

ARMY RESEARCH LABORATORY



High-Voltage Split System

by Benjamin J. Showalter

ARL-TN-290

August 2007

NOTICES

Disclaimers

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

Destroy this report when it is no longer needed. Do not return it to the originator.

Army Research Laboratory

Aberdeen Proving Ground, MD 21005-5069

ARL-TN-290

August 2007

High-Voltage Split System

Benjamin J. Showalter
Weapons and Materials Research Directorate, ARL

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188		
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) August 2007		2. REPORT TYPE Final		3. DATES COVERED (From - To) January 2007	
4. TITLE AND SUBTITLE High-Voltage Split System			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Benjamin J. Showalter			5d. PROJECT NUMBER AH80		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Research Laboratory ATTN: AMSRD-ARL-WM-TB Aberdeen Proving Ground, MD 21005-5069			8. PERFORMING ORGANIZATION REPORT NUMBER ARL-TN-290		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT This technical note was written to help better inform any certified operator to the capabilities of this split system unit, explain and give a better understanding to the safety expectations, and provide a guideline and operating procedure.					
15. SUBJECT TERMS split system, firing unit, firing module					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (Include area code)
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL	12	Benjamin J. Showalter 410-278-6036

Contents

List of Figures	iv
1. Introduction	1
2. Procedures	1
3. Misfire	3
Distribution List	5

List of Figures

Figure 1. FS-43 control unit.....	1
Figure 2. FS-43 firing module with “short to discharge” key or plug inserted.	2
Figure 3. RISI light box (TA-10B).	2
Figure 4. Schematic for high-voltage split system ARL transfer box.	4

1. Introduction

In accordance with Reynolds Industries Systems Incorporated (RISI), the purpose of the FS-43 control unit (figure 1) is to provide low-voltage electrical energy to the firing module and to ensure a safe and reliable operation sequence for the firing of exploding bridge wire (EBW) detonators.



Figure 1. FS-43 control unit.

The purpose of the FS-43 firing module, shown in figure 2, is to provide a significant amount of flexibility to this EBW detonator firing system. Since the firing pulse to function the EBW detonator must be applied at the proper rate of rise, or frequency, the firing module must be placed relatively close to the detonator. By being able to separate the firing module from the control unit, the operator can perform the detonation at extended distances as required by the size and characteristics of the main explosive charge.¹

2. Procedures

The following procedures have been approved as a change to U.S. Army Research Laboratory (ARL) standard operating procedure (SOP) 385-008² and should only be used by certified personnel. SOPs must be followed at all times during experimental operations.

¹<http://www.teledynersi.com> (accessed January 2007).

²ARL SOP 385-008. *Static Detonation of High Explosives at Outdoor Facilities*; U.S. Army Research Laboratory Safety Office: Aberdeen Proving Ground, MD, December 2000.



Figure 2. FS-43 firing module with “short to discharge” key or plug inserted.

When using the high-voltage split system, the test director and explosives operator will incorporate the following steps.

Prior to capping the charge, conduct a post-RISI light box (TA-10B shown in figure 3) test of firing line.



Figure 3. RISI light box (TA-10B).

1. Disconnect the low-voltage cable from the FS-43 control unit and plug it into a shorted connector and secure in the bombproof lock box.
2. Place the FS-43 firing module in the transfer box with the low-voltage cable attached. Connect the output connectors of the FS-43 firing module to the double-pole double-throw switch B (DPDTB).
3. Securely insert the “short to discharge” plug into the FS-43 firing module.
4. Verify the transfer box firing line leads are permanently attached to the DPDTB and are secured in the output connectors of the FS-43 firing module. Check to make sure the DPDTB, the double-pole double-throw switch A (DPDTA), and the single-pole single-throw switch (SPST) are in the safe (down/shorted) position. Also check that the “short to discharge” plug is secured in the FS-43 firing module. Lock the transfer box and proceed with capping the charge in accordance with ARL SOP 385-008.

After the charge has been capped:

1. Return to the transfer box; move the DPDTB switch to the fire (up) position.
2. Remove the “short to discharge” plug from the FS-43 firing module.
3. Move the DPDTA to the fire (up) position, move the SPST to the fire position (up), and secure the transfer box.
4. Return to the bombproof lock box and remove the low-voltage cable, connect it to the FS-43 control unit, and proceed with normal firing sequence as outlined in ARL SOP 385-008.

