MIL-T-62063(AT)
4 May 1967
SUPERSEDING
DAPD-315
13 June 1966

## MILITARY SPECIFICATION

# TIME DELAY UNIT; ADJUSTABLE, SOLID STATE

#### 1. SCOPE

1.1 Scope. This specification covers a solid state type, electrical time delay device capable of providing an adjustable time delay cycle at a specific time between 50 milli-seconds and 10 seconds, for use in 28 volt (nominal) DC electrical circuits with minimum output of two amperes at 28 volts (resistive), (see 6.1). In this time delay, timing circuitry is solid state but output is optional (solid state or relay).

### 2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS		
Military		
MIL-R-11	-	Resistors, Fixed, Composition (Insulated), General Specification for.
MIL-R-26	-	Resistors, Fixed, Wire-Wound (Power Type) General Specification for.
MIL=C=3965	-	Capacitors, Fixed, Nonsolid, Electrolytic, (Tantalum, Foil and Sintered-Slug) General Specification for.
MIL-R-5757	-	Relays (Electrical (Excluding Thermal) For Electronic and Communication - Type Equipment), General Specification for.
MII_R-10509	-	Resistors, Fixed, Film (High Stability), General Specification for.
MIL-D-13570	-	Dust, Testing by Exposure To.
MIL-F-13926	•	Fire Control Materiel; General Specification Governing the Manufacture and Inspection of.
MIL-F-13927	-	
MIL-S-19500	-	Semiconductor, Devices, General Specification for.
MIL-C-26655	-	Capacitors, Fixed, Solid Electrolyte, Tantalum, General Specification for.
MIL-C-27287	-	Capacitors, Fixed, Plastic Dielectric, Direct Current (Non-Metallic Cases).
MIL-E-55301	-	Electromagnetic Compatability.

FSC-5945

#### STANDARDS

Military

MIL\_STD=105 - Sampling Procedures and Tables for Inspection by Attributes.

MII\_SID-130 - Identification Marking of US Military Property.

MIL-STD-202 - Test Methods for Electronic and Electrical Component

Parts.

MIL-SID-701 - Preferred and Guidance Lists of Semiconductor Devices.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

#### NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20025.)

#### 3. REQUIREMENTS

- 3.1 Preproduction sample. Preproduction samples of the time delay to be furnished under this specification shall be produced prior to the manufacture of these items in production quantity. The preproduction samples shall be submitted to the Government for preproduction inspection to determine conformance to the quality assurance provisions of this specification (see 4.2). The preproduction samples submitted by a contractor shall be fully representative of the time delay to be supplied from production facilities and tooling.
- 3.2 Materials. Material shall be as specified herein, in applicable specifications and on applicable drawings. Materials not specifically designated shall be suitable for use in the time delay operating over an ambient temperature range from minus 65° to plus 185°F without any change in physical or dimensional properties that would result in operation of the time delay falling outside of the limits herein specified.
- 3.2.1 Semi-conductor material. Silicon semi-conductor components shall be used and shall conform to MIL-S-19500, or be selected from MIL-STD-701.
- 3.2.2 Capacitors. Capacitors shall conform to MIL-C-26655, MIL-C-3965 or MIL-C-27287.
- 3.2.3 Resistors. Resistors when used shall conform to MIL-R-26; MIL-R-11 or MIL-R-10509.
  - 3.2.4 Relays. Relays shall conform to MIL-R-5757.

- 3.2.5 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals which would encourage galvanic action shall be avoided.
- 3.3 Construction. Military standard components shall be used wherever possible. The time delay covered by this specification shall conform to figure 1 with respect to mounting and clearance dimensions, and shall be contained within the envelope outline indicated thereon.
- 3.3.1 Threaded parts. All screw threads shall conform to National Bureau of Standards Handbook, H28 (see 2.2).
- 3.3.2 Circuit diagram. An electrical schematic circuit diagram shall be provided with each time delay. If modules are used, the encapsulated circuitry shall be shown. The diagram shall be marked white-on-black on the housing in a readily accessible location. Height and size of diagram symbols and lettering shall be sufficient to provide legibility to normal 20/20 vision at a distance of two feet. Input and output terminals shall be plainly marked.

