

UNCLASSIFIED

AD NUMBER
ADA800193
CLASSIFICATION CHANGES
TO: unclassified
FROM: secret
LIMITATION CHANGES
TO: Approved for public release; distribution is unlimited.
FROM: Distribution authorized to DoD only; Administrative/Operational Use; 24 AUG 1943. Other requests shall be referred to Department of Defense, ATTN: Public Affairs Office, Washington, DC 20301. Pre-dates formal DoD distribution statements. Treat as DoD only.
AUTHORITY
SOD memo dtd 2 Aug 1960; SOD memo dtd 2 Aug 1960

THIS PAGE IS UNCLASSIFIED

Reproduced by
AIR DOCUMENTS DIVISION



HEADQUARTERS AIR MATERIEL COMMAND

WRIGHT FIELD, DAYTON, OHIO

The
U.S. GOVERNMENT

IS ABSOLVED

FROM ANY LITIGATION WHICH MAY
ENSUE FROM THE CONTRACTORS IN -
FRINGING ON THE FOREIGN PATENT
RIGHTS WHICH MAY BE INVOLVED.

REEL - C

548

A.T.I.

15542

SECRET

TSDIN FORM NO. 72
1 APR. '47

INTELLIGENCE T-2 SPECIAL ORDER SHEET

WF-(B)-O-12 DEC 47 5M

1. REFERENCE NUMBER 15542

TITLE Test specification for AN/APQ-1 carpet sweeper

AUTHOR(S) Monroe, R. B.; Rhiger, R. R. DATE _____

ORIG. AGENCY Harvard Univ. Q.A. NO. R-7

2. SECURITY	U	R	C	☒ S	TS	INTELLIGENCE	SOURCE	A	B	C	D	E	F
PRIORITY	1	2	3	DISCARD	CODE	INFO.	1	2	3	4	5	6	

3. SUB. HEADINGS: _____

ABSTRACT: _____

PREPARED BY: _____

DATE: _____

4. ☐ RETURN TO A.D.D. FOR CATALOGING ☐ RETAINED BY ANALYSIS DIVISION

☐ MICROFILM AND DISTRIBUTION

Air Document Division, T-2
AMC, W. Field
Micro. NO.
RC 548 F 15542

5. ☒ LOANED DOCUMENT. DO NOT MARK. HANDLE WITH CARE.

- ☐ 2. DISTRIBUTION LIMITED TO:
- ☐ 3. LIMITED DISTRIBUTION BY:
- ☒ 4. SEND ORIGINAL TO: TSRCG-4
- ☒ 5. MICROFILM AND SEND TO: TSRWF
- ☐ 6. PHOTOSTAT AND SEND TO:
- ☐ 7. 4 BY 5 AND SEND TO:
- ☐ 8.
- ☐ 9. FORWARD TO ANALYSIS DIVISION.

BY: S. S. DATE: 17 Dec 47

Preliminary

RADIO RESEARCH LABORATORY
HARVARD UNIVERSITY

SECRET

No. 7

August 24, 1943

TEST SPECIFICATION

FOR

AN/APQ-1 CARPET SWEEPER

SECRET

Notice: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act (U.S.C. 50:31, 32). The transmission of this document or the revelation of its contents in any manner to any unauthorized person is prohibited by law.

SECRET

Copy No.

RADIO RESEARCH LABORATORY
Harvard University

Written by: R. B. Monroe
R. R. Rhiger

SECRET

SECRET

-1-

RRL TEST SPECIFICATION NO. 7

AN/APQ-1 "CARPET SWEEPER"

I Introduction

This test specification outlines the required performance characteristics of the AN/APQ-1 "Carpet Sweeper" and gives a description of the methods of measuring the performance of this equipment used at this laboratory.

The AN/APQ-1 "Carpet Sweeper" is a combination transmitter and receiver, which automatically scans a predetermined frequency spectrum until a signal emanating from a radar station is received. It then locks itself on that frequency and for a predetermined time interval transmits a noise modulated jamming signal intended to render illegible the information presented to the radar station. Upon completing the period of transmission the "Carpet Sweeper", depending upon the setting of a switch, either:

- (a) determines whether the radar station is still transmitting, and if so, repeats its cycle of listening and jamming until the radar signal is no longer detected, or --
- (b) sweeps off the first signal frequency and proceeds until another signal is received and thereupon jams that signal for the selected time interval, after which it continues sweeping and jams each signal successively in the frequency range to which the equipment is adjusted.

