Functional Test Procedure
for MILES 2000 MGSS & DIFCUE
- Keyless System -

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REVISIONS

Rev	Description
1.0	Initial issue.
1.1	Revised per CDS comments.
1.2	Revised per CDS comments, dated 30 Jun 98. Added correct specification references and correct Kit part numbers.
1.3	Modified in accordance with STRICOM comments, dated 11 Dec 98
1.4	Modified in accordance with STRICOM comments, dated 1 Apr 99

CONTENTS

0. RELATED DOCUMENTS

[1] Specification AMSTI-93-S026 Performance Specification for the Main Gun Signature Simulator (MGSS) Device Number 17-180 dated 1 April, 1994, including modification P00013.

[2] Specification AMSTI-93-S027 Performance Specification for the Direct / Indirect Fire Cue (DIFCUE) Device Number 06-69 dated dated 1 April, 1994 including modification P00013.

[3] Critical Item Development Specification for Audio / Visual Cue Pyrotechnic Simulator 19200-DS-138 dated 1 April, 1994, including modification P00013.

[4] Electromagnetic Interference Test Procedure for MILES2000 MGSS & DIFCUE -Keyless System- Doc. 9718801.

[5] Software Requirements Data, SDRL A025.

[6] Environmental Test Procedure for MILES2000 MGSS & DIFCUE -Keyless System- Doc. 9718802.

[7] Software Verification Plan for MILES2000 MGSS & DIFCUE, SDRL A021.

0. 1. Acronyms and Abbreviations

AVCPS	Audio / Visual Cue Pyrotechnic Simulator
DC	Direct current
DIFCUE	Direct / Indirect Fire Cue
EED	Electric Explosive Device
FCU	Fire Control Unit
FU	Firing Unit
IBIT	Initiated Built-In Test
LED	Light Emitter Diode
MGSS	Main Gun Signature Simulator
SW	Software
UUT	Unit under test

0. 2. Test / Similarity Matrix

Table 0-1.

	MGSS	DIFCUE
Rate of Fire	Test	Test
Firing Sequence	Test	Test
Indication of Rounds	Test	Test
Firing Sequence Reset	Test	Test
Firing Capacity	Test	Test
Operating Voltages	Test	Test
Power On / Off	Test	Test
Safety Interlock	Test	Test
Warning Whistle	Test	Test
Replacement of Pyrotechnic	Test	Test
Pyrotechnic Interchangability	Test	Test
SAWE Interface Test	Test	Test
Weight	Examination	Examination
Trigger Test	Test	Test
Size	Examination	Examination

0. 3. Software Requirements Qualification Matrix

Requirement *	Précis	Test Paragraph(s)	
		DIFCUE	MGSS
[ERQ-01]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[ERQ-02]	Load status detection	1.2.3	2.2.3
[ERQ-03]	Trigger during IBIT or power down mode	1.2.14	2.2.13
[ERQ-04]	Firing sequence	1.2.2	2.2.2
[ERQ-05]	Indication of rounds	1.2.3	2.2.3
[ERQ-06]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[ERQ-07]	Power down mode	1.2.6	N/A
[ERQ-08]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[ERQ-09]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[ERQ-10]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[ERQ-11]	IBIT requirements	1.2.6	1.2.6
[ERQ-12]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[CRQ-01]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[CRQ-02]	Trigger duration	1.2.14	2.2.13
[CRQ-03]	Firing sequence, rate of fire, multiple triggering	1.2.1 1.2.2 1.2.14	2.2.1 2.2.2 2.2.13
[CRQ-04]	Indication of rounds	1.2.3	2.2.3
[CRQ-05]	Warning whistle	1.2.9	N/A
[CRQ-06]	BIT requirements	1.2.6	2.2.6
[CRQ-07]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[CRQ-08]	IBIT requirements	1.2.6	1.2.6
[CRQ-09]	Requirement will be verified by analysis. See Software Verification Plan [7].		
[CRQ-12]	Power down mode	1.2.6	N/A

* As per Software Requirements Data [5]

1. DIFCUE SYSTEM

1. 1. General

1. 1. 1. Terms and Definitions

The DIFCUE system consists of:

- 1 DIFCUE Firing Unit (FU), P/N 148770-2
- 1 DIFCUE Fire Control Unit (FCU), P/N 148731-2
- 1 Cable Assy, FCU/FIRING UNIT, DIFCUE, P/N 148768-1
- 1 DIFCUE Trigger Cable P/N 146450-1
- 1 Cable Assy, DC Power, MGSS/DIFCUE, P/N 148765-1
- Fastener Tape for FCU

The trigger cable used shall be adapted to the test setup.
The power supply cable used shall be adapted to the test setup.

The Direct / Indirect Fire Cue (DIFCUE) shall simulate both direct fire vehicle kill and incoming artillery during force-on-force training exercises. The DIFCUE shall provide a minimum of 30 shot capability and shall simulate the flash, smoke, and noise of a direct fire kill and incoming artillery explosion. The DIFCUE will be used in conjunction with the Multiple Integrated Laser Engagement System 2000 (MILES 2000), Tactical Engagement Simulation (TES) System for direct fire kill and the Simulated Area Weapons Effects/Multiple Integrated Laser Engagement System II - Vehicle Detection Device (SAWE/MILES II - VDD) for incoming artillery.

1. 2. Test Procedures

1. 2. 1. Rate of Fire

1. 2. 1. 1. Introduction

Purpose of the test:
The DIFCUE shall be capable of activating at the rate of once per every 3.5 ± 1 seconds.
The Firing Capacity Test (1.2.5) and Indication of Rounds Test (1.2.3) shall also be satisfied during this test.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Trigger Cable Assembly

Test Reference:
Specification paragraph 4.7.2.1.1, 3.2.1.1, 3.2.1.9, 4.7.2.1.9 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 1. 2. Required Test Equipment

The test equipment necessary is listed in table 1-1.

Table 1-1. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	30	N/A	149042-1	Diehl
5	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Stop Watch	1	TBD	N/A	TBD
8	Function Generator (alternative for #2)	1	164	N/A	Wavetech

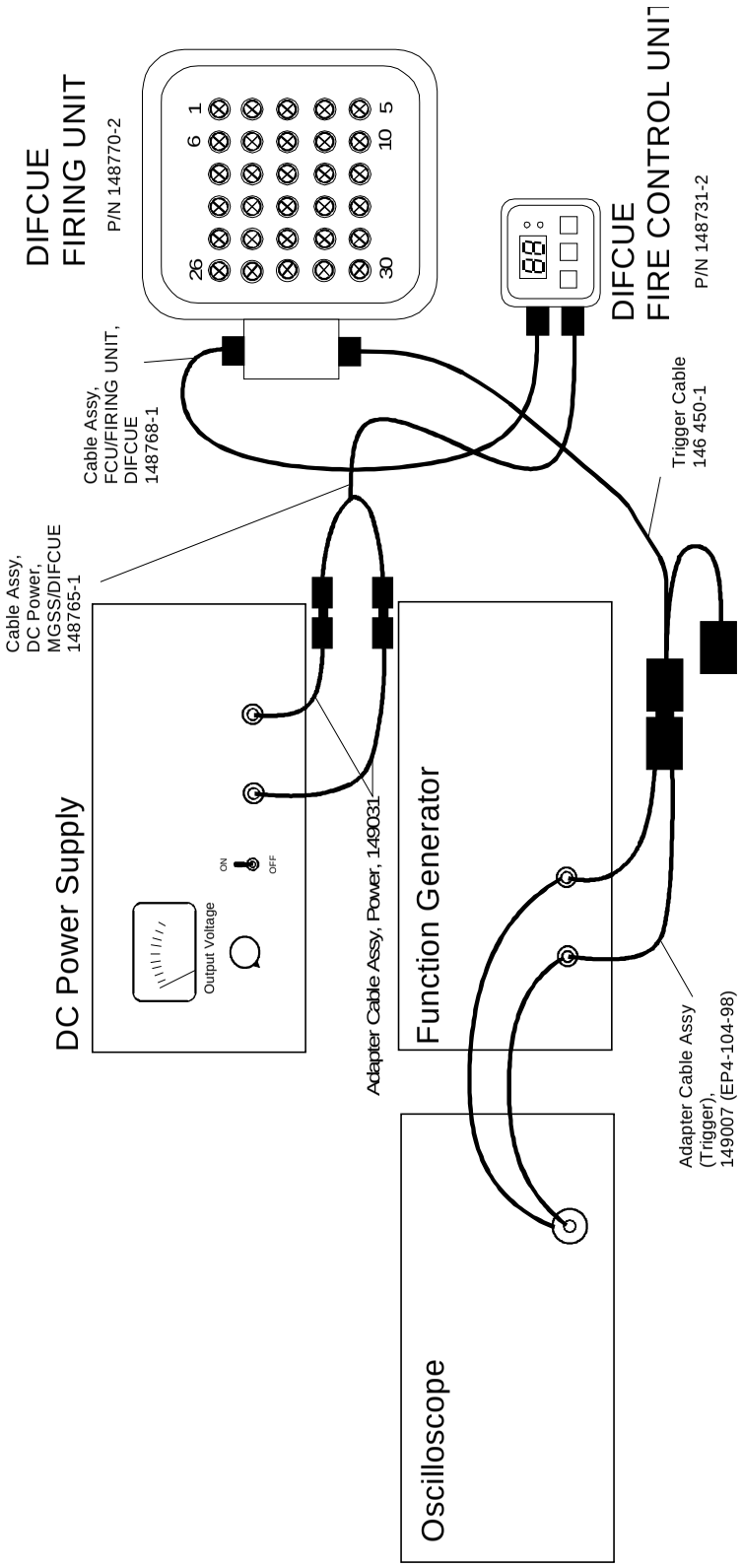


Figure 1-1. Rate of fire, test setup.

