

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
SAFETY EVALUATION OF DEVICE

NO: NR-575-D-101-S

DATE: SEP 24 1982

PAGE 1 OF 4

DEVICE TYPE: Gaseous Tritium Light Sources (GTLS) in Military Fire Control Products

MODEL: M17 Fire Control Quadrant, M18 Fire Control Quadrant

MANUFACTURER/DISTRIBUTOR:

Ruoff & Sons, Inc.  
1030 Rose Avenue  
Runnemede, NJ 08078

MANUFACTURER/DISTRIBUTOR:

Department of the Army  
U.S. Army Armament Readiness Command (ARRCOM)  
Rock Island, IL (License No. 12-00722-06)

SEALED SOURCE MODEL DESIGNATION:

U.S. Army Part No. 11730922-2 and  
11730922-2 (see Table 1)

ISOTOPE: Hydrogen-3  
Hydrogen-3

MAXIMUM ACTIVITY: 1.875 curies  
1.950 curies

LEAK TEST FREQUENCY: Not required

PRINCIPAL USE: (R) Gas Sources

CUSTOM DEVICE:  YES  NO

CUSTOM USER:

Department of the Army  
U.S. Army Armament Readiness Command (ARRCOM)  
Rock Island, IL

8403020107 840209  
PDR FOIA  
HAMMITT84-74 PDR

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
SAFETY EVALUATION OF DEVICE

NO: NR-575-D-101-S

DATE: SEP 24 1982

PAGE 2 OF 4

DEVICE TYPE: GTLS in Military Fire Control Products

DESCRIPTION:

Tritium radioluminous lamps (MB Microtec Models T4279-1 and T4280-1 or Brandhurst P1644 and P1643) are incorporated in the M17 and M18 Fire Control Quadrants by the U.S. Army M198 Towed Howitzer. The Tritium lamps are used for night illumination of level vials and mechanical counters in the M17 and M18 devices. The Tritium gas is encapsulated in borosilicate glass which is coated with a phosphor that emits visible light on activation by the radioactive Tritium. The glass envelop is secured by RTV Silicon adhesive to either an aluminum alloy or polycarbonate structure which is then mounted to the instrument to be illuminated. The RTV compound acts as a shock absorber in cushioning the lamp when exposed to the environments of the weapons system.

LABELING:

Fire control devices are labeled in accordance with 10 CFR Part 20 and labels are attached to the device with adhesives or screws.

Enclosures 1, 2 and 3 illustrate typical designs for the sealed light sources and their primary containment for assembly in the M17 and M18 fire control quadrants.

CONDITIONS OF NORMAL USE:

The M17 and M18 Fire Control Quadrants are used on the Army's M198 towed Howitzer and are subjected to Harsh field environments both during training exercises and military deployment of the weapon. These instruments are used by gunners to control elevation and bearing of the gun system. Typical environments include a wide range of temperatures, vibration, shock and outdoor weathering.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
SAFETY EVALUATION OF DEVICE

NO: NR-575-D-101-S

DATE: SEP 24 1982

PAGE 3 OF 4

DEVICE TYPE: GTLS in Military Fire Control Quadrants

PROTOTYPE TESTING:

These devices have been prototype tested by the U.S. Army using laboratory and field testing under actual operating conditions. Following extensive field testing of the devices on military Howitzers, they were examined by the U.S. Army environmental hygiene agency and found to meet requirements.

EXTERNAL RADIATION LEVELS:

None expected. The low energy beta emitter is encapsulated in glass and further contained in an aluminum alloy or polycarbonate housing.

QUALITY ASSURANCE AND CONTROL:

An acceptable quality assurance and control program is described in Ruoff & Sons, Inc. application dated June 14, 1982.

RESTRICTIONS AND/OR OTHER CONSIDERATIONS IF USE:

These devices shall be distributed only to specifically licensed military users.

SAFETY ANALYSIS SUMMARY:

The M17 and M18 fire control quadrants have been designed and prototype tested by the Department of the Army (see License No. 12-00722-06). These products contain gaseous Tritium activated light sources manufactured by either Brandhurst Company, Ltd. or MB Microtec. The products are to be assembled by Ruoff & Sons, Inc. in accordance with detailed military specifications. Assembly and testing of the products and quality assurance and control are in accordance with military specifications. Additionally, light sources used in the fire control products have been tested by the source manufacturer in accordance with ANSI N540.

