PAGE 15

4.7.4.8: Delete "...Immediately when this happens the target should lower through activation of the motor relay and down valve relay. Restore a good crystal condition..." and substitute the following:

"...Immediately when this happens, the target should lower through activation of the motor relay and down valve relay, and a signal will be generated and sent to the smoke scorer relay. Restore a good crystal condition..."

* 4.7.4.11.3: Delete "40 ms +/- 5 ms and substitute "44 ms +/- 5 ms"

PAGE 16

4.7.4.13: At end of paragraph add the following:

"The 9 to 13 second time period is measured from the time the target is first hit until it begins to raise again."

PAGE 17

Table IV: 4 th line down delete	"500HZ	4	205 to 255MV"
and substitute the following	"500 HZ	4	205 to 280 MV"

The margins of this amendments are marked with an asterisk to indicate where changes (additions, modifications, correction, deletion) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

Custodian
Army-AR

Preparing activity
ArmyAR

(Project 6920-0182)

INCH-POUND

MIL-E-70694A (AR)
26 September 1991
SUPERSEDING
MIL-E-70694 (AR)
30 December 1988

MILITARY SPECIFICATION

ELECTRONIC CONTROL UNIT: 11784504

This specification is approved for use by the U.S. Army Armament, Munitions and Chemical Command, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements and tests for the Electronic Control Unit (ECU) part of the Improved Lifting Target Elevating Mechanism (ILTEM) and the Target Holding Mechanism/Tank Gunnery (THM/TG) for the Remote Target System (RETS) (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

MILITARY

MIL-F-13926 - Fire Control Materiel, Manufacture and Inspection, General Specification for
MIL-I-45607 - Inspection Equipment, Acquisition, Maintenance and Disposition of

AMSC N/A FSC 6920

STANDARDS

MILITARY

MIL-STD-109 - Quality Assurance Terms and Definitions
MIL-STD-810 - Environmental Test Methods and Engineering Guidelines
MIL-STD-2000 - Standard Requirements for Soldering Electrical and Electronic Assemblies

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS (see 6.4)

US ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC)

11784504 - Electronic Control Unit
11784505 - Schematic Diagram, Electronic Control Unit
11784632 - Panel, Electronic

SPECIAL PACKAGING INSTRUCTION

PS 11784504 - Packaging of Electronic Control Unit

(Copies of drawings, publications and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Fabrication. The electronic control unit shall be manufactured in accordance with drawing 11784504 and drawings pertaining thereto.

3.2 General specifications. Where applicable, the ECU shall meet the requirements of MIL-F-13926 as follows:

a. Dimensions and tolerances
b. Inorganic protective surface finishings
c. Workmanship
d. Part identification and marking

3.3 Environmental requirements.

3.3.1 Vibration.

3.3.1.1 Non-operating. The ECU shall meet the requirements of 3.5.1.1 through 3.5.2.7 after having been subjected to MIL-STD-810, Method 514, Procedure I-3.3.1 using Figure 514.4-1 for one hour of random vibration along the vertical axis.

3.3.2 Temperature.

3.3.2.1 Non-operating (storage). The ECU shall not suffer permanent damage when subjected to at least four hours at each temperature extreme of -40 degrees F and +160 degrees F and shall meet the requirements of 3.5.1.1 through 3.5.2.7 when returned to and thermally stabilized at ambient temperature (+60 degrees F to +90 degrees F).

3.3.2.2 Operating. The ECU shall meet the requirements of 3.5.1.1 through 3.5.2.7 when thermally stabilized at -25 degrees F and 125 degrees F.

3.3.3 Pressure and water tight test. The ECU shall not show any signs of bubbles from any surface part when submerged in a tank of water and dry nitrogen pressurized to 1.5 to 2 PSI for 5 minutes. It shall meet the requirements of 3.5.1.1 through 3.5.2.7.

3.4 Construction.

3.4.1 General description. The Electronic Control Unit (ECU) responds to target commands, operating relays that raise or lower an armored vehicle target and fire the gunfire simulator (GUFS). The ECU is a sealed operating unit containing circuit cards and is operated through connectors and switches on the front panel.

