GEPP-PI-598

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ENGINEERING PROCESS INSTRUCTIONS
and
DEVELOPMENT SUMMARY

MC3642 THERMAL BATTERY

D. Jacobs
Thermal Battery Development
6/1/81

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General Electric Company
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ENGINEERING

PROCESS INSTRUCTIONS

AND

DEVELOPMENT SUMMARY

MC3642 THERMAL BATTERY

D. JACOBS

THERMAL BATTERY DEVELOPMENT

6/1/81

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INTRODUCTION

The MC3642 is a dual channel thermal battery used on the DE1010/W85 Command Disable Controller. It utilizes the $Ca/CaCrO_4$ electrochemical system. The electrical requirements of this battery are as follows:

	RISE TIME	PEAK VOLTAGE	ACTIVE LIFE	LOAD
Channel 1	1.0 Sec. Max. to 20 Volts	34 Volts	10 Sec. Min. above 20 Volts	40.0 Ohms
Channel 2	.350 Sec. Max. to 23 Volts	42 Volts	10 MSec. Min. above 23 Volts	6.5 Ohms

The battery consists of 14 cells connected in series (Channel 2) and 12 cells connected in series (Channel 1). Each cell is composed of an anode fabricated from a bimetallic sheet (0.005" thick calcium on 0.005" thick iron substrate), a depolarizer-electrolyte-binder (DEB) pellet and a heat pellet. Activation is achieved by mechanical primer.

Optimum battery performance is achieved with a 35/55/10 DEB pellet weighing .80g and a heat pellet, weighing 1.30 grams, of 88/12 heat powder.

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I. MC3642 DRAWING SET

ITEM	QUANTITY	1	2	3	4	5	6	7
1	1	318455-00 MC3642						
2	AR		324414-201 Mica Disc Ins.					
3	AR		324458-204 Disc Insulator					
4	1		344851-200 Case Assembly					
5	1			344902-200 Holder Primer				
6	1			324410-203 Case				
7	1		SS306772-200 Primer Percus.					
8	1			344818-200 Stack Assembly				
9	3				325472-201 Mica Strip			
10	1				33044-200 Dis W/Lead			
11	2				330445-200 Electrode W/Lead			
12	1				329629-206 Insul. Wrap			
13	28				343146-200 DEB Pellet			
14	31				344905-200 Heat Pellet			
15	5				324458-203 Disc Insulator			
16	25				332410-201 Elect. Bimetal			
17	3				334257-200 Heat Strip			
18	AR				330315-200 Heat Disc			
19	AR				9508101 Tape-802			
20	AR				SS307735-200 Tape			
21	1				344849-200 Header Encap.			
22	1					344850-200 Header Assembly		
23	1						344815-200 Header	
24	1							344814-200 Header Blank
25	1							343151-200 Terminal
26	8							SS304093-200 Glass
27	2						343242-201 Lead	
28	1						344861-200 Lead	
29	1						327335-202 Pad Insulator	
30	1						334215-200 Monitor Assembly	
31	2							306008-200 Rod
32	1							325312-200 Switch Thermal

PS318455 Product Acceptance Specification MC3642

SS322411 DEB Mixture 35-55-10

D. Jacobs
5/26/81
Issue C

II. PROCESS INSTRUCTIONS

MC3642 THERMAL BATTERY

ENGINEERING DEVELOPMENT PROCESS INSTRUCTIONS

NUMBER		
3642-01	*Pad Insulator*	*327335-202*
3642-02	*Monitor Assembly*	*334215-200*
3642-03	*Lead*	*343242-201*
3642-04	*Lead*	*344861-200*
3642-05	*Degrease Header*	*344815-200*
3642-06	*Install Monitor Pad*	*344850-200*
3642-07	*Spotweld Leads on Header*	*344850-200*
3642-08	*Install and Spotweld Monitor Assembly*	*344850-200*
3642-09	*Coat Seals*	*344850-200*
3642-10	*Test Header Assembly*	*344850-200*
3642-11	*Assemble Mold*	*344849-200*
3642-12	*Encapsulate Header Assembly*	*344849-200*
3642-13	*Mold Disassembly and Cleanup*	*344849-200*
3642-14	*Test Header Encapsulated*	*344849-200*
3642-15	*Insulator Center Hole*	*324458-203,204*
3642-16	*Positive Electrode with Lead*	*330445-200*
3642-17	*Bimetallic Disc with Lead*	*330444-200*
3642-18	*Electrode Bimetal*	*330410-201*
3642-19	*Heat Pellet*	*344905-200*
3642-20	*DEB Pellet*	*343146-200*
3642-21	*Mica Strip*	*325472-201*
3642-22	*Heat Paper Strip*	*334257-200*
3642-23	*Insulator Wrap*	*329629-206*
3642-24	*Disc, Heat Paper*	*330315-200*
3642-25	*Mica Disc*	*324414-201*
3642-26	*Mark Serial Number on Header*	*344849-200*
3642-27	*Assemble Stack*	*344818-200*
3642-28	*Install Heat Strips*	*344818-200*
3642-29	*Blanket Installation*	*344818-200*
3642-30	*Spotweld Leads*	*344818-200*
3642-31	*Case Assembly*	*344851-200*
3642-32	*Adjust Stack Height*	*318455-00*
3642-33	*Primer Installation*	*318455-00*
3642-34	*Leak Check*	*PS318455*
3642-35	*X-Ray Battery*	*PS318455*
3642-36	*Resistance Check*	*PS318455*
3642-37	*Label Battery*	*318455-00*

Process Number 3642-01

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title PAD, INSULATING Sheet 1 of 2

Drawing 327335-202 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-01

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *PAD, INSULATING* Sheet *2* of *2*

Drawing *327335-202* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Silicone Elastomer RTV sheet 4.6 ± 0.2mm, per 2070069.*
10	*Diacro Press* *Diacro Punch & Die Diam. .295 7.5 ± 0.8mm*	*Punch monitor pads from RTV sheets.*

Process Number 3642-02

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MONITOR ASSEMBLY Sheet 1 of 2

Drawing 334215-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-02

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

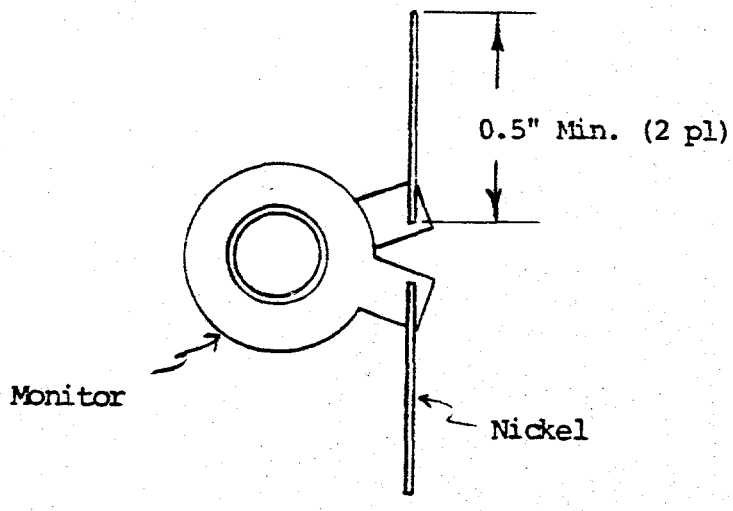
Title *MONITOR ASSEMBLY* Sheet *2* of *2*

