (ONLY 5 REJECTS OUT OF 265 UNITS BUILT FOR A REJECT RATE OF 1.8%), THERE WAS ONLY ONE MANUFACTURING OPERATION (WIRE STRIPPING OF COIL ASSEMBLIES) WHICH WAS SLOWER THAN ALL OF THE OTHER OPERATIONS BASED ON THE RUNNING TIME DATA SHEETS. THE AVERAGE STRIPPING RATE WAS DETERMINED TO BE 60 UNITS

PER HOUR. THIS OPERATION PROVED TO BE THE WORST CASE LIMIT OPERATION.

OUR RECOMMENDATIONS, THEREFORE, ARE TO REVISE THE WELDING METHOD USED TO WELD THE COIL ASSEMBLY TERMINALS. WE RECOMMEND THAT THE WELDING TECHNIQUE BE REVISED TO A METHOD WHICH CAN WELD THROUGH THE WIRE VARNISH INSULATION, THEREBY DELETING THE REQUIREMENT TO STRIP THE INSULATION FROM THE ENDS OF THE COIL ASSEMBLY.

IF THIS PROCEDURE IS REVISED AS RECOMMENDED, THE OUTPUT RATE WILL BE MORE THAN REQUIRED TO MEET THE 10,000 UNITS PER MONTH RATE.

4.4 DATA SUMMARY

THE TRAVELER AND DATA SHEETS HAVE BEEN ANALYZED. THE ANALYSIS INDICATES THAT THE PRESENT OUTPUT QUALITY LEVEL OF THE DEMONSTRATION UNITS PRODUCED ON THE M.M. & T. FIXTURES AND EQUIPMENT IS ADEQUATE FOR HIGH VOLUME MANUFACTURE DURING THIS PHASE OF THE PROGRAM.

TABLE-1 AND TABLE-2 ENCLOSED HEREIN SUMMARIZE THE DATA IN GRAPHICAL FORMAT FOR EASE OF READING. THE ACTUAL DATA IS ATTACHED AND MAY BE FOUND IN APPENDIX.

4.5 DESCRIPTION OF EQUIPMENT

A LIST AND DESCRIPTION OF ALL EQUIPMENT USED TO MANUFACTURE AND TEST SET-BACK GENERATORS FOR THE M509A2E1 BASE DETONATING ELEMENT IS AVAILABLE TO THE READER.

THE DATA CAN BE FOUND IN THE APPENDIX OF THIS DOCUMENT.

4.6 TEST PROCEDURES

THE FOLLOWING IS A LIST OF THE APPLICABLE TEST PROCEDURES, WHICH HAVE BEEN ENCLOSED IN THIS APPENDIX. THE PROCEDURES HAVE BEEN ENCLOSED FOR INFORMATIONAL PURPOSES.

330-028

330-030

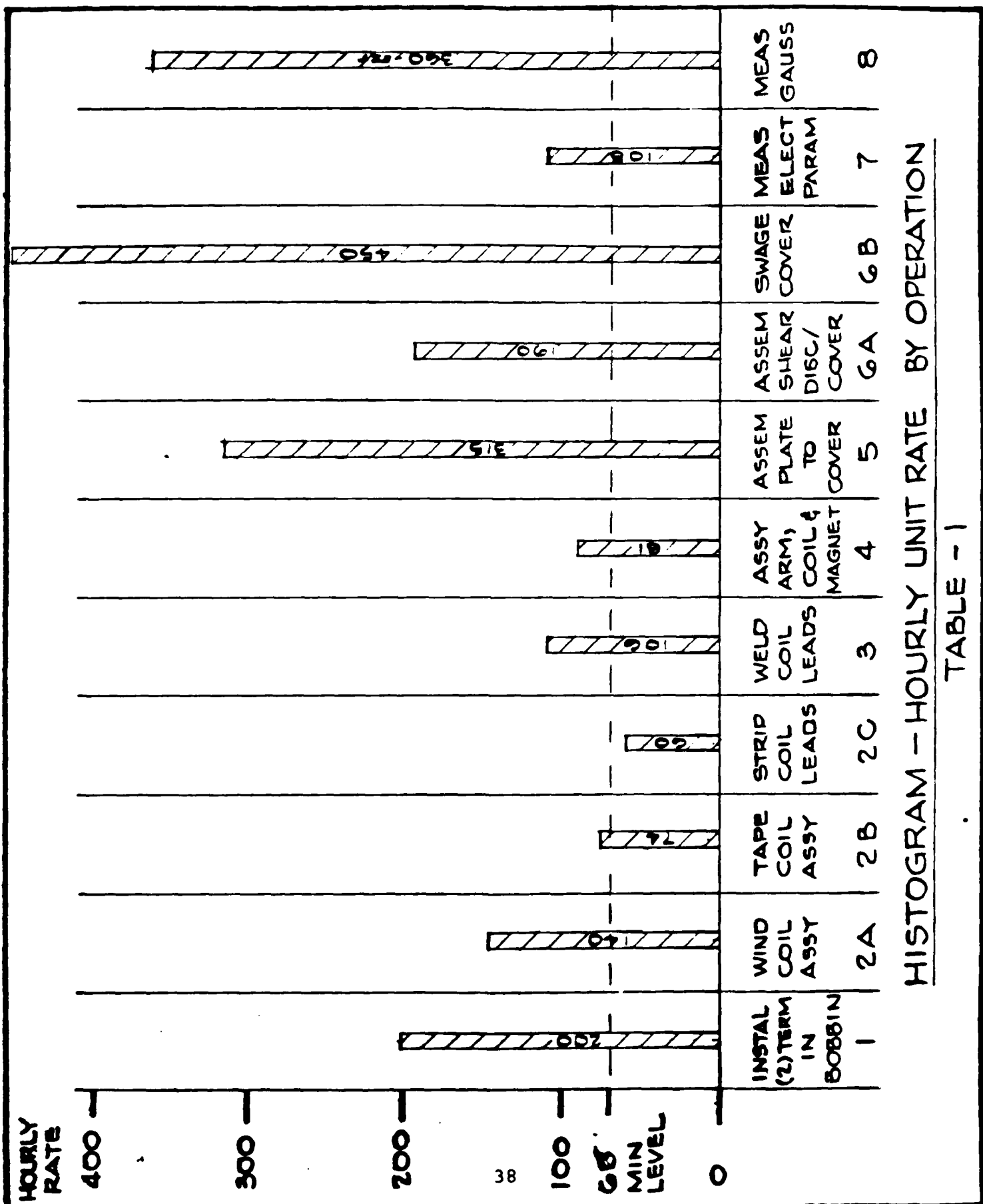
330-029

4.7 DATA SHEETS

A COPY OF EACH DATA SHEET USED FOR RECORDING THE RATE PER HOUR OF MANUFACTURE FOR EACH OPERATION HAS BEEN ENCLOSED IN THE APPENDIX.

THE APPENDIX ALSO CONTAINS A COPY OF THE TRAVELLER INDICATING THE STATUS OF THE (UNITS) SET-BACK GENERATORS ALL THROUGH MANUFACTURE.

APPENDIX



HISTOGRAM - HOURLY UNIT RATE BY OPERATION

TABLE - 1

% DEFECTIVE	0	0	0	0	0	0	.3	0	0	0	0	0	1.1	.3
QTY REJECT	0	0	0	0	0	0	1	0	0	0	0	0	3	1
LOT QTY END	480	265	265	265	265	264	264	264	264	264	264	264	262	270
LOT QTY START	480	265	265	265	265	265	265	264	264	264	264	264	265	271
DESCRIPTION	39 INSTAL (2)TERM IN BOBBIN	WIND COIL ASSY	TAPE COIL ASSY	STRIP COIL LEADS	WELD COIL LEADS	ASSEM ARM, COIL & MAGNET	ASSEM PLATE TO COVER	ASSEM SHEAR DISC TO COVER	SWAGE COVER	MEAS. ELECT PARAM	MEAS GAUSS			
STATION	1	2A	2B	2C	3	4	5	6A	6B	7	8			

QUALITY - PERCENTAGE DEFECTS BY OPERATION

TABLE - 2

LIST AND DESCRIPTION OF EACH STATION

STA #	TOOL NUMBER	DESCRIPTION
1	273-19006	AIR-PRESS W/SLIDING ANVIL FIXT. FOR INSTALLING TERMINALS INTO BOBBIN
1	273-60009	PIN-PULL TESTER: TESTS TERMINAL STRENGTH IN BOBBIN
2	273-19002	COIL WINDING MACHINE, CUSTOMIZED, INCLUDING WIRE TENSIONING DEVICE
	273-19003	TO CONTROL WIRE FEED FOR MANUFACTURE OF SETBACK GENERATOR COILS
	BW-157349	
2	273-19008	STORAGE TRAY, PEG BOARD FOR COIL ASSEMBLIES
2	273-19007	HOLDING FIXTURE TO SUPPORT AND ROTATE COIL ASSY DURING TAPE APPLICATION
3	BW-158862	WELDING MACHINE, FOR WELDING SETBACK GENERATOR COIL WIRES TO TERMINALS
3	273-19010	SPECIAL WELDING ELECTRODES
3	273-19011	SPECIAL WELDING FIXTURE WITH ELECTRODES TO POSITION SETBACK GENERATOR FOR WELDING
3	273-60007	WELD TEST FIXTURE USED TO MEASURE WELD STRENGTH
3	273-60004	A CONTINUITY TESTER TO MEASURE COIL RESISTANCE
3	273-60010	A POLARIZATION TESTER USED TO ESTABLISH COIL DIRECTION AND START LEAD OF SETBACK GENERATOR
4	273-19013	AIR CYLINDER & PRESS IN FIXTURE - FOR PRESS FIT ARMATURE PLATE INTO ARMATURE BODY
4	273-19014	STORAGE TRAY FOR ARMATURE SUB. ASSEMBLY
5	273-19015	AIR CYLINDER AND PRESS IN FIXTURE FOR PRESSING SHEAR DISC INTO GENERATOR COVER

STA #	TOOL NUMBER	DESCRIPTION
6	273-19016	AIR CYLINDER AND PRESS IN FIXTURE FOR PRESSING SUB ASSEMBLY COVER INTO SUB ASSEMBLY
6	273-19017	AIR-PRESS AND TOOLING TO SWAGE ARMATURE BODY 360 DEGREES
7	273-60002	SETBACK GENERATOR, TO
	60003	MEASURE R/L AND INSULATION RESISTANCES
	60006	
	60008	
8	273-19001	MAGNETIC CHARGER, CHARGING FIXTURE AND TRAY USED TO CHARGE MAGNET OF SETBACK GENERATOR
8	273-60001	GAUSSMETER AND FIXTURE TO MEASURE LEAKAGE FLUX OF CHARGED GENERATOR

APPENDIX E
ACCEPTANCE TEST PROCEDURE
FOR
SETBACK GENERATOR ASSEMBLY

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION**
VALLEY STREAM, NEW YORK

TO:

DOCUMENT NO.

330-028

DATE 31 MAY-1983

PROGRAM M. M. & T. - M. P. S.
M509A2E1 B. D. E.

PURCHASE ORDER

PRIME CONTRACT

DAAK10-80-C-0183

SUBJECT

ACCEPTANCE TEST PROCEDURE

SETBACK GENERATOR ASSEMBLY

KD90830

PREPARED BY:

Irwin Podbielak
Reliability Engineer

APPROVED BY:

A. Koul
Quality Control Manager

APPROVED BY:

M. Moskowitz
Project Mgr. M. M. & T.

APPROVED BY:

B. Garfinkel
Director of Quality

APPROVED BY:

S. B. Schulman
Mgr. Special Devices Dept.

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DATE	APVL	1	2	3	4	5	6	7	8	9	10	11	'46	'14	15	16	17	18	19	21	22	23	24	25	26	27	28	29
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BULOVA

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

SHEET

330-028

1.0 SCOPE

- 1.1 THIS DOCUMENT DEFINES THE BSIC ACCEPTANCE TEST PROCEDURE WHICH SHALL BE ADHERED TO WHEN VERIFYING THE INSULATION RESISTANCE, RESISTANCE AND INDUCTANCE OF THE SETBACK GENERATOR PART NUMBER KD90830.

2.0 APPLICABLE DOCUMENTS

- 2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENT(S), THIS DOCUMENT SHALL GOVERN.

BSIC

KD90830	SETBACK GENERATOR ASSEMBLY
273-60006	FINAL ASSY TESTER, S.B. GENERATOR

3.0 REQUIREMENTS

3.1 MATERIAL

KD90830	SETBACK GENERATOR ASSEMBLY
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3.2 EQUIPMENT

273-60006	FINAL ASSY TESTER, S.B. GENERATOR
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4.0 PROCEDURE

- 4.1 THE SETBACK GENERATOR ASSEMBLY SHALL BE COMPLETE IN ACCORDANCE WITH THE REQUIREMENTS OF DOCUMENT KD90830.
- 4.2 EVERY UNIT SHALL BE TESTED IN ACCORDANCE WITH THIS DOCUMENT USING SETBACK GENERATOR FINAL ASSEMBLY TESTER 273-60006.

CAUTION: THE USE OF THIS FIXTURE INVOLVES HIGH VOLTAGE. DO NOT TOUCH THE TEST SOCKET OR S.B. GENERATOR DURING TESTING. SET THE MEASURE-CHARGE-DISCHARGE SWITCH ON THE MEGOHMMETER TO THE DISCHARGE POSITION.

47

- 4.3 ACTIVATE MAIN PANEL POWER SWITCH AND THE POWER SWITCH ON EACH OF THE THREE METERS TO THE ON POSITION.
- 4.4 ACTIVATE THE HOME SWITCH ON THE MAIN PANEL. THE NUMBER-1 LED ON THE MAIN PANEL SHOULD BE LIT. THE MEGOHMMETER IS CONNECTED TO THE TEST SOCKET IN THIS POSITION.
- 4.5 INSERT A SETBACK GENERATOR UNDER TEST INTO THE TEST SOCKET.
- 4.6 SET THE VOLTAGE SELECTOR KNOB ON THE MEGOHMMETER TO 200 VOLTS AND THE DIAL SELECTOR TO THE 100 MEGOHM POSITION.
- 4.7 ACTIVATE THE MEASURE-CHARGE-DISCHARGE SWITCH TO THE MEASURE POSITION. THE MEGOHMMETER DIAL SHALL INDICATE 5 (500 MEGOHMS) OR HIGHER. SET THE MEASURE-CHARGE-DISCHARGE SWITCH BACK TO DISCHARGE (SAFE) POSITION.
- 4.8 ACTIVATE THE STEP SWITCH ON THE MAIN PANEL TWICE. LED NUMBER-3 SHOULD BE LIT INDICATING THAT THE TEST UNIT IS NOW CONNECTED TO THE DIGITAL MULTIMETER. WITH THE MULTIMETER RANGE SELECTORS IN THE DC, K OHM AND THE SCALE FACTOR ON 200 OHMS THE MULTIMETER SHOULD INDICATE BETWEEN 40 AND 50 OHMS.
- 4.9 ACTIVATE THE STEP SWITCH ONCE. LED NUMBER 4 SHOULD BE LIT INDICATING THAT THE TEST UNIT IS NOW CONNECTED TO THE DIGIBRIDGE.

4.10 ACTIVATE THE L (INDUCTANCE) SWITCH AND LOW RANGE SWITCH ON THE DIGIBRIDGE. THE DIGIBRIDGE SHOULD INDICATE BETWEEN 7 AND 8 MILLIHENRY.

4.11 REMOVE UNIT UNDER TEST FROM TEST SOCKET.

5.0 PRODUCE ASSURANCE

5.1 ANY UNIT NOT MEETING THE REQUIREMENTS OF THIS DOCUMENT SHALL BE REJECTED.

APPENDIX F
MAGNETIC CHARGING PROCEDURE
FOR
SETBACK GENERATOR

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION**
VALLEY STREAM, NEW YORK

TO:

DOCUMENT NO.
330-029

DATE 2 JUNE 1983

PROGRAM M. M. & T. M. P. S.
M509A2E1 - B. D. E.

PURCHASE ORDER

PRIME CONTRACT
DAAK10-80-C-0183

SUBJECT

SETBACK GENERATOR P/N KD 90830

MAGNETIC CHARGING PROCEDURE

PREPARED BY: _____

Irwin Podbielak
Reliability Engineer

APPROVED BY: _____

A. Koul
Quality Control Manager

APPROVED BY: _____

B. Garfinkel
Director of Quality

APPROVED BY: _____

M. Moskowitz
Project Mgr. M. M. & T.

APPROVED BY: _____

S. B. Schulman
Mgr. Special Devices Dept.

1.0 SCOPE

- 1.1 THIS DOCUMENT DEFINES THE PROCEDURE WHICH SHALL BE ADHERED TO WHEN MAGNETIZING THE SETBACK GENERATOR PART NUMBER KD90830.

2.0 APPLICABLE DOCUMENTS

- 2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENTS, THIS DOCUMENT SHALL GOVERN.

BSIC

KD90830

SETBACK GENERATOR

3.0 REQUIREMENTS

3.1 MATERIALS

KD90830

SETBACK GENERATOR

3.2 EQUIPMENT

159963

CHARGING STATION, RFL INDUSTRIES
MODEL 1500

4.0 PRELIMINARY

(CAUTION !! REMOVE WRIST WATCHES)

- 4.1 TURN CHARGING STATION ON BY ACTIVATING EQUIPMENT ON/OFF SWITCH TO ON POSITION. SET CHARGING VOLTAGE ON/OFF SWITCH TO HIGH POSITION.

5.0 PROCEDURE

- 5.1 INSTALL SETBACK GENERATORS KD90830 TO BE CHARGED INTO THE CHARGING FIXTURE HOLDER, TERMINALS UP. THIS FIXTURE CONSISTS OF TWO LAYERS HOLDING 15 UNITS PER LAYER. EACH LAYER IS MADE OUT OF TEFLON AND HAS 15 HOLES APPROXIMATELY

THE SIZE OF THE SETBACK GENERATOR. LOCK THE TOP AND BOTTOM LAYER TOGETHER FINGER TIGHT, WITH THE KNURLED SCREW. THERE SHOULD BE NO SPACE BETWEEN THE TOP AND BOTTOM LAYER.

5.2 PLACE THE CHARGING FIXTURE HOLDER INTO THE CHARGING FIXTURE HOLDER CAVITY AND SLIDE THE TOP COVER OF THE CAVITY CLOSED.

5.3 PUSH THE "PUSH-TO-CHARGE" BUTTON. THE D.C. VOLTMETER SHOULD DROP SHARPLY TOWARD ZERO AND THEN RECOVER TO APPROXIMATELY 1300 VOLTS.