The switch for selecting the (a) or (b) type of operation is located on the chassis inside the dust cover.

The "Carpet Sweeper" utilizes the same tubes and circuits when operating either as a transmitter or a receiver and therefore is, in effect, a "transceiver". The block diagram, shown in Fig. 1 illustrates how this is accomplished.

II Performance Characteristics

The chart given on page 3 outlines the performance requirements of the AN/APQ-1.

SECRET

SECRET

-2-

AN/APQ-1 "CARPET SWEEPER", cont'd.

III Tube Complement

<u>Quantity</u>	<u>Type</u>	<u>Function</u>
1	931	Noise Generator
1	6AC7	Video Amplifier
1	6AG7	Video Amplifier
1	6SN7GT	Amplifier and Detector
1	807	Modulator
1	2050	Control Tube
2	WE 368AS	Oscillators
	(or 703A)	
2	5R4GT	Rectifiers
	(or 5U4G)	
1	2X2	Rectifier

All of these tubes, with the exception of the 931 noise generator and the WE 368AS (or WE 703A), are listed on the Army-Navy preferred tube list.

IV Precautions During Service Acceptance Tests

The AN/APQ-1 "Carpet Sweeper" equipment is very similar to the RC-156/CYCD "Carpet Transmitter" which has already passed the Army service acceptance tests.

- (a) It is believed, however, that some trouble may be encountered under the most severe conditions of acceleration during the vibration test because of the relays used in the timing mechanism of this equipment. These relays and the mechanical timing equipment should be carefully watched during this test.
- (b) A type "N" antenna connector is used on the AN/APQ-1 equipment. The insulation in this connector at the present time is polystyrene, the softening point of which is 83 to 84° C. It is therefore recommended that a temperature of 80° C be used in the special, temperature only, non-operating test outlined in ARL Bulletin 102A.

SECRET

PERFORMANCE CHARACTERISTICS OF AN/APQ-1 "CARPET SWEEPER"		
SPECIFICATIONS	PERFORMANCE	METHOD OF TESTING
Frequency Range	460 to 600 megacycles	G.R. 720A* or equivalent frequency meter
Sweep Range	10 megacycles at 480 megacycles 20 megacycles at 560 megacycles	G.R. 720A* or equivalent frequency meter
Power Output	Greater than 4 watts (output will vary with frequency, but should not drop below this value).	RRL type J-500 wattmeter--Lamp load tests are not satisfactory since the AN/APQ-1 must operate into a load which has less than a 2 to 1 standing wave ratio over the swept band.
Spectrum of Modulated Transmission	Varies with conditions of tuning, but can be stated to be approximately 0.4 watts/megacycle at 0.6 megacycles, and 1.0 watt/megacycle at 0.4 megacycles.	RRL type D-1203 Spectrum Analyzer
Sweep Rate	Approximately 26 megacycles/second, or one complete sweep in approximately 1.5 seconds.	
Jamming Period	Adjustable in six steps from 20 to 120 seconds.	
Locking Accuracy	Dependent on such factors as the radar pulse width, pulse repetition rate and signal intensity, - But at a PRF of 2000 with 2 microsecond pulses should be approx. 1.5 megacycles at 10 millivolt signal level (as measured at input to equipment) and approx. 0.5 megacycles at 50 millivolt signal level and gradually decreasing accuracy at higher signal levels.	Measured by RRL F-2200* Carpet Pulser and F-2300* Carpet Checker - or - F-2200* Carpet Pulser and G.R. 720A* Frequency Meter.
Sensitivity in Receive Position	Operates on input signals as low as 10 millivolts, as measured at input.	RRL type F-2200* Carpet Pulser and F-2300* Carpet Checker.
Input Power	311 watts, Transmitting position 276 watts, Receiving position	Wattmeter
Power Source Variation	30 watts, 28 volts d.c. 80 or 115 volts, 4.0%	Voltmeter and F-2200* Carpet Pulser and F-2300* Carpet Checker.
Power Factor	Approximately 95% at 400 cps.	Wattmeter, Voltmeter, and Ammeter
Size	Standard Aircraft Rack	
Weight	55 pounds	
* This equipment will be provided to the Laboratory conducting the service acceptance test by RRL.		

