MIL-T-81587A(AS)
6 May 1971

Superseding

MIL-T-81587(AS)
13 June 1968

MILITARY SPECIFICATION

TIMER ASSEMBLY-RAIN REPELLENT

This specification has been approved by the Naval Air Systems Command, Department of the Navy.

1. SCOPE - This specification covers the requirements for an interval timer for controlling the duration of an electrical pulse to a solenoid valve for use in Rain Repellent systems covered by Specification MIL-R-81589.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on the date of invitation for bids, form a part of this specification to the extent specified herein:

Specifications

Military

MIL-C-5015	Connectors, Electric, "AN" Type
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-E-5400	Electrical Equipment, Airborne, General Specification for
MIL-E-17555	Electronic and Electrical Equipment and Associated Repair Parts, Preparation for delivery of
MIL-R-81589	Rain Repellent Fluid Application System, Aircraft Windshield

Federal

PPP-T-0060	Tape, Pressure Sensitive Adhesive-Water Proof

Standards

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-171	Finishing of Metal and Wood Surfaces
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-461	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of
MIL-STD-831	Test Reports, preparation of
MS-3102	Connector, Receptacle, Electric Box Mounting
MS-3106	Connector, Plug, Electric, Straight
MS-29527	Valve, Fuel Shut Off, Solenoid Operated 28 Volts DC

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Preproduction - This specification makes provision for preproduction testing.

3.2. Parts and Materials - Approval for the use of non-standard parts and materials other than microelectronic devices shall be based on Category II of Specification MIL-E-5400.

3.2.1 Non-Standard Semiconductors - Approval for the use of non-standard and non-preferred semiconductors shall be in accordance with Military Standard MIL-STD-454, Requirement 30.

3.2.2 Vacuum Tubes - No vacuum tubes shall be used.

3.3 Design and Construction - The timer shall be a complete, self-contained unit consisting of an interval timing circuit, electro-mechanical or solid state, a connecting receptacle and an enclosure. Design shall conform to the requirements of Specification MIL-E-5400. Workmanship shall conform to Military Standard MIL-STD-454, Requirement 9. Electromagnetic relays shall comply with Military Standard MIL-STD-454, Requirement 57.

3.3.1 Weight - The total weight of the timer shall be a minimum consistent with good design and shall not exceed 0.5 pound.

3.3.2 Container - The timing circuit shall be enclosed in an aluminum alloy container cylindrical in form with a maximum outside diameter of 1-3/4 inches and a maximum length of 2-5/8 inches, not including the connector. The container shall be finished in accordance with Finish Numbers 7.1.1 plus 21.3 of Military Standard MIL-STD-171, Black No. 27038. A 1/4 inch diameter hole may be provided in the container for access to the timer adjustment. The hole shall be covered with pressure sensitive, water-proof, adhesive tape, Specification PPP-T-0060, Type I, Class I and sealed with one coat of shellac.

3.3.3 Operating Power - The timer shall provide the specified performance when energized from a 28 volt d.c. power source with power characteristics conforming to Military Standard MIL-STD-704 for Category B utilization equipment. The electrical load for the timer operation is defined by solonoid valve, Military Standard MS-29527-1.

3.3.4 Timing Circuit - The timing circuit shall provide a 28 volt d.c. pulse to a solenoid valve which conforms to Military Standard MS-29527-1. A single timed pulse shall be initiated by a 28 volt d.c. electrical pulse not longer than 0.5 second duration. The timed pulse from the timer shall be adjustable from 1.0 to 5.0 seconds. The timer adjustment shall be accessible with the timer assembled. The timer shall not be capable of automatic recycling. The timer shall be set by the contractor to the time interval specified in the procurement document.

3.3.5 Electrical Connection - The timer shall be equipped with a receptacle conforming to Military Standard MS-3102R-14S-5P in accordance with Specification MIL-C-5015. The receptacle shall be securely attached to the timer base. Pin connections shall be as shown in 4.4.1.

3.3.6 Printed Wiring - Printed wiring to interconnect electronic components shall be in accordance with Military Standard MIL-STD-454, Requirement 17.