3.4.1.1 Front panel. The front panel contains seven connectors with rubber waterproof covers, two rotary switches, one toggle switch and a battery light indicator.

3.4.1.1.1 Connectors. Four connectors are used to input target hit information from four hit sensors attached to the targets. The remaining three connectors are used for the visual hit indicator lamp, the smoke scorer unit, the gunfire simulator.

3.4.1.1.2 Rotary switches. The rotary switch marked "Function" has seven positions with the first position turning the ECU on and positions two through seven providing selectable modes varying target raising and lowering functions. The second rotary switch provides four positions to vary hit sensor sensitivity, depending on ammunition type used.

3.4.1.1.3 Toggle switch. The toggle switch provides a test capability of target raising and lowering and the visual hit indicator lamp operating functions.

3.4.1.1.4 Battery lamp indicator. The battery lamp indicator provides the battery voltage condition during target raising or lowering operations.

3.4.1.2 Electronic components. The inner electronics consists of three printed circuit cards and six relays.

3.4.1.2.1 Circuit cards. The three circuit cards consists of a logic control card, a hit amplification card, and a battery test card.

3.4.1.2.2 Relays. The six relays controls the hydraulic lifting unit, visual hit indicator lamp, smoke scorer, and the gunfire simulator.

3.4.2 Construction. The ECU shall conform to the requirements drawings and notes contained in technical data package 11784504.

3.5 Performance requirements.

3.5.1 Test switch.

3.5.1.1 Raise target. The test switch is placed in the raise position and a signal is generated to raise the target and to turn on the visual hit indicator lamp. The target will remain in a raised position until a lower target signal is received. The visual hit indicator lamp will remain lit for as long as test switch is held in position. The up-valve relay will disengage 2 $\pm$ 1 seconds after the motor relay disengages.

3.5.1.2 Lower target. The test switch is placed in the lower position and a signal is generated to lower the target. The down-valve relay shall disengage 2 $\pm$ 1 seconds after motor relay disengages.

3.5.2 Function switches.

3.5.2.1 Position zero. Position zero will perform as an off switch and shall remove all electrical power from the ECU.

3.5.2.2 Position one. The target will be raised and lowered by remote signal and hit signals from the hit sensor will have no effect on the target position. The smoke scorer relay will activate for 2 ± 1 seconds after a hit.

3.5.2.3 Position two. The target will be raised and lowered by remote signal and hit signals from the hit sensor will lower the target until another signal to raise the target is received. The smoke scorer relay will activate for 2 ± 1 seconds after a hit.

3.5.2.4 Position three. The target will be raised and lowered by remote signal and hit signals from the hit sensor shall lower the target. The ECU will generate another signal 11 ± 2 seconds after receipt of the hit signal to raise the target. The smoke scorer relay will activate for 2 ± 1 seconds after a hit.

3.5.2.5 Position four. The target will be raised and lowered by remote signal and the visual hit indicator and smoke scorer relays will operate for 2 ± 1 seconds after a hit. Hit signals from the hit sensor will have no effect on target position.

3.5.2.6 Position five. The target will be raised and lowered by remote signal. Hit signals from the hit sensor will operate the visual hit indicator lamp and smoke scorer relays for 2 ± 1 seconds and lower the target until another signal to raise the target is received.

3.5.2.7 Position six. The target will be raised and lowered by remote signal. Hit signals from the hit sensor will operate the visual hit indicator lamp and smoke scorer relays for 2 ± 1 seconds. The ECU will generate another signal 11 ± 2 seconds after receipt of a hit signal to raise the target.

3.5.3 Lifting mechanism failure. Failure of the target to complete raising or lowering operation will result in the ECU generating a signal to shut off the lifting mechanism motor 11 ± 2 seconds after raising/lowering motion was initiated.

3.5.4 Battery check indicator. The voltage indicator light (LED) will indicate sufficient power is available during raising and lowering of the target to operate the lifting mechanism. The light will remain constant when voltage exceeds 10.5 volts and will flash when voltage is equal to 10.5 -0.1 volts.

3.5.5 Target sensitivity limit switch. The target sensitivity limit switch will operate independently of the function switch or sensitivity switch setting and will enable the ECU to process hit signals when the target is in a raised position. Should the switch be shorted to ground the ECU shall not respond to hit signals.