1. 2. 1. 3. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF

Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

Function generator (item #2):
Pulse amplitude 5.00 V
Pulse offset 0.00 V
Pulse duration 150 ms
Pulse interval 3.50 s
Repetition continuous
Output GND

Function generator (item #8):
Pulse amplitude 5.00 V
Pulse offset 0.00 V
Pulse duration 150 ms
Pulse interval 3.50 s
Repetition continuous
Output GND

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. Establish test setup according to fig. 1-1. 2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1). 3. Use the oscilloscope to verify the parameters of the output pulse: 5 V, 150 ms, 3.5 s 4. Insert 30 AVCPS (DIFCUE, inert with EED) into the FU. 5. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	*Test preparation*

6. Turn the safe / arm wheel of the Firing Unit to ARMED.	
7. Switch the Fire Control Unit to ARMED.	
8. Ensure that the FCU indicates 30 available rounds.	*Load status test*
9. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
10. Activate continuous trigger - see trigger generation procedure above. Start timing.	
11. Ensure that the following sequence is performed with every activation: 1. The FU whistle shall beep for approximately 2.5 s. 2. The next higher numbered AVCPS position ignites. 3. The FCU indication decrements by one round.	*Timed Test* *approximately 105 sec total*
12. End continuous triggering - see trigger generation procedure above.	
13. Observe the test, and measure the time until all 30 rounds are fired.	
14. Ensure that the FCU indicates 00 available rounds.	*Load status test*
15. Press the push-button „FIRED ROUNDS“ at the FCU. The FCU display shall be activated for approximately 5 seconds (or as long as button is pressed). Read the indication of the FCU display. Ensure that the FCU indicates 30 fired rounds.	
16. Switch the Fire Control Unit to SAFE.	
17. Turn the safe / arm wheel of the Firing Unit to SAFE.	
18. Switch the DC supply off.	

Test evaluation:
The FU was loaded with 30 pyrotechnics.
The trigger pulse rate was 3.5 seconds.
The test has demonstrated that the UUT is able to fire at a rate of 3.5 seconds ± 0.5 seconds per activation and all 30 rounds were fired after 30 x (3.5 seconds ± 0.5 seconds).

1. 2. 1. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 2. Firing Sequence

1. 2. 2. 1. Introduction

Purpose of the test:
The DIFCUE shall sequence from the first active loaded position to the last active loaded position.
The DIFCUE shall activate only once when a single activation signal is sent.
The Indication of Rounds Test (1.2.3) shall also be satisfied during this test.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assy (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.2, 3.2.1.2 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 2. 2. Required Test Equipment

The test equipment necessary is listed in table 1-2.

Table 1-2. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	6	N/A	149042-1	Diehl
5	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
6	Function Generator (alternative for #2)	1	164	N/A	Wavetech
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to

„Manual“.

1. 2. 2. 3. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF

Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

Function generator:
Pulse amplitude 5.00 V
Pulse offset 0.00 V
Pulse duration 150 ms
Pulse interval 3.50 s
Repetition single (manually triggered)
Output GND

1. Establish test setup according to fig. 1-1.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1). Verify pulse amplitude, duration and period with the oscilloscope.	
3. Insert 2 AVCPS (DIFCUE, inert with EED) into the FU, one at position #17, second at position #25 (fig. 1-1)	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 02 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #17 ignites. 3. The FCU indication displays 01.	
11. Activate a single trigger - see trigger generation procedure above.	
12. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s.	

2. The AVCPS at position #25 ignites.
3. The FCU indication displays 00.

13. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.
14. Switch the Fire Control Unit to SAFE.
15. Turn the safe / arm wheel of the Firing Unit to SAFE.
16. Insert 2 AVCPS (DIFCUE) into the FU, one at position #9, second at position #21.
17. Repeat steps 5. Through 15, with the following exception: the AVCPS (DIFCUE) at position #9 fires first, and the AVCPS (DIFCUE) at position #21 fires second.
18. Insert 2 AVCPS (DIFCUE) into the FU, one at position #5, second at position #13.
19. Repeat steps 5. Through 15, with the following exception: the AVCPS (DIFCUE) at position #5 fires first, and the AVCPS (DIFCUE) at position #13 fires second.
20. Switch the DC supply off.

Test evaluation:
The DIFCUE shall always ignite the AVCPS starting at the lowest number position.
One trigger pulse shall activate only one round.

1. 2. 2. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 3. Indication of Rounds

Purpose of the test:
The DIFCUE shall provide a visual indication of the number of activations since loading and the number of activations left prior to reloading.

Test Reference:
Specification paragraph 4.7.2.1.3 [2]

Test requirement is covered by the following tests:
Rate of Fire (paragraph 1.2.1)
Firing Sequence (paragraph 1.2.2).

1. 2. 4. Firing Sequence Reset

1. 2. 4. 1. Introduction

Purpose of the test:
The DIFCUE shall reset the Firing Device back to the first active loaded position each time the system is armed.
The DIFCUE shall not lose count when switching from external DC power to internal battery power.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.4 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 4. 2. Required Test Equipment

The test equipment necessary is listed in table 1-3.

Table 1-3. Test equipment.

Item #	Function	Quan-tity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter, Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	5	N/A	149042-1	Diehl
5	Adapter Cable Assy(power)	1	N´/A	149031-1	Diehl
6	Function Generator (alternative for #2)	1	164	N/A	Wavetech
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch. To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately).

To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 4. 3. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF

Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

Function generator:
Pulse amplitude 5.00 V
Pulse offset 0.00 V
Pulse duration 150 ms
Pulse interval 3.50 s
Repetition single (manually triggered)
Output GND

The battery of the DIFCUE Firing Device must be fully charged. To ensure proper battery power, the DIFCUE must be powered up, with an external power supply, for 10 hours in armed mode prior to this test.

1. Establish test setup according to fig 1-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1).	
3. Insert 2 AVCPS (DIFCUE, inert with EED) into the FU, one at position #1, second at position #25.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 02 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #1 ignites. 3. The FCU indication displays 01.	

10a. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
11. Switch the Fire Control Unit to SAFE.	*DIFCUE Reset*
12. Turn the safe / arm wheel of the Firing Unit to SAFE.	
13. Remove the fired AVCPS (DIFCUE) from position #1.	*Reloading*
14. Insert a new AVCPS (DIFCUE) into the FU on position #30.	
15. Turn the safe / arm wheel of the Firing Unit to ARMED.	
16. Switch the Fire Control Unit to ARMED.	
17. Ensure that the FCU indicates 02 available rounds.	*Load status test*
18. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
19. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
20. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #25 ignites. 3. The FCU indication displays 01.	
21. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
22. Switch the Fire Control Unit to SAFE.	*DIFCUE Reset*
23. Turn the safe / arm wheel of the Firing Unit to SAFE.	
24. Remove the fired AVCPS (DIFCUE) from position #25.	*Reloading*
25. Insert a new AVCPS (DIFCUE) into the FU on position #20.	
26. Turn the safe / arm wheel of the Firing Unit to ARMED.	
27. Switch the Fire Control Unit to ARMED.	
28. Ensure that the FCU indicates 02 available rounds.	*Load status test*
29. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
30. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
31. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #20 ignites. 3. The FCU indication displays 01.	
32. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	

33. Switch the DC supply off.	
34. Activate a single trigger - see trigger generation procedure above.	*Single shot firing (external power off)*
35. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #30 ignites. 3. The FCU indication displays 00.	*No loss of pyro count*
36. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.	
37. Switch the Fire Control Unit to SAFE.	
38. Turn the safe / arm wheel of the Firing Unit to SAFE.	

Test evaluation:
When switched from SAFE to ARMED status, the DIFCUE shall start activations from the lowest number loaded position.
The DIFCUE shall not lose count when external power is switched off.

1. 2. 4. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 5. Firing Capacity

Purpose of the test:
The DIFCUE shall be capable of a minimum of 30 activations without reloading.

Test Reference:
Specification paragraph 4.7.2.1.5 [2]

Test requirement is covered by the following tests:
Rate of Fire (paragraph 1.2.1)

1. 2. 6. Operating Voltages

1. 2. 6. 1. Introduction

Purpose of the test:
The DIFCUE shall operate from the vehicle power source (28 VDC).
The DIFCUE shall be capable of charging it's internal battery.
Verify low battery BIT function.
Demonstrate battery charging function.
Verify low battery error code override.
(The spikes requirement will be verified in the EMI test as described in the EMI Test Procedure, Doc. 9718801.)

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger) Second Firing Unit may be required (see step 42)

Test Reference:
Specification paragraph 4.7.2.1.6 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 6. 2. Required Test Equipment

The test equipment necessary is listed in table 1-4.

Table 1-4. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	135	N/A	149042-1	Diehl
5	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
6	Voltmeter	1	87	N/A	Fluke
7	Resistor, **variable**	1	N/A	10 Ohms (max.) (set to 6 Ohms, tolerance $\pm$ 1 Ω) $\geq$ 40 Watts	Bourns
8	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 6. 3. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF

Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

The battery of the DIFCUE Firing Device(s) must be fully charged. To ensure proper battery power, the DIFCUE must be powered up, with an external power supply, for 10 hours in armed mode prior to this test.

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3.50 s
Repetition	continuous
Output	GND

1. Establish test setup according to fig 1-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1).	
3. Insert 30 AVCPS (DIFCUE, inert with EED) into the FU.	
4. Adjust the DC voltage to 16.5 V ± 0.5 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 30 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
9. Activate continuous trigger - see trigger generation procedure above.	*Continuous firing*
10. Ensure that the following sequence is performed with every activation: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS ignites in the sequence #1 through #30. 3. The FCU indication display decrements by one after each AVCPS ignition.	
11. Observe the firing sequences until the last AVCPS is activated.	
12. End continuous triggering - see trigger generation procedure above.	
13. Ensure that the FCU indicates 00 available rounds.	*Load status test*
14. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 30 fired rounds.	
15. Switch the Fire Control Unit to SAFE.	
16. Turn the safe / arm wheel of the Firing Unit to SAFE.	
17. Unload used AVCPS and insert 30 AVCPS (DIFCUE) into the FU.	*Reloading*