Drawing *334215-200* Originator *D.J.*

Process Approved *D. Jacob* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Monitor 325312-200* *2. Nickel Wire 304087-200*
10	*Unitek Spotwelder (setting 20WS) Welding Tweezer*	*Spotweld nickel wire to monitor tabs as shown by sketch below.* *Adjust welder output as required to obtain a good weld as determined by pull test (material must break, not the weld).*
20	*(X-acto knife or small file)*	*NOTE - Weld bonding may be enhanced by removing the gold plating from the monitor tabs before welding.*



Process Number 3642-03

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title LEAD (2 required) Sheet 1 of 2

Drawing 343242-201 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-03

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title LEAD (2 required) Sheet 2 of 2

Drawing 343242-201 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3246 Issue A

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Iron per AMS-7706 or low carbon steel per QQ-S-698 .007" thick stock.*
10	*Lead Cutter* *77 ± 3mm Long* *6.35 ± .3mm Wide*	*Punch leads from stock.*
20	*Degreaser*	*Degrease parts.*
30		*Place finished parts in Kerr jar and seal.*

Process Number 3642-04

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title LEAD Sheet 1 of 2

Drawing 344861-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-04

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *LEAD (1 required)* Sheet *2* of *2*

Drawing *344861-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Iron per AMS-7706 or low carbon steel per QQ-S-698 .007" thick stock.*
10	*Lead Cutter* *77 ± 3mm Long* *6.35 ± .3mm Wide*	*Punch leads from stock.*
20	*Degreaser*	*Degrease parts.*
30		*Place finished parts in Kerr jar and seal.*

Process Number 3642-05

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title DEGREASE HEADER Sheet 1 of 2

Drawing 344815-200 (Header) Originator D.J.

Process Approved _____ Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-05

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *DEGREASE HEADER* Sheet *2* of *2*

Drawing *344815-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Header 344815-200*
10	*Degreaser*	*Degrease parts.*

Process Number 3642-06

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title INSTALL MONITOR PAD Sheet 1 of 2

Drawing 344850-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-06

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSTALL MONITOR PAD* Sheet *2* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Monitor Pad 327335-202* *2. Silicone Rubber Adhesive SS306048-200* *3. Header 344815-200 (Degreased)*
10	*MC3642 Header Assembly Fixture*	*Place header in the assembly fixture. The component side of the header should face the locator arm of the fixture.*
20	*Plastic Syringe*	*Place a small amount of silicone adhesive on one side of the monitor pad.*
30		*Glue the pad to the header, locating it directly under the "monitor" cavity in the fixture locator arm.*
40		*Allow to air dry approximately 24 hours.*

Process Number 3642-07

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *SPOTWELD LEADS ON HEADER (4 places)* Sheet *1* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved D. Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D. Jacobs

Process Number 3642-07

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *SPOTWELD LEADS ON HEADER (4 places)* Sheet *2* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Lead 344861-200 (1)* *2. Lead 343242-201 (2)* *3. Header 344815-200 (Degreased)*
10	*Unitek Spotwelder (setting approx. 45WS)* *Use welding tweezers.*	*Spotweld leads per header assembly Dwg. 344850-200 (4 places).* *Adjust welder output as required to obtain a good weld as determined by pull test (material must break, not the weld).*

Process Number 3642-08

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSTALL AND SPOTWELD MONITOR ASSEMBLY* Sheet *1* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved D. Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D. Jacobs

Process Number 3642-08

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSTALL AND SPOTWELD MONITOR ASSEMBLY* Sheet *2* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Monitor Assembly 334215-200* *2. Header 344815-200*
10	*MC3642 Header Assembly Fixture*	*Place header in the assembly fixture. The component side of the header should face the locator arm of the fixture.*
20		*Insert the monitor assembly into the molded cup of the locator arm. Orient the wires of the monitor assembly so that they are facing the circumferences of the header.*
30		*Assemble the locator arm to the header assembly fixture:* *NOTE: The monitor assembly should be approximately centered over the monitor pad. It should also be pressed snugly against the monitor pad.*
40	*Long-Nosed Pliers*	*Carefully form the monitor assembly wires so they press against the "M" pins of the header (see Dwg. 344850-200.*
50	*Unitek Spotwelder (setting 45WS) Large hand clamp.*	*Spotweld the monitor assembly in place per header assembly Dwg. 344850-200 (2 places). Adjust welder output as required to obtain a good weld as determined by pull test. (Material must break, not the weld.)*
60	*Filament Cutter*	*Clip off the excess lead.*

Process Number 3642-09

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *COAT SEALS - HEADER ASSEMBLY* Sheet *1* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	*D. Jacobs*

Process Number 3642-09

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *COAT SEALS - HEADER ASSEMBLY* Sheet *2* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Header Assembly 344850-200* *2. Silicone Rubber Adhesive SS306048-200*
10	*Plastic Syringe*	*Thinly coat glass seals of header and ceramic insulator of monitor with silicone rubber adhesive. Allow a minimum of 24 hour cure at room temperature outside dry room.* *NOTE: Top of monitor must be free of adhesive.*

Process Number 3642-10

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title TEST HEADER ASSEMBLY - PT 3010 Sheet 1 of 2

Drawing 344850-200 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3642

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Process Number 3642-10

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *TEST HEADER ASSEMBLY - PT 3010* Sheet *2* of *2*

Drawing *344850-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Header Assembly 344850-200* *2. Testing Procedure AF-UA2249* *3. Test Adapter UA2249*
10	*PT3010 Tester*	*Non-destructively test the header assembly on the PT3010 tester using the testing procedure AF-UA2249 and the test adapter UA2249.*

Process Number 3642-11

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title ASSEMBLE MOLD (Header Encapsulation) Sheet 1 of 3

Drawing 344849-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-11

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ASSEMBLE MOLD (Header Encapsulation)* Sheet *2* of *3*

Drawing *344849-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		NOTE: This process does not require dryroom conditions. *Material Required:* *1. Header Assembly 344850-200* *2. Encapsulating Mold Assembly - MC3642* *3. Mold Release SS303944-200* *4. Latex Rubber 118A1336-P22* *5. Alcohol 124A1105*
05	*Encapsulation Mold* *Plastic Scraper* *Alcohol* *Kimwipes* *RTV Rubber inserts, part of mold assy.*	*PREPARATION OF ENCAPSULATING MOLD* *Remove encapsulating compound residue from mold and rubber inserts.* *Clean mold surfaces with alcohol if a heavy residue of mold release remains.* *Examine rubber inserts for damage. Replace if necessary.*
10	*Fluorocarbon Mold Release Agent*	*Spray or dip molds and rubber inserts with mold release agent. Also apply to header weld groove and to header leads for approximately 1 inch from point of exit from encapsulation. Allow to dry a minimum of 5 minutes.*
15	*Header Assy.* *Mold Cavity*	*ASSEMBLE HEADER ASSEMBLIES TO MOLD* *Form slight depression in 3 flat leads close to terminal pin.* *Align leads using mold cavity as a gage.*
20	*Visual*	*Examine the header assembly component side up. Visually, verify component position (Ref. 344850-200).*

Process Number 3642-11

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ASSEMBLE MOLD (Header Encapsulation)* Sheet *3* of *3*

Drawing *344849-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
25	RTV Pad with Grooves (Part of Mold Assy) Latex Rubber	Place RTV pad with grooves over the monitor. A small spot of latex rubber may be used to hold it in place.
30	Encapsulation Mold Body	Carefully position mold cavity over the header assembly. Make sure the flat leads seat properly in the mold grooves and that they do not touch the header.
35		While holding header tightly against the mold cavity, pick up and turn over (header component side down).
40	Rubber Inserts (Part of Mold)	Place the 3 rubber inserts in the mold cavity at the three lead exit grooves.
45	Backup Ring - 3 Screws	Place backup ring over the header. Insert 3 mounting screws and tighten snugly.
50	Otoscope	<u>FINAL MOLD PREPARATION</u> Check component locations on both header assemblies thru the potting fill hole.
55	Latex Rubber	Seal lead exits and potting sprue with latex rubber.
60		<u>Carefully</u> fold the exposed header assembly leads back around the mold. Take care that the leads do not experience any sharp bend (round off the corners). This will help prevent lead damage due to handling of the mold during the pouring process.