3. Misfire

CAUTION: Follow these procedures after the second attempt to fire the charge has failed in accordance with ARL SOP 385-008.

1. Disconnect the low-voltage cable from the FS-43 control unit and plug it into a shorted connector and secure it in the bombproof lock box.
2. After the 30-min waiting period outlined in ARL SOP 385-008, return to the transfer box. Move the SPST to the safe (down) position.
3. Move the DPDTA to the safe (down) position.
4. Insert the “short to discharge” plug into the FS-43 firing module.

5. Move the DPDTB to the safe (down) position.
6. Secure the transfer box. Resume operations in accordance with ARL SOP 385-008.

The previous steps work in accordance with the schematic shown in figure 4.

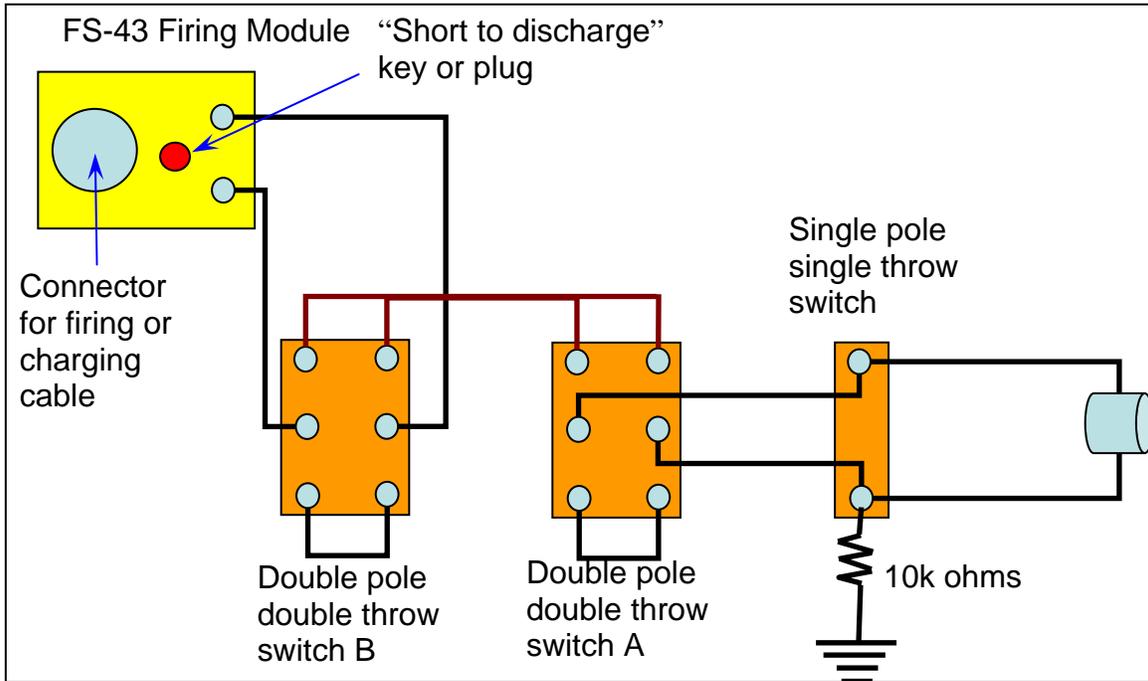


Figure 4. Schematic for high-voltage split system ARL transfer box.

NO. OF
COPIES ORGANIZATION

1 DEFENSE TECHNICAL
(PDF INFORMATION CTR
ONLY) DTIC OCA
8725 JOHN J KINGMAN RD
STE 0944
FORT BELVOIR VA 22060-6218

1 US ARMY RSRCH DEV &
ENGRG CMD
SYSTEMS OF SYSTEMS
INTEGRATION
AMSRD SS T
6000 6TH ST STE 100
FORT BELVOIR VA 22060-5608

1 DIRECTOR
US ARMY RESEARCH LAB
IMNE ALC IMS
2800 POWDER MILL RD
ADELPHI MD 20783-1197

3 DIRECTOR
US ARMY RESEARCH LAB
AMSRD ARL CI OK TL
2800 POWDER MILL RD
ADELPHI MD 20783-1197

ABERDEEN PROVING GROUND

1 DIR USARL
AMSRD ARL CI OK TP (BLDG 4600)

NO. OF
COPIES ORGANIZATION

ABERDEEN PROVING GROUND

10 DIR USARL
AMSRD ARL WM TB
B SHOWALTER