5.4 AFTER METER RETURNS TO APPROXIMATELY 1300 VOLTS REPEAT STEPS 5.3.

5.5 REMOVE SETBACK GENERATORS BY SLIDING BACK THE CAVITY COVER. REMOVE THE CHARGING FIXTURE HOLDER. UNSCREW THE KNURLED SCREW AND REMOVE THE SETBACK GENERATORS FROM THE CHARGING FIXTURE HOLDER.

5.6 VERIFICATION OF SETBACK GENERATOR CHARGE SHALL BE ASCERTAINED BY MEASURING THE SETBACK GENERATOR IN ACCORDANCE WITH ACCEPTANCE TEST PROCEDURES, DOCUMENT NUMBER 330-030.

6.0 PRODUCT ASSURANCE

6.1 VERIFY THAT CHARGING STATION IS CALIBRATED BEFORE USE.

APPENDIX G
ACCEPTANCE TEST PROCEDURE
FOR
GAUSS CHARGE VERIFICATION

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION**
VALLEY STREAM, NEW YORK**TO:****DOCUMENT NO.**

330-030

DATE 14 June 1983**PROGRAM** M. M. & T. - M. P. S.
M509A2E1 B. D. E.**PURCHASE ORDER****PRIME CONTRACT**

DAAK10-80-C-0183

SUBJECT

GAUSS CHARGE VERIFICATION

ACCEPTANCE TEST PROCEDURE

PREPARED BY: _____Irwin Podbielak
Reliability Engineer**APPROVED BY:** _____A. Koul
Quality Control Manager**APPROVED BY:** _____M. Moskowitz
Proj. Mgr. M. M. & T.**APPROVED BY:** _____B. Garfinkel
Director Of Quality**APPROVED BY:** _____S. B. Schulman
Mgr. Special Devices

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BULOVA

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

SHEET

330-030

1.0 SCOPE

1.1 THIS DOCUMENT DEFINES THE TEST PROCEDURE WHICH SHALL BE ADHERED TO IN PERFORMING A VERIFICATION OF GAUSS CHARGE LEVEL OF A SETBACK GENERATOR ASSEMBLY KD 90830.

2.0 APPLICABLE DOCUMENTS

2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENTS, THIS DOCUMENT SHALL GOVERN.

BSIC

KD 90830
273-60001

SETBACK GENERATOR ASSEMBLY
GAUSSMETER

3.0 REQUIREMENTS

3.1 MATERIAL

KD 90830

SETBACK GENERATOR ASSEMBLY

3.2 EQUIPMENT

273-60001

GAUSSMETER, RFL MODEL 750AR

4.0 PROCEDURE

- 4.1 VERIFY CALIBRATION, EACH TIME THE OPERATOR STARTS TO MEASURE A LOT.
- 4.2 TURN POWER SWITCH ON GAUSSMETER MODEL 750 AR TO ON.
- 4.3 WAIT THREE MINUTES FOR GAUSSMETER TO STABILIZE. SET GAUSS FULL SCALE SWITCH TO CAL POSITION. THE METER SHOULD INDICATE CAL AT THE RIGHT END OF THE DIAL. ADJUST IF NECESSARY USING THE CAL KNOB. (THE INNER KNOB OF THE DUAL KNOB CONTROL)
- 4.4 SET THE GAUSS FULL SCALE KNOB TO THE 200 POSITION SET THE
OPERATOR - STANDARD GENERATOR INTO THE HOLDING FIXTURE.
- 4.5 THE METER SHALL INDICATE BETWEEN PLUS AND MINUS 5 GAUSS OF THE OPERATOR STANDARD GENERATOR. (LEVEL MARKED)
- 4.6 IF THE METER INDICATION IS WITHIN ± 5 GAUSS OF THE ESTABLISHED STANDARD REMOVE THE STANDARD AND TEST EACH UNIT UNDER TEST BY SETTING IT INTO THE HOLDING FIXTURE AND READING THE GAUSS LEVEL
- 4.7 IF THE METER INDICATION IS NOT WITHIN ± 5 GAUSS OF THE ESTABLISHED STANDARD LEVEL, DO NOT PROCEED WITH TESTING. CALIBRATION PERSONNEL SHALL RECALIBRATE THE GAUSSMETER IN ACCORDANCE WITH THE OPERATOR MANUAL.

5.0 QUALITY CONTROL

5.1 ANY UNIT NOT MEETING THE REQUIREMENTS OF THIS
DOCUMENT SHALL BE REJECTED.

APPENDIX H
TRAVELER
FOR
DEMONSTRATION TEST PLAN
PART A

M509A2E1 BDE CONFIGURATION - DEMONSTRATION TEST PLAN TRAVELER

WEEK ENDING 9/24/83 AND 9/30/83

STA #	WEEK ENDING	ASSY #	DESCRIPTION	LOT #	QTY MADE	QTY SAMPLED	QTY ACCEPT	QTY REJECT	SIG	MFG/INSP	DATE	REMARKS
1	KC90825		BOBBIN ASSY	1 2 3 4	100 120 120 120					MFG		1 9/5 101209 2 9/5 101209 3 9/5 101209 4 9/5 101209
1	KC90825		INSPECT	1 2 3 4	120 120 120 120	20/5	120	0	0	INSP		1 9/5 59878 2 9/5 59878 3 9/5 59878 4 9/5 59878
2	KC90829		WIND COIL ASSY	1 2	130 135					MFG		1 9/5 101208 2 9/5 101210
3	KC90829		WELD & TEST							MFG		
3	KC90829		INSPECT	1 2	130 135	20/5	130 134	0	1	INSP		1 9/5 67561 2 9/5 67563
4	KD90830		S.B. GEN ASSY	1 2	130 135					MFG		1 9/5 101209 2 9/5 101211
5	P/O		PRESS FIT SHEAR PLATE							MFG		
6	KD90830		ASSY DISC & SWAGE COVER							MFG		
7	P/O		A-T-P IR-R-L INSPECT	1 2	130 135	130 135	127 135	3	0	INSP		1 9/5 67562 2 9/5 67604
8	KD90830		MAGNETIZE S.B. GEN		6		6	0	0	MFG		9/5 101210 9/5 67509
8	KD90830		MEASURE GAUSS	1 2	130 135 6	130 135	130 134 6	1	0	INSP		COMPLETES DEMO PLAN
8	KD90830		AIR SEAL TEST		24	24 6	24 6	1	0	INSP		P/O PIP TOOL-ING NOT PART OF DEMO/PLAN 9/5 101212 9/5 67509

DATA

REVIEWED

ENG

RSIC

DATE

QC

DATE

ARRADCOM REP

DATE

ARRADCOM

9/5/83

Bentley

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

APPENDIX I
SAMPLE DATA COLLECTION FORM
PART A

INSTALLATION		STATION NO.		DATA COLLECTION		NO. UNITS PRODUCED		REMARKS		REMARKS		REMARKS	
OPERATION		EVENT CODE		DURATION		START TIME OF SHIFT		END TIME OF SHIFT		DATE		TIME	
OPERATION		EVENT CODE		DURATION		START TIME OF SHIFT		END TIME OF SHIFT		DATE		TIME	
OPERATION		EVENT CODE		DURATION		START TIME OF SHIFT		END TIME OF SHIFT		DATE		TIME	
INSTALL (2) TERMINAL PINS IN BOSSIN		1		8:00 AM		4:45 PM		186		480		0	
START LOT 1 (120 PCS)		1		10:00		10:00		10:00		10:00		10:00	
COMPLETE LOT 1		1		10:00		10:00		10:00		10:00		10:00	
START LOT 2 (120 PCS)		2		10:00		10:00		10:00		10:00		10:00	
COMPLETE LOT 2		2		10:00		10:00		10:00		10:00		10:00	
START LOT 3 (120 PCS)		3		10:00		10:00		10:00		10:00		10:00	
BREAK MORNING		3		10:00		10:00		10:00		10:00		10:00	
RESUME OPERATION		3		10:00		10:00		10:00		10:00		10:00	
COMPLETE LOT 3		3		10:00		10:00		10:00		10:00		10:00	
START LOT 4 (120 PCS)		4		10:00		10:00		10:00		10:00		10:00	
COMPLETE LOT 4		4		10:00		10:00		10:00		10:00		10:00	

1. END OF SHIFT
2. BREAK/LUNCH
3. CONNECTIVE MAINTENANCE
4. END OF TEST

5. PREVENTIVE MAINTENANCE
6. ADMINISTRATIVE (STATE REASON)
7. ARRADCOM RESERVED
8. OPERATIONAL DOWNTIME (FOOL CHASER)

MP - MAINTENANCE PERSONNEL

Signature: Thomas W. Hargraves
TYPE NAME: THOMAS HARGRAVES

APPENDIX J
DEMONSTRATION TEST REPORT
PART B

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION**
VALLEY STREAM NEW YORK

TO:

UNITED STATES ARMY ARMAMENT

R & D COMMAND

DOCUMENT NO.

330-043-2

DATE 30 SEPTEMBER 1983

PROGRAM

M509A2E1 - M.M. & T.

PURCHASE ORDER

PRIME CONTRACT

DAAK10-80-C-0183

SUBJECT

DEMONSTRATION TEST REPORT PHASE B
FACILITIZATION OF THE MAGNETIC POWER
SUPPLY ASSEMBLY OF THE M509A2E1 PIBD FUZE

P/O CDRL ITEM: A014

PREPARED BY:

Irwin Podbielak
Reliability Engineer

APPROVED BY:

A. Koul
Quality Control Manager

APPROVED BY:

M. Moskowitz
Project Eng. M.M. & T.

APPROVED BY:

B. Garfinkel
Director of Quality

APPROVED BY:

S. B. Schulman
Mgr. Special Devices Dep.

[illegible]

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1.0 SCOPE

1.1 THIS DOCUMENT IS THE BULOVA SYSTEMS AND INSTRUMENTS CORPORATION (BSIC) DEMONSTRATION TEST REPORT, P/O CDRL ITEM A014, PREPARED FOR THE M.M.& T. PROGRAM OF THE M509A2E1 BASE DETONATING ELEMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT DAAK10-80-C-0183. THIS DOCUMENT IS THE SECOND HALF OF THE DEMONSTRATION TEST (PHASE B) TEST REPORT. THE COMBINED DOCUMENTS 340-043-1 AND 340-043-2 FORM THE COMPLETE DEMONSTRATION TEST REPORT. THIS REPORT MEETS THE REQUIREMENTS OF DATA ITEM DI-T-1906 CITED IN THE CDRL ITEM.

2.0 GENERAL

2.1 THE TEST DEMONSTRATION, PHASE - B WAS PERFORMED TO VERIFY THE CAPABILITY OF THE FIXTURES AND TEST EQUIPMENT TO MANUFACTURE M509A2E1 BASE ELEMENTS. THE PHASE B DEMONSTRATION STARTED AT THE COMPLETION OF THE SET-BACK GENERATOR (STATION 8) AND CONTINUED THROUGH THE COMPLETE BASE ELEMENT (STATION 23).

2.2 THE PHASE B TEST WAS DEMONSTRATED DURING THE MONTH OF SEPTEMBER 1983. PERSONNEL IN ATTENDANCE INCLUDED:

BSIC

M.MOSKOWITZ - PROJ. ENG.
K.KNIGHT - Q.C. ENGINEER
B.PATTERSON - PROJ.ENG.
I.PODBIELAK - REL.ENG.
T.HARGARTHER - IND.ENG.

ADDITIONAL INSPECTION PERSONNEL

ARRADCOM

R.NOBLE - PROJ. ENGINEER
J.BEDNARZ - PROD.ASSUR.ENG.
R.PITMAN - PROJ. ENGINEER

2.3 THE PHASE B TEST SAMPLE WAS BUILT AND TESTED IN ACCORDANCE WITH BSIC DEMONSTRATION TEST PLAN, CDRL ITEM A013. THE SAMPLE QUANTITIES PROCESSED VARIED IN ACCORDANCE WITH:

S2 CONTACT ASSEMBLY	260
S2 SWITCH ASSEMBLY	480
MAGNETIC POWER SUPPLY	263
HOUSING PIN & CONTACT ASSEMBLY	291
MOLDED ASSEMBLY HOUSING	162
DELIVERED AIR-GUN UNITS	50

IT SHOULD BE NOTED THAT MANY ASSEMBLIES WERE PRODUCED AT QUANTITIES FAR IN EXCESS OF THOSE REQUIRED FOR THE 50 DELIVERABLE UNITS, DUE TO THE OPERATING SPEED OF THE TOOLING AND FIXTURES.

3.0 APPLICABLE DOCUMENTS

3.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION:

BSIC

330-033	ENCAPSULATION PROCEDURE
330-034	FINAL ELECTRICAL COMPONENT TEST
330-035	ENCAPSULATION PROCESS
330-040	WAVE SOLDERING PROCESS SPECIFICATION
330-042	VAPOR DEGREASER PROCESS SPECIFICATION
DATA SHEETS	DATA SHEETS - PHASE B B.D.E.
TRAVELLER	TRAVELLER - PHASE B B.D.E.

4.0 SUMMARY

THE PHASE B DEMONSTRATION TEST OF THE BASE DETONATING ELEMENTS (LESS THE SET-BACK GENERATORS WHICH WERE BUILT DURING PHASE A DEMONSTRATION TEST) WERE BUILT USING M.M. & T. TEST FIXTURES TO VERIFY THE CAPABILITY OF THE M.M. & T. FIXTURES AND TEST EQUIPMENT.

THE DEMONSTRATION TEST VERIFIED THAT THE FIXTURES AND EQUIPMENT ARE CAPABLE OF MANUFACTURING BASE DETONATING ELEMENTS TO THE LATEST REVISION OF THE M509A2E1 DRAWINGS.

THE TEST ALSO DEMONSTRATED THAT THE FIXTURES AND EQUIPMENT ARE CAPABLE OF PRODUCING THE B.D. ELEMENTS AT A RATE OF AT LEAST 10,000 PER MONTH, AS SPECIFIED IN THE CONTRACT DAAK10-80C-0183.

4.1 DESCRIPTION OF SAMPLES

THE PHASE B DEMONSTRATION SAMPLES WERE MANUFACTURED ON THE PRODUCTION TOOLING AND EQUIPMENT DEVELOPED FOR THE M509A2E1, M.M. & T. PROGRAM.

THE PHASE A SAMPLES OF THE S.B. GENERATORS WERE USED IN CONJUNCTION WITH THE SAMPLES MANUFACTURED FOR PHASE B BASE DETONATING ELEMENTS.

4.2 DISPOSITION OF SAMPLES

AT THE COMPLETION OF THE PHASE "B" DEMONSTRATION, THE 50 AIR-GUN CONFIGURATION LD-90230-7 BASE DETONATING ELEMENTS WERE DELIVERED TO ARRADCOM. THE REMAINDER OF THE PHASE B DEMONSTRATION MATERIAL WHICH WAS NOT DELIVERED, IS PRESENTLY BEING STORED AT BSIC UNDER THE COGNIZANCE OF THE BSIC GOVERNMENT PROPERTY ADMINISTRATOR.

THIS EQUIPMENT CONSISTS OF 108 ENCAPSULATED UNITS WITHOUT MECHANISM AND 108 ADDITIONAL UNITS WHICH WERE ASSEMBLED BUT NOT ENCAPSULATED. FINAL DISPOSITION INSTRUCTIONS FOR THIS MATERIAL ARE PENDING.

4.3 CONCLUSIONS AND RECOMMENDATIONS

THE EQUIPMENT AND TOOLING DESIGNED AND BUILT FOR THE M509A2E1 M.M. & T. PROGRAM, PRODUCED UNITS WHICH MET ALL FINAL REQUIRED PARAMETERS. FIFTY M509A2E1 BASE DETONATING ELEMENTS (AIR-GUN CONFIGURATION) WERE DELIVERED TO ARRADCOM.

IT SHOULD BE NOTED THAT THE MECHANISM ASSEMBLIES USED WERE SUPPLIED FROM THE M509A2E1 PROGRAM SINCE NO TOOLING WAS INCLUDED IN THE M.M. & T. PROGRAM FOR BUILDING MECHANISMS.

ONE MODIFICATION WAS MADE DURING THE MANUFACTURING CYCLE. THE PRINTED CIRCUIT BOARD (P.C.B.) ASSEMBLIES WERE NOT STAKED INTO THE HOUSINGS. THE P.C.B. USED TO MANUFACTURE THE PART B DEMONSTRATION UNITS WERE NOMINALLY .047 THICK AS PER THE LATEST M509A2E1 AND XM815 CONFIGURATION. THE HOUSINGS USED HOWEVER WERE RELEASED FOR PRODUCTION AND MANUFACTURED DURING 1982. AT THAT TIME FRAME THE P.C.B. CONFIGURATION WAS REQUIRED TO BE .032 THICK. BOTH ARRADCOM AND BSIC WERE AWARE OF THIS CONDITION BEFORE THE START OF THE DEMONSTRATION TEST. WE BELIEVE THAT A LIGHT STAKE WOULD BE POSSIBLE, THEREFORE ARRADCOM DIRECTED BSIC TO PROCEED WITH THE DEMONSTRATION TEST BASED ON THESE BASELINE PARAMETERS. WE SUBSEQUENTLY DETERMINED THAT THE TOLERANCING WAS SUCH THAT EVEN THE LIGHT STAKING WOULD BE DESTRUCTIVE TO THE P.C.B., THEREFORE NO STAKING WAS PERFORMED.

THE TOOLS AND FIXTURES DESIGNED AND BUILT FOR THE M.M. & T. CONTRACT ARE REQUIRED TO BE CAPABLE OF PRODUCING M509A2E1, B.D.E. UNITS AT A MINIMUM RATE OF 63 PER HOUR.

A REVIEW OF THE TRAVELLER AND DATA SHEETS, PROVIDED IN THE APPENDIX, INDICATES THAT THERE ARE PROCESSES WHICH ARE CONSIDERABLY SLOWER THAN THE 63 UNITS PER HOUR REQUIRED.

SOME PROCESSES DID NOT MEET THE 63 UNITS PER HOUR RATE. WE RECOMMEND THAT ADDITIONAL FIXTURES AND PERSONNEL BE EMPLOYED TO MEET THIS REQUIREMENT AS THE PRODUCTION RATE DICTATES. SPECIFICS OF EACH PROCESS MAY BE FOUND IN THE DATA SUMMARY, PARAGRAPH 4.4.

BSIC RECOMMENDS THAT THE M.M. & T. PROGRAM BE EXPANDED TO INCLUDE TOOLING FOR THE MECHANISM ASSEMBLY TO ASSURE TOTAL CAPABILITY COMPLIANCE WITH THE 10,000 B.D.E. UNITS REQUIRED PER MONTH, AND AUTOMATIC INSERTION EQUIPMENT TO LOAD THE COMPONENTS ON THE P.C.B. SHOULD AN INCREASED RATE BECOME NECESSARY.