Process Number 3642-12

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ENCAPSULATE HEADER ASSEMBLY* Sheet *1* of *2*

Drawing *344849-200 9927061-02* Originator *D.J.*

Process Approved *D Jacob* Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	*D Jacob*

Process Number 3642-12

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ENCAPSULATE HEADER ASSEMBLY* Sheet 2 of 2

Drawing *344849-200 9927061-02* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		NOTE: The process described herein is to be performed in the Materials Engineering Lab. *Material Required:* *1. Assembled Mold* *2. Encapsulant (aluminum oxide filled epoxy) per 9927061-02*
10	*Preheat Oven (Materials Eng. Lab)*	*Preheat the assembled mold to 71 ± 3°C.*
20	*Encapsulant*	*Pour encapsulant into the preheated mold per Dwg. 9927061-02.*
30	*Curing Oven (Materials Eng. Lab)*	*Cure the encapsulated mold per Cure 1 of 9927061 (cure 4 hours minimum @ 54 ± 3°C) plus 16 hours @ 93 ± 3°C).* *NOTES:* *1. Peel latex rubber off external mold surfaces before placing in 93°C oven.* *2. The initial 4 hour cure @ 54°C may be done in a pressure tank pressurized to 90 ± 5 PSIG instead of a forced connection oven. This option is to be used only if needed to minimize potting voids in the encapsulated header.*
40		*Remove encapsulated molds from oven and allow to cool.*

Process Number 3642-13

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MOLD DISASSEMBLY AND CLEANUP Sheet 1 of 2

Drawing 344849-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-13

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MOLD DISASSEMBLY AND CLEANUP Sheet 2 of 2

Drawing 344849-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642 Issue A

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Encapsulated mold from Materials Engineering Lab.*
10	*T-Handle Allen Wrench*	*Remove 3 mounting screws from mold assembly. Remove backing plate and rubber inserts.*
15		*Break off potting sprue.*
20	*Header Removal Tool*	*Remove encapsulated header from mold. Pry header at lead exits, if necessary, to release header from mold.*
25	*Toothpick, Scribe or Tweezers*	*Remove RTV pad from top of monitor.*
30	*File, Sandpaper or Grinder*	*Grind off protrusion from potting sprue. Clean off any potting flashings from around the monitor.*
35	*Plastic Scraper. Brush & Alcohol*	*Clean off encapsulation residue from leads, header and monitor. Wash mold release off leads and header with alcohol.*
40		*Examine encapsulation for voids. If voids greater than .040" exist, return the encapsulated header to Materials Engineering Lab for repair.*

Process Number 3642-14

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title TEST HEADER ENCAPSULATED PT3010 Sheet 1 of 2

Drawing 344849-200 AF-UA2249 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

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Process Number 3642-14

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *TEST HEADER ENCAPSULATED - PT3010* Sheet 2 of 2

Drawing *344849-200 AF-UA2249* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Encapsulated Header 344849-200* *2. Testing Procedure AF-UA2249* *3. Test Adapter UA2249*
10	*PT3010 Tester*	*Nondestructively test the encapsulated header on the PT3010 tester using the testing procedure AF-UA2249 and the test adapter UA2249.*
20	*Rubber Stamp (3010)*	*All encapsulated headers that pass the PT3010 test shall be stamped "3010" with the rubber stamp.*
30		*Return all "3010" headers to dryroom as soon as possible.*

Process Number 3642-15

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title INSULATOR CENTER HOLE Sheet 1 of 2

Drawing 324458-203, 204 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-15

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSULATOR, CENTER HOLE* Sheet *2* of *2*

Drawing *324458-203, 204* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Refractory Laminate SS306047-200 .050" thick stock (Fiber Frax - F/F)* *2. Refractory laminate SS306047-200 .020" thick stock (Fiber Frax - F/F) for Insulator P/N 324458-204*
10	*Diacro Press* *Diacro Punch & Die* *As required.*	*Punch F/F disks from the F/F sheets.*
20	*Thermolyne Furnace* *600° ± 25°C* *Quartz Tray*	*Place the F/F disks in the quartz tray and bake them for 1.0 Hr. ± 15 min.* *After baking, allow the parts to cool outside the furnace.*
30	*Kerr Jar*	*Store the parts in the Kerr Jar under conditions of SS295130-200.* *NOTE: Care should be taken to keep parts separated and have proper identification on Kerr jars.*

Process Number 3642-16

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title POSITIVE ELECTRODE WITH LEAD Sheet 1 of 2

Drawing 330445-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-16

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *POSITIVE ELECTRODE WITH LEAD* Sheet *2* of *2*

Drawing *330445-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Iron per AMS-7706 or Low Carbon Steel per QQ-S-698, .005" thk. stock*
10	*Diacro Press Punch & Die*	*Punch the collectors from the sheet stock.*
20	*Degreaser*	*Degrease the collectors.*
30	*Dennison Press MN85501 5.75 ± .25 tons*	*Press the collectors to flatten any burrs that may be present as a result of the punching operation.*
40	*Kerr Jar*	*Place finished parts in jar. Seal the lid snugly and store it under conditions of SS295130-200.*

Process Number 3642-17

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title BIMETALLIC DISC, WITH LEAD Sheet 1 of 2

Drawing 330444-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-17

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *BIMETALLIC DISC, WITH LEAD* Sheet *2* of *2*

Drawing *330444-200* Originator *D.J.*

Process Approved *E Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Bimetallic sheet per SS306015-200*
10	*Diacro Press Punch & Die*	*Punch the collectors from the bimetallic sheet stock.*
20	*Dennison Press MN85501 5.75 ± .25 tons*	*Press the collectors to flatten any burrs that may be present as a result of the punching operation.*
30	*Kerr Jar*	*Place finished parts in jar. Seal the lid snugly and store it under conditions of SS295130-200*

Process Number 3642-18

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ELECTRODE, BIMETAL* Sheet *1* of *2*

Drawing *332410-201* Originator *D.J.*

Process Approved *E. Jacobs* Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	*E. Jacobs*

Process Number 3642-18

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ELECTRODE, BIMETAL* Sheet *2* of *2*

Drawing *332410-201* Originator *D.J.*

Process Approved D. Jacobs Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Bimetallic sheet per SS306015-200*
10	*Diacro Press* *Punch & Die*	*Punch the electrodes from the bimetallic sheet stock.*
20	*Dennison Press* *MN85501* *5.75 ± .25 tons*	*Press the collectors to flatten any burrs that may be present as a result of the punching operation.*
30	*Kerr Jar*	*Place finished parts in jar.* *Seal the lid snugly and store it under conditions of SS295130-200*

Process Number 3642-19

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *HEAT PELLET* Sheet *1* of *3*

Drawing *344905-200* Originator *D.J.*

Process Approved D Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D Jacobs

Process Number 3642-19

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *HEAT PELLET* Sheet *2* of *3*