Extensive military field testing of the M17 and M18 fire control mechanisms have been conducted with the devices installed on Howitzer guns which have fired several thousand rounds. The U.S. Army's environmental hygiene laboratory has performed radiological tests on the products and found them to satisfactorily contain the Tritium gas.

Based on the above considerations and the information and test data contained in the references cited below, we conclude that the M17 and M18 Fire Control Quadrants containing the sealed Tritium light sources specified above are acceptable for licensing purposes.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
SAFETY EVALUATION OF DEVICE

NO: NR-575-D-101-S

DATE: SEP 24 1982

PAGE 4 OF 4

DEVICE TYPE: GTLS in Military Fire Control Quadrants

REFERENCES:

The following supporting documents are hereby incorporated by reference and are made a part of this registry document:

- ° Ruoff & Sons, Inc. application dated May 29, 1981 and enclosures thereto (Control No. 11559)
- ° Ruoff & Sons, Inc. letter dated August 16, 1982 and enclosures thereto
- ° NRC License No. 12-00722-06 issued to Department of Army Rock Island Arsenal

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: \_\_\_\_\_

Reviewer: Earl H. Knight

Date: SEP 24 1982

Concurrence: Richard J. Jones

Table 1

<u>U.S. Army P/N</u>	<u>MB-Microtec P/N</u>	<u>Brandhurst PN</u>	<u>Activity Per Source</u>
11730922-2	T4279-1	P 1644	450 millicuries
11729510-2	T4280-1	P 1643	75 millicuries

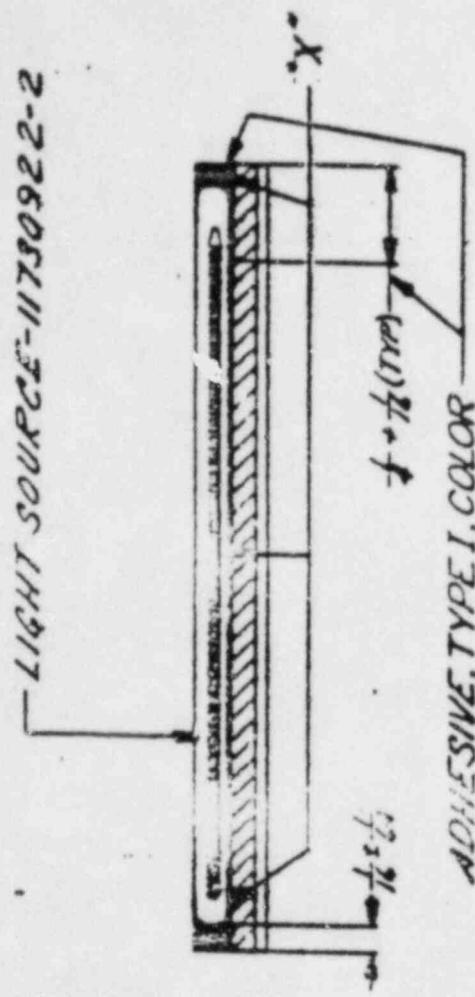
Tritium gas is contained in laser sealed borosilicate glass vial filled with 99% pure (less than 1% Tritium oxide) Tritium (H-3).

NOTE

LIGHT ASSEMBLY SHALL BE ALLOWED TO CURE AT LEAST 5 DAYS AT ROOM TEMPERATURE, PRIOR TO ASSEMBLING INTO THE SEALED INSTRUMENT

REFLECTING SURFACE

BLOCK-11729571



ADHESIVE, TYPE I, COLOR WHITE, SPEC MIL-A-46106 (EXCEPT IN AREAS MARKED 'X')