4.4 DATA SUMMARY

AN ANALYSIS OF THE DATA INDICATES THAT THE FIXTURES AND TOOLING ARE CAPABLE OF PRODUCING M509A2E1 B.D.E. TO THE LATEST REVISION OF THE SPECIFICATION.

THE DATA INDICATES THAT THERE WERE SEVEN PROCESSES WHICH REQUIRED MULTIPLE EQUIPMENT AND OPERATORS.

THESE PROCESSES WERE:

- A INSTALLATION OF S2 CONTACT ASSEMBLY ON THE P.C.B. AT 36/HR.
- B INSTALLATION OF ELECTRONIC COMPONENTS ON THE P.C.B. AT 20/HR.

- C TOUCH UP - P.C.B. AT 40/ HR.
- D PRELIMINARY ENCAPSULATION OF P.S. ASSEMBLY AT 53/
- E ENCAPSULATION OF P.S. AT 20/HR.
- F ATP AT 42/HR.
- G ATP TIMING AT 26/HR.

FROM THE RATES, WHICH WERE ESTABLISHED DURING THE DEMONSTRATION TESTING, WE ARE ABLE TO MAKE THE FOLLOWING DETERMINATION FOR EACH OF THESE PROCESSES.

A. ONE FIXTURE WAS ABLE TO MEET THE RATE OF 5,000 U PER MONTH. A SECOND FIXTURE OR A REDESIGN OF THE WIRE MOUNTING HOLDER ALLOWING THE UNIT TO BE WAVE SOLDERED WOULD MEET 63 UNITS PER HOUR RATE.

B. ONE OPERATOR WAS ABLE TO MOUNT ALL THE COMPONENTS ONTO THE P.C.B. AT A RATE OF 20 UNITS PER HOUR. INCREASE THE RATE TO 63 UNITS PER HOUR WILL REQUIRE (3) OPERATORS. AN ALTERNATIVE PROGRAM TO AUTOMATICALLY INSERT THE COMPONENTS WOULD REDUCE THE REQUIREMENT FOR (3) OPERATORS.

C. TOUCHING UP THE P.C.B. AFTER WAVE SOLDERING WAS PERFORMED AT THE RATE OF 40 PER HOUR. OUR ANALYSIS INDICATES THAT THE TOUCH-UP WAS REQUIRED DUE TO DESIGN OF THE PRESENT P.C.B. WHICH HAS HOLE SIZE OPTIMIZED FOR HAND SOLDERING. WHEN THE P.C.B. DESIGN IS REVISED FOR WAVE SOLDERING THE RATE SHOULD INCREASE TO OVER 63 PER HOUR.

D/E. TO PERFORM ENCAPSULATION OF THE POWER SUPPLY ASSEMBLY AT THE RATE OF 53 UNITS PER HOUR REQUIRE ADDITIONAL FIXTURES AND OPERATORS. AS AN ALTERNATIVE, WE RECOMMEND THAT A REVISED ENCAPSULATION TECHNIQUE BE EMPLOYED.

F. THE ACCEPTANCE TESTING OF THE COMPONENTS IS CONTROLLED AND THE RESULTS PRINTED OUT, BY A MODEL 85 H.P. COMPUTER. A COMPLETE PRINTOUT SLOWS THE TEST CYCLE. WE RECOMMEND THAT A PRINTOUT OF ACCEPT OR REJECT, WITHOUT COMPONENT PARAMETERS BE EMPLOYED, SPEEDING UP THE TEST CYCLE.

G. WE RECOMMEND THAT THE COMPUTER SOFTWARE PROGRAM USED ON THE H.P. MODEL 85 COMPUTER TO EVALUATE AND PROVIDE ACCEPT/REJECT TIMING CRITERIA BE REVISED TO PERFORM THE EVALUATION MORE RAPIDLY.

4.5 DESCRIPTION OF EQUIPMENT

A LIST AND DESCRIPTION OF ALL EQUIPMENT USED TO MANUFACTURE AND TEST M509A2E1 B.D.E. UNITS IS AVAILABLE TO THE READER.

AN UP TO DATE LIST CAN BE FOUND IN THE APPENDIX OF THIS DOCUMENT.

4.6 TEST PROCEDURES

THE FOLLOWING IS A LIST OF THE APPLICABLE TEST PROCEDURES WHICH HAVE BEEN ENCLOSED IN THE APPENDIX. IT SHOULD BE NOTED THAT THE PROCEDURES APPLICABLE TO THE S.B. GENERATOR WERE PREVIOUSLY SUPPLIED IN THE PHASE "A" DEMONSTRATION TEST REPORT DOCUMENT NUMBER 330-043-1. THE PROCEDURES REQUIRED FOR PHASE "B" HAVE BEEN ENCLOSED FOR INFORMATIONAL PURPOSES.

330-034

330-037

330-038

APPENDIX

APPENDIX K
ACCEPTANCE TEST PROCEDURE
FOR
MOLDED HOUSING ASSEMBLY

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION**
VALLEY STREAM, NEW YORK

TO:

UNITED STATES ARMY ARMAMENT

R & D COMMAND

DOCUMENT NO.

330-034

DATE 12 SEPTEMBER 1983

PROGRAM M. M. & T. - M. P. S
M509A2E1 - B. D. E.

PURCHASE ORDER

PRIME CONTRACT

DAAK10-80-C- 0183

SUBJECT

ACCEPTANCE TEST PROCEDURE

COMPONENT TESTING

105 MM

MOLDED HOUSING ASSEMBLY: KD 90852

CDRL: A008

PREPARED BY: _____

Irwin Podbielak
Reliability Engineer

APPROVED BY: _____

A. Koul
Quality Control Manager

APPROVED BY: _____

M. Moskowitz
Proj. Mgr. M. M. & T.

APPROVED BY: _____

B. J. Garfinkel
Director of Quality

APPROVED BY: _____

S. B. Schulman
Mgr. Special Svcs. Dept.

E
D
C
B
A

DATE APVL 1 2 3 4 5 6 7 8 9 10 11 90 14 15 16 17 18 19 21 22 23 24 25 26 27 28 29

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

SHEET

330-034

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1.0 SCOPE

- 1.1 THIS DOCUMENT HAS BEEN PREPARED BY BULOVA SYSTEMS & INSTRUMENTS CORPORATION (BSIC) IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT NO. DAAK10-80-C-0183 FOR THE 105MM BASE ELEMENT AND IS IN COMPLIANCE WITH THE REQUIREMENTS OF CDRL ITEM: A008.
- 1.2 ALL 105MM MOLDED HOUSING ASSEMBLIES SHALL BE SUBJECTED TO AND PASS THE COMPONENT TEST PROCEDURE IN ACCORDANCE WITH THIS DOCUMENT.
- 1.3 THE COMPUTER PRINT-OUT DATA SHEET SHALL BE SERIALIZED AND SIGNED BY THE PERSONNEL PERFORMING THE TEST. THE DATA SHEET SHALL ACCOMPANY THE HARDWARE AS IT PROGRESSES THROUGH THE MANUFACTURING AND TEST PROCESS.

2.0 APPLICABLE DOCUMENTS

- 2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT. IN CASE OF CONFLICT THIS DOCUMENT SHALL GOVERN.

MILITARY

DAAK10-80-C-0183

CONTRACT ARRADCOM, 105MM, B.E.

BSIC

273-60005

TEST CONSOLE, COMPONENT

3.0 EQUIPMENT

273-60005

TEST, CONSOLE, COMPONENT

85

H.P. COMPUTER

4.0 GENERAL

4.1 THIS DOCUMENT DEFINES THE OPERATION OF AN AUTOMATED COMPUTER CONTROLLED TEST SET.

5.0 TEST/START-UP

5.1 ACTIVATE POWER SWITCH ON CONSOLE 273-60005 TO "ON".

5.2 ACTIVATE POWER SWITCH ON MODEL H.P. 85 COMPUTER TO "ON". THE COMPUTER WILL AUTOMATICALLY LOAD.

5.3 COMPUTER SCREEN SHALL INDICATE "SELECT PROGRAM TO BE LOADED", MESSAGE. ACTIVATE COMPUTER "K1" KEY BELOW "M509" MESSAGE.

5.4 WAIT UNTIL "ENTER DATE" MESSAGE APPEARS.

5.5 ENTER DATE OF TEST INTO COMPUTER USING THE FOLLOWING FORMAT. (EXAMPLE-JULY 4, 1983 WOULD BE ENTERED INTO THE COMPUTER AS 07/04/83).

5.6 ACTIVATE "END LINE" KEY ON COMPUTER. "ENTER TIME" MESSAGE APPEARS.

5.7 ENTER TIME OF TEST INTO COMPUTER USING THE FOLLOWING FORMAT. (EXAMPLE - 10.37) ACTIVATE "END LINE" KEY.

5.8 THE MESSAGE ON THE COMPUTER NOW INDICATES "SELECT ONE", "PRINT RUN" OR "STRAIGHT RUN".

5.9 ACTIVATE "K1" KEY ON COMPUTER BELOW "PRINT RUN" MESSAGE. COMPUTER MESSAGE NOW ASKS "WHAT TEST TO BEGIN?"

5.10 ACTIVATE NUMBER # (1) KEY ON COMPUTER.

- 5.11 ACTIVATE "AUTO/MANUAL" SWITCH ON CONSOLE TO "AUTO".
- 5.12 ACTIVATE "END LINE" KEY ON COMPUTER.
- 5.13 INSTALL NEXT UNIT UNDER TEST INTO FIXTURE POSITION IN ACCORDANCE WITH COMPUTER DISPLAY MESSAGE (STATION #1 OR STATION #2). INSTALL UNIT UNDER TEST BY PUSHING FIXTURE KNOB FORWARD AND ROTATING THE KNOB CLOCKWISE TO LOCK UNIT UNDER TEST INTO TEST POSITION.
- 5.14 WAIT FOR PRINT-OUT OF TEST.
- 5.15 UNLOAD UNIT UNDER TEST BY ROTATING TEST FIXTURE LEVER COUNTERCLOCKWISE AND LOAD NEXT UNIT IN ACCORDANCE WITH COMPUTER MESSAGE DIRECTION.
- 5.16 WRITE-IN SERIAL NUMBER OF UNIT UNDER TEST IN APPROPRIATE LOCATION ON PRINT-OUT SHEET (SAMPLE PRINT-OUT - TABLE -1).
- 5.17 ACCEPT OR REJECT M509A2E1 COMPONENT TEST UNITS BASED ON THE PRINT-OUT PARAMETERS AND COMPUTER DECISION INFORMATION. THE DATA PRINTOUT INDICATES PARAMETER LIMITS AND COMPONENT TEST VALUE.

APPENDIX

M509 ARE1 BDE DATA SHEET
DATE 09 28 83
TIME 9 05
SERIAL NO

1 F (R2101)
MIN = 450 MOHMS
MAX = 800 MOHMS
ACTUAL = 5902.1 MOHMS
*** ABOVE MAXIMUM VALUE ***

CONT (R1)
MIN = 90 KOHMS
MAX = 114 KOHMS
ACTUAL = 102.13 KOHMS
WITHIN SPEC

CONT (D1 FWD)
MIN = 250 OHMS
MAX = 730 OHMS
ACTUAL = 348.93 OHMS
WITHIN SPEC

CONT (D1 REV)
MIN = 4000 MOHMS
MAX = 9.9999 MOHMS
ACTUAL = 5711.6 MOHMS
WITHIN SPEC

CONT (L1)
MIN = 40 OHMS
MAX = 50 OHMS
ACTUAL = 41.897 OHMS
WITHIN SPEC

XELD (L1000000)

CAP (C1)
MIN = 5 MFD
MAX = 7 MFD
ACTUAL = 57009 MFD
WITHIN SPEC

CONT (CONTACT)
MIN = 0 OHMS
MAX = 1 OHMS
ACTUAL = 035201 OHMS
WITHIN SPEC

-TEST 1 ABOVE SPEC

TABLE - 1

96

AD-A142 816

MAGNETIC POWER SUPPLY ASSEMBLY OF M509A2E1 FUZE(U)
BULOVA SYSTEMS AND INSTRUMENTS CORP RALLEY STREAM N Y
M MOSKOWITZ MAY 84 330-044 ARLCD-CR-83047

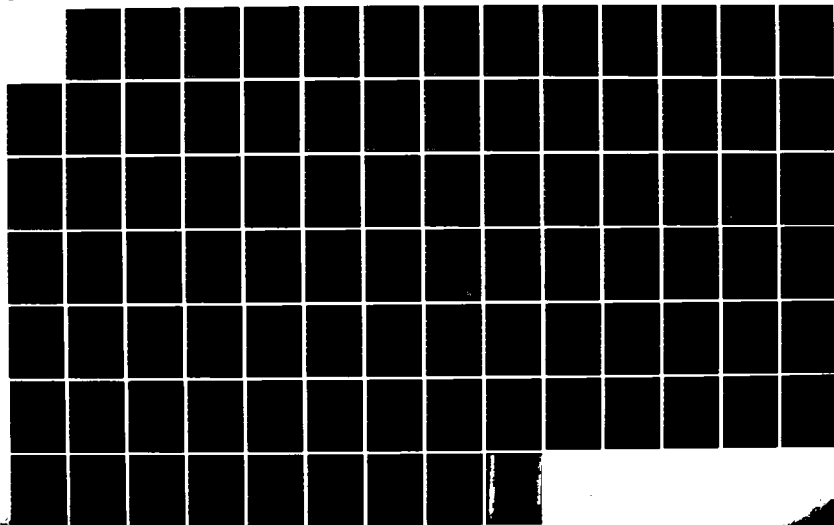
2/2

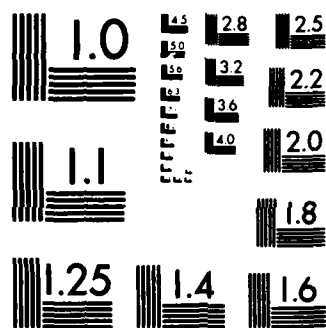
UNCLASSIFIED

DARK10-80-C-0183

F/G 19/1

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```

5 01=4
10 DIM A(12), L(12), H(12), W(12),
   F(12), T$(8)
20 DIM A$(40)
30 SHORT L, H, A
40 A$="-----"
50 CLEAR
60 DISP "ENTER DATE (MM-DD-YY)"
   @ INPUT D$
65 IF TIME 5000 THEN 90
70 DISP "ENTER TIME (H-MM)" @ IN
   PUT T
80 SETTIME INT(T)*3600+FP(T)*10
   @*60 :
90 REM *** INITIALIZE ARRAYS ***
100 FOR X=1 TO 12
110 READ W(X)
120 NEXT X
130 FOR X=1 TO 12
140 READ L(X)
150 NEXT X
160 FOR X=1 TO 12
170 READ H(X)
180 NEXT X
190 CONTROL 4.4 : 204
200 CLEAR
210 DISP @ DISP @ DISP @ DISP "
   SELECT ONE"
220 P=0 @ ON KEY# 1, "PR, RUN" GOT
   O 260
230 ON KEY# 2, "PUN, EV " GOTO 270
240 KEY LABEL
250 GOTO 220
260 P=1
270 CLEAR
280 DISP "WHAT TEST TO BEGIN":@
   INPUT N
290 REM *** WAIT FOR START ***
300 CLEAR
310 DISP @ DISP @ DISP @ DISP @
   DISP " PRESS START"
320 ENTER 410 USING "#.W" : Z1
330 IF BIT(Z1,5)=1 THEN 320
340 CLEAR
350 DISP @ DISP @ DISP @ DISP
360 IF 01=4 THEN DISP " IN
   SERT UNIT #2"
365 IF 01=0 THEN DISP " IN
   SERT UNIT #1"
370 ENTER 410 USING "#.W" : Z1
380 IF 01=0 AND BIT(Z1,6)=0 AND
   BIT(Z1,7)=1 THEN 01=4 @ GOTO
   450
390 IF 01=4 AND BIT(Z1,6)=1 AND
   BIT(Z1,7)=0 THEN 01=0 @ GOTO
   450
400 IF BIT(Z1,6)=0 AND BIT(Z1,7)
   =0 THEN GOTO 420

```

```

410 GOTO 440
420 IF 01=4 THEN CLEAR @ DISP "
   REMOVE UNIT #1"
422 IF 01=0 THEN CLEAR @ DISP "
   REMOVE UNIT #2"
425 ENTER 410 USING "#.W" : Z1
430 IF BIT(Z1,6)=0 AND BIT(Z1,7)
   =0 THEN GOTO 425
440 GOTO 370
450 CLEAR
460 FOR X=1 TO 12 @ F(X)=0 @ NEW
   T X @ F=0
470 REM *** HOME TI PROG ***
480 OUTPUT 410 USING "#.W" : Z+0
   1 @ WAIT 100 @ OUTPUT 410 US
   ING "#.W" : 0+01
490 REM *** WAIT FOR HOME ***
500 ENTER 410 USING "#.W" : Z1
510 IF BIT(Z1,8)=0 THEN 480
520 REM *** MAIN TEST LOOP ***
530 FOR X=N TO 12
540 REM ***STEP TI TO NEXT TEST*
   **
550 OUTPUT 410 USING "#.W" : 1+0
   1 @ WAIT 20 @ OUTPUT 410 USI
   NG "#.W" : 0+01
560 REM *** CHECK TEST NUMBER **
   *
570 ENTER 410 USING "#.W" : X1
580 Z1=BINAND(X1,15)
590 IF Z1>9 THEN 10
600 T=10*BIT(X1,4)+Z1
610 IF T=0 THEN 750
620 IF T>X AND T<12 THEN 550
630 IF T>X AND T<12 THEN 480
640 REM *** GET BCD FROM DVM **
   **
650 WAIT W(X)
660 ENTER 3 : Z1
670 IF Z199999 THEN DISP "OVERF
   LOW" @ GOTO 10
680 IF Y=7 THEN Z=Z* 01
690 IF Y=6 THEN Z=Z* 001
700 IF Y=5 THEN Z=Z* 0001
710 IF Y=4 THEN Z=Z* 00001
720 IF Y=3 THEN Z=Z* 000001
730 A(X)=Z
740 NEXT X
750 REM ** PRINT OUT **
760 X=0
770 IF P<>1 THEN 900
780 PRINT "M509 A2E1 BDE DATA SH
   EET"
790 PRINT "DATE " : D$
800 T=TIME
810 T1=INT(TIME/3600)
820 T2=INT((T-T1)*3600)/60
830 IF T2>9 THEN T$=VAL$(T1)&" "
   &VAL$(T2)
840 IF T2<10 THEN T$=VAL$(T1)&"
   TABLE - 20"&VAL$(T2)

```

TABLE - 20"&VAL\$(T2)

PROGRAM

97