SECRET

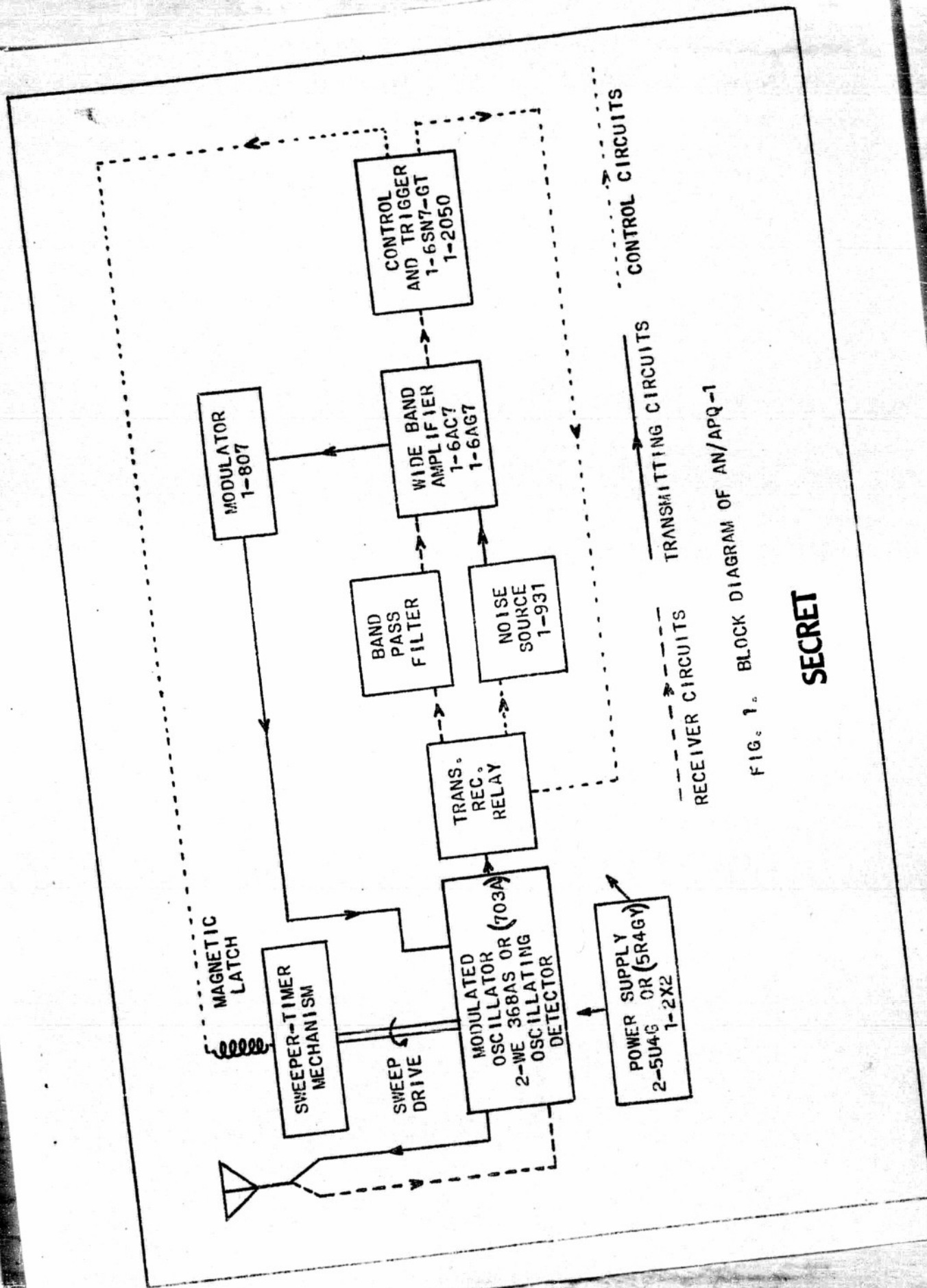


FIG. 1. BLOCK DIAGRAM OF AN/APQ-1

SECRET

CONFIDENTIAL

RADIO RESEARCH LABORATORY
HARVARD UNIVERSITY 430801

ARMY, NAVY, C.A.A., AND BRITISH EQUIPMENT SPECIFICATIONS

	ARMY AIRBORNE EQUIPMENT	NAVY AIRBORNE EQUIPMENT	NAVY MARINE EQUIPMENT	C. A. A.	BRITISH AIRBORNE EQUIPMENT
VIBRATION	SIMPLE HARMONIC ACTION IN ANY DIRECTION RELATIVE TO THE MOUNTING AXES. FREQUENCY RANGE: 10 - 55 CPS AMPLITUDE: 0.05 INCH (TOTAL EXCURSION 0.05 INCH) TIME: 4 HOURS	SIMPLE HARMONIC VIBRATION IN ANY PLANE. FREQUENCY RANGE: 10 - 30 CPS AMPLITUDE: 0.0125 INCH (TOTAL EXCURSION 0.0625 INCH) TIME: 4 HOURS	VIBRATION IN A PLANE PERPENDICULAR TO THE PLATFORM. FREQUENCY RANGE: 0 - 33.3 CPS AMPLITUDE: 0.0025 INCH TIME: 30 MINUTES	AMPLITUDE AND WAVEFORM TO PRODUCE VERTICAL ACCELERATION OF 10G. FREQUENCY RANGE: 30 - 50 CPS TIME: 4 HOURS	EQUIPMENT MUST WITHSTAND AND CONTINUE TO FUNCTION UNDER CONTINUOUS EXPOSURE TO VIBRATION OF THE ABOVE CHARACTER CORRESPONDING TO ENGINE SPEED AND MUST SHOW NO EVIDENCE OF MECHANICAL RESONANCE WITHIN THE RANGE 20 TO 100 CYCLES PER SECOND.
HUMIDITY	HUMIDITY RANGING UP TO 95% RELATIVE AT ALL POSSIBLE TEMPERATURES FOR LONG PERIODS OF TIME.	HUMIDITY WILL VARY FROM LOW VALUES TO POINT OF SATURATION.	WITH AN AMBIENT TEMPERATURE OF 40° TO 45°C, THE HUMIDITY SHALL BE HELD AT 50% FOR ONE-HALF HOUR, THEN CHANGED TO 90% FOR ONE HOUR, AND THEN BACK TO 50% FOR ONE HOUR.	EQUIPMENT WILL BE PLACED IN AN ATMOSPHERE OF CLEAN VAPOR MAINTAINED AT A HUMIDITY OF 90%, AT TEMPERATURE OF 50°C, FOR A PERIOD OF 40 HOURS.	RELATIVE HUMIDITIES UP TO 100%.