18. Adjust the DC voltage to 31.5 V ± 0.5 V.	
19. Turn the safe / arm wheel of the Firing Unit to ARMED.	
20. Switch the Fire Control Unit to ARMED.	
21. Ensure that the FCU indicates 30 available rounds.	*Load status test*
22. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
23. Activate continuous trigger - see trigger generation procedure above.	*Continuous firing*
24. Ensure that the following sequence is performed with every activation: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS ignites in the sequence #1 through #30. 3. The FCU indication display decrements by one after each AVCPS ignition.	
25. Observe the firing sequences until the last AVCPS is activated.	
26. End continuous triggering - see trigger generation procedure above.	
27. Ensure that the FCU indicates 00 available rounds.	*Load status test*
28. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 30 fired rounds.	
29. Switch the Fire Control Unit to SAFE.	
30. Turn the safe / arm wheel of the Firing Unit to SAFE.	
31. Unload used AVCPS and insert 30 AVCPS (DIFCUE) into the FU.	*Reloading*
32. Turn the safe / arm wheel of the Firing Unit to ARMED.	
33. Switch the Fire Control Unit to ARMED.	
34. Switch the DC supply off.	
35. Ensure that the DIFCUE enters power down mode after 5 s (the green GO LED at the FCU shall be flashing).	*Entering power down mode*
36. Push either push-button on the FCU to reactivate the display. Ensure that the FCU indicates 30 available rounds.	*Load status test in power down mode*
37. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
38. Ensure that the DIFCUE enters power down mode after 5 s (the green GO LED at the FCU shall be flashing).	
39. Wake the DIFCUE up by pressing the TEST push-button at the FCU.	
40. Initiate an IBIT by pressing the TEST push-button again and	*Starting IBIT*

holding it down for approximately 500 ms.	
41. Ensure that the IBIT is completed with a GO signal (green LED on) within <u>a maximum time of 60 s</u>.	
42. A minimum, four day wait is required to perform the rest of this test. Use of another DIFCUE, that has been fully charged and left in it's operational state for 4 days, for the remaining steps is allowed. NOTE: The Unit will enter power down mode after 5 s (the green GO LED at the FCU shall be flashing).	
43. Switch the Fire Control Unit to SAFE.	
44. Turn the safe / arm wheel of the Firing Unit to SAFE.	
45. Unload used AVCPS and insert 30 AVCPS (DIFCUE) into the FU. ***Note:*** If the current unit under test is used, skip this step. If another DIFCUE is used (fully charged and left in it's operational state for 4 days) then insert 30 AVCPS (DIFCUE) into FU.	
46. Turn the safe / arm wheel of the Firing Unit to ARMED.	
47. Switch the Fire Control Unit to ARMED.	
48. Activate continuous trigger - see trigger generation procedure above.	*Continuous firing*
49. Ensure that the following sequence is performed with every activation: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS ignites in the sequence #1 through #30 3. The FCU indication display decrements by one after each AVCPS ignition.	
50. Observe the firing sequences until the last AVCPS is activated.	
51. End continuous triggering - see trigger generation procedure above.	
52. Ensure that the FCU indicates 00 available rounds.	*Load status test*
53. Press the push-button „FIRED ROUNDS" at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 30 fired rounds.	
54. Switch the Fire Control Unit to SAFE.	
55. Turn the safe / arm wheel of the Firing Unit to SAFE.	*End of operating voltages test.*
56. To verify the low battery indicators and demonstrate the charging capability of the DIFCUE.	*Begin low battery - battery charging test.*
57. Discharge the battery – Open the battery compartment, connect a 6 ± 1 Ohm resistor across the battery terminals. Connect also the voltmeter across the battery terminals.	
58. Turn the safe / arm wheel of the Firing Unit to ARMED.	

59. Switch the Fire Control Unit to ARMED. Allow the battery to discharge
60. When the voltmeter indicates 9 ± 1 VDC reset the DIFCUE via the SAFE / ARMED switch on the FCU. Observe the FCU display for blinking error code 09 (low battery), and red „NO GO“ indicator permanently on.
    After approximately 5 seconds the system will enter power down mode. The FCU display goes off, red „NO GO“ indicator flashes.
61. Continue to discharge battery until the voltmeter is approximately 5 ± 1 VDC, the red „NO GO“ indicator will change from flashing to continuous (indicating the system is in reset mode).
62. Discontinue discharge process by removing the resistor from the battery - leave the voltmeter attached. (The battery may recover somewhat and some indicators may re-activate.)
63. Switch on the external DC power supply to nominal 28 VDC. Start battery charging process. (System re-activates from power down mode.)
64. The „GO“ indicator and the „NO GO“ indicator, as well as the FCU display, will light up for apprioximately 0.5 seconds. BIT also runs.
65. The FCU display will show error code 09 if battery voltage is below 9 ± 1 V.
66. Press both pushbuttons „FIRED ROUNDS“ and „TEST“ on the FCU at one time for at least five seconds, thus activating the manual override procedure.

Manual error override

67. Ensure that the BIT procedure is running.
68. Ensure that the FCU indicates 00 available rounds, the „GO“ indicator lights and the „NO GO“ indicator is off.
    Note:
    The FCU display may not indicate 00 available rounds if one or more of the fired rounds (see step 49) did not open its bridgewire during firing. This will not constitute a failure.
69. Reset the DIFCUE by switching the FCU to SAFE, after approximately five seconds back to ARMED.

70. The „GO“ indicator and the „NO GO“ indicator, as well as the FCU display, will light up for apprioximately 0.5 seconds. BIT also runs.
71. The FCU display will show error code 09 if battery voltage is below 9 ± 1 V.
72. Verify voltage meter at the battery indicates rising voltage level. ´(Error code 09 remains until system is reset.)
73. Allow the system to charge the battery for a minimum of 1 hour - then reset the system by turning the safe/arm switch of the FCU from ARMED to SAFE then back to ARMED and check for error codes on the FCU display. There shall be no error codes displayed. Verify that the FCU does indicate 00 rounds available and 00 rounds fired. If the FCU is still displaying the 09 error code, allow the battery to charge for another hour and then repeat this step.
74. Close the battery compartment.
75. Switch the DC power supply off.
76. Switch the FCU to SAFE.
77. Insert 15 AVCPS (DIFCUE) into the FU in positions 1 through 15.
78. Turn the safe / arm wheel of the FU to ARMED.
79. Switch the FCU to ARMED.
80. Verify the FCU display indicates 15 rounds available.
81. Activate continuous trigger - see trigger generation procedure above.
82. Ensure that the following sequence is performed with every activation:
    1. The FU whistle shall beep for approximately 2.5 s.
    2. The AVCPS ignites in the sequence #1 through #15
    3. The FCU indication display decrements by one after each AVCPS ignition.
83. Observe the firing sequences until the last AVCPS is activated
84. End continuous triggering - see trigger generation procedure above.
85. Ensure that the FCU indicates 00 available rounds
86. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 15 fired rounds.
87. Switch the FCU to SAFE.
88. Turn the safe / arm wheel of the FU to SAFE.

Test evaluation:
The DIFCUE shall operate normally at 16.5 V ± 0.5 V and 31.5 V ± 0.5 V and when converted to the internal battery.
The DIFCUE shall operate normally after four days in power down mode.
Verify low battery indicator, battery charging function, and battery override function.

1. 2. 6. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 7. Power On / Off

1. 2. 7. 1. Introduction

Purpose of the test:
The DIFCUE shall start with the first active loaded position when all external power is lost or turned off from the system and is reapplied and the system is reset.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.7 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 7. 2. Required Test Equipment

The test equipment necessary is listed in table 1-5.

Table 1-5. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	30	N/A	149042-1	Diehl
5	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
6	Function Generator (alternative for #2)	1	164	N/A	Wavetech
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 7. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3.50 s
Repetition	single (manually triggered)
Output	GND

1. Establish test setup according to fig. 1-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1).	
3. Insert 30 AVCPS (DIFCUE, inert with EED) into the FU.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 30 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	

9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #1 ignites. 3. The FCU indication displays 29.	
11. Switch DC power supply off.	*Power Reset*
12. After (60 ± 10) seconds switch the DC power supply on.	
13. Ensure that the FCU indicates 29 available rounds.	*Load status test*
14. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
15. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
16. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #2 ignites. 3. The FCU indication displays 28.	
17. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.	
18. Switch DC power supply off.	
19. After 60 seconds switch power supply on	
20. Ensure that the FCU indicates 28 available rounds.	
21. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.	
22. Activate a single trigger - see trigger generation procedure above.	
23. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #3 ignites. 3. The FCU indication displays 27.	
24. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 03 fired rounds.	
25. Switch the Fire Control Unit to SAFE.	
26. Turn the safe / arm wheel of the Firing Unit to SAFE.	
27. Switch the power supply off.	

Test evaluation:
The DIFCUE shall activate the first active loaded (lowest number) AVCPS (DIFCUE) when all external power is lost or turned off from and is reapplied and the system is reset.

1. 2. 7. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 8. Safety Interlock

1. 2. 8. 1. Introduction

Purpose of the test:
The DIFCUE shall not activate an AVCPS (DIFCUE) when either or both FCU and FU are in the SAFE mode.
The DIFCUE shall also remain in SAFE mode after reloading when the FU is switched to ARMED.
The threshold SAFE/ARMED position of the safe wheel shall be verified.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.8 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 8. 2. Required Test Equipment

The test equipment necessary is listed in table 1-6.

Table 1-6. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	30	N/A	149042-1	Diehl
5	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
6	Function Generator (alternative for #2)	1	164	N/A	Wavetech
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix
8	Protractor	1	N/A	N/A	any available

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 8. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

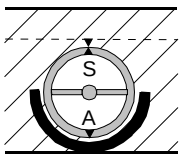
Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3.50 s
Repetition	single (manually triggered)
Output	GND

Test preparation

1. Establish test setup according to fig. 1-1.
   Verify pulse amplitude, duration and period with the oscilloscope.
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1).
3. Insert 30 AVCPS (DIFCUE, inert with EED) into the FU.
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.
5. The FCU remains in SAFE position, the safe / arm wheel of the FU also remains in SAFE position (see figure below).



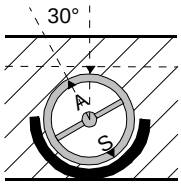
6. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = SAFE, FU = SAFE

7. Ensure that no firing takes place.
8. Switch the FCU to ARMED.
9. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU = SAFE

10. Ensure that no firing takes place.
    An error code „00“ shall flash on FCU display and the NO GO indicator shall illuminate continuously.
11. Switch the FCU to SAFE.
12. Turn the safe / arm wheel of the FU to the right approaching to the ARMED position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.



13. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = SAFE, FU = SAFE

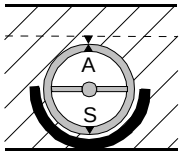
(threshold position of safe wheel)

14. Ensure that no firing takes place.
15. Switch the FCU to ARMED.
16. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU = SAFE

(threshold position of safe wheel)

17. Ensure that no firing takes place.
    An error code „00“ shall flash on FCU display and the NO GO indicator shall illuminate continuously.
18. Switch the FCU to SAFE.
19. Turn the safe / arm wheel of the FU to the right into ARMED position (see figure below)



20. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = SAFE, FU = ARMED

21. Ensure that no firing takes place.

22. Switch the FCU to ARMED.

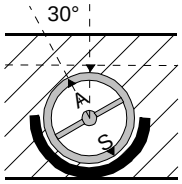
23. Ensure that the FCU performs the start-up procedure and indicates 30 available rounds after completeing it.

24. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU =ARMED

25. Ensure that the following sequence is performed:
    1. The FU whistle shall beep for approximately 2.5 s.
    2. The AVCPS at position #1 ignites.
    3. The FCU indication displays 29.

26. Turn the safe / arm wheel of the FU to the left approaching to the SAFE position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.



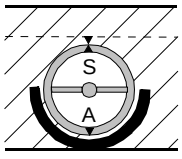
27. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU =SAFE

(threshold position of safe wheel)

28. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.

29. Turn the safe / arn wheel of the FU in full SAFE position (see figure below).

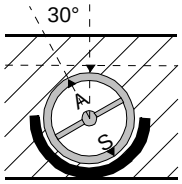


30. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU = SAFE

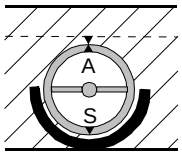
31. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
32. Open the FU, then close the FU.
33. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU = ARMED, FU = SAFE
34. Ensure that no firing takes place.
35. Turn the safe / arm wheel of the FU to the right approaching to the ARMED position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.



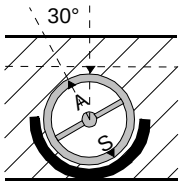
36. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU = ARMED, FU = SAFE
37. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
38. Turn the safe / arm wheel of the FU to the right into ARMED position (see figure below)



39. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU =ARMED, FU = ARMED
40. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
41. Turn the safe / arm wheel of the FU to the left approaching to the SAFE position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.

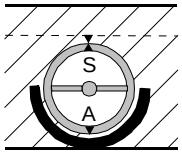


42. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU =SAFE

43. Ensure that no firing takes place.
An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.

44. Turn the safe / arn wheel of the FU in full SAFE position (see figure below).



45. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU = SAFE

46. Ensure that no firing takes place.
An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.

47. Switch the Fire Control Unit to SAFE.

48. Switch the DC supply off.

Test evaluation:
The DIFCUE shall not activate an AVCPS (DIFCUE) when it is switched to SAFE mode.
The DIFCUE shall also remain in SAFE mode after reloading when the FU is switched to ARMED.
The threshold SAFE-ARMED position of the safe wheel is verified.

1. 2. 8. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 9. Warning Whistle

1. 2. 9. 1. Introduction

Purpose of the test:
The DIFCUE warning whistle shall generate a sound level of (80.0 ± 5.0) dB at 2 meters.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.9.1 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 9. 2. Required Test Equipment

The test equipment necessary is listed in table 1-7.

Table 1-7. Test equipment.

Item #	Function	Quan-tity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE, inert with optical indicator)	30	N/A	149043-1	Diehl
5	Sound measurement equipment	1	depending on test facility *	depending on test facility *	depending on test facility *
6	Stop-watch	1	depending on test facility *	depending on test facility *	depending on test facility *
7	Adapter Cable Assy (Power supply)	1	N/A	149031-1	Diehl
8	M1A1 Mounting Adapter	1	N/A	148302-1	CDS
9	Function Generator (alternative for #2)	1	164	N/A	Wavetech
10	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

* All test equipment model numbers, part numbers, manufacturer, calibration dates, control settings, etc shall be entered on data sheets and be included in the Test report.

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 9. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3.50 s
Repetition	single (manually triggered)
Output	GND

Test preparation

1. Mount the FU on the M1A1 DIFCUE adapter, or equivalent so that the FU is at an angle similar to that shown in fig 1-2.
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1). Establish the microphone test setup according to fig. 1-2.
   Verify pulse amplitude, duration and period with the oscilloscope.
3. Insert 30 AVCPS (DIFCUE, inert with optical indicator) into the FU.
4. Establish the sound power level test setup. The sound power meter shall be at a distance of 2 meters from the FU.
5. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.
6. Turn the safe / arm wheel of the Firing Unit to ARMED.
7. Switch the Fire Control Unit to ARMED.

8. Activate a single trigger - see trigger generation procedure above.
9. Measure the sound power level of the whistle. — *Sound level measurement*
10. Repeat steps 8. and 9. to obtain ten (10) measurements.
11. Prepare the timer to measure the duration of the whistle signal.
12. Activate a single trigger - see trigger generation procedure above.
13. Measure the duration of the whistle signal. — *Signal duration measurement*
14. Repeat steps 12. and 13. to obtain ten (10) measurements.
15. Switch the Fire Control Unit to SAFE.
16. Turn the safe / arm wheel of the FU to SAFE.
17. Switch the DC supply off.

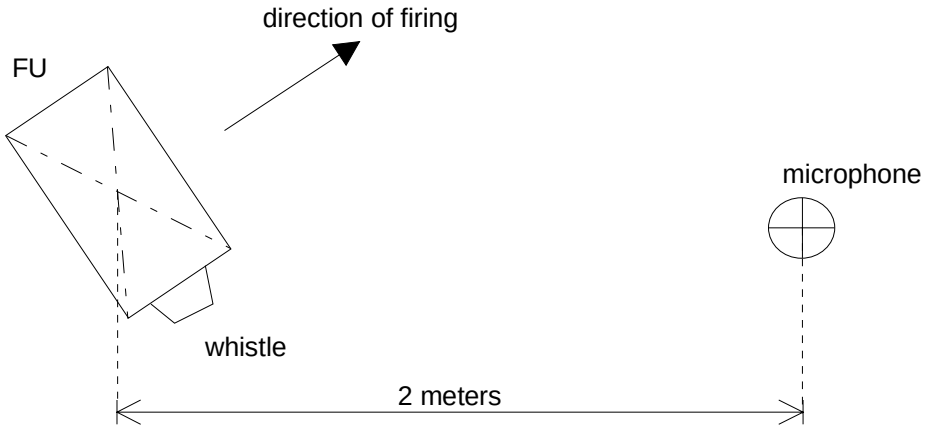


Figure 1-2. Test setup for sound measurement.

Test evaluation:
The sound pressure level shall be within the limits of 75 dB(A) - 85 dB(A).
The whistle signal duration shall be within 2.0 s - 3.0 s.

1. 2. 9. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 10. Replacement of Pyrotechnic

1. 2. 10. 1. Introduction

Purpose of the test:
The operator of the DIFCUE shall be able to load / unload the pyrotechnic without the use of tools.

Equipment to be tested:
Firing Unit, AVCPS (DIFCUE)

Test Reference:
Specification paragraph 4.7.2.1.10.1 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 10. 2. Required Test Equipment

The test equipment necessary is listed in table 1-8.

Table 1-8. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	AVCPS (DIFCUE) (inert)	30	N/A	149043-1	Diehl

1. 2. 10. 3. Step-By-Step procedure:

1. Load the FU with 30 pyrotechnic simulators (AVCPS DIFCUE, inert).
2. Close the FU.
3. Open the FU.
4. Unload the AVCPS (DIFCUE).

Test preparation

Test evaluation:
No tools must be used for loading and unloading.

1. 2. 10. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 11. Pyrotechnic Interchangability

1. 2. 11. 1. Introduction

Purpose of the test:
The DIFCUE shall not be able to use or activate MGSS pyrotechnic.

Equipment to be tested:
Firing Unit (DIFCUE)

Test Reference:
Specification paragraph 4.7.2.1.10.2 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 11. 2. Required Test Equipment

The test equipment necessary is listed in table 1-9.

Table 1-9. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	AVCPS (MGSS), inert	30	N/A	149043-2	Diehl

1. 2. 11. 3. Step-By-Step procedure:

1. Try to load the DIFCUE FU with 1 AVCPS MGSS, inert.
2. Try to close and latch the FU with AVCPS MGSS installed.
3. Open the FU.
4. Unload the AVCPS MGSS..
5. Repeat step 1 thru 4, four more times in random locations. Use different AVCPS MGSS for each test if used ones become deformed.

Test preparation

Test evaluation:
The FU must not close with the MGSS pyrotechnics loaded.

1. 2. 11. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 12. SAWE Interface Bench Test

The SAWE interface demonstration is to be done via separate procedures.

1. 2. 12. 1. Introduction

Purpose of the test:
The DIFCUE shall interface with MILES 2000 TES, SAWE/MILES II. The Vehicle interface will be accomplished via separate field demonstrations.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU)

Test Reference:
Specification paragraph 3.2.2 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 12. 2. Required Test Equipment

The test equipment necessary is listed in table 1-10.

Table 1-10. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (SAWE Trigger)	1	N/A	149030	Diehl
4	Deleted				
5	AVCPS (DIFCUE) (inert, with EED)	30	N/A	149042-1	Diehl
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Function Generator (alternative for #2)	1	164	N/A	Wavetech
8	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 12. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	28.00 V ± 1.50 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3.50 s
Repetition	continuous
Output	GND

1. Establish test setup according to fig. 1-1(use SAWE adapter cable) . NOTE: SAWE Trigger Cable Assy is used in place of the MILES 2000 Trigger Cable Assy Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1).	
3. Insert 30 AVCPS (DIFCUE, inert with EED) into the FU.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 30 available rounds.	*Load status test*

8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
9. Activate continuous trigger - see trigger generation procedure above.	
10. Observe the Fire Indicator at the test equipment. Ensure that the following sequence is performed with every activation: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS ignites in the sequence #1 to #30. 3. The FCU indication decrements by one round after each AVCPS ignition.	*Autonomous firing*
11. Observe the test until all 30 rounds are fired.	
12. End continuous triggering - see trigger generation procedure above.	
13. Ensure that the FCU indicates 00 available rounds.	*Load status test*
14. Press the push-button „FIRED ROUNDS“ at the FCU. The FCU display shall be activated for approximately 5 seconds (or as long as button is pressed). Read the indication of the FCU display. Ensure that the FCU indicates 30 fired rounds.	
15. Switch the Fire Control Unit to SAFE.	
16. Turn the safe / arm wheel of the Firing Unit to SAFE.	
17. Switch the DC supply off.	