```

850 PRINT "TIME ",T$
860 PRINT "SERIAL NO."
870 PRINT A$
880 PRINT B$
890 PRINT "I.F. (R21C1)"
900 GOSUB 1200
910 IF P=0 THEN 930
920 PRINT "I.P. (OPEN)"
930 GOSUB 1200
940 IF P=0 THEN 960
950 PRINT "CONT. (R1)"
960 GOSUB 1200
970 IF P=0 THEN 990
980 PRINT "CONT. (D1/FWD)"
990 GOSUB 1200
1000 IF P=0 THEN 1020
1010 PRINT "CONT. (D1/REV)"
1020 GOSUB 1200
1030 IF P=0 THEN 1050
1040 PRINT "CONT. (L1)"
1050 GOSUB 1200
1060 IF P=0 THEN 1080
1070 PRINT "XEL3 (L102000Hz)"
1080 GOSUB 1200
1090 IF P=0 THEN 1110
1100 PRINT "CAP. (C1)"
1110 GOSUB 1200
1120 IF P=0 THEN 1140
1130 PRINT "CONT. (CONTACT)"
1140 GOSUB 1200
1150 GOSUB 1360
1160 GOTO 300
1170 DATA 12000,3000,3000,3000,6
      000,3000,0,3000,3000,0,0,0
1180 DATA 460000000,90000,90000,
      250,4000000000,40,0,5,0,0,
      0,0
1190 DATA 820000000,820000000,11
      4000,730,9,9E105,50,0,7,1
      ,0,0,0
1200 X=X+1
1210 IF W(X)=0 THEN 1330
1215 GOSUB 1400
1220 IF P=0 THEN 1300
1240 PRINT "MIN =" ; L ; T$
1250 PRINT "MAX =" ; H ; T$
1260 PRINT "ACTUAL =" ; A ; T$
1270 IF A>=L AND A<=H THEN PRINT
      "      WITHIN SPEC"
1280 IF A<L THEN PRINT "**** BEL
      OW MINIMUM VALUE ***" @ F(X)
      )=-1
1290 IF A>H THEN PRINT "**** ABO
      VE MAXIMUM VALUE ***" @ F(X)
      )=1
1300 IF A<L THEN F(X)=-1
1310 IF A>H THEN F(X)=1
1320 IF P=0 THEN 1350
1330 PRINT A$
1340 PRINT B$

```

```

1350 RETURN
1360 CLEAR
1370 FOR X=1 TO 12
1380 IF F(X)=0 THEN 1410
1390 IF F(X)=0 THEN PRINT "-TEST
      "X." ABOVE SPEC" @ F=1
1400 IF F(X)=0 THEN PRINT "-TEST
      "X." BELOW SPEC" @ F=1
1410 NEXT X
1420 PRINT @ PRINT @ PRINT @ PPI
      NT @ PRINT
1430 IF F=0 THEN 1470
1440 DISP @ DISP @ DISP @ DISP @
      DISP " *****
      *****"
1450 DISP " ***** GOOD UNIT
      *****"
1460 WAIT 5000
1470 RETURN
1480 ON X GOTO 1500,1500,1550,16
      00,1500,1700,1750,1800,1850
1490 STOP
1500 L=L(X)/10^6
1510 H=H(X)/10^6
1520 A=(200*A(X)-11)*10^-1
1530 T$="MOHMS"
1540 RETURN
1550 L=L(X)/1000
1560 H=H(X)/1000
1570 A=A(X)*1000000/1000
1580 T$="KOHMS"
1590 RETURN
1600 L=L(X)
1610 H=H(X)
1620 A=200000*A(X)-10100
1630 IF L<0 THEN L=0
1640 T$="OHMS"
1650 IF L>10^5 THEN 1670
1660 GOTO 1690
1670 L=L/10^6 @ H=H/10^6 @ A=A/1
      0^6
1680 T$="MOHMS"
1690 RETURN
1700 L=L(X)
1710 H=H(X)
1720 A=A(X)*9900
1730 T$="OHMS"
1740 RETURN
1750 L=L(X)
1760 H=H(X)
1770 A=10000*A(X)/(1-A(X))/4*PI
1780 T$="MH"
1790 RETURN
1800 L=L(X)
1810 H=H(X)
1820 A=A(X)*10
1830 T$="MFD"
1840 RETURN
1850 L=L(X)
1860 H=H(X)

```

TABLE - 2

PT 98 AM