SECTION A-A

REQUIREMENTS

1. MARKING, LABELING AND SHIPPING SHALL BE ACCORDANCE WITH MIL-STD-1302.
2. THERE SHALL BE NO EVIDENCE OF PHYSICAL DAMAGE SUCH AS FRACTURING OR LIGHT LOSS DUE TO EXPOSING THE LIGHT ASSEMBLY TO 80°F AND 90% RH FOR A PERIOD OF SEVENTEEN MONTHS AT EACH TEMPERATURE.
3. REMOVABLE RADIOLOGICAL CONTAMINATION BY WIPING SHALL BE LESS THAN 1000 DPM.
4. BRIGHTNESS LEVEL—600 MICROLAMBERTS (MIN).--

1. HANDLING, SHIPPING, PACKING AND DISPENSING OF KNOWLEDGE CONTAMINATED SHALL BE IN ACCORDANCE WITH DSHN 414578 "PROTECTIVE COMMODITIES IN THE DOD Supply System"

APPLICABLE DOCUMENTS

PARTS LIST-PL11729559  
SQAP-11729559

4. The BRIGHTNESS LEVEL OF THE FINISHED ASSEMBLY MUST BE A MINIMUM OF 95% OF THE BRIGHTNESS LEVEL OF THE UNFINISHED LAMP AS SPECIFIED IN Lamp DWG.

(FOR 2013 PRINTING)

PART No. 11729559

U.S. GOVERNMENT PRINTING OFFICE: 1971	
DATE: 15 JUNE 1971	BY: J.A.
DESIGN: 158	SCALE: 1/8"
APPROVED: [Signature]	DATE: 15 JUNE 1971
PROJECT: 11729559	WORK CENTER: 11729559
C 10200	11729559
LIGHT ASSEMBLY	

11	11729559	11729559
12	11729559	11729559
13	11729559	11729559
14	11729559	11729559
15	11729559	11729559

101

REV	DESCRIPTION	DATE	BY
02	SEE EAR FRAP 3013	75 02 24	DP
-	PRODUCTION RELEASE SEE EAR FRAP 3013	75 04 30	DP

-51 (5)