#### 3.4 Electrical.

- 3.4.1 Polarity. The time delay shall operate with a negatively grounded circuit. The voltage input shall be positive at terminal 1 and negative at terminal 6 (see 4.5.2.1).
- 3.4.1.1 Polarity protection. When subjected to the test specified in 4.5.2.1.1, there shall be polarity protection to continuous minus 50 volts.
- 3.4.2 Insulation resistance. All insulation between ungrounded circuits and ground shall have a minimum resistance of 100 megohms at 1850F and shall withstand the test specified in 4.5.2.2 without any evidence of physical or electrical damage.
- 3.4.3 Dielectric strength. When subjected to the test specified in 4.5.2.3, there shall be no arcing, no physical damage and no decrease in dielectric strength.
- 3.4.4 Short circuit protection (solid state only). Short circuit protection shall be provided. The time delay shall withstand the test specified in 4.5.2.4.
- 3.4.5 Low voltage, input. Protection shall be provided against damage and malfunction from continuous input potentials below 16 volts DC (0-16 volts). The time delay shall withstand the test specified in 4.5.2.5.
- 3.4.6 Operating voltage, input. The time delay shall be capable of continuous operation without damage or malfunction with input potentials from 16 to 35 volts DC. The time delay shall withstand the test specified in 4.5.2.6.
- 3.4.7 Transient. The time delay shall withstand the test specified in 4.5.2.7 without damage or malfunction.

- 3.4.8 Output rating. The time delay output contacts shall carry and switch a minimum of two amperes at 28 volts DC with a resistive load (see 4.5.2.9).
- 3.4.8.1 Power drain. The time delay shall have a power drain of two watts, maximum at 26 volts DC (see 4.5.2.9).
- 3.4.8.2 Voltage drop. The maximum voltage drop across the time delay output contacts shall not exceed 1.0 volt (see 4.5.2.9).

#### 3.5 Performance.

- 3.5.1 Variability. Time delay tolerance as a result of test under any and all of the test conditions and combinations thereof shall not exceed \( \frac{1}{2} \) 10 percent.
- 3.5.2 Repeatability. The time delay shall have a repeatability of  $\frac{1}{2}$  percent at any specific reset time and temperature ambient and voltage.
- 3.5.3 Power-off operation. The time delay shall not operate with the primary power source disconnected.
- 3.5.4 Reliability. The time delay shall withstand the test series indicated in table I under preproduction testing for sample 1.
- 3.5.5 Reset time. The time for snapover from the timing circuit to the output shall not exceed 10 milliseconds.
- 3.5.6 Recycle time. When tested in accordance with 4.5.2.8, maximum allowable time between operations for the unit to repeat the time delay cycle shall be 750 milliseconds.
- 3.5.7 Adjustment. The device shall be adjustable in time delay from 50 milliseconds to 10 seconds by means of an adjustment screw (see figure 1). Adjustment shall be accomplished in approximately 25 turns of the adjustment screw.

## 3.6 Environmental.

### 3.6.1 Temperature.

- 3.6.1.1 High temperature (185°F). The time delay shall meet the requirements of 3.4 and 3.5 when tested in accordance with 4.5.3.1.
- 3.6.1.2 Low temperature (-65°F). The time delay shall meet the requirements of 3.4. and 3.5 when tested in accordance with 4.5.3.2.
- 3.6.1.3 Storage temperature (-65° and \$185°F). The time delay shall show no evidence of physical failure and shall meet the requirements of 3.4 and 3.5 when tested in accordance with 4.5.3.3.
- 3.6.2 Shock. The time delay shall evidence no breakage, loosened or distorted parts or other physical damage and shall meet the requirements of 3.4 and 3.5 after having been tested in accordance with 4.5.3.4.

- 3.6.3 Vibration. The time delay shall evidence no breakage, loosened or distorted parts or other physical damage when tested in accordance with 4.5.3.5.
- 3.6.4 Humidity. When tested in accordance with 4.5.3.6, the time delay shall show no change in physical, electrical or material characteristics. Immediately subsequent to humidity exposure, the unit shall meet the requirements of 3.4 and 3.5.
- 3.6.5 Water resistance. When tested in accordance with 4.5.3.7, the time delay shall evidence no water penetration or damage that would impair performance.
- 3.6.6 Dustproofness. When tested in accordance with 4.5.3.8, the time delay shell show no change in physical, electrical or meterial characteristics. There shall be no evidence of leakage of current to ground or short circuits as a result of this test. Inmediately after the test, the time delay shall meet the requirements of 3.4 and 3.5.
- 3.6.7 Corrosion. After having been subjected to the salt spray test specified in 4.5.3.9, the time delay shall evidence no corrosion affecting performance. Upon completion of the test, the time delay shall meet the requirements specified in 3.4 and 3.5.
- 3.6.8 Fungus. When tested in accordance with 4.5.3.10 the time delay shall evidence no microbial growth adversely affecting performance. Subsequent to the test the time delay shall meet the requirements of 3.4 and 3.5.
  - 3.7 Weight. The time delay weight shall not exceed three ounces avoirdupois.
- 3.0 Identification marking. Identification marking shall be in accordance with MIL-STD-130 and as a minimum shall include the following:

Time Delay - 28 Volt DC
Federal Stock Number
Manufacturer's Identification
Date of Manufacture (month, year e.g. Feb 67)
US

- 3.9 Electromagnetic compatibility. The time delay shall cause no radio interference or electrical disturbance which produce undesirable response or malfunctioning of communication equipment when tested in accordance with 4.5.3.11.
- 3.10 Workmanship. Workmanship shall be such as to assure a product free of burrs, scratches, sharp edges and chips.
  - 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 Govern-

ment. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Preproduction inspection. A preproduction sample of six time delays shall be submitted for preproduction inspection. Preproduction inspection shall be performed by the supplier; at a location acceptable to the Government (see 6.2) and shall consist of examinations for the defects specified in table II and performance of tests as specified in table I in the order indicated.

Paragraph							
No.	Test	Samples					
		1	5	3	4	5	6
+.5.2.9	Output rating, power drain,						
	voltage drop	X	X	X	X	X	X
<b>4.5.2.5</b>	Low voltage, input	X	X	X	X	X	X
1.5.2.6	Operating voltage, input	X	X	X	X	X	X
+.5.2.7	Transient	X	X	X	X	X	X
1.5.2.8	Recycle time	X	X	X	X	X	X
4.5.2.1.1	Polarity protection	X	X	X	X	X	X
+.5.2.3	Dielectric strength	X	X	X	X	X	X
+.5.2.2	Insulation resistance	X	X	X	X	X	X
ı.5.2.4	Short circuit protection	X	X	X	X	X	X
.5.3.1	High temperature	X					
1.5.3.2	Low temperature	X					
1.5.3.4	Shock		X				
.5.3.5	Vibration		X				
1.5.3.6	<u>Rumidity</u>			X			
.5.3.7	Water resistance			X			
.5.3.8	Dustproofness					X	
.5.3.10	Fungus				X		
.5.3.9	Corrosion					X	
.5.3.11	Electromagnetic competibility						x
.5.2.9	Output rating, power drain, voltage drop	X	X	X	ĭ	X	X
<b>5.8</b>	Recycle time	X	X	X	X	X	χ

<sup>4.2.1</sup> Failure. Failure of a preproduction sample to pass any of the specified examinations or tests may be cause for the Government to refuse to conduct additional testing until the faults revealed by the tests have been corrected.

#### 4.3.1 Sampling.

4.3.1.1 Lot formation. A lot shall consist of all time delays from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

<sup>4.3</sup> Quality conformance inspection.

- 4.3.1.2 Sampling for examination. Samples for quality conformance examination shall be selected in accordance with MIL-STD-105.
- 4.3.1.3 Sampling for testing. Samples for quality conformance testing shall be selected in accordance with inspection level S-3 of MIL-STD-105 from each lot that has passed the examination specified in 4.3.2.2.

## 4.3.2 Examination.

4.3.2.1 Acceptable quality level. Each time delay selected in accordance with 4.3.1.2 shall be examined for conformance to the following acceptable quality levels (AQL) on the basis of percent defective:

Classification	AQL		
Major	1.0		
Minor	2.5		

4.3.2.2 Classification of defects. For examination purposes, defects shall be classified as follows:

Table II. Classification of Defects

Major (1.0 AQL)	Examination Method
101. Dimensions affecting interchangeable not within tolerance (see 3.3)	IIty Gage
102. Marking, missing or incorrect (see ; 3.3 and 3.8)	3.3.2, Visual
Minor (2.5 AQL)	
201. Dimensions not affecting interchang not within tolerance (see 3.3)	eability Gage
202. Weight (see 3.7)	Scale
203. Faulty workmenship (see 3.10)	Visual

### 4.3.3 Tests.

4.3.3.1 Quality conformance tests. Samples selected in accordance with 4.3.1.3 shall be subjected to the tests specified in table III using an AQL of 6.5 on the basis of percent defective.