```

1870 A=2000*A(X)/(20-A(X))
1880 T$="OHMS"
1890 RETURN

```

APPENDIX L
ACCEPTANCE TEST PROCEDURE
FOR
COIL ASSEMBLY

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK****TO:****UNITED STATES ARMY ARMAMENT
R & D COMMAND****DOCUMENT NO.
330-037****DATE 16 JUNE 1983****PROGRAM M. M. & T. - M. P. S.
M509A2E1 B. D. E.****PURCHASE ORDER****PRIME CONTRACT
DAAK10-80-C-0183****SUBJECT****ACCEPTANCE TEST PROCEDURE****COIL ASSEMBLY - KC90829****PREPARED BY: _____
Irwin Podbielak
Reliability Engineer****APPROVED BY: _____
A. Kbul
Quality Control Manager****APPROVED BY: _____
B. Garfinkel
Director of Quality****APPROVED BY: _____
M. Moskowitz
Proj. Mgr. M. M. & T.****APPROVED BY: _____
S. B. Schulman
Mgr. Special Devices Dept.**

E
D
C
B
A

LATE APVL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 25 26 27 28 29

102

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

SHEET

330-037

1.0 SCOPE

1.1 THIS DOCUMENT DEFINES THE BSIC ACCEPTANCE TEST PROCEDURE WHICH SHALL BE ADHERED TO WHEN VERIFYING THE CONTINUITY AND RESISTANCE OF THE COIL ASSEMBLY - KC90829.

2.0 APPLICABLE DOCUMENTS

2.1 THE FOLLOWING DOCUMENTS FORM A PART OF THIS DOCUMENT TO THE EXTENT SPECIFIED HEREIN. UNLESS OTHERWISE INDICATED THE LATEST ISSUE IN EFFECT SHALL APPLY. IN CASE OF CONFLICT BETWEEN THIS DOCUMENT AND THE REFERENCED DOCUMENTS, THIS DOCUMENT SHALL GOVERN.

BSIC

KC90829	COIL ASSEMBLY
273-60004	COIL ASSEMBLY, CONTINUITY FIXTURE

3.0 REQUIREMENTS

3.1 MATERIAL

KC90829	COIL ASSEMBLY
---------	---------------

3.2 EQUIPMENT

273-60004	COIL ASSEMBLY, CONTINUITY FIXTURE MULTIMETER, SIMPSON MODEL 269
-----------	--

4.0 PROCEDURE

4.1 SET RANGE SELECTOR SWITCH ON MULTIMETER TO R-X-1 POSITION.

4.2 SHORT LEADS OF MULTIMETER TOGETHER AND ADJUST ZERO OHMS KNOB UNTIL METER INDICATES ZERO OHMS.

4.3 CONNECT LEADS OF MULTIMETER TO TERMINALS ON CONTINUITY TEST FIXTURE 273-60004.

4.4 PLUG COIL ASSEMBLY UNDER TEST INTO CONTINUITY TEST
FIXTURE.

4.5 MULTIMETER SHOULD INDICATE CONTINUITY BETWEEN 40 and 50
OHMS, DIRECT READING SINCE MULTIMETER IS ON R-X-1 SCALE.

5.0 QUALITY ASSURANCE

5.1 INSPECTION PERSONNEL SHALL VERIFY THAT THE MULTIMETER
USED IS WITHIN CALIBRATION PERIOD.

5.2 INSPECTION PERSONNEL SHALL VERIFY CONTINUITY IN
ACCORDANCE WITH DRAWING REQUIREMENTS.

APPENDIX M
ACCEPTANCE TEST PROCEDURE
FOR
ARMING TIME TEST

BULOVA**SYSTEMS & INSTRUMENTS CORPORATION**
VALLEY STREAM, NEW YORK**TO:****UNITED STATES ARMY ARMAMENT
R & D COMMAND****DOCUMENT NO.
330-038****A****DATE 15 AUGUST 1983****PROGRAM M. M. & T. - M. P. S.
M509A2E1 - B. D. E.****PURCHASE ORDER****PRIME CONTRACT
DAAK10-80-C-0183****SUBJECT****ACCEPTANCE TEST PROCEDURE****ARMING TIME TEST****105MM HOUSING AND MECHANISM ASSY: KF90853****PREPARED BY:****Irwin Podbielak
Reliability Engineer****APPROVED BY:****A. Koul
Quality Control Manager****APPROVED BY:****M. Moskowitz
Proj. Mgr. M. M. & T.****APPROVED BY:****B. Garfinkel
Director of Quality****APPROVED BY:****S. B. Schulman
Mgr. Special Devices Dept.**

E
D
C
B

		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A												
DATE	APVL	1	2	3	4	5	6	7	8	9	10	11	12	108	15	16	17	18	19	21	22	23	24	25	26	27	28	29	

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORK

SHEET

330-038

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SHEET

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WARNING

THESE UNITS CONTAIN LIVE DETONATORS AND MUST BE HANDLED WITH EXTREME CARE IN ACCORDANCE WITH BASIC HAZARDOUS MATERIAL PROCEDURES. SAFETY GLASSES MUST BE WORN BY ALL PERSONNEL IN THE AREA AND GROUNDING STRAP MUST BE WORN BY THE TEST OPERATOR.

UNITS MUST BE TRANSPORTED ONLY IN PORTABLE MAGAZINES (RED BOXES) WITH A MAXIMUM OF ONE LAYER USED PER MAGAZINE.

ALL TEST EQUIPMENT AND FIXTURES USED MUST BE APPROVED FOR USE BY THE SAFETY ENGINEER AND THE DESIGNATED PROJECT ENGINEER.

WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR

1.0 SCOPE

THIS DOCUMENT HAS BEEN PREPARED BY BULOVA SYSTEMS AND INSTRUMENTS CORPORATION (BSIC) IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACT NO. DAAK10-80-C-0183 FOR THE 105MM BASE ELEMENT AND IS IN COMPLIANCE WITH THE REQUIREMENTS OF CDRL ITEM: A008

1.1 ALL 105MM BASE ELEMENTS SHALL BE SUBJECTED TO AND PASS THE FINAL TEST PROCEDURE IN ACCORDANCE WITH THIS DOCUMENT.

1.2 THE DATA SHEET WHICH SHALL BE COMPLETED, SERIALIZED, AND SIGNED BY THE PERSONNEL PERFORMING THE TEST, SHALL BE THE COMPUTER PRINT-OUT SHEET ATTACHED TO THIS DOCUMENT. THE DATA SHEET SHALL ACCOMPANY THE HARDWARE AS IT PROGRESSES THROUGH THE MANUFACTURING AND TEST PROCESS.

2.0 APPLICABLE DOCUMENTS

THE FOLLOWING DOCUMENTS, OF THE ISSUED IN EFFECT ON THE DATE OF REQUEST FOR PROPOSAL, FORM A PART OF THIS DOCUMENT.

MILITARY

DAAK10-80-C-0183 CONTRACT ARRADCOM 105MM B.E.

3.0 EQUIPMENT REQUIRED

358-19012	ROTOR ADJUSTMENT TOOL
L1-4091	CENTRIFUGE
236-60007	CENTRIFUGE TEST CONSOLE
236-60007-13	CENTRIFUGE HOLDING FIXTURE
MODEL 290	NICOLET OSCILLOSCOPE
MODEL 206	NICOLET PLUG-IN AMPLIFIER
331-60001	ARMING TIME TEST CONSOLE

WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR

4.0 GENERAL

4.1 ALL 105MM HOUSING & MECHANISM, BASE ELEMENTS SHALL BE SUBJECTED TO AND PASS THE ACCEPTANCE TESTS LISTED HEREIN.

**A) ACCEPTANCE TEST PROCEDURE, HOUSING MECHANISM ASSY
330-038**

4.2 THE DATA SHEET WHICH SHALL BE COMPLETE, SERIALIZED, AND SIGNED BY THE PERSONNEL PERFORMING THE SPECIFIC TEST, SHALL BE THE COMPUTER PRINT-OUT SHEET. THE DATA SHEET SHALL ACCOMPANY THE HARDWARE TESTED AS IT PROGRESSES THROUGH THE MANUFACTURING AND TEST PROCESS. THE DATA SHEET SHALL ACT AS A TRAVELER AND INDICATE THE STATUS OF THE HARDWARE.

4.3 THIS TEST MAKES USE OF A PROGRAMMED HP-85 COMPUTER TO EVALUATE THE CURVE TRACE AND ARMING TIME OF FROM (1) TO (4) HOUSING AND MECHANISM ASSEMBLIES (H.M.A.) SIMULTANEOUSLY. THE ACCEPT/REJECT CRITERIA ARE ANALYZED BY THE COMPUTER WHICH PROVIDES A PRINT-OUT FOR EACH OF THE (4) STATIONS, PROVIDING A HIGH SPEED THROUGH PUT OF THE UNITS UNDER TEST. THE OPERATOR IS ONLY REQUIRED TO WRITE IN THE APPLICABLE SERIAL NUMBER, DATE AND SIGNATURE. ALL REJECTED UNITS SHALL BE SEGREGATED AND DISPOSITIONED BY AN INSPECTION SUPERVISOR.

5.0 TESTING

5.1 COMPONENT TEST - EVERY 105MM HOUSING MOLDED ASSEMBLY BSIC P/N KD90852-1 SHALL BE TESTED IN ACCORDANCE WITH REL-330-008-2.

WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR

5.2 DETONATOR TEST

OPERATOR WARNING

WEAR GROUND STRAP AND SAFETY GLASSES

5.2.1 ALL UNITS TO BE ARM TIME TESTED SHALL BE HANDLED AND TRANSPORTED IN THE SECOND SAFETY LOCK POSITION I.E.: THE ROTOR TRAP PIN SHALL BE ENGAGED WITH THE DRAG SENSOR PIN MAINTAINING A LOCKED POSITION APPROXIMATELY 51 DEGREES BEFORE THE ARM POSITION.

5.2.2 THE H.M.A. (S) SHALL BE SUBJECTED TO APPROXIMATELY 15 G'S (213 TO 219 RPM) ON THE CENTRIFUGE TO ASSURE THAT THE BASE ELEMENT ARMS WITHIN THE PRESCRIBED ENVIRONMENT.

5.2.3 TURN THE COMPUTER POWER SWITCH ON. (BACK OF COMPUTER. SEE FIGURE-4). VERIFY THAT THE PROGRAM TAPE IS INSTALLED. WAIT FOR THE COMPUTER SCREEN TO PROVIDE INSTRUCTIONS. THEN SET THE OPERATION TO AUTOMATIC BY TYPING IN THE LETTER "A" AND THEN THE "END-LINE" KEY.

ACTIVATE THE POWER ON SWITCH UNDER THE ARMING TIME TEST CONSOLE SHELF (ATTC). ACTIVATE THE POWER ON SWITCH ON THE LEFT SIDE OF CENTRIFUGE TIMER CONSOLE. (CTC) - (FIGURE-5)

ACTIVATE THE LATCH RELEASE SWITCH ON THE FRONT OF THE CENTRIFUGE. UNLATCH AND RAISE CENTRIFUGE COVER.

5.2.4 USING EXTREME CARE INSTALL THE H.M.A. (S) (AN EVEN QUANTITY UP TO (4) UNITS OR DUMMIES SHALL BE INSTALLED TO MAINTAIN BALANCE ON CENTRIFUGE ARMS) INTO THE CENTRIFUGE HOLDING FIXTURE, WHILE THE LOAD-SAFE KNOB IS IN THE LOAD POSITION ALLOWING THE H.M.A. TO SEAT. CONNECT THE CENTRIFUGE HOLDING FIXTURE, (CHF) CONNECTOR TO THE HOLDING FIXTURE.

WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR

ENGAGE THE ROTOR ADJUSTMENT TOOL INTO THE ROTOR SHAFT SLOT.

CAUTION: CARE SHALL BE EXERCISED TO PREVENT SLIPPING OF THE TOOL CAUSING ROTOR TO SPIN WHICH IN TURN MAY DAMAGE THE DRAG SENSOR SLOT.

ROTATE THE ROTOR ADJUSTMENT TOOL COUNTER CLOCKWISE (CCW).

HOLDING THE ROTOR ADJUSTMENT TOOL IN THIS POSITION GENTLY PRESS PLASTIC KNOB DOWN AND TURN IT CLOCKWISE (CW) UNTIL IT LOCKS IN THE SLOT. REMOVE THE ROTOR ADJUSTMENT TOOL. THE ROTOR IS NOW LOCKED IN THE SAFE POSITION (S2a).

5.2.5 NOTE: IF THE FIXTURE DID NOT ENGAGE PROPERLY AND ALLOWED THE ROTOR TO RETURN TO THE SECOND SAFETY POSITION STEP 5.2.4 CAN BE REPEATED WITH NO DAMAGE TO THE HOUSING AND MECHANISM ASSEMBLY.

5.2.6 CLOSE AND LATCH CENTRIFUGE DOOR.

ACTIVATE CTC START SWITCH. SPIN CENTRIFUGE AT 15 G'S (213 TO 219 RPM). ALLOW CENTRIFUGE TO STABILIZE AT 15 G'S. ACTIVATE "TEST ALL" SWITCH ON THE ARMING TIME TEST CONSOLE (ATTC). COMPUTER PRINT-OUT SHALL INDICATE TIMING OBTAINED ON ALL FOUR UNITS UNDER TEST. THE INDICATION SHALL BE ACCEPT OR REJECT.

THE ARMING TIME IS ALSO AVAILABLE FOR CORROBORATION ON THE OSCILLOSCOPE. THE TIMING SHALL BE GREATER THAN 10 AND LESS THAN 18 MILLISECONDS. THE WAVESHAPE SHALL BE EQUIVALENT TO FIGURE-1.

NOTE: ONLY THE COMPUTER PRINT-OUT IS REQUIRED.

WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR

THE TIMING SHALL CONSIST OF TWO (2) TRACES, S2 AND S3. TIMING STOP PULSE (S-3) OCCURS AFTER S3 HAS CLOSED. THE S3 TRACE SHALL PROVIDE EVIDENCE OF PROPER CLOSURE AND A SIGNAL LEVEL CHANGE SHALL BE EVIDENT.

5.2.7 ACTIVATE THE PLUG STOP SWITCH ON THE CTC. DO NOT REMOVE H.M.A. FROM THE CHF. USE EXTREME CAUTION AT THIS POINT AS THE DETONATOR IS NOW IN THE ARMED POSITION AND IS MOST DANGEROUS.

5.3 SAFE RESET (REPEAT FOR EACH UNIT)

5.3.1 WITH THE H.M.A. MAINTAINED IN THE CENTRIFUGE HOLDING FIXTURE AND THE CENTRIFUGE COMPLETELY STOPPED (RPM DIAL IS ZERO), RESET THE ROTOR TO THE SECOND SAFETY POSITION BY; ROTATING THE LOAD-SAFE LEVER TO THE SAFE POSITION LIFTING THE DRAG WEIGHT OUT OF ITS LOWEST POSITION.

5.3.2 USING THE ROTOR ADJUSTMENT TOOL, ROTATE THE ROTOR SHAFT (CCW) COUNTERCLOCKWISE FOR APPROXIMATELY 90 DEGREES. WHILE HOLDING THE ROTOR IN THIS POSITION, ROTATE THE LEVER, TO LOAD POSITION. SLOWLY ALLOW THE TOOL AND ROTOR TO TURN CW. WHEN UNIT STOPS - REMOVE TOOL.

5.3.3 UNIT IS NOW IN THE SECOND SAFETY POSITION. RECORD SERIAL NUMBER(S) AND SIGN PRINT -OUT SHEET IN THE APPROPRIATE AREA.

5.3.4 CONTINUING TO USE EXTREME CAUTION AND FOLLOWING THE PROCEDURES PRESCRIBED IN THE WARNING ON SHEET 4, REMOVE THE H.M.A. UNDER TEST FROM THE CENTRIFUGE HOLDING FIXTURE:

1. REMOVE THE CENTRIFUGE HOLDING FIXTURE CONNECTOR.

WARNING!! THIS UNIT CONTAINS A LIVE DETONATOR

5.3.5 THE ARMING TIME TEST CONSOLE SHALL HAVE AUTOMATICALLY RECYCLED TO HOME AND SHALL BE READY TO EVALUATE THE NEXT SET OF H.M.A(S).

6.0 QUALITY CONTROL

6.1 THE INSPECTOR SHALL VERIFY THAT CALIBRATION OF ALL EQUIPMENT REQUIRED TO PERFORM THIS TESTING IS UP TO DATE.

6.2 ALL UNITS TESTED WHICH INDICATE REJECT ON THE COMPUTER PRINT-OUT SHALL BE SEGREGATED FOR DISPOSITION.

APPENDIX

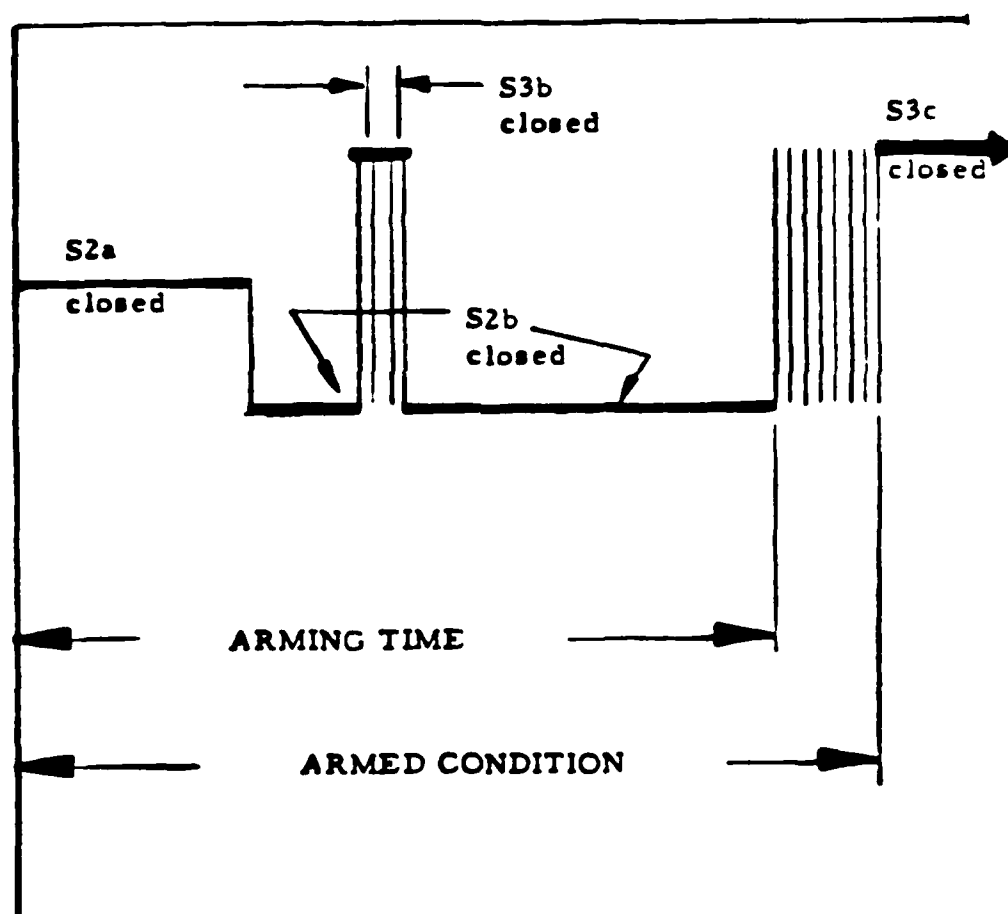
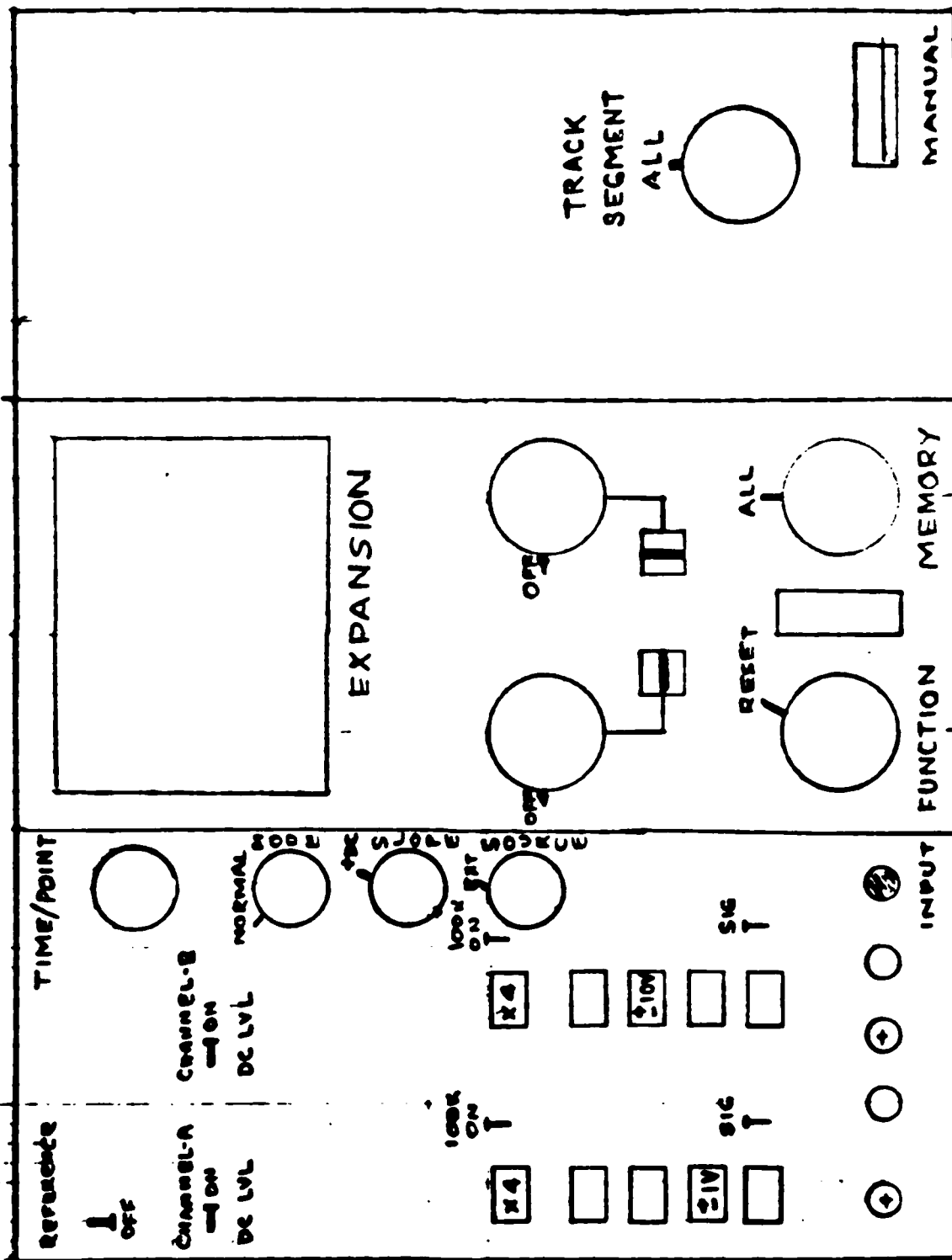


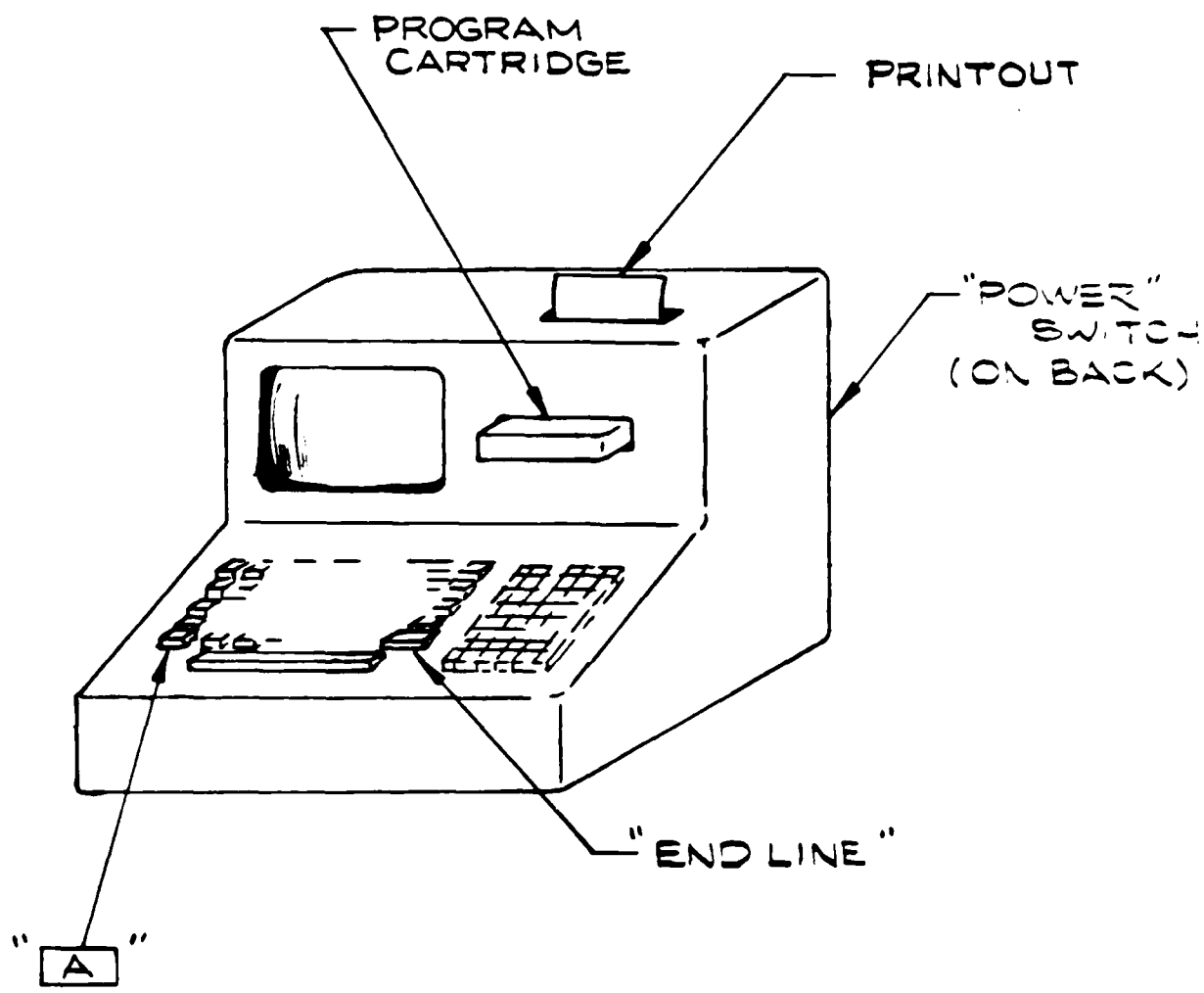
FIG. 1 **VIEW OF NICOLET OSCILLOSCOPE TRACE**
FOR AN ACCEPTABLE TEST.

NICOLET MODEL 206 - INITIAL SET-UP.

FIGURE-2

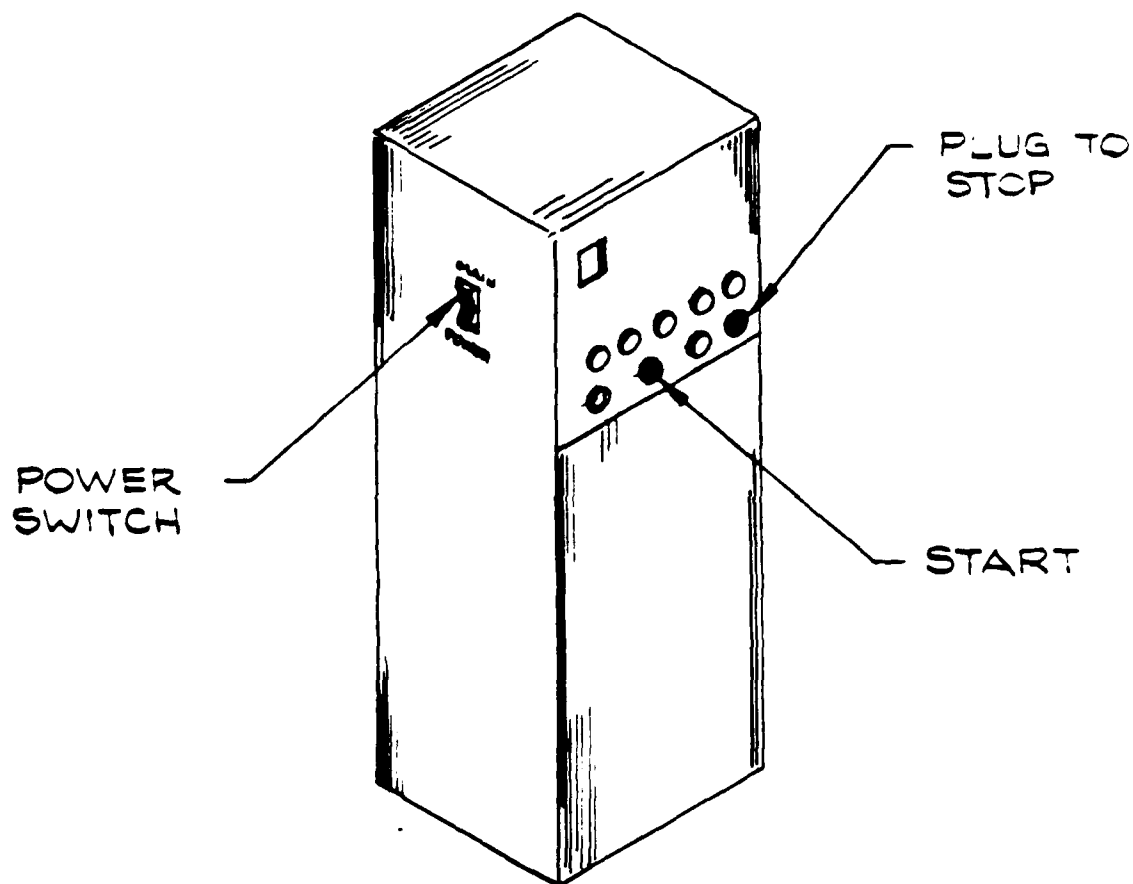


SWITCHES INDICATED (NOM) ARE ACTIVATED



MODEL 85
COMPUTER

FIGURE 4
121



CENTRIFUGE TIMER
CONSOLE
(SPEED CONTROLLER
CENTRIFUGE)

FIGURE - 5

PROJECT 330

DATE 9/22/83CENTRIFUGE ARMING TIME
ACCEPTANCE TEST
DATA SHEETS/N EM 1013 thru 1016 LOT# 1ASSY# KF 90853-2

Rev. A

REMARKS

M509A2E1 Detonator Lot No. Aug 1-2

M509A2E1 Detonator Installed By:

Sig: _____ Date: _____

Ball Staked By:

Sig: _____ Date: _____

Arm Time Tested By:

Sig: _____ Date: _____

Reset TA "Safe" By:

Sig: _____ Date: _____

X-Ray To Verify Safe By: NA

Sig: _____ Date: _____

UNIT # 1 EM 1013

ACCEPT

14.1 12.1 5.64 9.87 6

9.74

UNIT # 2 EM 1014

ACCEPT

15.5 13.5 6.2 10.85 6

11.37

UNIT # 3 EM 1015

ACCEPT

15.7 13.7 6.28 10.95 3

12.21

UNIT # 4 EM 1016

ACCEPT

14.3 12.3 5.72 10.01 3

10.93

SERIAL NUMBER

INTERNAL COMPUTER DATA

INITIAL TRAVEL TIME TO REACH
90° CONTACT (MILLISECONDS)

ARMING TIME (MILLISECONDS)

APPENDIX N
TRAVELER
FOR
DEMONSTRATION TEST PLAN
PART B

PROJECT 330 - PHASE II

SHEET OF

M509A2E1 BDE CONFIGURATION - DEMONSTRATION TEST PLAN TRAVELER

WEEKS ENDING 9/2/83, 9/9/83, 9/16/83, 9/23/83, 9/30/83

STA #	ASSY #	DESCRIPTION	LOT #	MADE	QTY	SAMPLED	QTY	ACCEPT	QTY	REJECT	MFG/INSP SIG	DATE	REMARKS
9	KB90184	S2 CONT. ASSY.	1 2	130 130				130 130		0 0	MFG		10/5 109852 20/5 109852
9	KB90184	INSPECTION	1 2	↓ ↓		20/ 20/					INSP		10/5 67516 20/5 67516
10	KF90839	S2 & JACK ASSY TO P.C.B.	1	260							MFG		
10	KB90839	INSPECTION	1	260	260						INSP.		INSP PART OF STA 15
11	KB90841	S2 SW ASSY.	1 2 3 4	120 120 120 120							MFG		10/5 109852 20/5 109852 30/5 109852 40/5 109852
11	KB90841	INSPECTION	1 2 3 4	↓ ↓ ↓ ↓		20/ 20/ 20/ 20/		120 120 120 120		0 0 0 0	INSP		10/5 67516 20/5 67516 30/5 67516 40/5 67516
12A	KF90839-2	LEAD FORM. AXIAL LEADS	1	500							MFG		
121	12 0839-2	LEAD FORM. RAD.	1	160							MFG		
13	KF90839-2	INSTALL COMP									MFG		STA 13 & 14 COMBINED
14	KF90839-2	COMP LEAD DRESS	1	256							MFG		STA 13 & 14 COMBINED
15	KF90839-2	SOLDER & CLEANING	1	256							MFG		
15	KF90839-2	DISASSEMBLY & TOUCH UP	1	256							MFG		
15	KF90839-2	Magnetic Power Supply INSPECTION	1 2 3	49 54 160		49/ 54/ 160/		54 144		49 0 16	INSP.		10/5 109852 20/5 109852 30/5 109852 40/5 109852

DATA

REVIEWED

BY

BSIC

ENG

QC

DATE

DATE

ARRADCOM REP

ARRADCOM

DATE:

STA #	ASSY #	DESCRIPTION	LOT #	QTY MADE	QTY SAMPLED	QTY ACCEPT	QTY REJECT	MFG/INSP SIG	DATE	REMARKS
15	KF 90824-1 1641KD90834-2	Housing, PIN CONTACT Assy	1 2 3	54 108 129				MFG.		1 DJS 109658 2 DJS 109680 3 DJS 109661
16	KD90824-1 KD90834-2	INSPECTION	1 2 3	↓ ↓ ↓	19 20 21 32 32 32 19 20 20	54 108 129	0 0 0	INSP.		1 Acc 67531 2 Acc 67525 3 Acc 67604
17	KD90852-2	STK MPSA INTO HOUSING		NON	APPLICABLE	REV B		MFG		
17	KD90852-2	NOT APPLICABLE INSPECTION NO STAKING		NON	APPLICABLE	REV B		INSP.		
18	KD90852-2	POWER SUPPLY COVER ASSY.	1 2	150 110				MFG		
18	KD90852-2	INSPECTION		NON	APPLICABLE			INSP.		
19	KD90852-2	ALIGN & SWAGE PWR SUPP. CVR	1	260				MFG		
20	KD90852-2	M. P. S. ASSY. ENCAPSULATION	1 2	54 108				MFG		