Drawing *344905-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Heat Powder SS265866-000 ((88/12)*
10	*(#60 Mesh Screen)*	*Verify that heat powder SS265866-000 has been sifted through a #60 mesh screen.*
15	*Pellet Die MN46D920418-12 Wabash 50 Ton Press*	*Install the pellet die in the press.*
20	*Mettler Scale*	*Weigh out the heat powder (88/12) until the scale reads 1.30 ± .02g.*
25		*Place the powder in the die cavity. Rake the powder in evenly to a minimum die cavity volume.*
30	*Wabash 50 Ton Press*	*Press the pellet and remove from the die. (Ref: approximate press tonnage is 10 tons.)*
35	*Mettler H31 Balance Pellet Wt. & Density Record Form*	*Weigh and record pellet weight.*
40	*Microcode Indicator*	*Measure and record thickness of pellet at 4 locations (approximately .25" from edge - 90° apart).*
45	*Calculator*	*Determine & record average pellet thickness.*

Process Number 3642-19

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *HEAT PELLET* Sheet *3* of *3*

Drawing *344905-200* Originator *D.J.*

Process Approved *E Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
50	*Calculator*	*Determine and record pellet density for the following formula:* $D(\text{Density, g/cm}^3) = \frac{W\ (\text{Pellet Wt.g})}{A\ (\text{Pellet Area,cm}^2) X\ T\ (\text{thk,cm})}$ $A = 7.92\ \text{cm}^2$ *(for this pellet)* *NOTE 1: If the density is not within limits (Ref: 344905), the press pressure may be adjusted to change density. After the press settings are established, the density calculations need to be calculated on one out of every 20 pellets to verify that the pelletizing process is remaining constant.* *NOTE 2: Use the thickness measurements from the 4 quadrants to verify thickness variations of not more than .003" in the pellet.*
55	*Stainless Steel Tray*	*Place good heat pellets on the tray so that they overlap each other by not more than 50% of pellet diameter. Fill the tray.*
60	*National Vacuum Oven*	*Vacuum dry the heat pellets at an absolute pressure of 2 in. max. of Hg for 16 hours minimum. (The pellets will be removed from the vacuum between 16 and 72 hours after beginning the vacuum dry cycle.)* *Maintain pellets under conditions of SS295130-200.*

Process Number 3642-20

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title DEB PELLET Sheet 1 of 3

Drawing 343146-200 Originator D.J.

Process Approved D. Jacks Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacks

Process Number 3642-20

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *DEB PELLET* Sheet *2* of *3*

Drawing *343146-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. DEB Powder SS322411-201 (35-55-10)*
10	*Pellet Die MN46D920418-14 Wabash 50 Ton Press*	*Install the pellet die in the press*
15	*Mettler Scale*	*Weigh out the DEB powder until the scale reads .80 ± .02 grams.*
20	*Pellet Die*	*Place the powder in the die cavity. Rake the powder in evenly to a minimum die cavity volume.*
25	*Wabash 50 Ton Press*	*Press the pellet and remove from the die. (Ref: approximate press tonnage is 10 tons.)*
30	*Mettler H31 Balance Pellet Wt. & Density Record Form*	*Weigh and record pellet weight.*
35	*Microcode Indicator*	*Measure and record thickness of pellet at 4 locations (approximately .25" from edge - 90° apart).*
40	*Calculator*	*Determine & record average pellet thickness.*

Process Number 3642-20

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *DEB PELLET* Sheet *3* of *3*

Drawing *343146-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
45	*Calculator*	*Determine and record pellet density for the following formula:* $D(\text{Density, g/cm}^3) = \frac{W\ (\text{Pellet Wt.g})}{A\ (\text{Pellet Area,cm}^2) X\ T\ (\text{thk, cm})}$ $A = 7.92\text{cm}^2$ *(for this pellet)* *NOTE 1: If the density is not within limits (Ref. 343146), the press pressure may be adjusted to change density. After the press settings are established, the density calculations need to be calculated on one out of every 20 pellets to verify that the pelletizing process is remaining constant.* *NOTE 2: Use the thickness measurements from the 4 quandrants to verify thickness variations of not more than .003" in the pellet.*
50	*Stainless Steel Tray*	*Place good DEB pellets on the tray so that they overlap each other by not more than 50% of pellet diameter. Fill the tray.*
55	*National Vacuum Oven*	*Vacuum dry the DEB pellets at an absolute pressure of 2 in. max. of Hg for 16 hours minimum. (The pellets will be removed from the vacuum between 16 and 72 hours after beginning the vacuum dry cycle.)* *Maintain DEB pellets under conditions of 295130-200.*

Process Number 3642-21

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MICA STRIP Sheet 1 of 2

Drawing 325472-201 Originator D.J.

Process Approved L Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	L Jacobs

Process Number 3642-21

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *MICA STRIP* Sheet *2* of *2*

Drawing *325472-201* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Mica SS306049-200 (.004" - .007" thick stock)*
10	*Metal Shear MN85492*	*Shear the mica sheets into strips .50" wide (length is sheet width).* *Store the mica strips under the conditions of SS295130-200.*

Process Number 3642-22

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title HEAT PAPER STRIP Sheet 1 of 2

Drawing 334257-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-22

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *HEAT PAPER STRIP* Sheet *2* of *2*

Drawing *334257-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		NOTE: Pyrotechnic Material - Handle with Care *Do not attempt to make this part unless the heat paper is wet (from bulk storage). This operation is performed outside the dryroom.* *Material Required:* *1. Heat Paper 400 cal/gm SS298422-200*
10	*Premier Rotary Blade Trimmer Board*	*Cut the heat paper to the dimensions on the drawing.*
20	*Stainless Steel Tray*	*Lay the strips on the tray so they are not touching each other.*
30	*Precision Scientific Oven (MN85479) (set at 100°C)*	*Dry the heat strips over night (16 hours minimum).*
40	*Heat Paper Storage - (Box from dryroom) Spatula*	*As soon as the heat strips are removed from the drying oven, remove the strips from the S/S tray with the spatula. Place the strips in the storage box, with proper identification and store the box in the proper cabinet in the dryroom.*

Process Number 3642-23

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSULATOR, WRAP* Sheet *1* of *2*

Drawing *329629-206* Originator *D.J.*

Process Approved D. Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D. Jacobs

Process Number 3642-23

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title INSULATOR WRAP Sheet 2 of 2

Drawing 329629-206 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3642 Issue A

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Refractory paper SS306158-200 (.040" thick stock)*
10	*Premier St. Blade Trimmer Board*	*Cut the refractory paper to the following dimensions:* *Length 225 ± 3 mm* *Width 54 ± 3 mm*
20	*Stainless Steel Tray*	*Stack the blankets on the tray.*
30	*National Vacuum Oven (75°C setting)*	*Vacuum dry the blankets for 16 hours minimum under a pressure of 2 in. Hg.*
40		*After vacuum drying the blankets, maintain them under conditions of SS295130-200.*

Process Number 3642-24

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title DISC, HEAT PAPER Sheet 1 of 2

Drawing 330315-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-24

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *DISC, HEAT PAPER* Sheet 2 of 2

Drawing *330315-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		NOTE: Pyrotechnic Material - Handle with Care *Do not attempt to make this part unless the heat paper is wet (from bulk storage). This operation is performed outside the dryroom.* *Material Required:* *1. Heat Paper 400 cal/gm SS298422-200*
10	*Diacro Press Diacro Punch & Die 6.3 ± .3mm diam.*	*Cut the heat paper to the dimensions on the drawing.*
20	*Stainless Steel Tray*	*Lay the discs on the tray so they are not touching each other.*
30	*Precision Scientific Oven (MN85479) (set at 100°C)*	*Dry the discs over night (16 hours minimum).*
40	*Heat Paper Storage - (Box from dryroom) Spatula*	*As soon as the heat discs are removed from the drying oven, remove the discs from the S/S tray with the spatula. Place the discs in the storage box, with proper idenification and store the box in the proper cabinet in the dryroom.*

Process Number 3642-25

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MICA DISC (CASE) Sheet 1 of 2

Drawing 324414-201, Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-25

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MICA DISC (CASE) Sheet 2 of 2

Drawing 324414-201 Originator D.J.