Table III. Quality conformance tests

Paragraph	Test
4.5.2.5	Low voltage, input
4.5.2.6	Operating voltage, input
4.5.2.3	Dielectric strength
4.5.2.2	Insulation resistance

## 4.4 Control tests.

- 4.4.1 Sampling for control tests. Control test samples shall be selected at the rate of two time delays for each 100 produced except that not more than four or less than two may be selected in any 30 day period. Samples shall be selected from a lot which has passed the quality conformance examination specified in 4.3.2.2 and the quality conformance tests specified in 4.3.3.1 and shall be subjected to the tests specified for sample 1 in table I.
- 4.4.2 Failure. Failure of a control test sample unit to pass any specified examination or test may be cause for the Government to refuse to accept subsequent lots until it has been proved to the satisfaction of the Government that the faults revealed by the tests have been corrected.

## 4.5 Test procedure.

## 4.5.1 General.

- 4.5.1.1 Conditions. Tests shall be conducted in a laboratory free of dust, drafts, and fumes. Room temperature of the laboratory shall be 77° £ 15°F. Except as otherwise specified herein or in applicable specifications, test specimens shall be thermally stabilized for one hour prior to being subjected to tests and tests shall be conducted at laboratory room ambient temperature.
- 4.5.1.2 Test circuit. The test circuit shall have the following nominal characteristics. The input circuit shall have a continuous capacity of 20 superes at all test input voltages, with 35 supere capacity for intermittent, 20 second, duty and shall include a source impedance of 0.1 ohms or less within the input range from 10 to 40 volts DC. Any equivalent circuit approved by the Government may be used.
- 4.5.1.3 Apparatus. In addition to the standard measuring equipment (see table V and applicable test specifications), the apparatus shall include a test chamber capable of maintaining specified air temperature over the range from minus 65° to plus 185°F. Air movement in the chamber shall be held to a minimum to prevent a temperature gradient and any cooling resulting from excess air motion. The means of supplying heat shall not radiantly affect the time delay.
- 4.5.1.4 Calibration of test equipment. Unless specified herein, test equipment accuracy shall be such as to permit measurement of 10 percent of product or test specification tolerance. Calibration of test equipment shall be conducted at intervals sufficient to establish required accuracy. Records of calibration shall be made available to the Government. The inspector may refuse to conduct an inspection where accuracy of test equipment has not been established to the satisfaction of the Government. Required measuring instrument tolerances are as listed in table V.

## Table V. Measuring instrument tolerances

Instrument	Accuracy tolerance - Maximum		
DC Voltmeter	0.25 percent		
DC Ammeter	0.25 percent		
Harmonic distortion	3.0 percent		

#### 4.5.2 Electrical.

- 4.5.2.1 Polarity. To determine conformance to 3.4.1, observations shall be made of the multi-range ammeter in the input circuit throughout the test procedure.
- 4.5.2.1.1 Polarity protection. To determine conformance to 3.4.1.1, input polarity shall be reversed and voltages from 0 to 50 volts DC shall be applied. Anneter readings in the input circuit shall indicate a maximum current flow of 5 milliamperes with polarity reversed.
- 4.5.2.2 Insulation resistance. The insulation resistance shall be measured as specified in method 302, test condition B, of MIL-SID-202 and shall meet the requirements of paragraph 3.4.2. The measurements shall be made between terminals 1 through 9 tied together and the case.
- 4.5.2.3 Dielectric strength. The time delay shall be tested in accordance with method 301 of MIL-STD-202 and shall meet the requirements of paragraph 3.4.3. The measurements shall be made between the case and terminals 1 through 9 tied together at 1000 /0 -50 volts root-mean-square (vrms) at 60 cycles per second (cps) for not less than three, nor more than five seconds.
- 4.5.2.4 Short circuit protection (solid state only). To determine conformance to 3.4.4, the output side of the time delay shall be short circuited with time delay operating at two amp output load within the functional operational range (16-35 volts DC).
- 4.5.2.5 Low voltage, input. To determine conformance to 3.4.5, the time delay shall be subjected to 16 volts DC input. The output load shall be two amperes. Input voltage shall be reduced to the zero and then returned to 16 volts DC input. Rate of change of voltage shall be one volt every three minutes.
- 4.5.2.6 Operating voltage, input. To determine conformance to 3.4.6, the time delay shall be subjected to input potentials of 16-35 voltsDC and an output load of two amperes resistive. The load shall be applied for a period of one minute at each voltage between 16 and 35 volts DC.
- 4.5.2.7 Transient. To determine conformance to 3.4.7 the time delay shall be subjected to 2000 transient cycles. Each cycle shall consist of plus 50 volts, square wave applied for 10 milliseconds on and 750 milliseconds off.