TEMPERATURE	TEMPERATURES RANGING FROM -55°C TO +71.1°C; THE TEMPERATURE MAY VARY AT A RATE AS HIGH AS 2° PER MINUTE. AS A SPECIAL TEMPERATURE-ONLY CONDITION, THE EQUIPMENT, NON-OPERATING, SHALL BE SUBJECTED TO AN AMBIENT TEMPERATURE OF 50°C FOR A PERIOD NOT TO EXCEED 15 MINUTES. WHILE STILL SUBJECTED TO THIS TEMPERATURE, IT SHALL BE FULLY OPERATED FOR A PERIOD OF FIFTEEN MINUTES.	THE EQUIPMENT MUST BE DESIGNED TO OPERATE IN ANY AMBIENT TEMPERATURE BETWEEN -32°C TO +55°C, AND IN RELATIVE HUMIDITIES FROM LOW VALUES UP TO 95%.	THE AMBIENT TEMPERATURE SHALL BE KEPT AT 50°C. THE HUMIDITY IS KEPT AT 50% OR LESS.	THE EQUIPMENT MUST OPERATE IN TEMPERATURES FROM +55°C TO -35°C.	APPARATUS SHOULD BE SUITABLE FOR USE UP TO 55°C AND WITHSTAND EXPOSURE TO AMBIENT TEMPERATURES FROM -40°C TO -110°C.
SHOCKS	THE EQUIPMENT SHALL BE CAPABLE OF WITHSTANDING ACCELERATION AND SHOCK EQUIVALENT TO A FORCE OF 10G APPLIED FOR NOT LONGER THAN 10 MINUTES, IN ANY DIRECTION WITH RESPECT TO THE MOUNTING AXES. THE EQUIPMENT SHALL BE OPERATED IN ANY POSITION INCLUDING COMPLETE INVERSION.	THE EQUIPMENT SHALL BE DESIGNED TO WITHSTAND A MAXIMUM ACCELERATION OF 50 G (257.7 FT./SEC ²) APPLIED IN ANY DIRECTION.	EQUIPMENT IS TO BE SUBJECTED TO SHOCKS OF THE FOLLOWING CHARACTERISTICS: IT SHALL BE SUBJECTED TO A SINGLE BLOW OF 50 G (257.7 FT./SEC ²) IN ANY DIRECTION. APPROXIMATELY 50% OF ITS NORMAL POSITION AND ALLOWING IT TO FREELY STRIKE THE EQUIPMENT, A 1/2 X 2-STEEL STRAP MAY BE CLAMPED ACROSS THE TOP FRAME FOR STIFFENING, IF DESIRED.	AT LEAST 100 FREE DROPS AS FOLLOWS: 4 DROPS FROM 6 INCHES 16 DROPS FROM 12 INCHES 50 DROPS FROM 18 INCHES ONE INCH THICK COMMERCIAL SPONGE RUBBER MAY BE INTERPOSED BETWEEN THE EQUIPMENT AND THE FLOOR AS A DAMPING MEDIUM.	EQUIPMENT SHOULD BE CAPABLE OF WITHSTANDING SHOCKS OF THE ABOVE CHARACTER IN ANY DIRECTION WITHOUT DAMAGE AND SHOULD CONTINUE FUNCTIONING UNDER ACCELERATIONS UP TO 5G IN ANY DIRECTION.