21	KD90852-3	MOLDED ASSY. ACCEPT. TEST	1 2	54 108	34 103 34 30 30 30	51 99	3 9	INSP.		45 109207 - LOT 1 Acc 67526 20/109209 - LOT 2 Acc 67607
22	KC90827	PART OF REAR BEARING PLATE	1	480				MFG		
23	KF90853-2	INSP. ARMING TIMING TEST INSPECTION	1	51	51 32 20	50	1	INSP.		45 109210 508 06867 Acc 67528
	KB 90249 Rev. A	DRAG SENSOR WEIGHT ASSY INSPECTION	1	54	54	54	0	INSP.		
	KF 90853-2 AFTR TIMING	HOUSING & MECHANISM Assy INSPECTION	1	50	50	50	0	INSP.		45 105372 Acc 67605

DATA

BSIC

ARRADCOM

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DATE

QC

DATE

ARRADCOM REP

DATE

APPENDIX O
SAMPLE DATA COLLECTION FORM
PART B

[illegible]

APPENDIX P
DEMONSTRATION TEST PLAN

DEMONSTRATION TEST PLAN

CDRL ITEM A013

Manufacturing, Methods & Technology
relating to the
Magnetic Power Supply Assembly
of the
M509A2E1 Base Detonating Element

Submitted to:

U. S. Army Armament R & D Command

Dover, N.J. 07801

Attn: DRDAR-QAR-E

BULOVA

SYSTEMS & INSTRUMENTS CORPORATION

Project 330

135

6 Sept. 1983

Revision B

BULOVASYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM NEW YORK

TO: Commanding Officer
U. S. Army Armament R&D Command
Dover, N.J. 07801

Att: DRDAR-QAR-E
Mr. J. Bednarz

DOCUMENT NO.
330-017

B

DATE 6 Sept. 1983

PROGRAM MM&T Relating to
the MPSA of the M509A2E1
BDE

PRIME CONTRACT
DAAK10-80-C-0183

SUBJECT

DEMONSTRATION TEST PLAN

CDRL Item A013

PREPARED BY: _____
M. Moskowitz

APPROVED BY: _____
S. B. Schulman

APPROVED BY: _____

APPROVED BY: _____

APPROVED BY: _____

BULOVA SYSTEMS & INSTRUMENTS CORPORATION

**MANUFACTURING, METHODS & TECHNOLOGY
FOR THE
M509A2E1 FUZE MAGNETIC POWER SUPPLY
CDRL ITEM A013
DEMONSTRATION TEST PLAN**

	<u>TABLE OF CONTENTS</u>	<u>PAGE NO.</u>
1.0	Objective of the Demonstration Test	1
2.0	Major Assemblies to be Tested	1
3.0	Identification of Equipment Required and Description of Set-up	2
4.0	Sequence of Assembly Procedures	6
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7.0	Floor Plan	6
8.0	Test Data Collection	9
9.0	Criteria for Acceptance	9
10.0	Demonstration Procedures	9
11.0	Demonstration Test Schedule	10
	Appendix A- Assembly Station Layouts	A1 - A33
	Appendix B- Inspection Instruction Cards	B1 - B13

REV. A

1.0 Objective of the Demonstration Test

The objective of this test is to demonstrate pilot assembly, inspection, and test equipment operation of the Magnetic Power Supply equipment. This equipment was designed to support a monthly production rate of 10,000 units on a single shift, 8 hour day, 5 days a week basis. This is to be performed in conjunction with the assembly line available for the M509A2E1 Fuze.

2.0 Major Assemblies to be Assembled and Tested

LIST OF MAJOR ASSEMBLIES			
ASSY. STATION #	ASSY. PART #	DESCRIPTION OF ASSEMBLY	REMARKS
8	KD90830	SETBACK GENERATOR ASSY.	
15	KF90839	MAGNETIC POWER SUPPLY ASSEMBLY	
21	KD90852-1	HOUSING, MOLDED ASSEMBLY	

3.0 IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
1	273-19006	Air Press W/Sl'd'g Anvil Fixt.	Install (2) Terminal in Bobbin
1	273-60009	Pin Pull Out Tester	Pull Test (2) Terminals Installed in Bobbin
2	BW-157349 273-19002 273-19003	Modified Bulova Production Type Coil Winding Machine & Wire Tensioning Devices	Wind Coil Assembly of Setback Generator Assy Control Wire Feed to Winding Machine
2	273-19008	Tray Peg Board	Storage Tray for Coil Assy
2	273-19007	Holding Fixture	Support and Rotate Coil Assy During Application of Tape
3	BW-158862	Bulova-Resistance Welding Machine	Power Pack, Remote Control and Welding Head
3	273-19010	Modified Electrodes	Special Welding Electrodes
3	273-19011	Welding Fixture Indexing -2 Positions	Fixture to Position Assy for Welding
3	273-60007	Weld Test Fixture	To Measure Weld Strength
3	273-60004	Continuity Tester	V.O.M. and Interface Fixt.
3	273-60010	Polarization Tester	Validates Direction of Coil Winding & Start Lead of Winding
4	273-19013	Air Cylr. and Press-In Fixt.	Press Fit Armature Plate into Armature Body
4	273-19014	Tray, Storage	For Armature Sub Assy
5	273-19015	Air Cylr and Press-in Fixt.	Press Fit Shearing Plt. into Generator Cover
6	273-19016	Air Cylr and Press-in Fixt.	Press Fit Cover Sub Assy into Arm. Sub Assy
6	273-19017	Air Press and Tooling	Swage Body of Armature 360° Around Cover Sub-Assy

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
7	273-60006 273-60002 273-60003 273-60008	Setback Generator Final Assy Tester	Measures Generator R, L and Insulation Resistance. Contains Tools 273-60002, 60003, 60008 and Interface Fixture.
8	273-19001	Magnetic Charger Charging Fixt. and Charging Tray	Charge Magnet of Setback Generator Assy
8	273-60001	Gaussmeter and Holding Fixture W/ Probe Built In	Measures Leakage Flux of Magnetically Charged Generator Assy
9	273-19009	Crimping Tool- "Automator"	Crimp Contact Wire in Switch Terminal
9	273-19018	Tray Storage	Storage Tray
11	273-19019	Press-In Fixture W/Horizontal Slide Lever	Press-In (1) S2 Switch Contact in S2 Housing
10	273-19020	Staking Tool Automator	Stake Movable S2 Switch Contact to P. C. Board
10	273-19022	Press-In Fixture "Potence"	Press-In Connector Jack to P. C. Board
12A	273-19004	Axial Lead Component Forming System	Heller Leadmaster H-116A and Custom Dies. Forming Component Leads of R1, R2, D1 and S4
12B	273-19005	Radial Lead Component Forming System	Heller Radial Component Former RD-70C and Custom Die For Capacitor C1
13	331-19005	Assembly Holding Fixture	Holder P. C. Board Carrier during Assy
14	331-19006	Assembly Fixture P. C. Board Carrier 140	Fixture to Hold P. C. Board Carrier while Applying Spot Mask & Dress Leads

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
15	331-19004	P. C. Board Carrier Rack	Hold P. C. Board Carrier Before/After Wave - Soldering and Cleaning Process.
15	331-19002	P. C. Board Cleaning Machine	Hollis Ultra-Clean Cleans PC Board Carriers after Soldering
15	331-19003	Wavesoldering Machine	Hollis Wavesoldering Machine TDL 10" Wide for Soldering P. C. Board Carriers.
15	331-19007	Slide-Wavesoldering Machine	Soldered P. C. Carrier Slide From Soldering Machine Output End to Work Table
15	331-19008	Storage Container -Stiffeners	Storage container for P. C. Carrier Stiffeners
15	331-19009	P. C. Board Removal Tool	Remove Individual P. C. Boards from P. C. Board Carriers
15	331-19010	Soldering Fixture for S2 Switch	Fixture for Hand Soldering S2 Switch Assy
15	331-19011	Alignment Fixt. for S4 Impact Switch	Perpendicularity Alignment Fixt. for S4 Impact Switch
15	331-19012	Modified Cleaning Machine P. C. Board Basket	Modified Cleaning Machine Basket to Hold P. C. Board Carriers during Cleaning Operation
15	273-19021	Tray Storage	Storage Tray for Individual P. C. Board Assemblies
16	273-19027	Staking Tool "Automator"	Stake GND Wire in Rotor Housing
17	273-19028	Staking Tool Air Press	Stake P. C. Board (M. P. S.) in Housing Assy
18	273-19030	Press-In Fixture Probe Grom 141	Install (4) Grommets in Power Supply Cover
18	273-19031	Press-In Fixture Shell Receptacle	Installed Shell Receptacle in Power Supply Cover

IDENTIFICATION OF EQUIPMENT REQUIRED AND DESCRIPTION OF SET-UP

ASSY STA NO.	TOOL NUMBER	TOOL DESCRIPTION	SET-UP DESCRIPTION
19	273-19032	Swaging Tool P. S. Cover to Rotor Housing	Swage P. S. Cover to Rotor Housing
19	273-19034	Tray-Storage	Storage Tray
20	331-19013	Encapsulation Holding Fixt. for Rotor Housing	Holding Fixture for Rotor Housing during Encapsulation of Magnetic Power Supply
20	331-19001	Encapsulant Dispensing Device	Dispenses predetermined qty of Encapsulating Material Repeatedly
21	273-60005- 002	Acceptance Test Console - Magnetic Power Supply Assy	Electrical Check Out of Magnetic Power Supply Assembly after Encapsulation Computer Evaluated W/Print Out
22	273-19035 273-19036	Radial Riveting Machine and Fixture	Install (2) Leaf Pins in Rear Bearing Bridge Plate Assembly
23	331-60001	Acceptance Test Console Arming Time Test	Arming Time Test: Computer Evaluated W/Print Out - Housing and Mechanism Assy.

REV. A

4.0 Sequence Of Assembly Procedures

The flow of major assemblies through the manufacturing sequence is depicted in the chart KB90840 on page 7. A total of 23 assembly stations have been planned. The assembly and inspection stations designed for this project are bench type, aided - assembly fixtures, which are consistent with the desired production rate.

5.0 Assembly Station Layouts

Each of the 23 assembly stations are described in detail on the Assembly Station Layouts, pages A1 to A33. The arrangement of the work station is shown, together with a description of the operation. The applicable operation sheet is noted as well as the tooling used at the station and a listing of the input parts required to feed the station.

6.0 Bench Layouts

The floor space requirements for the individual stations are shown on Page 8. A total area not to exceed 1,500 sq. ft. is indicated using 5 ft. benches.

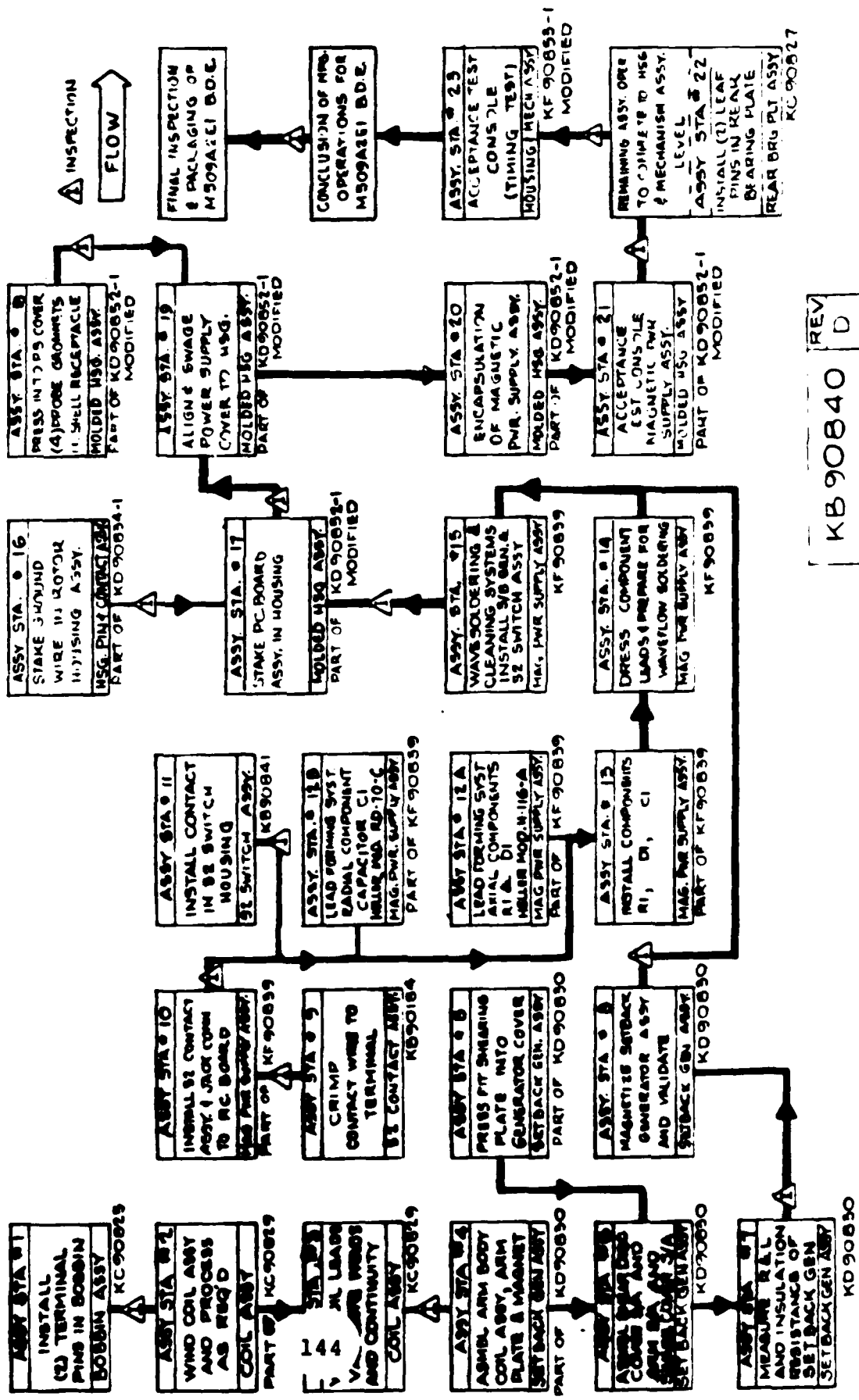
7.0 Floor Plan

An arrangement of the work stations to form a potential assembly line configuration is shown on Page 8. The locations indicated may not reflect the current or final locations of the equipment. Bulova Systems & Instruments Corporation is presently rearranging the entire Valley Stream plant subsequent to the transfer of metal fabrication to the Freeport plant.

SYSTEMS & INSTRUMENTS DIVISION
SULLY WATSON COMPANY, INC.
SUBJECT: MAGNET POWER SUPPLY
PART 5 OF 11
ASSEMBLY SEQUENCE

SHEET NO. 330 OF 331
JOB NO. 330
REV. 0

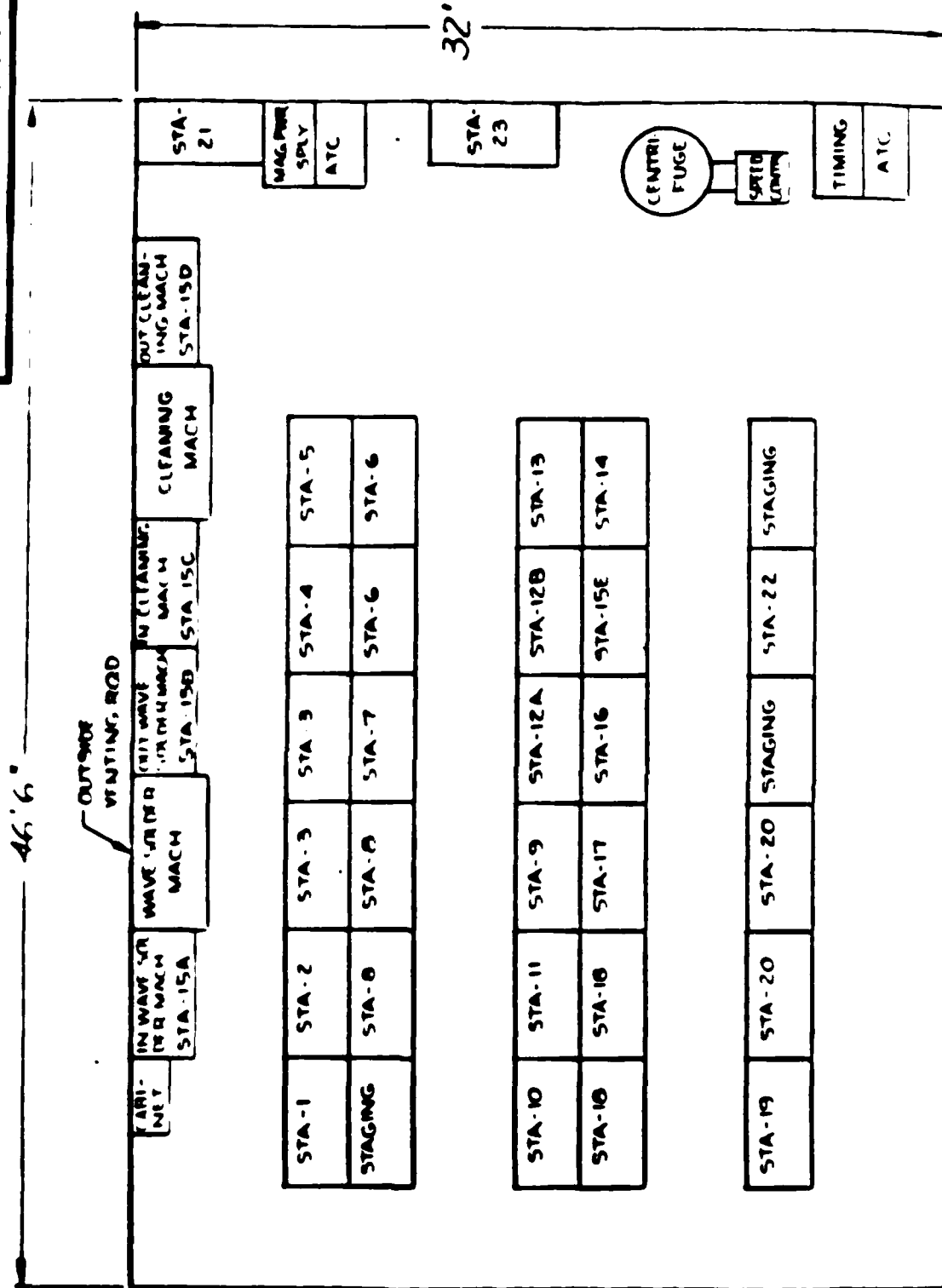
REF: M509A2E1 BUE 7/11/64



KB 90840 REV D

FLOOR PLAN - DEMONSTRATION TEST

STATION & EQUIPMENT IDENTIFICATION
 (SEE LIST OF STATIONS AND EQUIPMENT)



SCALE



0 1 2 3 4 5 FEET

1/2" = 1'

145

APR 10-

1900 SQ. FT.

REV. A

8.0 Test Data Collection

Data will be collected using the form and instructions furnished by the U. S. Government as shown on pages 12 and 13 , and other Bulova forms where appropriate. The Industrial Engineer shall be responsible for the entries on the data sheet and the calculation of the actual operating rate. The Quality Control Department will assure adherence to specification requirements by inspecting material in accordance with the Inspection Instruction Cards.

9.0 Criteria for Acceptance

The Assembly Flow Chart, KR90840, page 7 identifies those assembly stations whose output is subject to inspection. Where required, inspection will be conducted in accordance with the Inspection Instruction Card. Acceptance criteria shall be in accordance with the applicable drawing and Inspection Instruction Card. A further evaluation will be made by a Quality Control Engineer, together with the Project Engineer, to determine the repairable/scrap status of any non-conforming units. In no event shall the scrap rate exceed 10%.

10.0 Test Procedures

The general procedures for all assembly or inspection stations are given below.

1. The station operator will be from the Bulova hourly workforce assigned to that area, where feasible.
2. The operator shall have had a minimum of 8 hours instruction and/or operating time for the station under test, where feasible.
3. The material required for the test will be at the station prior to the start of the test. All the relevant piece part inspection sheets and identifiers will be recorded on the data sheet.

REV. A

4. The test will be under the control of the Assembly Group Leader, the only person who will issue instructions to the operator and inform the test data recorder of specific reasons for stopping (if not obvious). The test data will be recorded by the Industrial Engineer Inspector.
5. Prior to the start of any test, a minimum of three assemblies/test units will be run through the station and inspected to verify that the station is operating properly, where applicable.
6. The participants from ARRADCOM shall receive a 3 working day minimum notice prior to the start of any test.
7. Testing of assembly/inspection stations will be handled as expeditiously as possible. First piece inspection will be followed by batch inspection conducted concurrently as far as is feasible.
8. A fifteen minute break will be scheduled approximately half way through each 4 hour demonstration. It will not be part of the 4 hour run time. If any unexpected work stoppages occur, the run time will be extended, where feasible, to fulfill the 4 hour run time.

11.0 Demonstration Test Schedule

Demonstration testing will occur in two phases. Phase A will encompass Assembly Stations Nos. 1 through 8 which will utilize 11 bench set-ups. The target starting date for this phase is 20 June 1983 with completion estimated to be 30 June 1983.

Phase B will cover Assembly Stations 9 through 23 which will utilize 20 bench set-ups. The target starting date for this phase is 1 September 1983 with completion estimated to be 21 September 1983.

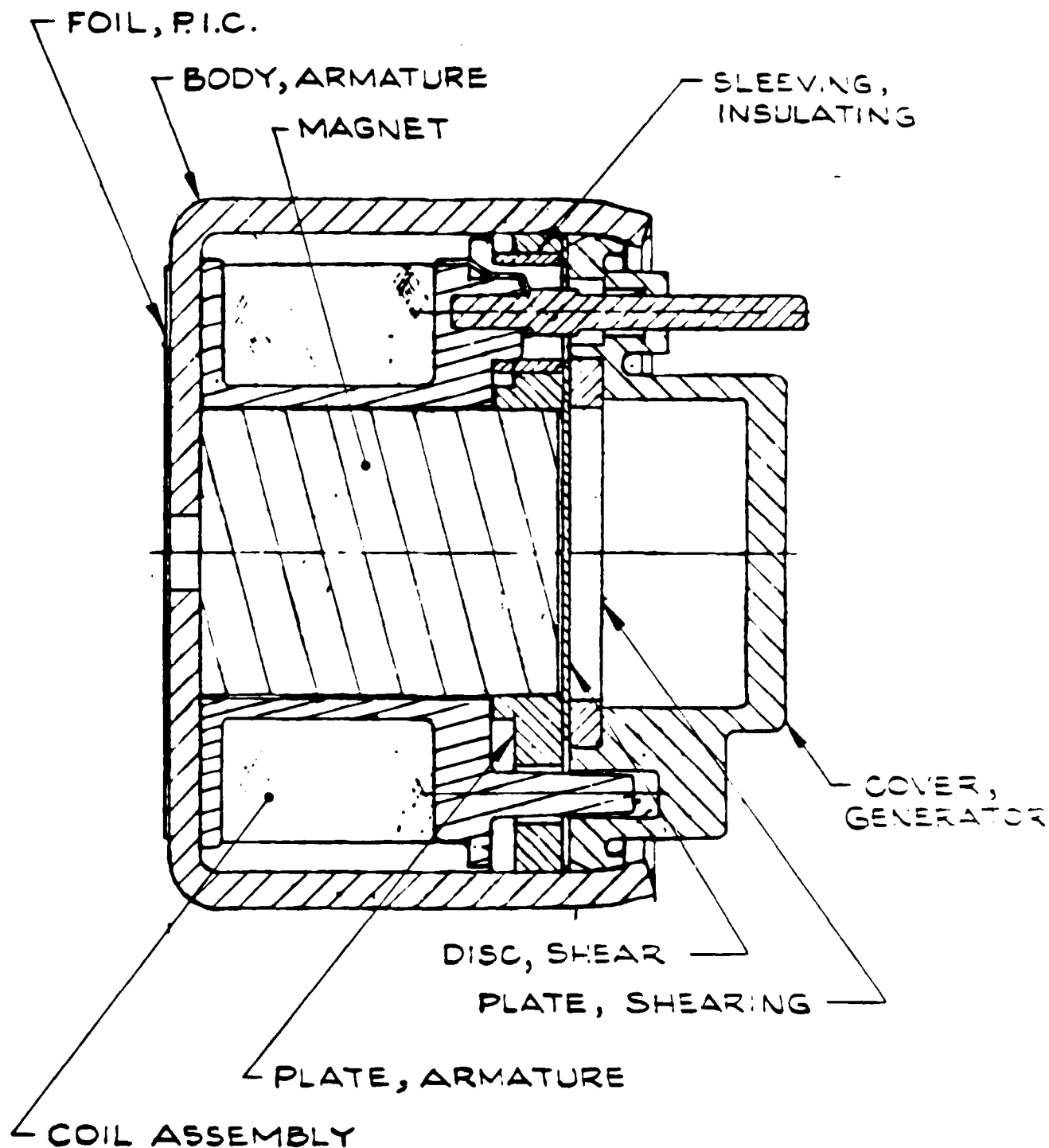
A final report on the condition of the Demonstration Test will be furnished by 30 September 1983.

INSTRUCTIONS FOR COMPLETING DATA COLLECTION FORM

BLK INSTRUCTIONS

- 1 Enter name of production facility.
- 2 Print or type data collector's name in box in lower right corner of sheet, leaving space for signature.
- 3 Enter function or operation that the station performs. Only one station per data sheet.
- 4 Enter page number and total number of pages for the station in the format "Page No. ____ of ____."
- 5 Enter assigned station number.
- 6 When the station under observation starts up the "Start of Shift" time, to the nearest minute, using Military (2400 hr) time, will be recorded. If more than one station is watched, take care and record each station's start time on the appropriate data sheet.
(Blocks 7 through 12 are to be completed for each station stoppage following indicated start times)
- 7 Enter test date on each data record line used. Start a new sheet each day. A 6-digit format should be used; e.g., 3 February 1980 would be recorded JS 020380.
- 8 Enter the event stop time to the nearest minute, using Military time. (A timing device, such as a stopwatch, should be started immediately to measure precisely the duration of the stoppage).