3.5.6 Hit signal. An acceptable hit signal based upon the sensitivity switch setting from any one or combination of hit sensors will lower the target depending upon the function switch setting. The ECU shall meet the requirements in Table IV.

3.5.7 Remote control operation. The ECU shall be capable of receiving a 12 volt ± 1.4 volt remote pulse (duration equal to or greater than 40 ± 5 ms) command to raise or lower the target, and energize the hostile fire simulator. This shall be accomplished at both ends of the voltage range (10.6 volts, 13.4 volts) without damaging the ECU.

3.5.8 Bad hit sensors. The ECU shall be capable of detecting a shorted or open sensor condition by lowering the target. The ECU shall not respond to any hit signals, or remote target commands, or test switch actions to raise the target.

3.5.9 40 ms output. When a hit is processed a 40 ms ± 5 ms pulse shall be applied to pin ST1-G.

3.6 First article. When specified in the contract or purchase order, sample shall be subjected to first article inspection in accordance with the technical provisions herein (see 4.3).

3.7 Soldering. All soldering shall be in accordance with the general requirements of MIL-STD-2000 in addition detail requirement (Task) F and paragraph 1.2 of MIL-STD-2000.

3.8 Workmanship. The workmanship requirements of MIL-F-13926 shall apply except for soldering.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 General provisions. The component and subassembly inspection requirements of MIL-F-13926 form a part of the quality assurance provisions of this specification. Reference shall be made to MIL-STD-109 to define quality assurance terms used herein.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).
b. Quality conformance inspection (see 4.4).
c. Special sampling inspection (see 4.5).

4.2.1 Inspection conditions. Unless otherwise specified, all examinations and tests shall be conducted at the following standard ambient conditions:

a.	Temperature	+60°F to +90°F
b.	Relative humidity	90% RH max.
c.	Pressure	28 to 32 inches of Hg (700 to 815 mmHg)

4.3 First article inspection.

4.3.1 Sample. The contractor shall submit a first article sample as designated by the contracting officer for evaluation in accordance with provisions of 4.3.2. The first article sample shall consist of the assemblies, components and test specimens listed below in the quantities indicated.

Name	Drawing	Quantity
Electronic Control Units	11784504	3

4.3.2 Inspections to be performed. As determined by the Government, the first article assemblies, components and test specimens may be subjected to any or all of the examinations and tests specified in Table I, Table II and Table III of this detail specification and be inspected for compliance with any or all requirements of the applicable drawings.

4.3.3 Rejection. If any assembly, component or test specimen fails to comply with any of the applicable requirements, the first article sample shall be rejected. The Government reserves the right to terminate its inspection upon any failure of any assembly, component or test specimen to comply with any of the requirements.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. The term "inspection lot" is defined as a homogenous collection of units of product from which a representative sample is drawn or which is inspected 100 percent to

determine conformance with applicable requirements. Units of product selected for inspection shall represent only the inspection lot from which they are drawn and shall not be construed to represent any prior or subsequent quantities presented for inspection. Homogeneity shall be considered to exist provided the inspection lot has been produced by one manufacturer, in one unchanged process, using the same materials and methods, in accordance with the same drawings, same drawing revisions, same specifications and same specification revisions. All material submitted for inspection in accordance with this specification shall comply with the homogeneity criteria specified herein, regardless of the type of inspection procedure which is being applied to determine conformance with requirements.

4.4.2 Examinations and tests.

4.4.2.1 Components, assemblies and subassemblies.

a. The contractor's quality program or detailed inspection plan shall provide assurance of compliance of all characteristics with the applicable drawings and specifications utilizing as a minimum the conformance criteria specified in this document and the Quality Assurance Provisions (QAP) listed in the Technical Data Package (TDP). In the absence of QAP's, the applicable quality assurance provisions of MIL-F-13926 shall apply.

b. Alternative inspection procedures, methods or equipment, such as statistical process control, tool control, other types of sampling procedures, etc., may be used by the contractor when they provide, as a minimum, the level of quality assurance required by the provisions specified herein. Prior to applying such alternative procedures, methods, or equipment, the contractor shall describe them in a written proposal submitted to the procuring contracting officer for evaluation and approval by the Government. When required, the contractor shall demonstrate that the effectiveness of the proposed alternative(s) is equal to or better than the specified quality assurance provisions herein. In cases of dispute as to whether the contractor's proposed alternative(s) provide equal assurance, the provisions of this specification shall apply. All approved alternative inspection provisions shall be specifically incorporated into the contractor's quality program plan or detailed inspection system, as applicable.