HOLDER-10554826



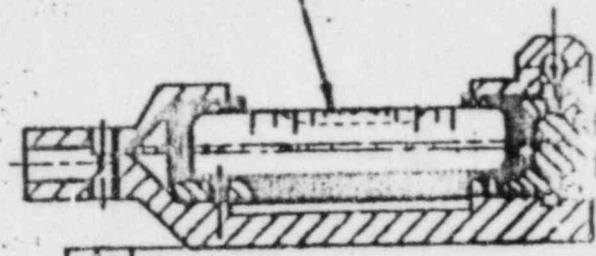
COVER-7597626

VIAL ASSEMBLY-11729512

RING-8202181

TORQUE TO 10-12 IN-LB

COVER WITH SEALING COMPOUND  
SPEC MIL-S-11091



SECTION A-A

ECCENTRIC-8202177

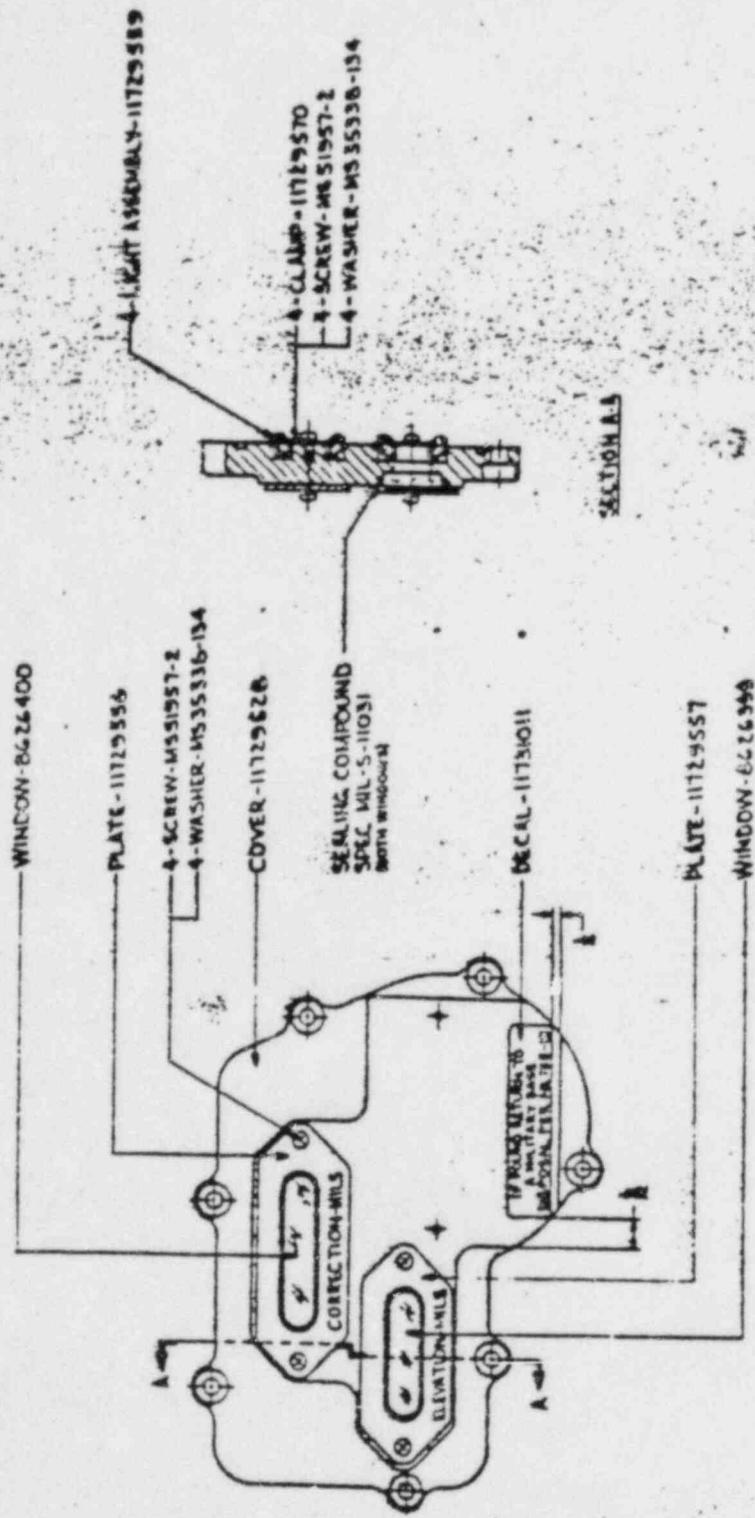
NOTES:  
1. WITH DATUM SURFACE "A" SET  
HORIZONTAL WITHIN ±1 MM OF ARC,  
SET VIAL ASSEMBLY 11729512 LEVEL  
WITHIN A GRADUATION LINE WIDTH.

APPLICABLE DOCUMENTS  
PARTS LIST-PL10554827

PART No. 10554827

U.S. ARMY MANUFACTURING DIVISION PHILADELPHIA, PA. 19157		DATE 1 JUNE 1971	
HOLDING DATE 1 JUNE 1971		HOLDING DATE 1 JUNE 1971	
F11729512 QDUNT F.C. F11729512 QDUNT P.C.		HOLDING DATE 1 JUNE 1971	
APPLICATION		HOLDING DATE 1 JUNE 1971	
NO. OF SET DATE FOR SET		HOLDING DATE 1 JUNE 1971	
C 19200		10554827	

-93 (5)