Test evaluation:
Every ignition sequence shall be performed using a valid SAWE Trigger signal.

1. 2. 12. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 13. Weight and Size

1. 2. 13. 1. Introduction

Purpose of the test:
The DIFCUE FU shall be one-man (male) lift / portable.
The DIFCUE FU shall not exceed 0.03 m^3 in volume.
The DIFCUE kit shall be four-man (male), 3-foot lift.
The DIFCUE kit shall not exceed 0.75 m^3 in volume.

Equipment to be tested:
DIFCUE Firing Unit P/N: 148770-2.
Quantity 2 DIFCUE systems (in transit case). Packed DIFCUE Kit P/N: 148306-2, except manuals (DIFCUE Kit, M2/M3 vehicle).

Test Reference:
Specification paragraph 4.7.2.3.1, 4.7.2.3.2 [2]

Test Conditions:
All tests at standard room ambient.

1. 2. 13. 2. Required Test Equipment

The test equipment necessary is listed in table 1-11.

Table 1-11. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	Balance	1	NW100	N/A	Toledo
2	Measure	1	500-UJ-M	N/A	Mitutoyo

1. 2. 13. 3. Step-By-Step procedure:

Measure the weight of the DIFCUE Firing Device (not loaded).
Measure the extension of the FU in all three axes and calculate the volume.
Measure the weight of the DIFCUE kit packed in the transit case.
Measure the transit case in all three axes and calculate the volume.

Test evaluation:
The weight of the Firing Device shall not exceed 25.4 kg.
The DIFCUE FU shall not exceed 0.03 m^3 in volume.
The weight of the DIFCUE kit shall not exceed 139.0 kg.
The DIFCUE kit shall not exceed 0.75 m^3 in volume.

1. 2. 13. 4. Data Sheets

Use Data sheets as per Appendix 3.

1. 2. 14. Trigger Test

1. 2. 14. 1. Introduction

Purpose of the test:
The DIFCUE shall be activated only by a valid trigger signal. A valid trigger signal for MILES 2000 is defined as a pulse of voltage level between 4.5 V and 31 V and a pulse duration of ≥ 80 ms. No subsequent trigger shall be accepted until the ongoing firing sequence is completed.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Software Requirements Data paragraph 3.3.1.3 [5] Firing Control, Specification 4.7.2.2.1[2]

Test Conditions:
All tests at standard room ambient.

1. 2. 14. 2. Required Test Equipment

The test equipment necessary is listed in table 1-12.

Table 1-12. Test equipment.

Item #	Function	Quan-tity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (DIFCUE) (inert, with EED)	30	N/A	149042-1	Diehl
5	Adapter Cable Assy (Power)	1	N/A	149031-1	Deihl
6	Function Generator (alternative for #2)	1	164	N/A	Wavetech
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

1. 2. 14. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	80 ms
Pulse interval	3.50 s
Repetition	single (manually triggered)
Output	GND

1. Establish test setup according to fig. 1-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 1-1).	
3. Insert 30 AVCPS (DIFCUE, inert with EED) into the FU.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 30 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	

9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The FU whistle shall beep for approximately 2.5 s. 2. The AVCPS at position #1 ignites. 3. The FCU indication displays 29.	
11. Switch the Fire Control Unit to SAFE.	
12. Turn the safe / arm wheel of the Firing Unit to SAFE.	
13. Adjust the function generator output amplitude to 4.0 V and the pulse duration to 150 ms. Verify pulse amplitude, duration and period with the oscilloscope.	
14. Turn the safe / arm wheel of the Firing Unit to ARMED.	
15. Switch the Fire Control Unit to ARMED.	
16. Activate a single trigger - see trigger generation procedure above.	*Trigger voltage too low*
17. Ensure that no firing takes place.	
18. Switch the Fire Control Unit to SAFE.	
19. Turn the safe / arm wheel of the Firing Unit to SAFE.	
20. Adjust the function generator output amplitude to 5.0 V. Adjust the pulse duration to 70 ms. Verify pulse amplitude, duration and period with the oscilloscope.	
21. Turn the safe / arm wheel of the Firing Unit to ARMED.	
22. Switch the Fire Control Unit to ARMED.	
23. Activate a single trigger - see trigger generation procedure above.	*Trigger too short*
24. Ensure that no firing takes place.	
25. Switch the Fire Control Unit to SAFE.	
26. Turn the safe / arm wheel of the Firing Unit to SAFE.	
27. Adjust the function generator output amplitude to 30.0 V. Verify pulse amplitude, duration and period with the oscilloscope.	
28. Turn the safe / arm wheel of the Firing Unit to ARMED.	
29. Switch the Fire Control Unit to ARMED.	
30. Activate a single trigger - see trigger generation procedure above.	*Trigger too short*
31. Ensure that no firing takes place.	
32. Switch the Fire Control Unit to SAFE.	
33. Turn the safe / arm wheel of the Firing Unit to SAFE.	

34. Adjust the function generator output amplitude to 5.0 V. Adjust the pulse duration to 150 ms. Verify pulse amplitude, duration and period with the oscilloscope.
35. Turn the safe / arm wheel of the Firing Unit to ARMED.
36. Switch the Fire Control Unit to ARMED.
37. Initiate an IBIT (by pressing the push-button TEST for more than 500 ms).
38. While the IBIT is running, initiate a trigger pulse. *Trigger during IBIT*
39. Ensure that the following sequence is performed:
    1. The FU whistle shall beep for approximately 2.5 s.
    2. The AVCPS at position #2 ignites.
    3. The FCU indication displays 28.
40. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.
41. Adjust the function generator to produce a series of two subsequent pulses, each 150 ms, 5.0 V, following with a delay time of 2.0 s. Verify pulse amplitude, duration and period with the oscilloscope.
42. Activate a single trigger - see trigger generation procedure above. *Multiple trigger pulses*

27. Ensure that only one firing takes place with the following sequence:
    1. The FU whistle shall beep for approximatelz 2.5 s.
    2. The AVCPS at position #3 ignites.
    3. The FCU indications displays 27.
28. Press push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 03 fired rounds.
29. Switch the DC supply off.
30. Ensure that the DIFCUE enters power down mode after 5 s (the green GO LED at the FCU shall be flashing).
31. While the DIFCUE is in power down mode, activate trigger - see trigger generation procedure above. *Trigger during power down mode*
32. Ensure that the following sequence is performed:
    1. The FU whistle shall beep for approximately 2.5 s.
    2. The AVCPS at position #4 ignites.
    3. The FCU indication displays 26.
33. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 04 fired rounds.

34. Switch the Fire Control Unit to SAFE.
35. Turn the safe / arm wheel of the Firing Unit to SAFE.

Test evaluation:
The DIFCUE shall be activated only by a valid trigger signal.

1. 2. 14. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. MGSS SYSTEM

2. 1. General

2. 1. 1. Terms and Definitions

The MGSS system consists of:
- 1 MGSS Firing Unit (FU), P/N 149105-2
- 1 MGSS Fire Control Unit (FCU), P/N 149101-2
- 1 Cable Assy, FCU/FIRING UNIT, MGSS, P/N 149104-1
- 1 MGSS Trigger Cable P/N 146 452-1
- 1 Cable Assy, DC Power, MGSS/DIFCUE P/N 148765-1
- Fastener Tape for FCU

The power supply cable and the trigger cable shall be adapted to the test setup.

Additional SAWE trigger cable (148212-1) shall be tested.
Additional MGSS Kit (M1A1) P/N 148201-2 in transit case shall be tested for weight and size.

The Main Gun Signature Simulator (MGSS) shall simulate main gun fire of armor vehicles during force-on-force training exercises. The MGSS shall provide a minimum of 60 shot capability and shall simulate the flash, smoke, and noise created when an armor vehicle main gun fires. The MGSS will be used in conjunction with the Multiple Integrated Laser Engagement System 2000 (MILES 2000) Tactical Engagement Simulation (TES) System.

2. 2. Test Procedures

2. 2. 1. Rate of Fire

2. 2. 1. 1. Introduction

Purpose of the test:
The MGSS shall be capable of activating at the rate of once per every 3.0 ± 1 seconds.
This test also satisfies 2.2.3 Indication of Rounds, and 2.2.5 Firing Capacity.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assambly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.1 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 1. 2. Required Test Equipment

The test equipment necessary is listed in table 2-1.

Table 2-1. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	60	N/A	149042-2	Diehl
5	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix
6	Function Generator (alternative for #2)	1	164	N/A	Wavetech
7	Stop Watch	1	TBD	N/A	TBD
8	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