4.4.2.2 Final acceptance inspection. Subsequent to first article approval, examinations and tests related to Section 3 herein shall be performed on a single defect (individual characteristic) basis in accordance with the sampling plans specified in 4.4.2.3 herein. Examination and test for packaging and marking shall be in accordance with Section 5 herein. The tabulated classification of defects in 4.4.2.3 shall constitute the minimum inspection to be performed by the contractor after first article approval and prior to Government acceptance or rejection by item or lot.

4.4.2.3 Functional tests. The tests in Table I shall be performed on a 100% basis.

TABLE I. Functional tests (100 percent inspection).

CHARACTERISTIC	REQUIREMENT	TEST PROCEDURE
Critical:	None	N/A
Major:		
101. Test switch - raise target	3.5.1.1	4.7.4.1.2
102. Test switch - lower target	3.5.1.2	4.7.4.2
103. Function switch position 1	3.5.2.2	4.7.4.11
104. Function switch position 2	3.5.2.3	4.7.4.12
105. Function switch position 3	3.5.2.4	4.7.4.13
106. Function switch position 4	3.5.2.5	4.7.4.14
107. Function switch position 5	3.5.2.6	4.7.4.14
108. Function switch position 6	3.5.2.7	4.7.4.14
Minor:	None	N/A

4.5 Special sampling. One ECU out of the first 50 produced and one out of each 100 produced thereafter shall be selected at random. The sample shall have met the requirements and tests of Table II and shall then meet the tests in Table III. Unless otherwise specified in the contract, the items shall be returned to the lot upon successful completion of testing.

TABLE II. Control sampling test

CHARACTERISTIC		REQUIREMENT	TEST PROCEDURES
Critical:		None	N/A
Major:			
301.	Fabrication	3.1	Applicable drawings/ Visual
302.	General specifications	3.2	MIL-F-13926/Visual
303.	Lifting mechanism failure	3.5.3	4.7.4.3
304.	Battery check indicator	3.5.4	4.7.4.4
305.	Remote control operation	3.5.7	4.7.4.5 through 4.7.4.7
306.	Bad hit sensors	3.5.8	4.7.4.8 through 4.7.4.10
307.	40 ms output pulse	3.5.9	4.7.4.11.3
308.	Bad target sensitivity limit switch	3.5.5	4.7.4.12.1
309.	Amplifier sensitivity	3.5.6	4.7.4.15
Minor:		None	N/A

TABLE III. Special sampling, environmental

CHARACTERISTIC		REQUIREMENT	TEST PROCEDURES
Critical:		None	N/A
Major:			
310.	Vibration (nonoperating)	3.3.1.1	4.7.2.1
311.	Low temperature (operating)	3.3.2.2	4.7.3.1
312.	High temperature (operating)	3.3.2.2	4.7.3.2
313.	Pressure & water tight test	3.3.3	4.7.3.3
Minor:		None	N/A

4.5.1 Failure of sample. Should any one item of a special sampling fail to meet any of the specified test requirements, acceptance of the product shall be suspended by the Government until necessary corrections to all production since the last test as well as to current production has been accomplished in accordance with the provisions of the contract.

4.6 Inspection equipment.

4.6.1 Government-furnished inspection equipment. Where the contract provides for Government-furnished test equipment, supply and maintenance of test equipment shall be in accordance with the applicable requirements of MIL-I-45607.

4.6.2 Contractor-furnished inspection equipment.

4.6.2.1 Government design. Unless otherwise specified in the contract, all inspection equipment identified by drawing number in specifications or QAPs forming a part of the contract shall be supplied by the contractor in accordance with the design specified. The contractor may, however, propose alternatives to Government designs for approval in accordance with 6.3.