Process Approved D. Jarvis Date 6/1/81

F.M.F. MC3642 Issue A

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Natural Mica Sheet SS306049-200 (.004" - .007" thick)*
10	*Diacro Press* *Diacro Punch & Die* *O.D. 36.83 + 0.0 - 0.3mm* *I.D. 7.62 ± 0.3mm*	*Punch mica discs from the mica sheets.*
20		*Store parts in Kerr jar under conditions of SS295130-200.*

Process Number 3642-26

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title MARK SERIAL NUMBER ON HEADER Sheet 1 of 2

Drawing 344849-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-26

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *MARK SERIAL NUMBER ON HEADER* Sheet *2* of *2*

Drawing *344849-200* Originator *D.J.*

Process Approved _____ Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Header, encapsulated 344849-200*
10	*Visual*	*Verify that the encapsulated header assembly has successfully passed the PT3010 Non-"D"-Test (evidenced by a "3010" on the header or potting).*
20	*Vibra Tool*	*Scribe the sequential (serial) number of battery to be built on the terminal side of the header.*

Process Number 3642-27

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ASSEMBLE STACK* Sheet *1* of *4*

Drawing *344818-200* Originator *D.J.*

Process Approved *E. Jacobs* Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	*E. Jacobs*

Process Number 3642-27

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ASSEMBLE STACK* Sheet *2* of *4*

Drawing *344818-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required:
		Mica Strip 325472-201 *Disc W/Lead* 330444-200 *Electrode W/Lead* 330445-200 *Insul. Wrap* 329629-206 *DEB Pellet* 343146-200 *Heat Pellet* 344905-200 *Disc Insulator* 324458-203 *Elect. Bimetal* 332410-201 *Heat Strip* 334257-200 *Heat Disc* 330315-200 *Tape-802* 9508101 *Tape* SS307735-200 *Header Encap.* 344849-200
		NOTE: Verify that the materials meet the conditions specified by Note #1 in Dwg. 344818-200. Do not open anode storage jar until just before beginning stack assembly.
10	*Stacking Fixture*	*Assemble stacking fixture and place on work surface within comfortable reaching distance. The front of the fixture should be slightly elevated (1/2" - 3/4").*
15	*Header, Encapsulation*	*Verify that the encapsulated header assembly has been properly marked with the battery serial number.*
20		*Place encapsulated header into the stacking fixture (pins down) with the positive leads to the right.*
25		*Place two header insulation discs (324458-203) on the header potting. Align the hole in the discs with the monitor in the header potting.*
30		*"Witness" mark the two insulators and potting.*
35	*Tweezers*	*Place heat discs 330315-200 and tightly stuff into the hole in the insulation over the monitor. Pack it down flush with the insulation with the tweezer handle.*

Process Number 3642-27

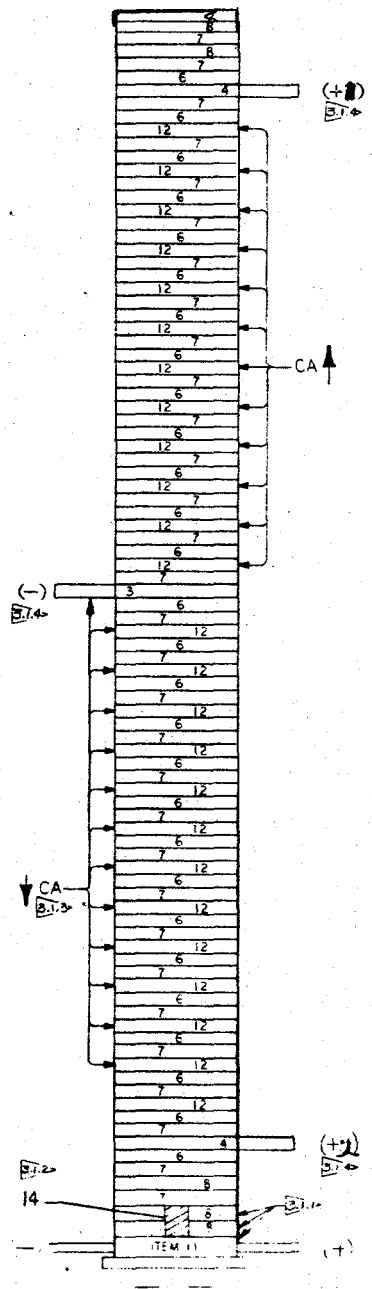
ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ASSEMBLE STACK* Sheet *3* of *4*

Drawing *344818-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
40		*Refer to the stack sketch. (Begin at #7 near bottom of sketch.)* 

Process Number 3642-27

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ASSEMBLE STACK* Sheet *4* of *4*

Drawing *344818-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
45		*Carefully align the stack parts.*
50	*Allen Wrench*	*Complete the assembly of the stacking fixture to hold the stack upright.*
55	*Airmite Press (set for 500 ± 50 lb)*	*Place the stacking fixture, with stack assembly, on the press bottom plate.*

Process Number 3642-28

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title INSTALL HEAT STRIPS Sheet 1 of 3

Drawing 344818-200 334257-200 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-28

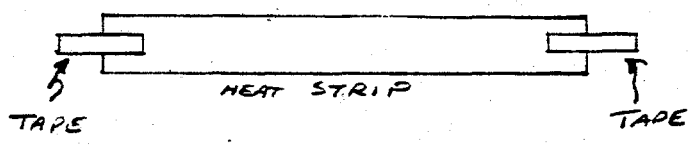
ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSTALL FUSE STRIPS* Sheet *2* of *3*

Drawing *334257-200* Originator *D.J.*

Process Approved *D. Jacuba* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Stack Assembly* *2. Heat Strips 334257-200* *3. Tape SS307735-200* *NOTE: Verify that the materials meet the conditions specified by Note #1 in Dwg. 344818-200.*
10	*Air Mite Press* *Dillon Gage* *(0-1500# range)*	*Verify that the press is set up for 500 ± 50 lbs. pressure.*
15	*Air Mite Press*	*Carefully place the stack assembly under pressure, straightening the stack as the press ram comes down. Be sure the electrode tabs are aligned with the leads in the header potting.*
20	*Allen Wrench*	*Remove the side supports from around the stack.*
25	*Cuticle Scissors*	*Cut six pieces of tape (approx. .1" X .5") and space them in a handy location for future use.*
30	*Tweezer*	*Select one heat strip (334257-200) and lay it down on the grounded portion of the table work surface.*
35	*Tweezer*	*Place one piece of tape (.1" X .5") at each end of the heat strip. Press firmly into place.* 
40	*Tweezer*	*Carefully pick up the heat strip with the tweezer, taking care not to pull the tape off the heat strip.*

Process Number 3642-28

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *INSTALL FUSE STRIPS* Sheet *3* of *3*

Drawing *334818-200 334257-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
45	*Tweezer*	*Position the heat strip vertically against the side of the stack in one of the locations shown in Section B-B of Dwg. 344818-200. Take care to insure that the heat strip overlaps the heat pellet #7.*
50	*Tweezer Orange Stick*	*While holding the heat strip in place, gently press the free ends of the tapes down to the stack with the flat portion of the orange stick. This will hold the heat strip against the stack after you release the tweezer's hold on the heat strip.*
55	*Tweezers Orange Stick*	*Repeat Operations #30 thru #50 for the remaining two heat strips and the two locations in Section B-B of Dwg. 344818-200.*
60	*Visual*	*Review the installed fuse strips. Each fuse strip must touch all heat pellets. The three pulse strips should be approximately equidistance from each other.*