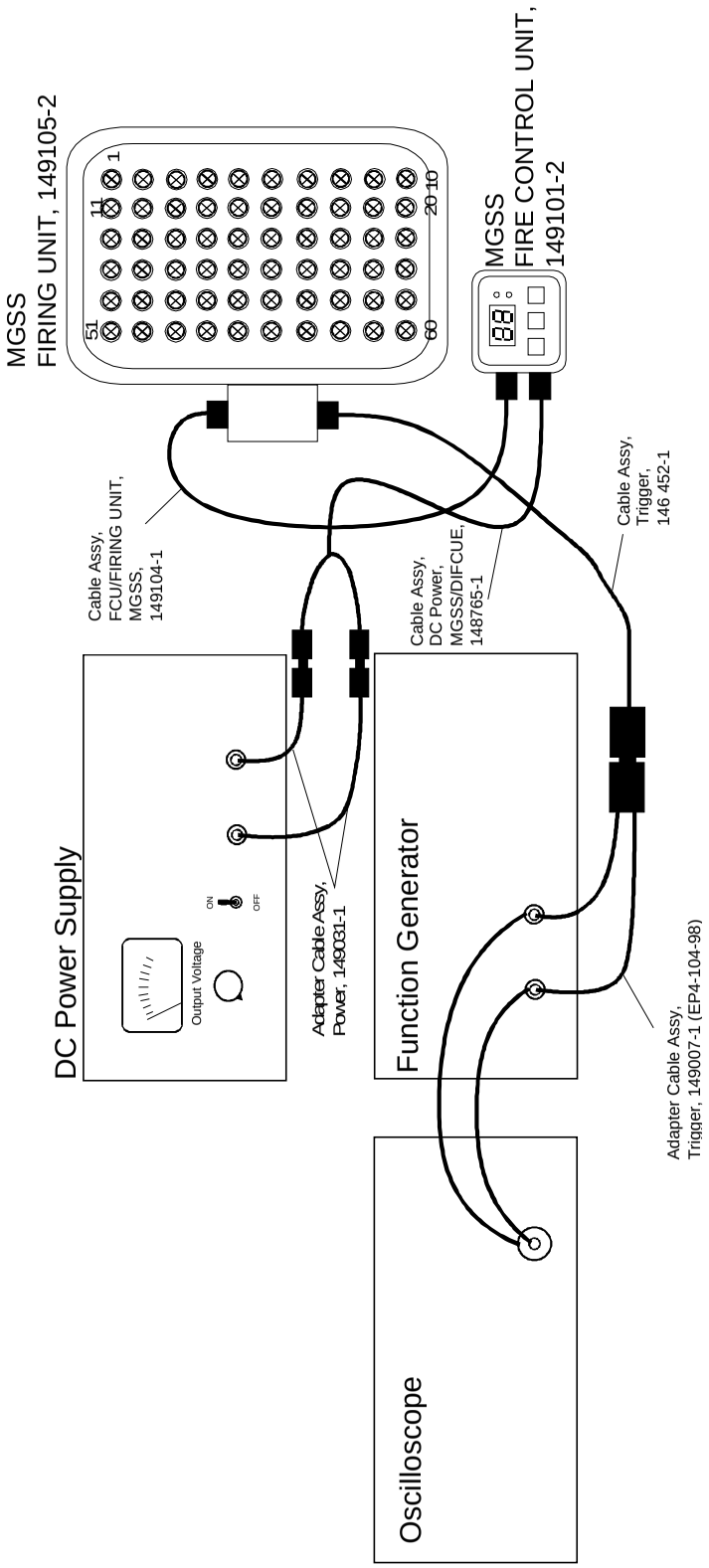


Figure 2-1. Rate of fire, test setup.

2. 2. 1. 3. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF

Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

Function generator:
Pulse amplitude 5.00 V
Pulse offset 0.00 V
Pulse duration 150 ms
Pulse interval 3 s
Repetition continuous
Output GND

1. Establish test setup according to fig. 2-1.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Use the oscilloscope to verify the parameters of the output pulse: 5 V, 150 ms, 3.0 s	
4. Insert 60 AVCPS (MGSS, inert with EED) into the FU.	
5. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
6. Turn the safe / arm wheel of the Firing Unit to ARMED.	
7. Switch the Fire Control Unit to ARMED.	
8. Ensure that the FCU indicates 60 available rounds.	*Load status test*
9. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
10. Activate continuous trigger - see trigger generation procedure above. Start time measurement.	*Timed Test*
11. Ensure that the following sequence is performed with every activation: 1. The next higher numbered AVCPS position ignites. 2. The FCU indication decrements by one round.	*Approximately 180 sec total*
12. Measure the total time and observe the test until all 60 rounds are fired.	
13. End continuous triggering - see trigger generation procedure above.	

14. Ensure that the FCU indicates 00 available rounds.

Load status test

15. After the last round has been fired, press the push-button „FIRED ROUNDS“ at the FCU. The FCU display shall be activated for approximately 5 seconds (or as long as the button is pressed).
    Read the indication of the FCU display.
    Ensure that the FCU indicates 60 fired rounds.
16. Switch the Fire Control Unit to SAFE.
17. Turn the safe / arm wheel of the Firing Unit to SAFE.
18. Switch the DC supply off.

Test evaluation:
Every activation (60 total) was performed.
The trigger pulse rate was 3.0 seconds.
The rate of fire was 3.0 seconds ± 1.0 second and all 60 rounds were fired in 60 x (3.0 seconds ± 1.0 second) = (180 seconds nom.).

2. 2. 1. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 2. Firing Sequence

2. 2. 2. 1. Introduction

Purpose of the test:
The MGSS shall sequence from the first active loaded position to the last active loaded position.
The MGSS shall activate only once when a single activation signal is sent.
The Indication of Rounds Test (2.2.3) shall also be satisfied during this test.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.2, 3.2.1.2 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 2. 2. Required Test Equipment

The test equipment necessary is listed in table 2-2.

Table 2-2. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	6	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 2. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3 s
Repetition	single (manually triggered)
Output	GND

1. Establish test setup according to fig. 2-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Insert 2 AVCPS (MGSS, inert with EED) into the FU, one at position #34, second at position #50.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 02 available rounds.	*Load status test*

8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.
9. Activate a single trigger - see trigger generation procedure above. — *Single shot firing*
10. Ensure that the following sequence is performed:
    1. The AVCPS at position #34 ignites.
    2. The FCU indication displays 01.
11. Activate a second trigger pulse - see trigger generation procedure above.
12. Ensure that the following sequence is performed:
    1. The AVCPS at position #50 ignites.
    2. The FCU indication displays 00.
13. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.
14. Switch the Fire Control Unit to SAFE.
15. Turn the safe / arm wheel of the Firing Unit to SAFE.
16. Insert 2 AVCPS (MGSS) into the FU, one at position #18, second at position #42.
17. Repeat steps 5. through 15, with the following exception: the AVCPS (MGSS) at position #18 fires first, and the AVCPS (MGSS) at position #42 fires second.
18. Insert 2 AVCPS (MGSS) into the FU, one at position #10, second at position #26.
19. Repeat steps 5. through 15, with the following exception: the AVCPS (MGSS) at position #10 fires first, and the AVCPS (MGSS) at position #26 fires second.
20. Switch the DC supply off.

Test evaluation:
The MGSS shall always ignite AVCPS starting at the lowest number position and sequencing to the highest number position.
One trigger pulse shall activate only one round.

2. 2. 2. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 3. Indication of Rounds

Purpose of the test:
The MGSS shall provide a visual indication of the number of activations since loading and the number of AVCPS (rounds) remaining before reloading is required.

Test Reference:
Specification paragraph 4.7.2.1.3 [1]

Test requirement is covered by the following tests:
Rate of Fire (paragraph 2.2.1)
Firing Sequence (paragraph 2.2.2).

2. 2. 4. Firing Sequence Reset

2. 2. 4. 1. Introduction

Purpose of the test:
The MGSS shall reset the Firing Unit back to the first (lowest numbered) active loaded position each time the system is armed or switched on.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.4 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 4. 2. Required Test Equipment

The test equipment necessary is listed in table 2-3.

Table 2-3. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	6	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 4. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3 s
Repetition	single (manually triggered)
Output	GND

1. Establish test setup according to fig. 2-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Insert 2 AVCPS (MGSS, inert with EED) into the FU, one at position #1, second at position #55.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 02 available rounds.	*Load status test*

8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The AVCPS at position #1 ignites. 2. The FCU indication displays 01.	
11. Switch the Fire Control Unit to SAFE.	*MGSS Reset*
12. Turn the safe / arm wheel of the Firing Unit to SAFE.	
13. Remove the fired AVCPS (MGSS) from position #1.	*Reloading*
14. Insert a new AVCPS (MGSS) into the FU on position #59.	
15. Turn the safe / arm wheel of the Firing Unit to ARMED.	
16. Switch the Fire Control Unit to ARMED.	
17. Ensure that the FCU indicates 02 available rounds.	*Load status test*
18. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
19. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
20. Ensure that the following sequence is performed: 1. The AVCPS at position #55 ignites. 2. The FCU indication displays 01.	
21. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
22. Switch the Fire Control Unit to SAFE.	*MGSS Reset*
23. Turn the safe / arm wheel of the Firing Unit to SAFE.	
24. Remove the fired AVCPS (MGSS) from position #55.	*Reloading*
25. Insert a new AVCPS (MGSS) into the FU on position #50.	
26. Turn the safe / arm wheel of the Firing Unit to ARMED.	
27. Switch the Fire Control Unit to ARMED.	
28. Ensure that the FCU indicates 02 available rounds.	*Load status test*
29. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
30. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*

31. Ensure that the following sequence is performed: 1. The AVCPS at position #50 ignites. 2. The FCU indication displays 01.	
32. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
33. Switch the DC supply off.	
34. After approximately 10 seconds, switch the DC supply on again.	
35. Ensure that the FCU indicates 01 available round.	*Load status test*
36. Activate a single trigger - see trigger generation procedure above.	*Single shot firing (external power off)*
37. Ensure that the following sequence is performed: 1. The AVCPS at position #59 ignites. 2. The FCU indication displays 00.	
38. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
39. Switch the Fire Control Unit to SAFE.	
40. Turn the safe / arm wheel of the Firing Unit to SAFE.	
41. Switch the DC supply off.	

Test evaluation:
When switched from SAFE to ARMED status, the MGSS shall start activations from the lowest numbered position.
The MGSS shall reset when external power is switched off.

2. 2. 4. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 5. Firing Capacity

Purpose of the test:
The MGSS shall be capable of a minimum of 60 activations without reloading.

Test Reference:
Specification paragraph 4.7.2.1.5 [1]

Test requirement is covered by the following tests:
Rate of Fire (paragraph 2.2.1)

2. 2. 6. Operating Voltages

2. 2. 6. 1. Introduction

Purpose of the test:
The MGSS shall operate from the vehicle power source (28 VDC).
(The spikes requirement will be verified in the EMI test as described in the EMI Test Procedure, Doc. 9718801.)

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.6 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 6. 2. Required Test Equipment

The test equipment necessary is listed in table 2-4.