4.6.2.2 Contractor design. The contractor shall design and supply inspection equipment compatible with the "Methods of Inspection" specified in 4.7 of this specification and with the component inspection procedures specified in "Examination" and "Test Facilities" requirements of MIL-F-13926 whenever Government designs are not specified (see 4.6.2.1). Since tolerance of test equipment is normally considered to be within 10 percent of the product tolerance for which it is intended, this inherent error in the test equipment design must be considered as part of the prescribed product tolerance limit. Thus, concept, construction, materials, dimensions, and tolerances used in the design of test equipment shall be so selected and controlled as to ensure that the test equipment will reliably indicate acceptability of a product which does not exceed 90 percent of the prescribed tolerance limit and permit positive rejection when nonconforming. Construction shall be such as to facilitate routine calibration of test equipment. Contractor inspection equipment designs shall be submitted for approval in accordance with 6.3.

4.7 Methods of inspection.

4.7.1 Environmental. Environmental tests shall be conducted in accordance with the general requirements and test methods of MIL-STD-810 except as specified herein. Testing equipment used in environmental tests shall be in accordance with Test Facilities and Apparatus requirements of MIL-STD-810. To facilitate ease in testing the ECU, a simple test fixture should be built to simulate relay responses using Light Emitting Diodes (LEDs), lights, etc. and that bad sensors (open or shorted) and target reed limit switches be simulated using toggle switches. Remote control command signals could be simulated using push button switches wired to produce the appropriate responses.

4.7.2 Non-operating.

4.7.2.1 Vibration.

4.7.2.1.1 Vibration, common carrier. This test shall be performed as specified in MIL-STD-810, Method 514, Procedure I-3.2.12 using Figure 514-34 for one hour along the vertical axis. After vibration, the assembly shall be tested as specified in 4.7.4 to determine compliance with 3.3.1.1; if it does not, it shall be rejected.

4.7.2.1.2 Vibration, tactical vehicle. This test shall be performed as specified in MIL-STD-810, Method 514, Procedure I-3.2.1, using Figure 514.3-7 for seven minutes along the vertical axis. After vibration, the assembly shall be operationally checked as specified in 4.7.4 to determine compliance with 3.3.1.1; if it does not, it shall be rejected.

4.7.2.2 Temperature (High). This test shall be as specified in MIL-STD-810, Method 501, Procedure I. The assembly shall be stabilized at +160°F for a minimum of 4 hours. After temperature exposure, the assembly shall be stabilized at ambient (+60°F to +90°F), and subjected to the test of 4.7.4 to determine compliance with 3.3.2.1; if it does not, it shall be rejected.

4.7.2.3 Temperature (Low). This test shall be as specified in MIL-STD-810, Method 502, Procedure I. The assembly shall be stabilized at -40°F for a minimum of 4 hours. After temperature exposure, the assembly shall be stabilized at ambient (+60°F to +90°F), and subjected to the test of 4.7.4 to determine compliance with 3.3.2.1; if it does not, it shall be rejected.

4.7.3 Operating.

4.7.3.1 Temperature (low). This test shall be as specified in MIL-STD-810, Method 502, Procedure II, stabilize at -25°F for a minimum of 4 hours. While stabilized at -25°F, the assembly shall be tested as specified in 4.7.4 to determine compliance with 3.3.2.2; it it does not, it shall be rejected.

4.7.3.2 Temperature (high). This test shall be as specified in MIL-STD-810, Method 501, Procedure II. Stabilize at 125°F. While stabilized at 125°F, the assembly shall be tested as specified in 4.7.4 to determine compliance with 3.3.2.2; if it does not, it shall be rejected.

4.7.3.3 Pressure and watertight test. This test shall be performed as follows. The ECU to be sealed and all parts plugged except the plug with preformed packing, in which a nipple is to be installed for connection of air supply. Apply dry nitrogen air pressure for 5 minutes at 1.5 to 2 psi. (Do not exceed an upper limit of 3 psi as damage may occur). Submerse the ECU into a tank of water for 5 minutes and look for signs of bubbles escaping from the connectors, plugs, switches, screws, cover and welds. Any sign of air bubbles warrants a rejection. After pressure and watertight testing the ECU shall be subjected to the test of 4.7.4 for compliance with 3.3.3; if it does not, it shall be rejected.