Process Number 3642-29

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title STACK BLANKET INSULATION Sheet 1 of 2

Drawing 344818-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-29

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *STACK BLANKET INSULATION* Sheet *2* of *2*

Drawing *344818-200* Originator *D.J.*

Process Approved *L. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Stack Assembly 344818-200* *2. Blanket Insulation 329629-206* *3. Tape 9508101-802* *4. Tape SS307735-200*
10		*Wrap the blanket insulation around the battery stack, as shown in view A-A. Leads will extend out of blanket.*
20	*Orange Stick*	*Using the orange stick, carefully press down the edges of the blanket insulation. Repair any blanket tears or holes at this time.*

Process Number 3642-30

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title SPOTWELD LEADS Sheet 1 of 3

Drawing 344818-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-30

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *SPOTWELD LEADS* Sheet *2* of *3*

Drawing *344818-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Stack Assembly 344818-200* *2. Mica Strip 325472-202* *3. Tape SS307735-200*
10	*Duck-Billed Pliers*	*Straighten leads so they protrude straight out of insulation on stack.*
15	*Orange Stick*	*Push insulation, around lead, back so it does not stick out on the lead.*
20	*Filament Cutter*	*Measure and cut the mica strips to fit snugly between the leads.*
25	*Duck-Billed Pliers*	*Hold the mica strips in place and form the leads into place so that they can be welded. Use the pliers to "square off" the bends at the mica strips and to pull the leads up tight. See Dwg. 344818-200.*
30	*Unitek Welder (45WS)* *Tweezer Clamps*	*While holding the leads in place, spotweld them in five places. (The spotwelder output may be adjusted to obtain a good weld.) A good weld is one that "breaks" or "pulls" the metal not the weld.*
35	*Duck-Billed Pliers*	*Fold the weld tabs down and press firmly into place per the drawing.*
40	*X-acto Knife* *Orange Stick*	*Press a strip of tape over the lead. Cut the length to size using the X-acto knife. Dress the tape down to stick to the mica on all sides of the leads. This will encase the lead between the tape and the mica.*

Process Number 3642-30

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *SPOTWELD LEADS* Sheet *3* of *3*

Drawing *344818-200* Originator *D.J.*

Process Approved _____ Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
50		*Wrap the blanket insulation around the battery stack.*
60	*Orange Stick*	*Using the orange stick, carefully press down the edges of the blanket insulation. Repair any blanket tears or holes at this time.*
70	*Tape Holder*	*Wrap the assembly with the glass tape (9508101-802) using a mummy-type wrap with approximately 1/2 tape width overlap. Cover the entire stack from the bottom of the header to the opposite end. Secure the end of the glass tape with a small piece of adhesive-back tape SS307735. Secure tape with nickel wire.*

Process Number 3642-31

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title CASE ASSEMBLY Sheet 1 of 3

Drawing 344851-200 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-31

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *CASE ASSEMBLY* Sheet *2* of *3*

Drawing *344851-200* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Holder Primer 344902-200* *2. Case 324410-203*
10	*Case Assembly Fixture MC3455 Lincoln Arc Welder MN85458 Air Mite Press with turn table Speed Setting 40 Electrode (.040)*	*TIG weld Item 1 to Item 2 using case assembly fixture, per drawing 344851-200, and following schedule.*

Process Number 3642-31

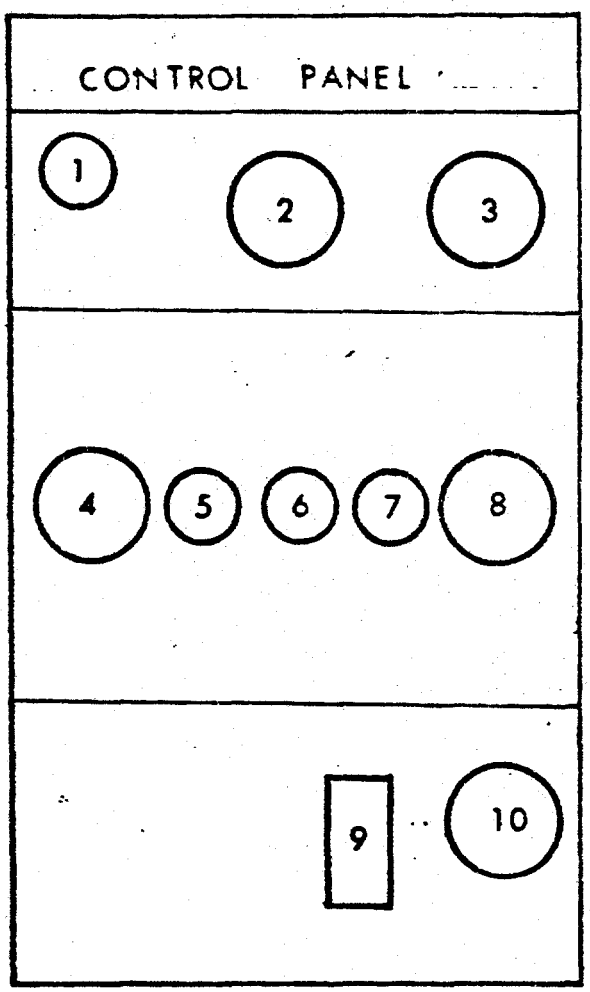
ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *CASE ASSEMBLY* Sheet *3* of *3*

Drawing *344851-200* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
	Control Panel Settings *1. Remote* *2. 2* *3. DC-* *4. .040* *5. ON* *6. Sw. Up* *7. Sw. Down* *8. 3* *9. 15-30* *10. Low*	*WELDER* 
20	*Microscope*	*Inspect the welds for any pin holes, cracks, inclusion, etc. Inspector must be a person other than the one who welded the battery.*

Process Number 3642-32

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ADJUST STACK HEIGHT AND TIG WELD* Sheet *1* of *3*

Drawing *318455-00* Originator *D.J.*

Process Approved D. Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D. Jacobs

Process Number 3642-32

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ADJUST STACK HEIGHT AND TIG WELD* Sheet *2* of *3*

Drawing *318455-00* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Case Assembly 344851-200* *2. Stack Assembly 344818-200* *3. Insulator 324458-204* *4. Mica Disc 324414-201*
10		*Verify that Items 1, 3 and 4 have been exposed to dryroom conditions SS295130-200 for 16 hours.*
15		*Verify that Item 2 has been vacuum dried per Dwg. 318455-00*
20	*Welding Fixture MC3642*	*Adjust stack height of stack assembly per Note 3 of 318455-00.*
25	*Welding Heat Sink MC3642*	*Clamp heat sink around case lip prior to welding operation.*
30	*Lincoln Arc Welder MN85458 (see sketch) Air Mite Press with turn table (speed setting-40) Electrode SAE (.040")*	*TIG weld completed assembly per 318455-00, Note 4, using the welder with settings shown below.*