APPLICABLE DOCUMENTS  
PARTS LIST-1172556

PART No 1172556		REV	
1		1 2/8 1978	
2		2 1/8 1978	
3		3 1/8 1978	
4		4 1/8 1978	
5		5 1/8 1978	
6		6 1/8 1978	
7		7 1/8 1978	
8		8 1/8 1978	
9		9 1/8 1978	
10		10 1/8 1978	
11		11 1/8 1978	
12		12 1/8 1978	
13		13 1/8 1978	
14		14 1/8 1978	
15		15 1/8 1978	
16		16 1/8 1978	
17		17 1/8 1978	
18		18 1/8 1978	
19		19 1/8 1978	
20		20 1/8 1978	
21		21 1/8 1978	
22		22 1/8 1978	
23		23 1/8 1978	
24		24 1/8 1978	
25		25 1/8 1978	
26		26 1/8 1978	
27		27 1/8 1978	
28		28 1/8 1978	
29		29 1/8 1978	
30		30 1/8 1978	
31		31 1/8 1978	
32		32 1/8 1978	
33		33 1/8 1978	
34		34 1/8 1978	
35		35 1/8 1978	
36		36 1/8 1978	
37		37 1/8 1978	
38		38 1/8 1978	
39		39 1/8 1978	
40		40 1/8 1978	
41		41 1/8 1978	
42		42 1/8 1978	
43		43 1/8 1978	
44		44 1/8 1978	
45		45 1/8 1978	
46		46 1/8 1978	
47		47 1/8 1978	
48		48 1/8 1978	
49		49 1/8 1978	
50		50 1/8 1978	
51		51 1/8 1978	
52		52 1/8 1978	
53		53 1/8 1978	
54		54 1/8 1978	
55		55 1/8 1978	
56		56 1/8 1978	
57		57 1/8 1978	
58		58 1/8 1978	
59		59 1/8 1978	
60		60 1/8 1978	
61		61 1/8 1978	
62		62 1/8 1978	
63		63 1/8 1978	
64		64 1/8 1978	
65		65 1/8 1978	
66		66 1/8 1978	
67		67 1/8 1978	
68		68 1/8 1978	
69		69 1/8 1978	
70		70 1/8 1978	
71		71 1/8 1978	
72		72 1/8 1978	
73		73 1/8 1978	
74		74 1/8 1978	
75		75 1/8 1978	
76		76 1/8 1978	
77		77 1/8 1978	
78		78 1/8 1978	
79		79 1/8 1978	
80		80 1/8 1978	
81		81 1/8 1978	
82		82 1/8 1978	
83		83 1/8 1978	
84		84 1/8 1978	
85		85 1/8 1978	
86		86 1/8 1978	
87		87 1/8 1978	
88		88 1/8 1978	
89		89 1/8 1978	
90		90 1/8 1978	
91		91 1/8 1978	
92		92 1/8 1978	
93		93 1/8 1978	
94		94 1/8 1978	
95		95 1/8 1978	
96		96 1/8 1978	
97		97 1/8 1978	
98		98 1/8 1978	
99		99 1/8 1978	
100		100 1/8 1978	
101		101 1/8 1978	
102		102 1/8 1978	
103		103 1/8 1978	
104		104 1/8 1978	
105		105 1/8 1978	
106		106 1/8 1978	
107		107 1/8 1978	
108		108 1/8 1978	
109		109 1/8 1978	
110		110 1/8 1978	
111		111 1/8 1978	
112		112 1/8 1978	
113		113 1/8 1978	
114		114 1/8 1978	
115		115 1/8 1978	
116		116 1/8 1978	
117		117 1/8 1978	
118		118 1/8 1978	
119		119 1/8 1978	
120		120 1/8 1978	
121		121 1/8 1978	
122		122 1/8 1978	
123		123 1/8 1978	
124		124 1/8 1978	
125		125 1/8 1978	
126		126 1/8 1978	
127		127 1/8 1978	
128		128 1/8 1978	
129		129 1/8 1978	
130		130 1/8 1978	
131		131 1/8 1978	
132		132 1/8 1978	
133		133 1/8 1978	
134		134 1/8 1978	
135		135 1/8 1978	
136		136 1/8 1978	
137		137 1/8 1978	
138		138 1/8 1978	
139		139 1/8 1978	
140		140 1/8 1978	
141		141 1/8 1978	
142		142 1/8 1978	
143		143 1/8 1978	
144		144 1/8 1978	
145		145 1/8 1978	
146		146 1/8 1978	
147		147 1/8 1978	
148		148 1/8 1978	
149		149 1/8 1978	
150		150 1/8 1978	
151		151 1/8 1978	
152		152 1/8 1978	
153		153 1/8 1978	
154		154 1/8 1978	
155		155 1/8 1978	