- 4.5.2.8 Recycle time. To determine conformance to 3.5.6 recycle time shall be determined by actuating the input switch and timing the interval required to reactivate the circuit.
- 4.5.2.9 Output rating, power drain, voltage drop. To determine conformance to 3.4.8, 3.4.8.1 and 3.4.8.2 wattage consumed will be determined by observing amperage and voltage throughout the test.

## 4.5.3 Environmental.

- 4.5.3.1 High temperature. To determine conformance to 3.6.1.1, the time delay shall be stabilized at a temperature of  $185^{\circ} \neq 5^{\circ}$ F and operated continuously for 10,000 operational cycles at 30  $\neq$  0.5 volts DC input and with output load at two amperes resistive. This test shall be conducted in still air.
- 4.5.3.2 Low temperature. After the high temperature test, the time delay shall be stabilized at -65° \$\frac{1}{2}\$ for a minimum of one hour with an input of 18 volts DC. After this period, the time delay shall be operated at the \$\frac{1}{4}0^{\text{O}}\$F temperature for 10,000 operational cycles with an input voltage of 19 \$\frac{1}{2}\$ 0.5 volts DC. During the cycling, the time delay shall be observed for conformance to 3.6.1.2.
- 4.5.3.3 Storage temperature (-65° and 185°F). To determine conformance to 3.6.1.3, the time delay shall be stored at ambient temperatures of 185°F and -65°F. Storage shall be for a period of eight hours at each temperature. This test shall be conducted in accordance with procedure I, conditions B and H of MIL-F-13926. Upon completion of the temperature cycling, the time delay shall be inspected for evidence of physical damage.
- 4.5.3.4 Shock. To determine conformance to 3.6.2, the time delay shall be tested in accordance with test condition C, method 205C (medium impact shock test) of MIL-SID-202.
- 4.5.3.5 Vibration. To determine conformance to 3.6.3, the time delay shall be mounted to simulate actual installation in use. The time delay shall then be vibrated in the direction of each of the three major axes as specified in method 204, test condition B of MIL-STD-202.
- 4.5.3.6 Humidity. To determine conformance to 3.6.4, the time delay unit shall be placed in the test chamber in its normal operating position and exposed to one complete humidity condensation cycle as specified in figure 2. Distilled or demineralized water having a PH value between 6.5 and 7.5 at / 77°F shall be used to obtain the desired humidity. The unit under test shall be placed no closer than six inches from the sides of the chamber and shall not be subject to radiant heat.
- 4.5.3.7 Water resistance. To determine conformance to 3.6.5, this test shall be conducted in accordance with procedure I of the rain test of MIL-F-13926.

- 4.5.3.8 Dustproofness. To determine conformance to 3.6.6, the time delay shall be tested in accordance with MIL-D-13570, with the exception that the test shall be conducted for a minimum of 24 hours, and the time delay operated at rated voltage (24 volts) during the entire test period.
- 4.5.3.9 Corrosion. To determine conformance to 3.6.7, the time delay shall be tested in accordance with test condition A of method 101 of MIL-STD-202 using a five percent salt solution.
- 4.5.3.10 Fungus. To determine conformance to 3.6.8, the time delay shall be tested in accordance with class 1, method B of MIL-F-13927 except the test period shall be a continuous 90 days. Time delays under this specification are scaled units and should not be operated during this test except possibly for final examination, and then only if practical.
- 4.5.3.11 Electromagnetic compatibility. To determine conformance to 3.9 the time delay shall be tested in accordance with the applicable provisions of MIL-E-55301 for tactical vehicle components.
  - 4.6 Inspection of preparation for delivery.
- 4.6.1 Materials and processes. The Government inspector shall, at unscheduled intervals, inspect all materials and processes involved in the preparation for delivery, to determine conformance to requirements of section 5 and specifications referenced therein. Any evidence of deviation from specified requirements shall be cause for refusal to conduct further inspection until objective evidence has been provided by the contractor that corrective action has been taken.