PRESSURES	BAROMETRIC PRESSURE RANGING FROM 2.5 TO 30.000 FT. TO 30 INCHES OF MERCURY. THE PRESSURE MAY VARY AT A RATE AS HIGH AS 0.5 INCHES OF MERCURY PER SECOND.	ALTITUDE UP TO 30,000 FT.	-----	PRESSURES FROM 29.92 TO 0.52 INCHES OF MERCURY (SEA LEVEL TO 31,000 FT. ALTITUDE.)	ALTITUDE UP TO 50,000 FT.
LINE VOLTAGE	EQUIPMENT TO BE CAPABLE OF OPERATING ON 115V AC SUPPLY. NO DAMAGE SHALL OCCUR TO EQUIPMENT, EXCEPT TUBES, IF THE VOLTAGE SHOULD RISE TO 30 VOLTS.	EQUIPMENT SHALL NOT BE DAMAGED BY CONTINUOUS EXPOSURE TO A 20% INCREASE IN THE NOMINAL LINE VOLTAGE.	THE LINE VOLTAGE SHALL BE VARIED FROM 105V TO 115V ABOVE THE NORMAL VALUE DURING A PERIOD OF 5 MINUTES.	20% ABOVE AND 10% BELOW NORMAL FOR 105V TO 115V. 10% ABOVE AND 10% BELOW NORMAL FOR 105V TO 115V. 10% ABOVE AND 10% BELOW NORMAL FOR 105V TO 115V. 10% ABOVE AND 10% BELOW NORMAL FOR 105V TO 115V.	THE EQUIPMENT SHOULD BE CAPABLE OF WITHSTANDING OVERLOAD CAUSED BY AN INCREASE OF 20% IN THE SUPPLY VOLTAGE FOR A PERIOD OF 3 MINUTES.

NOTE: THE ABOVE CHART IS NOT INTENDED TO DESCRIBE THE COMPLETE TESTS REQUIRED BY THE VARIOUS SERVICES, BUT TO OUTLINE THE REQUIREMENTS OF TESTING EQUIPMENT TO PERFORM THESE TESTS. FOR COMPLETE TESTING PROCEDURE, SEE THE FOLLOWING BULLETINS:

SIGNAL CORPS BULLETIN AR-102-A
NAVY DEPT. BULLETIN RE-13A-555A
DESIGN C. A. A. MANUAL 16
STANDARD PRACTICE IN THE DESIGN OF AIRBORNE RADIO EQUIPMENT

NON-ALN

REEL - C

548

A.T.I.

15542