156		156 1/8 1978	
157		157 1/8 1978	
158		158 1/8 1978	
159		159 1/8 1978	
160		160 1/8 1978	
161		161 1/8 1978	
162		162 1/8 1978	
163		163 1/8 1978	
164		164 1/8 1978	
165		165 1/8 1978	
166		166 1/8 1978	
167		167 1/8 1978	
168		168 1/8 1978	
169		169 1/8 1978	
170		170 1/8 1978	
171		171 1/8 1978	
172		172 1/8 1978	
173		173 1/8 1978	
174		174 1/8 1978	
175		175 1/8 1978	
176		176 1/8 1978	
177		177 1/8 1978	
178		178 1/8 1978	
179		179 1/8 1978	
180		180 1/8 1978	
181		181 1/8 1978	
182		182 1/8 1978	
183		183 1/8 1978	
184		184 1/8 1978	
185		185 1/8 1978	
186		186 1/8 1978	
187		187 1/8 1978	
188		188 1/8 1978	
189		189 1/8 1978	
190		190 1/8 1978	
191		191 1/8 1978	
192		192 1/8 1978	
193		193 1/8 1978	
194		194 1/8 1978	
195		195 1/8 1978	
196		196 1/8 1978	
197		197 1/8 1978	
198		198 1/8 1978	
199		199 1/8 1978	
200		200 1/8 1978	
201		201 1/8 1978	
202		202 1/8 1978	
203		203 1/8 1978	
204		204 1/8 1978	
205		205 1/8 1978	
206		206 1/8 1978	
207		207 1/8 1978	
208		208 1/8 1978	
209		209 1/8 1978	
210		210 1/8 1978	
211		211 1/8 1978	
212		212 1/8 1978	
213		213 1/8 1978	
214		214 1/8 1978	
215		215 1/8 1978	
216		216 1/8 1978	
217		217 1/8 1978	
218		218 1/8 1978	
219		219 1/8 1978	
220		220 1/8 1978	
221		221 1/8 1978	
222		222 1/8 1978	
223		223 1/8 1978	
224		224 1/8 1978	
225		225 1/8 1978	
226		226 1/8 1978	
227		227 1/8 1978	
228		228 1/8 1978	
229		229 1/8 1978	
230		230 1/8 1978	
231		231 1/8 1978	
232		232 1/8 1978	
233		233 1/8 1978	
234		234 1/8 1978	
235		235 1/8 1978	
236		236 1/8 1978	
237		237 1/8 1978	
238		238 1/8 1978	
239		239 1/8 1978	
240		240 1/8 1978	
241		241 1/8 1978	
242		242 1/8 1978	
243		243 1/8 1978	
244		244 1/8 1978	
245		245 1/8 1978	
246		246 1/8 1978	
247		247 1/8 1978	
248		248 1/8 1978	
249		249 1/8 1978	
250		250 1/8 1978	
251		251 1/8 1978	
252		252 1/8 1978	
253		253 1/8 1978	
254		254 1/8 1978	
255		255 1/8 1978	
256		256 1/8 1978	
257		257 1/8 1978	
258		258 1/8 1978	
259		259 1/8 1978	
260		260 1/8 1978	
261		261 1/8 1978	
262		262 1/8 1978	
263		263 1/8 1978	
264		264 1/8 1978	
265		265 1/8 1978	
266		266 1/8 1978	
267		267 1/8 1978	
268		268 1/8 1978	
269		269 1/8 1978	
270		270 1/8 1978	
271		271 1/8 1978	
272		272 1/8 1978	
273		273 1/8 1978	
274		274 1/8 1978	
275		275 1/8 1978	
276		276 1/8 1978	
277		277 1/8 1978	
278		278 1/8 1978	
279		279 1/8 1978	
280		280 1/8 1978	
281		281 1/8 1978	
282		282 1/8 1978	
283		283 1/8 1978	
284		284 1/8 1978	
285		285 1/8 1978	
286		286 1/8 1978	
287		287 1/8 1978	
288		288 1/8 1978	
289		289 1/8 1978	
290		290 1/8 1978	
291		291 1/8 1978	
292		292 1/8 1978	
293		293 1/8 1978	
294		294 1/8 1978	
295		295 1/8 1978	
296		296 1/8 1978	
297		297 1/8 1978	
298		298 1/8 1978	
299		299 1/8 1978	
300		300 1/8 1978	
301		301 1/8 1978	
302		302 1/8 1978	
303			