Table 2-4. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	120	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 6. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3 s
Repetition	continuous
Output	GND

1. Establish test setup according to fig. 2-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Insert 60 AVCPS (MGSS, inert with EED) into the FU.	
4. Adjust the DC voltage to 16.5 V ± 0.5 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 60 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	

9. Activate continuous trigger - see trigger generation procedure above.	*Continuous firing*
10. Ensure that the following sequence is performed with every activation: 1. The AVCPS ignites in the sequence #1 through #60. 2. The FCU indication displays decrements by one.	
11. Observe the firing sequences until the last AVCPS is activated.	
12. End continuous triggering - see trigger generation procedure above.	
13. Ensure that the FCU indicates 00 available rounds.	*Load status test*
14. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 60 fired rounds.	
15. Switch the Fire Control Unit to SAFE.	
16. Turn the safe / arm wheel of the Firing Unit to SAFE.	
17. Remove the 60 previously fired AVCPS and insert 60 AVCPS (MGSS) into the FU.	*Reloading*
18. Adjust the DC voltage to 31.5 V ± 0.5 V.	
19. Turn the safe / arm wheel of the Firing Unit to ARMED.	
20. Switch the Fire Control Unit to ARMED.	
21. Ensure that the FCU indicates 60 available rounds.	*Load status test*
22. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
23. Activate continuous trigger - see trigger generation procedure above.	*Continuous firing*
24. Ensure that the following sequence is performed with every activation: 1. The AVCPS ignites in the sequence #1 through #60. 2. The FCU indication displays decrements by one.	
25. Observe the firing sequences until the last AVCPS is activated.	
26. End continuous triggering - see trigger generation procedure above.	
27. Ensure that the FCU indicates 00 available rounds.	*Load status test*
28. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 60 fired rounds.	
29. Initiate an IBIT by pressing the TEST push-button and holding it down for approximately 500 ms.	*Starting IBIT*

30. Ensure that the IBIT is completed with a GO signal (green LED on) within a maximum time of 60 s, (no fault code numbers shall be displayed at the „FIRED ROUNDS“ display of the FCU).
31. Switch the Fire Control Unit to SAFE.
32. Turn the safe / arm wheel of the Firing Unit to SAFE.
33. Switch the DC supply off.

Test evaluation:
The MGSS shall operate normally at 16.5 V ± 0.5 V and 31.5 V ± 0.5 V.

2. 2. 6. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 7. Power On / Off

2. 2. 7. 1. Introduction

Purpose of the test:
The MGSS shall start with the first active loaded position when all power is lost or turned off from the system and is reapplied and the system is reset.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), Cable Assembly (Trigger)

Test Reference:
Specification paragraph 4.7.2.1.7 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 7. 2. Required Test Equipment

The test equipment necessary is listed in table 2-5.

Table 2-5. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	60	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 7. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3 s
Repetition	single (manually triggered)
Output	GND

1. Establish test setup according to fig. 2-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Insert 60 AVCPS (MGSS, inert with EED) into the FU.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 60 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	

9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The AVCPS at position #1 ignites. 2. The FCU indication displays 59.	
11. Switch DC power supply off.	*Power Reset*
12. After (60 ± 10) seconds switch the DC power supply on.	
13. Ensure that the FCU indicates 59 available rounds.	*Load status test*
14. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
15. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
16. Ensure that the following sequence is performed: 1. The AVCPS at position #2 ignites. 2. The FCU indication displays 58.	
17. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 01 fired rounds.	
18. Repeat steps 11 through 17 ensuring that AVCPS #3 ignites, FCU display is 57, and FCU displays 01 fired rounds when fired rounds are called up.	
19. Switch the Fire Control Unit to SAFE.	
20. Turn the safe / arm wheel of the Firing Unit to SAFE.	
21. Switch the DC supply off.	

Test evaluation:
The MGSS shall activate AVCPS (MGSS) starting with the first active loaded position when all power is lost and then restored.

2. 2. 7. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 8. Safety Interlock

2. 2. 8. 1. Introduction

Purpose of the test:
The MGSS shall not activate an AVCPS (MGSS) when either or both FCU and FU are in the SAFE mode. The MGSS shall also remain in SAFE mode after reloading when the FU is switched to ARMED. The threshold safe/armed position of the safe wheel shall be verified.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU)

Test Reference:
Specification paragraph 4.7.2.1.8 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 8. 2. Required Test Equipment

The test equipment necessary is listed in table 2-6.

Table 2-6. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	60	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix
8	Protractor	1	N/A	N/A	any available

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 8. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

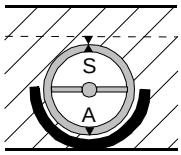
Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3 s
Repetition	single (manually triggered)
Output	GND

Test preparation

1. Establish test setup according to fig. 1-1.
   Verify pulse amplitude, duration and period with the oscilloscope.
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).
3. Insert 60 AVCPS (MGSS, inert with EED) into the FU.
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.
5. The FCU remains in SAFE position, the safe / arm wheel of the FU also remains in SAFE position (see figure below).



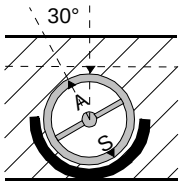
6. Activate a single trigger - see trigger generation procedure above.

   Single shot test, FCU = SAFE, FU = SAFE

7. Ensure that no firing takes place.
8. Switch the FCU to ARMED.
9. Activate a single trigger - see trigger generation procedure above.

   Single shot test, FCU = ARMED, FU = SAFE

10. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
11. Switch the FCU to SAFE.
12. Turn the safe / arm wheel of the FU to the right approaching to the ARMED position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.



13. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU = SAFE, FU = SAFE

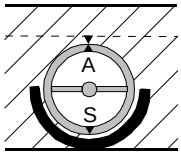
    (threshold position of safe wheel)

14. Ensure that no firing takes place.
15. Switch the FCU to ARMED.
16. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU = ARMED, FU = SAFE

    (threshold position of safe wheel)

17. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
18. Switch the FCU to SAFE.
19. Turn the safe / arm wheel of the FU to the right into ARMED position (see figure below)



20. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = SAFE, FU = ARMED

21. Ensure that no firing takes place.

22. Switch the FCU to ARMED.

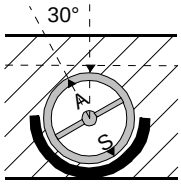
23. Ensure that the FCU performs the start-up procedure and indicates 60 available rounds after completeing it.

24. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU =ARMED

25. Ensure that the following sequence is performed:
    1. The AVCPS at position #1 ignites.
    2. The FCU indication displays 59.

26. Turn the safe / arm wheel of the FU to the left approaching to the SAFE position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.



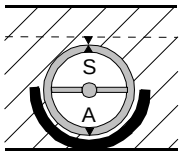
27. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU =SAFE

(threshold position of safe wheel)

28. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.

29. Turn the safe / arn wheel of the FU in full SAFE position (see figure below).



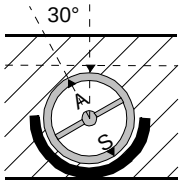
30. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU = SAFE

(threshold position of safe wheel)

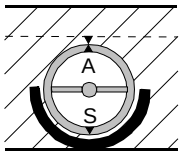
31. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
32. Open the FU, then close the FU.
33. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU = ARMED, FU = SAFE
34. Ensure that no firing takes place.
35. Turn the safe / arm wheel of the FU to the right approaching to the ARMED position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.



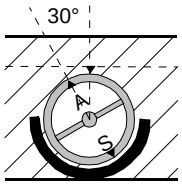
36. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU = ARMED, FU = SAFE
37. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
38. Turn the safe / arm wheel of the FU to the right into ARMED position (see figure below)



39. Activate a single trigger - see trigger generation procedure above.

    Single shot test, FCU =ARMED, FU = ARMED
40. Ensure that no firing takes place.
    An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.
41. Turn the safe / arm wheel of the FU to the left approaching to the SAFE position. Stop turning at an angle of 30° ± 2° left from the ARMED position (see figure below). Use protractor for angle measurement.

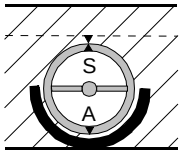


42. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU =SAFE

43. Ensure that no firing takes place.
An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.

44. Turn the safe / arn wheel of the FU in full SAFE position (see figure below).



45. Activate a single trigger - see trigger generation procedure above.

Single shot test, FCU = ARMED, FU = SAFE

46. Ensure that no firing takes place.
An error code „00“ shall flash on the FCU display and the NO GO indicator shall illuminate continuously.

47. Switch the Fire Control Unit to SAFE.

48. Switch the DC supply off.

Test evaluation:
The MGSS shall not activate an AVCPS (MGSS), when either the FCU or the FU or both are in safe mode. The threshold safe/armed position of the safe wheel shall be verified.

2. 2. 8. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 9. Replacement of Pyrotechnic

2. 2. 9. 1. Introduction

Purpose of the test:
The operator of the MGSS shall be able to load / unload the pyrotechnic without the use of tools.

Equipment to be tested:
Firing Unit, AVCPS (MGSS)

Test Reference:
Specification paragraph 4.7.2.1.10.1 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 9. 2. Required Test Equipment

The test equipment necessary is listed in table 2-7.

Table 2-7. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	AVCPS (MGSS) (inert)	60	N/A	149043-2	Diehl

2. 2. 9. 3. Step-By-Step procedure:

1. Load the FU with 60 pyrotechnic simulators (AVCPS (MGSS)).
2. Close the FU.
3. Open the FU.
4. Unload the AVCPS (MGSS).

Test preparation

Test evaluation:
No tools must be used for loading and unloading.

2. 2. 9. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 10. Pyrotechnic Interchangability

2. 2. 10. 1. Introduction

Purpose of the test:
The MGSS shall not be able use or activate DIFCUE pyrotechnic.

Equipment to be tested:
MGSS Firing Unit, AVCPS (DIFCUE)

Test Reference:
Specification paragraph 4.7.2.1.10.2 [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 10. 2. Required Test Equipment

The test equipment necessary is listed in table 2-8.

Table 2-8. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	AVCPS (DIFCUE, inert)	1	N/A	149043-1	Diehl

2. 2. 10. 3. Step-By-Step procedure:

1. Try to load the MGSS FU with 1 pyrotechnic simulator AVCPS (DIFCUE).
2. Try to close the FU.
3. Open the FU.
4. Unload the AVCPS (DIFCUE).
5. Repeat steps 1 through 4 four more times in random positions.
   Use a different AVCPS for each test if the used one becomes deformed.

Test preparation

Test evaluation:
The MGSS FU must not close with the DIFCUE pyrotechnics loaded.

2. 2. 10. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 11. SAWE Interface Bench Test

2. 2. 11. 1. Introduction

Purpose of the test:
The MGSS shall interface electrically with the MILES 2000 TES, SAWE/MILES II and the vehicles.

The MGSS shall be activated only by a valid trigger signal. A valid trigger signal for MILES 2000 and SAWE is defined as a pulse with a voltage level between 4.5 V and 31 V and a pulse duration of ≥ 80 ms. No subsequent trigger shall be accepted until the ongoing firing sequence is completed.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU), SAWE Trigger Cable

Test Reference:
Specification paragraph 3.2.2 [1]
(This is only a portion of the SAWE interface verification, the other is a field demonstration to verify vehicle interface.)