4.7.4 Functional. Tests contained in 4.7.4.1.1 through 4.7.4.15.3 are to be conducted utilizing appropriate calibrated meters, fixtures, adapters, and cables connected to the contacts specified in the TDP of respective test requirement paragraph. To facilitate ease in testing the ECU, a simple test fixture should be built to simulate relay responses using LEDs, lights, etc. and that bad sensors (open or shorted) and target reed limit switches be simulated using toggle switches. Remote control command signals could be simulated using push button switches wired to produce the appropriate responses; if it does not, it shall be rejected.

4.7.4.1 Target test switch - raising target and lamp test.

4.7.4.1.1 Initial conditions and switch conditions. Place a 5.6 kilohms, 1/2w, 20% resistors across all amplifier inputs. (Simulates typical crystal resistance.) Function selector switch-position 1. Sensitivity switch in any position. Target "down" limit switch is open (target-down position). Target "up" limit switch is shorted to ground (target down position). Target sensitivity limit switch in any position. Supply voltage +12v $\pm$ .1 volt. Connect a fault signal jumper from Pin C to Pin D of ST5 through ST8.

4.7.4.1.2 Raise target. Momentarily place test switch on the front panel to raise target. The motor and up valve relays shall set and while the switch in in the "raise target" position, the lamp relay shall be engaged while test switch is held. Within 5 seconds ± 1 second after initiation, change first, the target "down" limit switch to its "shorted" position (target up position) and then the target "up" limit switch to its open position (target up position). When the "up" limit switch is changed the motor relay will immediately disengage and the "up valve" relay will disengage 2 ± 1. seconds after the motor relay disengages. If it does not meet the requirements of 3.5.1.1, it shall be rejected.

4.7.4.2 Target test switch - lowering target. With the target limit switches in position for a raised target momentarily place the test switch in the position to lower the target. The motor and down valve relays shall set. Within 5 seconds ± 1 second after initiation change first, the target "up" switch to it's "down target: position and then the "down" limit switch to it's "down target position". When the "down" limit switch is changed the motor relay will immediately disengage and the "down valve" relay will disengage 2 ± 1 second after the motor relay disengages. If it does not meet the requirements of 3.5.1.2, it shall be rejected.

4.7.4.3 Lifting mechanism failure. Repeat 4.7.4.1 and 4.7.4.2 (raising and lowering target using the test switch) but in each case do not change the respective limit switch positions. The motor relay shall disengage 11 ± 2 seconds after which the respective valve solenoid relay will disengage as well. If it does not meet the requirements of 3.5.3, it shall be rejected.

4.7.4.4 Battery check indicator. Raise or lower the target using the front panel test switch. The front panel LED light shall be on continuously for as long as the motor relay is engaged and the ECU supply voltage greater than 10.5 volts. Raise or lower the target using the front panel test switch. During the next 5 seconds lower the supply voltage from the nominal + 12v to 8v and notice when the front panel led battery light starts to flash. The supply voltage battery test light shall start to flash when equal to 10.5 - 0.1 volts. If it does not meet the requirements of 3.5.4, it shall be rejected.

4.7.4.5 Remote control operation - remotely raising target. With the switch positions set as indicated in 4.7.4.1.1 remotely simulate raising the target by momentarily pressing the remote raise push button switch. The relay actions and responses shall be as those in 4.7.4.1.2 except that the lamp relay shall not energize. If it does not meet the requirements of 3.5.7, it shall be rejected.

4.7.4.6 Remote control operation - remotely lowering target. Remotely simulate lowering the target by momentarily pressing the remote lower push button switch. The relay actions and responses shall be as described in 4.7.4.2. If it does not meet the requirements of 3.5.7, it shall be rejected.

4.7.4.7 Remote operation of hostile fire relay. While the hostile fire remote push button control switch is pressed, the hostile fire relay shall be energized. If it does not meet the requirements of 3.5.7, it shall be rejected.