## 5. PREPARATION FOR DELIVERY

- 5.1 Preservation, packaging, packing and marking. Preservation, packaging, packing and marking shall be in accordance with the applicable packaging standard or packaging data sheet specified by the procuring activity (see 6.2).
  - 6. NOTES
- 6.1 Intended use. This time delay device is for controlling the interval of operation of a relay. Applications include the firing control on the Shillelagh.
  - 6.2 Ordering data. Procurement documents should specify the following:
    - (a) Title, number, and date of this specification.
    - (b) Address to which preproduction samples shall be sent (see 4.2).
    - (c) Selection of applicable packaging standard or packaging data sheet (see 5.1).

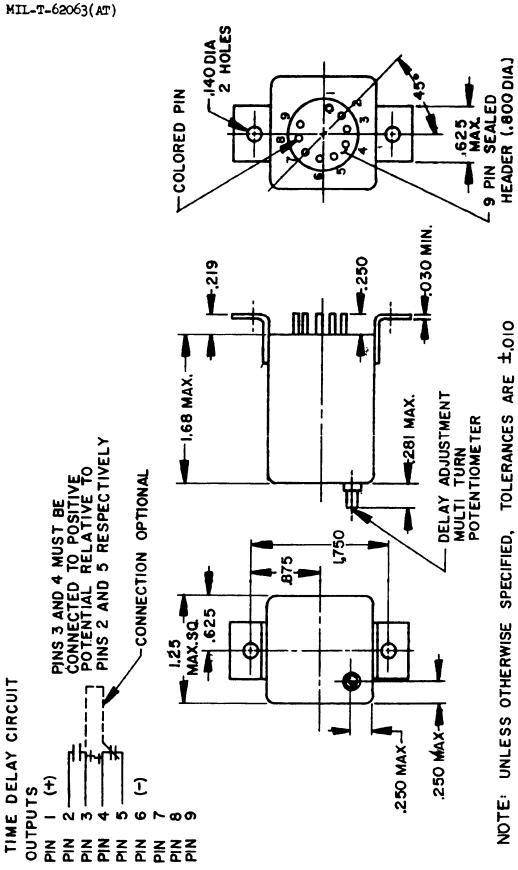
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Project No. 5945-A008



TIME DELAY-ENVELOPE AND MOUNTING

FIGURE (I)

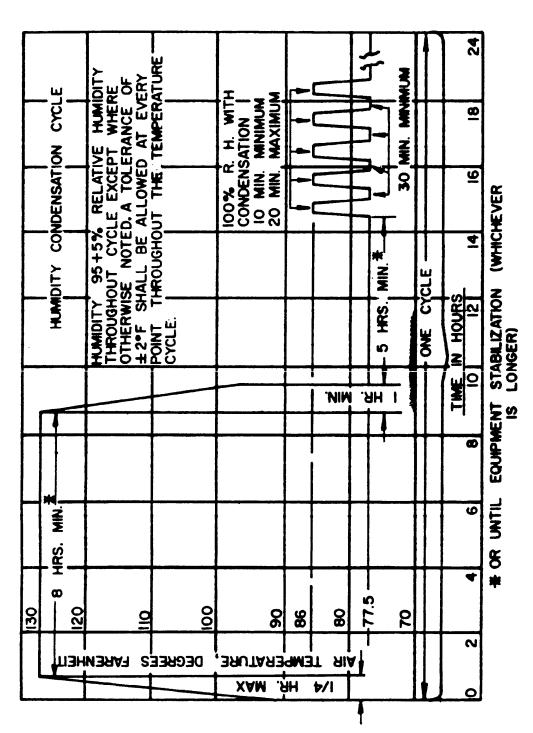


FIGURE 3 - HUMBITY CONDENSATION CYCLE

- 1	SPECIFICATION ANALYSIS SHEET	Form Approved					
	SPECIFICATION ANALYSIS SHEET	Budget Bureau No. 22-R255					
-1	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. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.						
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	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 - Optional)	DATE					
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DD . FORM 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.