3.3.7 Soldering - All soldering shall be in accordance with Military Standard MIL-STD-454, Requirement 5.

3.4 Radio Interference - Radio frequency interference shall be controlled within the requirements of Military Standard MIL-STD-461, Equipment Class IIC.

3.5 Maintainability - Maintainability shall consist of periodic functional checks and replacement.

3.6 Service Conditions

3.6.1 Temperature-Altitude - The timer shall meet the temperature-altitude requirements of Specification MIL-E-5272, Procedure 1, except that the altitude shall be 70,000 feet, and the upper temperature for storage shall be +95 degrees C.

3.6.2 Vibration - The timer assembly shall meet the requirements of Specification MIL-E-5272, Procedure XII without malfunction.

3.6.3 Shock - The timer assembly shall meet a shock requirement of 15 g's in accordance with Specification MIL-E-5272, Procedure V without malfunction.

3.6.4 Acceleration - The timer assembly shall meet an acceleration requirement of 14 g's in accordance with Specification MIL-E-5272, Procedure III without malfunction.

3.6.5 Fungus - The contractor shall certify in writing that no nutrients are used in the timer which would support fungus.

3.6.6 Explosion Proofing - The timer shall meet the explosion-proof requirements of Specification MIL-E-5272, Procedure IV.

3.7 Reliability - Reliability shall be stressed by the derating of electronic parts in accordance with Military Standard MIL-STD-454, Requirement 18. Comprehensive configuration control shall be exercised to ensure that production models are identical in every respect with the model that is qualified. This includes complete documentation of any special component part screening tests necessary to establish component part reliability at a level that will preclude failures during environmental tests.

3.8 Marking.

3.8.1 Identification of Product - The timer assembly and parts shall be marked for identification in accordance with MIL-STD-130.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specifications where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of Tests - The inspection and testing of the timer assemblies shall be classified as follows:

a. Preproduction Tests

b. Acceptance Tests

4.3 Test Procedures - Procedures for performing all tests specified herein shall comply with Specification MIL-E-5400 and be sent to the procuring activity for approval prior to conducting the tests.

4.4 Test Conditions.

4.4.1 Test Equipment - The timers shall be connected to the test circuit shown in Figure 1 for testing as specified in 4.5 and 4.6.

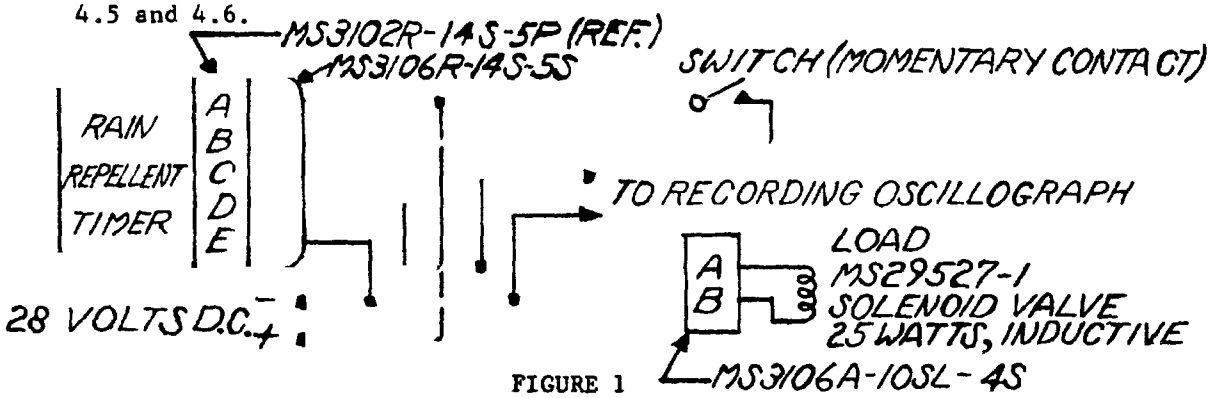

FIGURE 1

4.4.2 Test Conditions - Unless otherwise specified, the timer shall be subjected to the tests under the following conditions:

a. Temperature-Room Ambient (23°C ± 10°C)

b. Atmospheric Pressure - Prevailing room ambient

c. Vibration - None

d. Humidity - Room ambient

4.5 Preproduction Tests

4.5.1 Preproduction Test Samples - Preproduction test samples shall consist of samples representative of the production equipment. The contractor shall subject two timer assemblies to the preproduction tests as listed below. The tests shall be performed in the order as shown:

Preproduction Tests

Tests Required	Timer Number 1	Timer Number 2
Examination of Product (4.8.1)	X	X
Function Tests (4.8.2)	X	X
Temperature-Altitude (4.8.3.1)	X	
Radio Interference (4.8.7)		X
Vibration Test (4.8.4)		X
Acceleration Test (4.8.6)		X
Shock Test (4.8.5)	X	
Explosion Proofing (4.8.8)	X	

4.5.2 Tests - Preproduction tests shall consist of all the tests specified in 4.8 subject to the test conditions specified herein.

4.5.3 Preproduction Test Report - Upon completion of the preproduction tests, the contractor shall prepare a preproduction test report in accordance with Military Standard MIL-STD-831 and furnish three copies to the procuring activity. The test report shall include certification that all reliability requirements of 3.7.1 have been met.

4.5.4 Preproduction Samples for Procuring Activity - The contractor shall submit to the procuring activity, together with the preproduction test report the two preproduction timer assemblies as specified in 4.5.1 for use as follows:

Examination of Product.

For any tests included in this specification, after reviewing the contractor's test report.

4.6 Acceptance Tests - Acceptance tests shall consist of individual tests and sampling plans and tests.

4.6.1 Individual Tests - Each timer shall be subjected to the following tests:

Examination of Product	4.8.1
Function	4.8.2

4.6.2 Sampling Plan and Tests - The contractor shall select samples in accordance with Military Standard MIL-STD-105D, using Inspection Level I, Acceptable Quality Level (AQL) of 2.5 in Table II-A for a Single Sampling Plan.

4.6.3 Sampling Tests - Following individual tests, selected samples shall be tested as follows:

High Temperature Test - Procedure II of Specification MIL-E-5272 and exposed to the high temperature for 4 hours.

Low Temperature Test - Procedure II of Specification MIL-E-5272 and exposed to the low temperature for 1/2 hour.

Vibration - Procedure III of Specification MIL-E-5272.

Function Test - Operational test per 4.8.2 after sampling tests.

4.7 Rejection Criteria - Deterioration in performance of any component which prevents the timer from meeting functional, maintenance and service requirements shall provide cause for rejection. Changes in timer preset time greater than $\pm$ 25 percent following tests specified herein shall be cause for rejection.

4.7.1 Rejection and Retest - Timers which have been rejected may be reworked or have parts replaced only once to correct defects and resubmitted for tests. Before submitting, full particulars concerning the rejection and action taken to correct the defect shall be furnished the Government Inspector. When one timer from a production run fails, no timers on hand or produced later shall be accepted until the extent and cause of the failure are determined and corrected.

4.7.2 Defects in Timers Accepted - The investigation of a test failure could indicate that defects may exist in timers already accepted. The contractor shall advise the procuring activity of all defects and method of correction.

4.8 Test Methods.

4.8.1 Examination of Product - The timer assemblies shall be examined to verify that all the requirements of this specification, including the materials, design and construction, necessary mechanical measurements, markings and workmanship, are met.

4.8.2 Function Tests - Each timer assembly shall be connected to the test circuit shown in Figure 1 and operated for a minimum of ten (10) cycles by closing the momentary switch for approximately 1/2 second for each cycle. At least one cycle shall be with the timer adjustment set for the minimum pulse (1.0 to 1.3 seconds) and at least one cycle shall be at the maximum pulse duration (4.5 to 5.0 seconds). Approximately 15-20 seconds should elapse between cycles so as to provide 3 pulses per minute. The pulse duration shall be recorded on the oscillograph. Any timer malfunction or change in pulse time from that specified shall be cause for rejection.