Process Number 3642-32

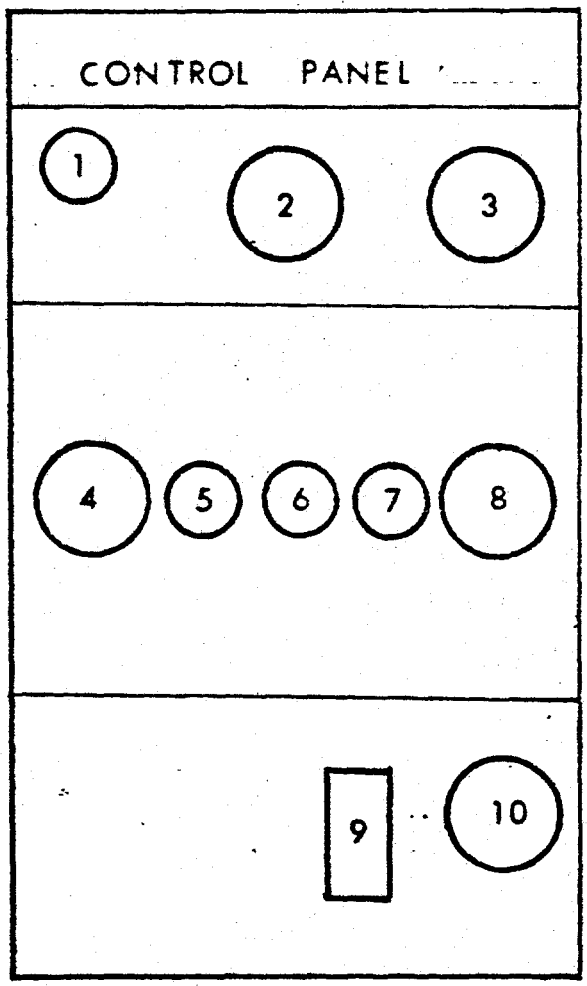
ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *ADJUST STACK HEIGHT AND TIG WELD* Sheet *3* of *3*

Drawing *318455-00* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
	Control Panel Settings *1. Remote* *2. 2* *3. DC-* *4. .040* *5. ON* *6. Sw. Up* *7. Sw. Down* *8. 3* *9. 15-20* *10. Low*	*WELDER* 
35	*Microscope*	*Inspect the welds for any pin holes, cracks, inclusion, etc. Inspector must be a person other than the one who welded the battery.*

Process Number 3642-33

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title PRIMER INSTALLATION Sheet 1 of 2

Drawing 318455-00 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacobs

Process Number 3642-33

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *PRIMER INSTALLATION* Sheet 2 of 2

Drawing *318455-00* Originator *D.J.*

Process Approved *D. Jocobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. Primer Percusion SS306772-200* *2. MC3642 (Oper. 31)*
10	*Primer Installation Fixture & Staking Tool*	*After welding, install primer into primer holder of battery per Note 4 of Drawing 318455-00.* *NOTE: Prior to insertion of primer, verify that there is no blockage of heat pellet due to misalignment of an insulator.*

Process Number 3642-34

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title LEAK CHECK Sheet 1 of 2

Drawing PS318455 Originator D.J.

Process Approved D Jacobs Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D Jacobs

Process Number 3642-34

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *LEAK CHECK* Sheet *2* of *2*

Drawing *PS318455* Originator *D.J.*

Process Approved *D. Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. MC3642 (Oper. 32)*
10		*The MC3642 shall be leak checked per 3.3.2.4 of PS318455.*

Process Number 3642-35

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title X-RAY BATTERY Sheet 1 of 2

Drawing PS318455 Originator D.J.

Process Approved D. Jacob Date 6/1/81

F.M.F. MC3642

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	Original	6/1/81	D.J.	D. Jacob

Process Number 3642-35

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *X-RAY BATTERY* Sheet *2* of *2*

Drawing *PS318455* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: *1. MC3642 (Oper. 33)*
10	*X-Ray Equipment* *240 KV* *10 ma* *48" Focal Dist.* *M8 Film* *No Filter*	*X-Ray the battery per 3.3.2.3 of PS318455.*

Process Number 3642-36

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *RESISTANCE CHECK (PT3010)* Sheet *1* of *2*

Drawing *PS318455* Originator *D.J.*

Process Approved D Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D Jacobs

Process Number 3642-36

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title RESISTANCE CHECK (PT3010) Sheet 2 of 2

Drawing PS318455 Originator D.J.

Process Approved D. Jacobs Date 6/1/81

F.M.F. MC3642 Issue A

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Material Required: 1. MC3642 (Oper. 34)
10	PT3010 AF(UA2568)	Perform insulation resistance and circuit resistance test per 3.3.2.5 and 3.3.2.6 of PS318455.
20	Rubber Stamp (3010)	All batteries that pass the PT3010 test shall be stamped "3010" on the header end.

Process Number 3642-37

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *LABEL BATTERY* Sheet *1* of *2*

Drawing *318455* Originator *D.J.*

Process Approved D. Jacobs Date *6/1/81*

F.M.F. *MC3642*

ISSUE NO.	CHANGES	DATE	ISSUED BY	APPROVED BY
A	*Original*	*6/1/81*	*D.J.*	D. Jacobs

Process Number 3642-37

ENGINEERING DEVELOPMENT PROCESS INSTRUCTION

Title *LABEL BATTERY* Sheet *2* of *2*

Drawing *318455* Originator *D.J.*

Process Approved *D Jacobs* Date *6/1/81*

F.M.F. *MC3642* Issue *A*

OPERATION NO.	TOOLS REQUIRED	OPERATION DESCRIPTION
		Equipment Required: *1. MC3642 Battery 318455* *2. Master Label for Battery*
10	*Electro-Etch*	*Mark the units per Dwg. 318455, Note 1.*

III. SUPPORTING DATA

MC3642 THERMAL BATTERY

SUPPORTING DATA

The following data represents the test results from typical MC3642 thermal batteries built per the Process Instructions included within this document.

MC3642 DEVELOPMENT TEST RESULTS

	S/N	RISE TIME TO 20.0V 1000MSEC MAX.	PEAK VOLTAGE 34V	ACTIVE LIFE ABOVE 20.0V 10SEC MIN.	RECOVERY TIME TO 23 VOLTS 350MSEC MAX.	PEAK VOLTAGE 42V	ACTIVE LIFE ABOVE 23.0V 0.010SEC MIN.
74°C		CHANNEL 1 (40 OHMS)				CHANNEL 2 (6.5 OHMS)	
	012	310	30.9	130	0	31.5	8.9
	014	340	31.0	83	10	30.7	8.2
	016	330	31.0	95	0	29.5	7.2
	018	300	30.8	134	0	32.0	10.4
	020	320	30.8	166	0	32.0	7.9
-36°C							
	011	410	30.8	92	0	34.8	8.3
	015	410	30.8	84		EXTERNAL LEAD BROKE	
	017	400	30.7	85	50	34.1	8.6
	019	430	30.7	82	30	34.4	8.1
	021	360	30.7	80	10	34.0	10.0

HEAT POWDER 88/12 1.30 GRAMS

MC3642 DEVELOPMENT TEST RESULTS

DAILY LOT SAMPLE

S/N	RISE TIME TO 20.0V 1000MSEC MAX.	PEAK VOLTAGE 34V	ACTIVE LIFE ABOVE 20.0V 10SEC MIN.	RECOVERY TIME TO 23 VOLTS 350MSEC MAX.	PEAK VOLTAGE 42V	ACTIVE LIFE ABOVE 23.0V 0.010SEC MIN.
-36°C	CHANNEL 1 (40 OHMS)				CHANNEL 2 (6.5 OHMS)	
022	360	30.7	72	40	34.5	9.0
032	410	30.7	88	90	34.8	8.8
040*	400	30.8	86	0	35.5	7.6
047	390	30.7	85	30	34.5	8.3
054	380	30.8	95	35	34.2	8.6
74°C						
026	300	30.9	135	0	32.2	8.7
036	310	30.7	86	0	32.0	7.3
045**	330	30.8	96	0	32.0	10.9
051	300	30.8	164	0	32.5	10.1
056	300	30.8	156	0	32.0	8.8

*MONITOR DID NOT OPEN.