4.7.4.8 Bad hit sensor test - shorted crystal condition. Raise target using front panel test switch as described in 4.7.4.1. Using appropriately connected switches on amplifier inputs create a shorted crystal condition on connection to amplifier 1. Immediately when this happens the target should lower through activation of the motor relay and down valve relay. Restore a good crystal condition, raise the target and repeat this test for amplifiers 2 through 4. If it does not meet the requirements of 3.5.8, it shall be rejected.

4.7.4.9 Bad hit sensor test - open crystal condition. Repeat the test in 4.7.4.8 but simulate an open crystal condition. If it does not meet the requirements of 3.5.8, it shall be rejected.

4.7.4.10 Trying to raise target with a simulated bad crystal. With either a shorted or open crystal condition simulated, try to raise the target by remote and by the front panel test switch. The target shall not be raised by further means. If it does not meet the requirements of 3.5.8, it shall be rejected.

4.7.4.11 Function switch test - position 1. Target remains up and does not lower.

4.7.4.11.1 Initial conditions and switch positions. Function selector switch in position 1. Target sensitivity limit switch in the "open" position (ready to receive firing pulses-target up). Target "down" limit switch is open (target down position). Target "up" limit switch is closed and shorted to ground (target up position). Sensitivity switch in position 1. Supply voltage + 12v $\pm$ .1 volt. Connect the pulse generator to amplifier #1 input and place a 5.6 kilohm 1/2w 20% resistor across all amplifier inputs to simulate good crystals (Hit sensors). Set pulse generator to produce a 5 KHZ sine wave, having 100 mv peak amplitude set in a burst mode to produce a 2ms burst. Remove fault signal jumper for amplifier 1 (ST5-C to D).

4.7.4.11.2 Raise target. Raise the target remotely and set target limit switches accordingly. With the target raised burst the pulse generator. The smoke scorer relay shall activate for 2 $\pm$ 1 seconds but the target shall remain in the up position. If it does not meet the requirements of 3.5.2.2, it shall be rejected.

4.7.4.11.3 40ms pulse output. Repeat the test using an oscilloscope connected to ST1-G. A 40ms $\pm$ 5ms pulse shall occur at the pin. If it does not meet the requirements of 3.5.9, it shall be rejected.

4.7.4.12 Function switch test - position 2 - target lowers after a hit and stays lowered. Set the initial conditions per 4.7.4.11.1. With the target raised burst the pulse generator. The smoke scorer relay shall activate for 2 seconds ± 1 second and the target shall lower and stay lowered through activation of the motor and down valve relays. If it does not meet the requirements of 3.5.2.3, it shall be rejected.

4.7.4.12.1 Bad target sensitivity limit switch. Repeat the test in 4.7.4.12 but short the target sensitivity limit switch in this case to ground. The target shall not lower nor shall the smoke scorer engage. If it does not meet the requirements of 3.5.5, it shall be rejected.

4.7.4.13 Function switch test position 3 - target lowers after a hit and then automatically raises back up. Set the initial conditions per 4.7.4.11.1 and raise the target. Burst the pulse generator. The smoke scorer relay shall activate for 2 seconds ± 1 second and the target shall lower as indicated by the motor relay and the down-valve solenoid relays engaging. Switch target limit switches within 5 seconds accordingly for a lowered target by first changing the "up limit switch and then the "down" limit switch. The target shall raise again (motor and up valve relays engaging) 11 ± 2 seconds after the hit (pulse generator burst). Set target limit switches accordingly for a raised target by reversing the activation procedure ("down" switch first, then "up"). If it does not meet the requirements of 3.5.2.4, it shall be rejected.

4.7.4.14 Function switch test positions 4, 5, and 6. Repeat the test procedure in 4.7.4.11 through 4.7.4.13 for positions 4, 5 and 6. The responses in positions 4, 5 and 6 shall be as those in positions 1, 2 and 3 except that in addition, the lamp relay shall activate for 2 ± 1 seconds at the same time as the smoke scorer relay. If it does not meet the requirements of 3.5.2.5, 3.5.2.6 and 3.5.2.7, respectively, it shall be rejected.

4.7.4.15 Amplifier sensitivity tests.

4.7.4.15.1 Initial conditions and panel switch conditions. Refer to 4.7.4.11.1 for initial conditions and front panel switch conditions with the exception that the function selector switch shall be in position 6.