4.8.3 Environmental Tests - The timer assembly for this test shall be connected to the test circuit shown in Figure 1 which shall not be exposed to the test environment. During each environmental test, except at storage temperatures the momentary switch shall be closed for approximately 1/2 second. The timer shall be set to provide a 2.5-second pulse to the load. This cycle shall be repeated at a rate of 3 cycles per minute for the duration of each test time. Any evidence of malfunction of the timer including a change in pulse time during these tests shall be cause for rejection.

4.8.3.1 Temperature and Altitude Test - The temperature-altitude test shall be in accordance with Specification MIL-E-5272, Temperature-Altitude Tests Procedure I, except the altitude shall be 70,000 feet.

The test duration at each step in Procedure I shall be as follows:

Step	Condition	Timer Operation Time
1	-62°C, sea level altitude	Zero
2	-54°C, sea level altitude	One hour (180 cycles)
3	-54°C, 70,000 feet	One hour (180 cycles)
4	-10°C, 70,000 feet	1/2 hour (90 cycles)
5	+85°C, sea level altitude	Zero
6	+71°C, sea level altitude	1/2 hour (90 cycles)
7	+55°C, sea level altitude	4 hours (720 cycles)
8	+30°C, 60,000 feet	4 hours (720 cycles)
9	+35°C, 70,000 feet	1/2 hour (90 cycles)
10	+20°C, 70,000 feet	4 hours (720 cycles)

The timer shall be operated for a total of not less than 2700 cycles.

4.8.4 Vibration Test - The vibration test shall be performed on one timer in accordance with Specification MIL-E-5272, Procedure XII. The timer shall be connected to the test circuit of Figure 1 and cycled continuously throughout the vibration test period whenever practicable. Any deterioration shall not exceed that specified in 4.7. The timer shall be disassembled at the completion of the test and inspected visually for damage.

4.8.5 Shock Test - A shock test shall be performed on one timer in accordance with Specification MIL-E-5272, Procedure V. Upon completion of the shock test, the timer shall be connected to the test circuit, Figure 1, and cycled as required in 4.8.2. The unit shall be disassembled and inspected visually for damage.

4.8.6 Acceleration Test - An acceleration test shall be performed on one timer in accordance with Specification MIL-E-5272, Procedure III. Upon completion of the acceleration test, the timer shall be connected to the test circuit, Figure 1, and operated as required in 4.8.2. The timer shall be disassembled and inspected visually for damage.

4.8.7 Radio Interference - One timer shall be cycled as specified in 4.8.2 and tested for radio interference in accordance with 3.4.

4.8.8 Explosive Proofing - One timer shall be cycled as specified in paragraph 4.8.2 and tested in accordance with requirements of paragraph 3.6.6.

5. PREPARATION FOR DELIVERY

5.1 Preservation and Packaging - Preservation and packaging shall be Level A in accordance with Specification MIL-E-17555.

5.1.1 Unit Packaging - The unit package shall be considered as a single timer assembly.

5.1.2 Marking - In addition to marking required on the timer, the unit package and shipping container shall be marked in accordance with requirements of MIL-STD-129.

6. NOTES.

6.1 Use - The timer assemblies covered by this specification are for use in rain repellent fluid applications in aircraft, Specification MIL-R-81589.

6.2 Ordering Data - Procurement documents should specify the following:

a. Title, number, and date of this specification.

b. Selection of applicable levels of preservation, packaging and packing.

c. Where the preproduction samples should be sent and instructions concerning the submittal of the test reports.

d. The time interval setting of timers. (See 3.3.4)

Preparing Activity
Navy - AS

Project No. 6630-N173

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

MIL-T-81587A(AS) - Timer Assembly - Rain Repellent

ORGANIZATION *(Of submitter)* | CITY AND STATE

CONTRACT NO. | QUANTITY OF ITEMS PROCURED | DOLLAR AMOUNT
$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2 COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)* | DATE

DD, FORM 1 APR 63 1426

C-8978

FOLD

DEPARTMENT OF THE NAVY
Naval Air Systems Command
Washington, D.C. 20360

POSTAGE AND FEES PAID
NAVY DEPARTMENT

OFFICIAL BUSINESS

NAVAL AIR SYSTEMS COMMAND (AIR-530322)
DEPARTMENT OF THE NAVY
WASHINGTON, D. C. 20360

FOLD