- 9 Enter the appropriate 1-digit event code selected from the list of codes provided at the bottom of the form.
- 10 After the station is restored to an operating condition, enter the duration of downtime time in minutes and seconds.
- 11 Enter remarks which clearly describe reason for station stoppage unless an equipment failure code (see Blk 13) is applicable, in which case this block need not be completed. It is essential that stoppages for the same reason result in this block being completed in a consistent manner. The entry in this block is limited to 47 alphanumeric characters including blanks.
- 12 If number of maintenance personnel required to restore station to operation exceeds one (1), enter number utilized.
- 13 If the stoppage is the result of an equipment failure requiring corrective maintenance (Event Code 3) and a previously defined 3-digit failure code describes the mode of failure, the failure code is entered.
- 14 At least four times a shift the actual production rate should be measured while the machine is experiencing uninterrupted operation. The rate should be measured over a period of several (3-10) minutes and averaged to get the "per minute" rate. All rate measurements will be averaged to compute an average rate for the shift. The averaged rate is recorded in this block.
- 15 Enter the End of Shift time to the nearest minute in Military Time. If the End of Test (Event Code 4) occurs during the day data is being gathered, it is that time which is recorded in this block. Under any circumstances the time recorded in this block is the time at which the station was shut down for the day, unless required corrective maintenance on the station caused the shut down. In the latter case the time of day maintenance personnel comm effort is recorded.
- 16 Enter the total number of units processed during the shift whether it be in pounds or parts.
- 17 Indicate whether the entry in Blk 16 is in rounds or parts. If another term is applicable, i.e., bar, enter the term in OTHER.
- 18 Enter the number of acceptable (conforming or nondefective) units, parts, rounds, or pounds processed during the shift.
- 19 Enter the sum of the number of rejects which occurred during the shift. This includes reparable and non-reparable (scrap) rejects.
- 20 Sign completed data forms at the end of the shift and note in so individual responsible for gathering the data.

[illegible]



SETBACK GENERATOR
ASSF 150 PLY

DEMONSTRATION PROCEDURE

ASSEMBLY STATION NO.1

1.0 ASSEMBLY DESCRIPTION

Operator obtains (2) Post, Terminal from part bin with tweezers and places in position in nest of Tool No. 273-19006. Operator places Bobbin in required position in nest. Operator actuates tool to press Posts into Bobbin. Operator removes Bobbin assembly from tool and places in trav.

2.0 INSPECTION DESCRIPTION

Inspector checks first three (3) pieces from operator in accordance with Inspection Instruction Card. The inspector will use Tool No. 273-60009 to pull test 2 pins inserted in flange of Bobbin. If satisfactory, each completed lot will be inspected in accordance with the AQL of the Inspection Instruction Card. All results shall be recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 120/HOUR

4.0 RUN PLAN

Run to complete four lots of approximately 120 pieces per lot. This should take approximately four hours.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 2

1.0 ASSEMBLY DESCRIPTION

Operator installs 4 Bobbin assemblies into each of the two turrets of the coil winding machine, Tool No. 273-19002. Operator wraps wire around posts and starts coil winding on completion of coil winding at this station. The wire tension is controlled by tension device, Tool No. 273-19003. Operator advances turrets to next location and repeats operation. Operator removes completed coil assemblies, cutting leads approx. 2" from bobbin and reloads stations with new bobbin assemblies.

2nd Operator takes coil assemblies and places them into a holding fixture, Tool No. 273-19007, to rotate coil assemblies while applying tape to outside diameter of coil. On completion, this operator will chemically strip insulation from lead wires from coil. Operator places completed assemblies in tray, Tool No. 273-19008.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a 4 hour period to manufacture approximately 260 assemblies.

Rev. A

DEMONSTRATION PROCEDURE

ASSEMBLY STATION NO. 3

1.0 ASSEMBLY DESCRIPTION

Operator obtains Coil Assembly and winds the start and finish leads around designated areas on their respective terminal posts. The Coil Assembly is positioned on the indexing fixture - 2 position, Tool No. 273-19011, of the Bulova-resistance welding machine, Tool No. BW-158862. The special welding electrodes, Tool No. 273-19010 is engaged and positioned. Operator welds one terminal post; then the other. The Coil Assembly is removed from the welding machine and returned to same storage tray, Tool No. 273-19008, in which it arrived.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with the Inspection Instruction Card. Inspector checks the validity of the welds using the weld test fixture, Tool No. 273-60007, continuity of the Coil Assembly using continuity tester, Tool No. 273-60004, and direction of winding and start lead of winding using polarization tester, Tool No. 273-60010. If satisfactory, operator continues. At conclusion of lot run, assemblies are inspected in accordance with AQL of the Inspection Instruction Card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run to complete 2 lots of approximately 130 pieces per lot. It is anticipated that this will take approximately 4 hours.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 4

1.0 ASSEMBLY DESCRIPTION

Operator places Armature Plate over the three protruding pins of the Bobbin Assembly and lowers this assembly into the lower nest of Tool No. 273-19013.

The operator then places the Armature Body over the assembly and rotates the Body until it is located in proper position to clear the three recessed tabs.

Operator actuates tool to press plate into position in Armature Body. Operator removes assembly from nest and then installs two insulating sleeves into position over pins.

Operator then installs magnet into the central cavity of the assembly; then places assembly into storage tray, Tool No. 273-19014.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 5

1.0 ASSEMBLY DESCRIPTION

Operator places the Generator Cover into the nest of the fixture, Tool No. 273-19015, then obtains (1) Shearing Plate from part container with tweezers and places in position on Cover.

Operator actuates tool to press Shearing Plate into position. Operator removes assembly from nest and places into tray.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 6

1.0 ASSEMBLY DESCRIPTION

Operator places assembly of Armature Body into nest of fixture.

Operator assembles the Shear Disc onto the protruding locating pin and the (2) Terminal pins, and lowers into position.

Operator places the Cover Subassembly into the Armature, using Tool No. 273-19016 to press into position.

Operator actuates swaging fixture, Tool No. 273-19017, to swage edge of Armature over cover. Operator removes completed assemblies and places them into tray.

2.0 INSPECTION DESCRIPTION

No inspection will be conducted at this station

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 7

1.0 INSPECTION DESCRIPTION

Inspector obtains a completed Setback Generator from storage tray supplied by Station No. 6 and inspects it in the fixture of the final assembly tester of the Setback Generator tester, Tool No. 273-60006. The inspector activates the tester to measure resistance, inductance, and insulation resistance (Hi-Pot) - terminal post to armature case. If satisfactory results are obtained for the first (3) units, testing will continue in accordance with the AQL of the Inspection Instruction Card with results recorded on data sheet. Accepted assemblies will be placed in storage tray for transport to next assembly station.

2.0 ANTICIPATED INSPECTION RATE - 65/HOUR

3.0 RUN PLAN

Inspect continuously for a four-hour period yielding approximately 260 assemblies.

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 8

1.0 ASSEMBLY DESCRIPTION

Operator obtains setback generators from storage tray supplied by Station 7 and loads up to (30) of them in charging tray, Tool No. 273-19001. The operator places the loaded charging tray in the charging fixture of the magnetic charger, Tool No. 273-19001, and activates the unit. The charging tray is then unloaded and the charged generators placed in a storage tray for transport to inspection.

2.0 INSPECTION DESCRIPTION

Inspection checks first (3) generator assemblies for specified flux leakage using gaussmeter and holding fixture, Tool No. 273-60001. If satisfactory, operator continues. At conclusion of run, assemblies are inspected in accordance with AQL of Inspection Instruction Card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run to complete 2 lots of approximately 130 each. It is anticipated that this will take approximately 4 hours.

NOTE: The generators would normally be completed by installing a foil disc over the central hole. This operation will be conducted after the successful completion of the Pneumatic leakage test; not part of the M.M. & T. Program.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 9

1.0 ASSEMBLY DESCRIPTION

Operator places Switch Terminal into nest of fixture, Tool No. 273-19009. With tweezers, operator inserts Wire, Terminal, into Switch Terminal and activates Tool. With tweezers, operator removes assembly and places into tray, Tool No. 273-19018.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card. All results are recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run to complete 2 lots of approximately 130 assemblies per lot. It is anticipated that this will take approximately 4 hours.

Rev. B

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 10

1.0 ASSEMBLY DESCRIPTION

Operator installs S2 Contact Assembly into its mounting hole and solders into position. Operator then places S2 Switch Housing Assy. into position and heat stakes its (3) legs to P.C. Board.

Operator locates Jack connector into its mounting holes and presses into position using Tool No. 273-19022. Completed assemblies to be placed in P.C.Board carrier storage rack, Tool No. 331-19004.

2.0 INSPECTION DESCRIPTION

Inspection checks first (3) pieces from the operator in accordance with the Inspection Instruction Card. If satisfactory, each completed lot will be inspected in accordance with the AQL of the Inspection Instruction Card and the results recorded on the data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously to manufacture approximately 2 lots of approximately 130 per lot. It is anticipated that this will take approximately 4 hours.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 11

1.0 ASSEMBLY DESCRIPTION

Operator places S2 Switch Housing in nest in Tool No. 273-19019. Operator places (1) Wire Contact into location in Tool.

Operator activates tool and inserts Contact into Housing.

Operator places completed assembly into tray.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from the operator in accordance with the Inspection Instruction Card. If satisfactory, each completed lot will be inspected in accordance with the AQL of the Inspection Instruction Card and the results recorded on the data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 120/HOUR

4.0 RUN PLAN

Run continuously to manufacture approximately 4 lots of approximately 120 per lot. It is anticipated that this will take approximately 4 hours.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO.12A
(SEE NOTE AT BOTTOM)

1.0 ASSEMBLY DESCRIPTION

Operator locates Resistors R1 or R2 and fills a supply rack on Machine No. 273-19004.

Operator activates machine to bend the leads of the Resistor and crop the legs to a predetermined length.

Operator places completed Resistors into a plastic stack bin.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 480/HOUR

4.0 RUN PLAN

Run continuously for a one-hour period to manufacture 480 parts.

NOTE: Resistor R1 or R2 will be demonstrated; the machine can be reset to handle the Diode D1 and the Impact Switch S4.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 12B

1.0 ASSEMBLY DESCRIPTION

Operator locates Capacitors into nest in Machine No. 273-19005.

Operator actuates machine to cut Capacitor leads at approximately .10 from body of Capacitor. Operator places completed Capacitors into a plastic stack bin.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 480/HOUR

4.0 RUN PLAN

Run continuously for a one-hour period to manufacture 480 parts.

Rev. B

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 13

1.0 ASSEMBLY DESCRIPTION

The operator will install the P. C. Board Carrier assembly into the Assembly Holding Fixture, Tool No. 331-19005.

The operator will then install the following components into the marked locations on the P.C.Board. All the components will be handled using finger cots, tweezers, or needle-nosed pliers.

Components to be installed are:

- 1 Resistor R1
- 1 Diode D1
- 1 Capacitor C1
- 4 Jack, Pin

The P.C.Board Carrier Assemblies will stay in the Holding Fixture and proceed to next assembly station.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 8 P.C.Bd. CARRIER ASSEMBLIES/HOUR

4.0 RUN PLAN

Assembly will continue for a four-hour period to complete approximately 32 P.C. Board Carrier Assemblies.

Rev. B

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 14

1.0 ASSEMBLY DESCRIPTION

The operator will remove the P.C.Board Carrier Assembly from the Assembly Holding Fixture, Tool No. 331-19005, and mount them in the Fixture, Tool No. 331-19006.

Operator will mask P.C. Boards in accordance with the model supplied by Engineering. Any final positioning of electrical components will be carried out and lead legs will be dressed if necessary.