4.7.4.15.2 Raise the target. Raise target using front panel test switch. Referring to Table V, set the pulse generator to the frequency and front panel sensitivity switch positions accordingly. At each sensitivity switch position and frequency determine the lowest amplitude to a millivolt (MV) at which a "hit" will just be accepted and processed by the ECU amplifier. The millivolt reading shall lie within the range as specified in Table V. If it does not meet the requirements of 3.5.6, it shall be rejected.

4.7.4.15.3 Amplifiers 2-4. Repeat 4.7.4.15 for amplifiers 2-4. If it does not meet the requirements of 3.5.6, it shall be rejected.

TABLE IV. ECU sensitivity response.

2 MS Burst Frequency	Front Panel Sensitivity Switch Position	Peak Millivolt Acceptable Range
500 Hz	1	30 to 75 MV
500 Hz	2	95 to 140 MV
500 Hz	3	175 to 225 MV
500 Hz	4	205 to 255 MV
1000 Hz	1	10 to 55 MV
1000 Hz	2	50 to 95 MV
1000 Hz	3	95 to 140 MV
1000 Hz	4	115 to 160 MV
2000 Hz	1	5 to 45 MV
2000 Hz	2	25 to 70 MV
2000 Hz	3	55 to 100 MV
2000 Hz	4	70 to 110 MV
5000 Hz	1	5 to 50 MV
5000 Hz	2	25 to 70 MV
5000 Hz	3	50 to 95 MV
5000 Hz	4	60 to 105 MV
10,000 Hz	1	10 to 55 MV
10,000 Hz	2	35 to 80 MV
10,000 Hz	3	60 to 105 MV
10,000 Hz	4	75 to 120 MV

4.8 Soldering. Soldering processes shall be inspected by certified inspectors to the requirements and acceptance criteria of MIL-STD-2000 as specified in paragraph 3.7.

5. PACKAGING

5.1 General. Preservation, packing and marking shall be in accordance with Special Packaging Instruction PS 11784504. The level of protection shall be as specified in the procurement document.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This specification details the specific requirements for performance, quality assurance, and testing for the Electronic Control Unit (ECU). The ECU will be used as part of the Target Holding Mechanism/Tank Gunnery (THM/TG) and the Improved Lifting Target Elevating Mechanism (ILTEM) and will support live fire armor weapons training and qualification programs. These systems will provide training in identifying and firing on simulated armored vehicles during training exercises.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number and date of this specification.
b. Applicable stock number.
c. First article sample requirements.
d. Packaging requirements, if other than specified in Section 5.
e. Serialization requirements, if applicable.
f. Certification of conformance for each lot of shipment of product.
g. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1).

6.3 Submission of contractor inspection equipment designs for approval. Submit two copies of designs as required to: Commander, U.S. Army AMCCOM, Attn: AMSMC-QAF-I, Picatinny Arsenal, NJ 07806-5000. This address will be specified on the Contract Data Requirements List, DD Form 1423 in the contract.

6.4 Drawings. Drawings listed in Section 2 of this specification under the heading U.S. Army Armament Research, Development and Engineering Center (ARDEC), may also include drawings prepared by, and identified as, U.S. Army Armament Research and Development Command (ARRADCOM), Frankford Arsenal, Rock Island Arsenal or Picatinny Arsenal drawings. Technical data originally prepared by these activities is now under cognizance of ARDEC.

6.5 Subject term (key word) listing.

Improved Lifting Target Elevating Mechanism (ILTEM)
Target Holding Mechanism/Tank Gunnery (THM/TG)
Remote Target System (RETS)

6.6 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Army-AR

Preparing activity:
Army-AR

(Project 6920-A104)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-E-70694A (AR)	2. DOCUMENT DATE (YYMMDD) 26 SEPTEMBER 1991

3. DOCUMENT TITLE
ELECTRONIC CONTROL UNIT: 11784504

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets if needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

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c. ADDRESS (Include Zip Code) ATTN: SMCAR-BAC-S PICATINNY ARSENAL,NJ 07806-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340

DD Form 1426, OCT 89 *Previous editions are obsolete.* 128/290