**REBUILT AFTER PRIMER DID NOT IGNITE BATTERY DUE TO FIBER FRAX MISALIGNMENT.

IV. ANTICIPATED PROBLEMS

PROBLEMS

This battery represents no problems in assembly of the battery as in pellet fabrication. The battery performance requirements are easily met.

A possible problem exists in the function of the monitor assembly at the -36°C conditioning temperature. Care should be taken to pack the heat paper discs into the cavity above the monitor so as to provide sufficient heat to activate the monitor.

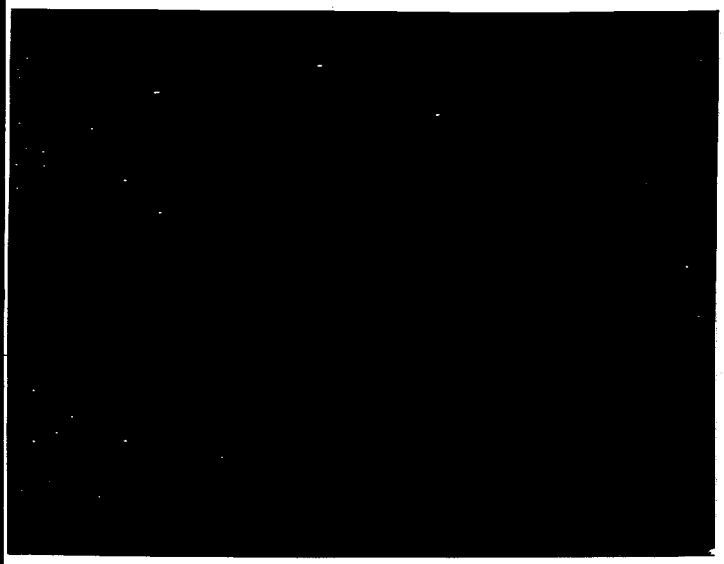
V. POSTMORTEM RESULTS

MC3642 THERMAL BATTERY

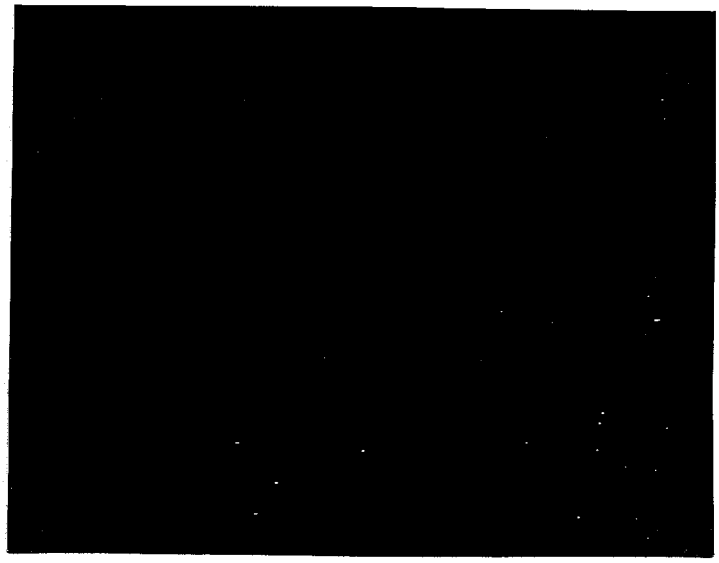
POSTMORTEM RESULTS

The postmortem results are pictorially shown. Typically, a battery conditioned at +74°C is totally consumed as in S/N 012, while a battery conditioned at -36°C is less consumed.

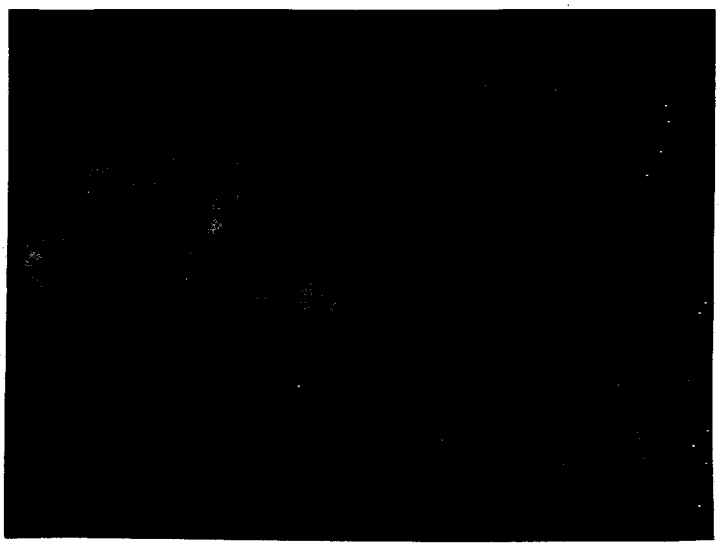
MC3642 POSTMORTEM



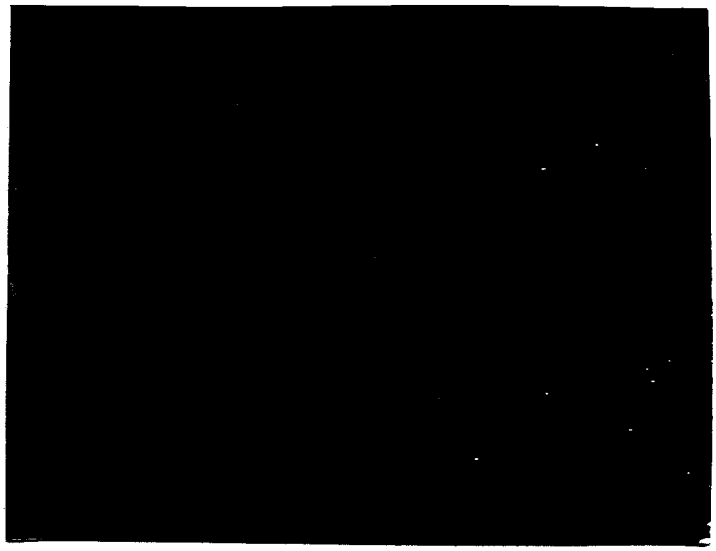
MC3642 SN 12 CELL #7 V_2 STACK



MC3642 SN 11 CELL #7 V_2 STACK



MC3642 SN 12 CELL #6 V_1 STACK



MC3642 SN 11 CELL #6 V_1 STACK

VI. PURCHASED PARTS

PURCHASED PARTS

HOLDER PRIMER 344902-200

This item was previously a 297222 Holder Primer originally designed for the MC2937 thermal battery. The drawing was revised to metric dimensions and reissued as a 344902-200. All gauges are in existance and can be used.

Local Source:
Ventura Machining Center
1944 Carroll Street
Clearwater, Florida 33515

Sample parts manufactured by Ventura to the 297222 drawing were inspected and were found to be satisfactory.

CASE 324410-203

The case is cut to size from stainless steel tubing, welded or seamless, Type 304 per MIL-T-8504 or 321 per MIL-T-8808.

Local Source:
Tube Sales
Orlando, Florida

HEADER 344815-200

This header was redesigned from the one originally used on the MC2937 thermal battery. Headers for the development activity were supplied by SNLA.

Source:
Astro Seal Inc.
9452 Rush Street
So. ElMonte, California 91733

ELECTRODE BIMETAL 332410-201

This material is SS306015-200 bimetallic sheet which is .005 inches calcium deposited on .005 inches iron substrate. The development program utilized bimetal supplied by:

Source:
Eagle Picher Inc.
Electronic Division
P.O. Box 47
Joplin, Missouri

This bimetal was inspected satisfactorily to the drawing. Parts were punched to tool controlled dimension.

DISTRIBUTION:

GEND

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