The completed Boards will now be transferred from the Fixture, Tool No. 331-19006 into the P.C.Board Carrier Rack, Tool No. 331-19004. Transport filled rack to next station No. 15A.

2.0 INSPECTION DESCRIPTION

No inspection is required at this operation.

3.0 ANTICIPATED ASSEMBLY RATE - 8 P.C.BOARD CARRIER ASSEMBLIES/HOUR

4.0 RUN PLAN

The operation will be continued for 4 hours or until all available components have been utilized to assemble 32 P.C.Board Carrier Assemblies.

NOTE: Assembly stations 13 and 14 may be combined and run at a single work station by one operator if circumstances at rehearsals/demonstration suggest this would better serve the purpose.

Rev. B

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 15

1.0 ASSEMBLY DESCRIPTION

The operator removes a P.C. Board Carrier Assembly from the storage rack, Tool No. 331-19004, and obtains (2) stiffeners from container, Tool No. 331-19008; then installs one stiffener each on front and rear of carrier assembly. Operator feeds carrier assembly into finger conveyor system of wavesoldering machine, Tool No. 331-19003. P.C. Board Carrier Assembly exits from the end of the conveyor onto a slide and comes to rest on the workbench. The operator removes the stiffeners from the carrier assembly and accumulates them for return to the input workbench for reuse.

The soldered carrier assemblies are placed in the cleaning machine's modified basket, Tool No. 331-19012, until the basket is filled. Additional carrier assemblies awaiting the cleaning process are temporarily stored in an additional storage rack, Tool No. 331-19004. The filled cleaning machine basket is lowered into the cleaning machine, Tool No. 331-19002, and cleaned.

After cleaning, the operator removes the filled cleaning basket from the machine. Operator then removes the P.C. Board Carrier Assemblies and places them in an additional storage rack, Tool No. 331-19004. The empty basket is returned to the input workbench of the cleaning station for reuse.

The operator removes the cleaned P.C. Board Carrier Assemblies, and using the P.C. Board removal tool, Tool No. 331-19009, removes each of the individual P.C. Board Assemblies from each carrier. Confor 166 Coat Diode D1 and Capacitor C1 in

accordance with assembly drawing KF90839.

The operator examines component lead dress and installs Setback Generator Assembly KD90830. The operator places the P.C. Board Assembly in storage tray, Tool No. 273-19021, for transport to the Inspection Station.

2.0 INSPECTION DESCRIPTION

Inspection will check the first P.C.Board Carrier Assembly for workmanship and soldering process in accordance with the Inspection Instruction Card. If satisfactory, return the Carrier Assembly to the operator for separation of the (8) individual P.C.Board Assemblies from their carrier and for completion of remaining assembly tasks. The inspector will then complete the remaining inspection requirement on the (8) P.C.Board Assemblies in accordance with AQL of the Inspection Instruction Card. Results shall be recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 8 CARRIER ASSEMBLIES/HOUR

4.0 RUN PLAN

The operation will continue for 4 hours, or until 32 Carrier Assemblies have been completed and inspected, and/or all available materials utilized.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 16
SEE NOTE BELOW

1.0 ASSEMBLY DESCRIPTION

Operator places Rotor Housing in nest of Tool No. 273-19027. Operator next secures ground wire, KB90228 from part pin and locates same in position on Rotor Housing, KF90824. Operator actuates tool to stake wire to Rotor Housing. Operator removes sub-assembly from tool. The operator will then cut the ground wire to the specified length and place the assembly in tray for transport to next station.

2.0 INSPECTION DESCRIPTION

Inspector checks first three (3) pieces from operator in accordance with the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card and results recorded on data sheet. (The inspector will be inspecting item 10 of the Inspection Instruction Card only.)

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

- A. Run one lot of 55 Rotor Housing Assemblies (Ref.: P/N KF90824). Identify individually.
- B. Run two lots of approximately 100 each Rotor Housing Assembly (Ref.: P/N KF90222 - obsolete type).

NOTE: The Rotor Housing will have previously been assembled with the following parts:

90° Contact Assembly	#KD90219
Pin Housing	#KB90119
Sleeving Insulation	168 #MIL-I-22129

and the 90° Contact Assembly will have been prepotted in position.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 17

1.0 ASSEMBLY DESCRIPTION

Operator obtains Power Supply Assembly from storage tray (Ref: Assembly Station No. 15E). Operator obtains quantity of prepared encapsulation material from Assembly Station No. 20 on an as-required basis. Operator applies a bead of this encapsulation material to the flange of the S2 Switch Housing to provide sealing at the Rotor Housing interface.

Operator then aligns the 2 pin jacks with the ground wire and 90° contact in the Pin and Contact, Housing Assembly, KD90834-1. Operator inserts Power Supply Assembly in the Housing Assembly, mating the two connectors. Operator places assembly in Tool No. 273-19028 and stakes P.C. Board into the Housing Assembly in four places. Units are then set aside to allow the encapsulation sealant to set.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with items 1 & 10 of the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run one lot of 55 Housing Assemblies and then two lots of approximately 100 each Housing Assemblies. This should take approximately four hours.

Rev. B

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 18

1.0 ASSEMBLY DESCRIPTION

Operator obtains (1) Insulator KC90822 and aligns with mating hole pattern in (1) Power Supply Cover KC90812. Operator secures (4) Probe Grommets, KB90819, from part bin with tweezers, aligns and places same into associated holes in Power Supply Cover KC90812. Operator places Power Supply Cover in Tool No. 273-19030 and activates tool to stake 4 grommets in place. Operator removes Power Supply Cover from tool and secures one Receptacle Shell, KC90342 from part bin. Operator locates same in position on Power Supply Cover and places in Tool No. 273-19031. Operator actuates tool to stake shell into cover at 4 places. Operator removes Cover Subassembly and places in tray.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) pieces from operator in accordance with the Inspection Instruction Card, Item 1 only. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with AQL of the Inspection Instruction card and results recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture 3 lots of approximately 85 assemblies per lot.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 19

1.0 ASSEMBLY DESCRIPTION

Operator secures Housing Subassembly from Assembly Station 17 and Power Supply Cover Subassembly from Assembly Station 18. Operator aligns and locates Cover Subassembly on Housing Subassembly and places same in Tool No. 273-19032. Operator actuates tool to swage Cover Subassembly to Housing Subassembly. Operator removes assembly from tool and places in storage tray, Tool No. 273-19034.

2.0 INSPECTION DESCRIPTION

No inspection at this station

3.0 ANTICIPATED ASSEMBLY RATE - 65/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 260 assemblies.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 20
SEE NOTE BELOW

1.0 ASSEMBLY DESCRIPTION

Operator obtains semi-completed Molded Housing Assemblies from storage trays supplied by Assembly Station No. 19 on an as-required basis. Operator performs pre-encapsulation preparations on Rotor Housing and installs same in holding fixture, Tool No. 331-19013. The operator obtains the encapsulating material, resin and hardener, and proceeds to proportion, mix, de-air, and fill encapsulating material dispensing device, Tool No. 331-19001, in accordance with encapsulating process. The operator completes encapsulation of the Molded Housing Assembly and allows to cure. The operator removes assembly from holding fixture and all assembly/process aides. The completed Molded Housing Assemblies are placed in storage tray. The assemblies will then be machined to add slot cut per drawing, but not as part of this demonstration.

2.0 INSPECTION DESCRIPTION

Inspector checks first (3) assemblies from the operator in accordance with the Inspection Instruction Card. If satisfactory, operator continues. At conclusion of each lot, assemblies are inspected in accordance with the AQL of the Inspection Instruction Card and results are recorded on data sheet.

3.0 ANTICIPATED ASSEMBLY RATE - 25/HOUR

4.0 RUN PLAN

Run to complete one lot of 55 assemblies and two lots of approximately 50 ea. assemblies. This should take approximately four hours.

NOTE: Pre-encapsulation preparation requires two operators for approximately four hours.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 21

1.0 INSPECTION PROCEDURE

Inspector obtains Molded Housing Assemblies as required from storage tray supplied by Station No. 20. Inspector loads (2) assemblies into dual nest fixture of Magnetic Power Supply Assembly acceptance test console, Tool No. 273-60005-002, and activates device. After assembly in nest one is tested, the inspector switches to assembly in nest two and replaces assembly in nest one with new unit to be tested. Accepted units are placed in storage tray for transport to next assembly station. Unsatisfactory units are identified and put aside. If the first (3) assemblies tested are satisfactory, the inspector continues testing in accordance with the AQL of the Inspection Instruction Card and records results on a data sheet. Test console printout shall be secured to data sheet for the first 55 units.

2.0 ANTICIPATED INSPECTION RATE - 35/HOUR

3.0 RUN PLAN

Run continuously for a four-hour period to inspect approximately 140 assemblies. If necessary, certain units can be reinspected to achieve a total run quantity of approximately 140 assemblies.

Rev. B

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 22

SEE NOTE BELOW

1.0 ASSEMBLY DESCRIPTION

Operator secures (2) Leaf Pins, KB90823 from part bin with tweezer and places in two holes in nest, 273-19036, of Tool No. 273-19035. Operator next aligns Rear Bearing Plate, KC90673 on nest and actuates to rivet the (2) Leaf Pins into this Rear Bearing Plate. Operator removes Bearing Plate from nest and places in tray.

2.0 INSPECTION DESCRIPTION

No inspection at this station.

3.0 ANTICIPATED ASSEMBLY RATE - 120/HOUR

4.0 RUN PLAN

Run continuously for a four-hour period to manufacture approximately 480 assemblies.

NOTE: If Leaf Pin, KB90823, is not available, Leaf Pin, KB90063, will be substituted. Rear Bearing Plate Assembly containing Leaf Pins, KB90063, will be clearly identified as demonstration material/sub assembly only. THEY CANNOT BE ASSIGNED FOR USE IN DELIVERABLE HARDWARE.

Rev. A

DEMONSTRATION PROCEDURE
ASSEMBLY STATION NO. 23

1.0 INSPECTION PROCEDURE

Inspector obtains Housing and Mechanism Assemblies from storage tray supplied by preceding assembly station on an as-required basis. Inspector installs up to (4) assemblies - one each per nest in the centrifuge, and activates equipment to proceed with test. If the first (3) assemblies test satisfactorily, they are placed in storage tray for accepted assemblies. Inspector will continue testing 100% of all assemblies submitted in accordance with Inspection Instruction Card and record results on data sheet. Any assembly which tests unsatisfactorily shall be identified and set aside with its data sheet for review. Test console printout shall be secured to data sheet for the first 55 units.

2.0 ANTICIPATED INSPECTION RATE - 65/HOUR

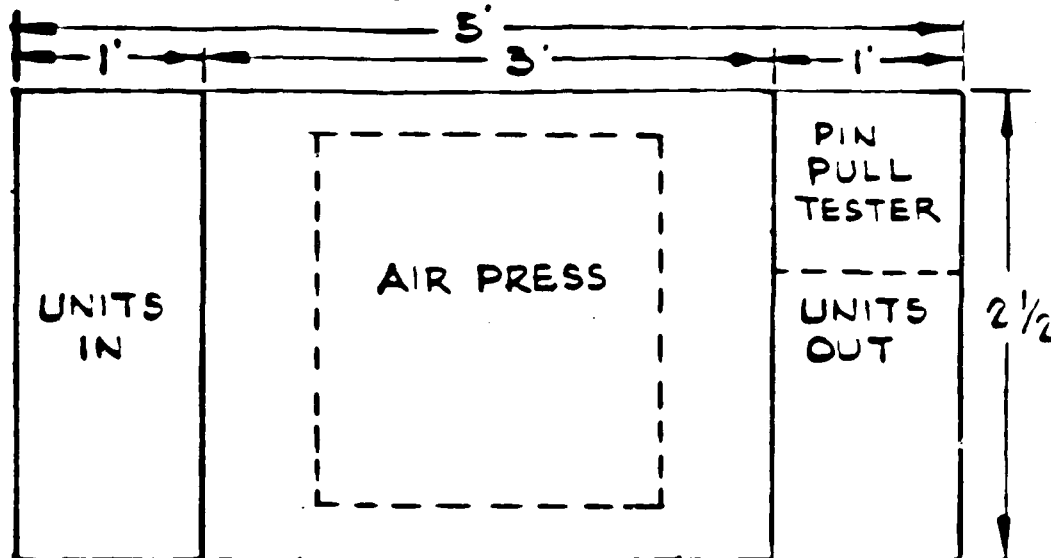
3.0 RUN PLAN

Run continuously for a four-hour period to test approximately 260 assemblies. In order to test 260 assemblies, certain assemblies may be recycled as required.

APPENDIX Q
SAMPLE ASSEMBLY STATION LAYOUT

BULOVADSYSTEMS & INSTRUMENTS CORPORATION
VALLEY STREAM, NEW YORKBY _____ DATE _____
APPRVD _____ DATE _____PROJ 330/331
REV A

ASSEMBLY STATION LAYOUT

CHAIR
FOR
ASSEMBLERBOBBIN ASSEMBLYASSY NO. KD90825ASSEMBLY STATION NO. 1PROCEDURE: INSTALL TWO TERMINAL
POSTS INTO BOBBINPARTS LIST (QTY PER ASSY)

- (1) KD90204 BOBBIN
- (2) KB90817 POST, TERMINAL

SPECIAL TOOLS/EQUIPMENT

- TOOL NO. 273-19006
- TOOLING TO INSTALL (2) TERMINAL POSTS
IN BOBBIN ASSY.
- TOOL NO. 273-60009
- PULL TEST OF (2) PINS PRESSED INTO
179 'GE OF BOBBIN.

Note: This is a sample. Stations 2 through 22 are available on request.

APPENDIX R
SAMPLE INSPECTION INSTRUCTION CARD

DISTRIBUTION LIST

Commander

U.S. Army Armament Munitions and Chemical Command

ATTN: DRSMC-TSS(D) (5)

DRSMC-CCL(D)

DRSMC-LCN-T(D), R. Noble

DRSMC-LCN(D), Dr. T. Davidson

DRSMC-LCN-T(D), A. Nash

DRSMC-LCU-CT(D), W. Joseph

DRSMC-QAR-E(D)

DRSMC-QAR-I(D)

DRSMC-QAT-A(D)

Dover, NJ 07801

Administrator

Defense Technical Information Center

ATTN: Accessions Division (2)

Cameron Station

Alexandria, VA 22314

Director

U.S. Army Materiel Systems Analysis Activity

ATTN: DRXSY-MP

Aberdeen Proving Ground, MD 21005

Commander/Director

Chemical Research and Development Center

ATTN: DRSMC-CLJ-L(A)

DRSMC-CLB-PA(A)

Aberdeen Proving Ground, MD 21010

Director

Ballistic Research Laboratory

U.S. ARDC

ATTN: DRSMC-TSB-S(A)

Aberdeen Proving Ground, MD 21005

Chief

Benet Weapons Laboratory

LCWSL, U.S. Armament Research and Development Center

ATTN: DRSMC-LCB-TL(W)

Watervliet, NY 12189

Commander

Headquarters, U.S. Army Armament,

Munitions and Chemical Command

ATTN: DRSMC-LEP-L(R)

DRSMC-IR(R), W. Hyrkas

Rock Island, IL 61299

Director
U.S. Army TRADOC Systems Analysis Activity
ATTN: ATAA-SL
White Sands Missile Range, NM 88002

Director
Industrial Base Engineering Activity
ATTN: DRXIB-MT
Rock Island, IL 61299

Commander
U.S. Army Munitions Production Base Modernization Agency
ATTN: DRSMCPM-PBM-MF, B. Rai
DRSMCPM-PBM-FE
Dover, NJ 07801

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