Test Conditions:
All tests at standard room ambient.

2. 2. 11. 2. Required Test Equipment

The test equipment necessary is listed in table 2-9.

Table 2-9. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (SAWE Trigger)	1	N/A	148212-1	CDS
4	AVCPS (MGSS) (inert, with EED)	60	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 11. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	28.00 V ± 1.50 V
Pulse offset	0.00 V
Pulse duration	150 ms
Pulse interval	3 s
Repetition	continuous
Output	GND

1. Establish test setup according to fig. 2-1 (use SAWE trigger cable instead of MILES2000 trigger cable). Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Insert 60 AVCPS (MGSS, inert with EED) into the FU.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 60 available rounds.	*Load status test*

8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	
9. Activate continuous trigger - see trigger generation procedure above.	
10. Observe the Fire Indicator at the test equipment. Ensure that the following sequence is performed with every activation: 1. The AVCPS ignites in the sequence #1 trough #60. 2. The FCU indication decrements by one round.	*Autonomous firing*
11. Observe the test until all 60 rounds are fired.	
12. End continuous triggering - see trigger generation procedure above.	
13. Ensure that the FCU indicates 00 available rounds.	*Load status test*
14. Press the push-button „FIRED ROUNDS“ at the FCU. The FCU display shall be activated for approximately 5 seconds (or as long as button is pressed). Read the indication of the FCU display. Ensure that the FCU indicates 60 fired rounds.	
15. Switch the Fire Control Unit to SAFE.	
16. Turn the safe / arm wheel of the Firing Unit to SAFE.	
17. Switch the DC supply off.	

Test evaluation:
Every ignition sequence shall be performed, using the SAWE trigger cable.

2. 2. 11. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 12. Weight and Size

2. 2. 12. 1. Introduction

Purpose of the test:
The MGSS FU shall be one-man (male) lift / portable.
The MGSS FU shall not exceed 0.05 m^3 in volume.
The MGSS Kit in transit case shall be four-man (male) lift.
The MGSS Kit in transit case shall not exceed 0.75 m^3 in volume.

Equipment to be tested:
MGSS Firing Unit.
MGSS Kit in transit case (CDS Kit P/N 148201-2) excluding manual.

Test Reference:
Specification paragraph 4.7.2.3.1, 4.7.2.3.2. [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 12. 2. Required Test Equipment

The test equipment necessary is listed in table 2-10.

Table 2-10. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	Balance	1	NW100	N/A	Toledo
2	Measure	1	500-UJ-M	N/A	Mitutoyo

2. 2. 12. 3. Step-By-Step procedure:

Measure the weight of the MGSS Firing Device (not loaded).
Measure the extension of the FU in all three axes and calculate the volume.
Measure the weight of the MGSS Kit (M1A1) in transit case.
Measure the dimensions of the transit case in all three axes and calculate the volume.

Test evaluation:
The weight of the Firing Device shall not exceed 25.4 kg.
The MGSS FU shall not exceed 0.05 m^3 in volume.
The weight of the MGSS Kit (M1A1) shall not exceed 90 kg.
The MGSS Kit in transit case shall not exceed 0.75 m^3 in volume.

2. 2. 12. 4. Data Sheets

Use Data sheets as per Appendix 3.

2. 2. 13. Trigger Test

2. 2. 13. 1. Introduction

Purpose of the test:
The MGSS shall be activated only by a valid trigger signal. A valid trigger signal is defined as a pulse of voltage level between 4.5 V and 31 V and a pulse duration of ≥ 80 ms. No subsequent trigger shall be accepted until the ongoing firing sequence is completed.

Equipment to be tested:
Firing Unit, Fire Control Unit, Cable Assembly (power supply), Cable Assembly (FU-FCU)

Test Reference:
Software Requirements Data paragraph 3.3.1.3 [5] Firing Control.
Performance specification paragraph 3.2.2.1 and 4.7.2.2.1. [1]

Test Conditions:
All tests at standard room ambient.

2. 2. 13. 2. Required Test Equipment

The test equipment necessary is listed in table 2-11.

Table 2-11. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Function Generator	1	1202.7072.30	N/A	Rohde & Schwarz
3	Adapter Cable Assy (Trigger)	1	N/A	149007-1 (EP4-104-98)	Diehl
4	AVCPS (MGSS) (inert, with EED)	60	N/A	149042-2	Diehl
5	Function Generator (alternative for #2)	1	164	N/A	Wavetech
6	Adapter Cable Assy (Power)	1	N/A	149031-1	Diehl
7	Oscilloscope, Digital Storage	1	2201	N/A	Tektronix

Trigger generation procedure:

- for function generator, 1202.7072.30, Rohde & Schwarz:
  For continuous trigger, program the function generator for continuous and then to initiate switch the output of the function generator to „50 Ohm“ to activate the function generator.
  For single trigger, program the function generator for single and then to initiate press the push-button „50 Ohm“ to activate.
- for function generator, 164, Wavetech:
  To initiate a manual, single trigger, place the output control switch in the „Manual“ position and press the „TRIG“ toggle switch.
  To initiate a continuous trigger, switch the output control switch to the „CONT“ position (trigger pulses begin immediately). To end continuous triggering, switch the output control switch from „CONT“ to „Manual“.

2. 2. 13. 3. Step-By-Step procedure:

Initial conditions:

DC supply:

ON / OFF	OFF

Test unit:

Firing Unit	SAFE
Fire Control Unit	SAFE

Function generator:

Pulse amplitude	5.00 V
Pulse offset	0.00 V
Pulse duration	80 ms
Pulse interval	3 s
Repetition	single (manually triggered)
Output	GND

1. Establish test setup according to fig. 2-1. Verify pulse amplitude, duration and period with the oscilloscope.	*Test preparation*
2. Establish all cable connections between the Firing Unit and the function generator and between the Fire Control Unit and the DC supply (fig. 2-1).	
3. Insert 60 AVCPS (MGSS, inert with EED) into the FU.	
4. Adjust the DC voltage to 28.0 V ± 1.0 V and switch the DC supply on.	
5. Turn the safe / arm wheel of the Firing Unit to ARMED.	
6. Switch the Fire Control Unit to ARMED.	
7. Ensure that the FCU indicates 60 available rounds.	*Load status test*
8. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 00 fired rounds.	

9. Activate a single trigger - see trigger generation procedure above.	*Single shot firing*
10. Ensure that the following sequence is performed: 1. The AVCPS at position #1 ignites. 2. The FCU indication displays 59.	
11. Switch the Fire Control Unit to SAFE.	
12. Turn the safe / arm wheel of the Firing Unit to SAFE.	
13. Adjust the function generator output amplitude to 3.5 V and the pulse duration to 150 ms. Verify pulse amplitude, duration and period with the oscilloscope.	
14. Turn the safe / arm wheel of the Firing Unit to ARMED.	
15. Switch the Fire Control Unit to ARMED.	
16. Activate a single trigger - see trigger generation procedure above.	*Trigger voltage too low*
17. Ensure that no firing takes place.	
18. Switch the Fire Control Unit to SAFE.	
19. Turn the safe / arm wheel of the Firing Unit to SAFE.	
20. Adjust the function generator output amplitude to 5.0 V. Adjust the pulse duration to 70 ms. Verify pulse amplitude, duration and period with the oscilloscope.	
21. Turn the safe / arm wheel of the Firing Unit to ARMED.	
22. Switch the Fire Control Unit to ARMED.	
23. Activate a single trigger - see trigger generation procedure above.	*Trigger too short*
24. Ensure that no firing takes place.	
25. Switch the Fire Control Unit to SAFE.	
26. Turn the safe / arm wheel of the Firing Unit to SAFE.	
27. Adjust the function generator output amplitude to 30.0 V. Verify pulse amplitude, duration and period with the oscilloscope.	
28. Turn the safe / arm wheel of the Firing Unit to ARMED.	
29. Switch the Fire Control Unit to ARMED.	
30. Activate a single trigger - see trigger generation procedure above.	*Trigger too short*
31. Ensure that no firing takes place.	
32. Switch the Fire Control Unit to SAFE.	
33. Turn the safe / arm wheel of the Firing Unit to SAFE.	

34. Adjust the function generator output amplitude to 5.0 V. Adjust the pulse duration to 150 ms. Verify pulse amplitude, duration and period with the oscilloscope.	
35. Turn the safe / arm wheel of the Firing Unit to ARMED.	
36. Switch the Fire Control Unit to ARMED.	
37. Initiate an IBIT (by pressing the push-button TEST for more than 500 ms).	
38. While the IBIT is running, initiate a trigger pulse.	*Trigger during IBIT*
39. Ensure that the following sequence is performed: 1. The AVCPS at position #2 ignites. 2. The FCU indication displays 58.	
40. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 02 fired rounds.	
41. Adjust the function generator to produce a series of two subsequent pulses, each 150 ms, 5.0 V, following with a delay time of 1.5 s. Verify pulse amplitude, duration and period with the oscilloscope.	
42. Initiate the trigger pulse series.	*Multiple trigger pulses*
43. Ensure that only one ignition occurs at position 3.	
44. Press the push-button „FIRED ROUNDS“ at the FCU and release it after reading the indication on the display. Ensure that the FCU indicates 03 fired rounds.	
45. Switch the Fire Control Unit to SAFE.	
46. Turn the safe / arm wheel of the Firing Unit to SAFE.	
47. Switch the DC supply off.	

Test evaluation:
The MGSS shall activate AVCPS (MGSS) only with a valid trigger signal.

2. 2. 13. 4. Data Sheets

Use Data sheets as per Appendix 3.

3. APPENDIX

Data Sheets

Qualification Test Report

DWG No.: 148731-2, 149762-1, 148765-1, 148768-1	AMENDT:	

To be used in conjunction with Functional Test Procedure Doc. 9718803, Issue 1.1, Index -.

Functional Test Procedure — DIFCUE

Test Procedure Paragraph	Test Description	Test Result	Remarks

Date of the test:

Performed:

Witnessed:

Qualification Test Report

DWG No.: 149101-2, 148762-2, 148765-1, 149104-1	AMENDT:	

To be used in conjunction with Functional Test Procedure Doc. 9718803, Issue 1.1, Index -.

Functional Test Procedure — MGSS

Test Procedure Paragraph	Test Description	Test Result	Remarks

Date of the test:

Performed:

Witnessed: