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CHRYSLER CORP CENTER LINE MI WARREN DEFENSE DIV
ELECTROMAGNETIC COMPATIBILITY AND ELECTRICAL TRANSIENT TEST M60--ETC(U)
DEC 77 J G NELSON

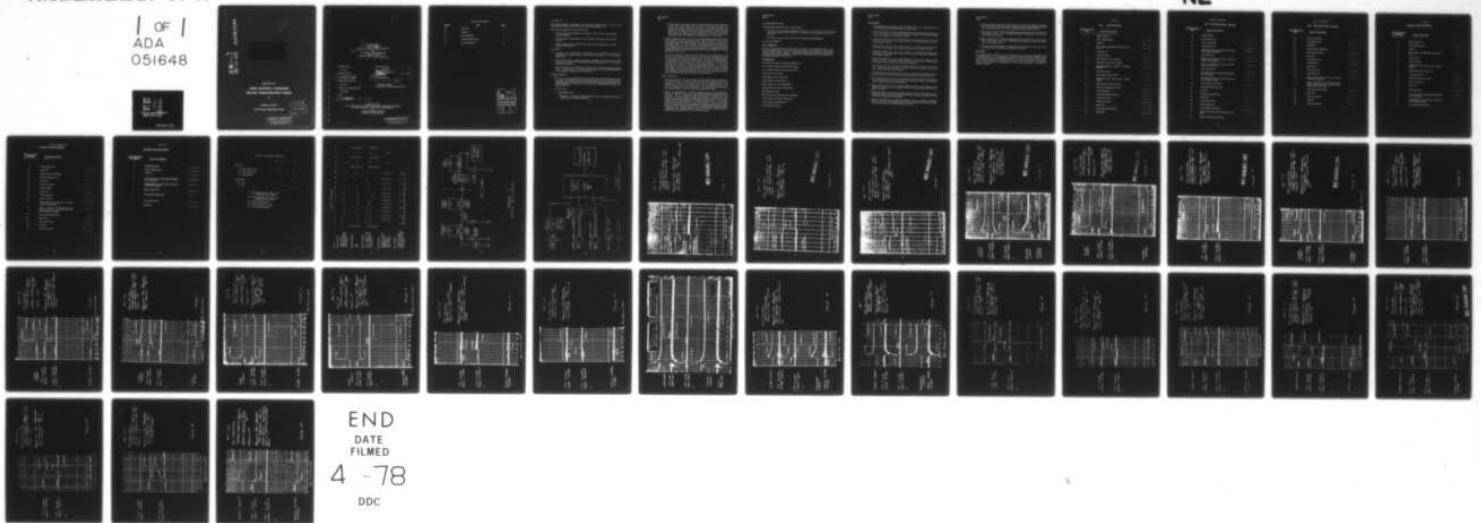
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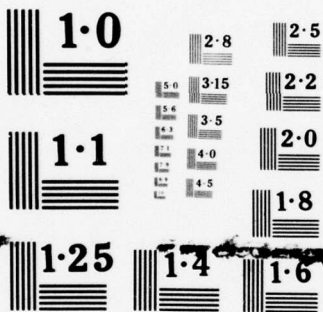
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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

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PREPARED FOR
ARMY MATERIEL COMMAND
PROJECT MANAGER-M60 TANKS

BY

DEFENSE DIVISION
CHRYSLER CORPORATION

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⑨
SUPPLEMENT
TEST REPORT
⑥
ELECTROMAGNETIC COMPATIBILITY
ELECTRICAL TRANSIENT TEST
M60A1 (P1) TANK
THERMAL SIGHT (TTS) AN/VSG-2

REQUESTED BY:

A. Abrew

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PREPARED FOR
U.S. ARMY TANK-AUTOMOTIVE MATERIEL READINESS COMMAND
PROJECT MANAGER - M60 TANK DEVELOPMENT
BY
WARREN DEFENSE DIVISION
CHRYSLER CORPORATION

400103

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1.0 PREFACE

The Electromagnetic Compatibility and Electrical Transient Test is part of the qualification test (PQT-C) plan M60A1 (P1) Tank Thermal Sight (TTS).

The data accumulated by this test is to provide:

- o Accurate Electrical Transient Load profile to the TTS at various vehicle battery conditions.
- o Electromagnetic Compatibility of the TTS while functioning various vehicle systems.
- o Baseline silent watch profile for the TTS with vehicle battery at a full and quarter charge condition.

2.0 OBJECT

1. Determine the electromagnetic compatibility of the M60A1E3/TTS system by functioning the vehicle systems and observing anomalies in the TTS system performance.
2. Determine the effect of the vehicle battery condition on the operation of the TTS system with the batteries at full charge, quarter charge, and then with the vehicle batteries disconnected.
3. Determine the time for a TTS silent watch with the vehicle batteries at full charge and at a quarter charge. Then determine the ability of the vehicle batteries to obtain an engine restart after this watch period.

3.0 CONCLUSIONS

1. EMC Test: The visual monitor of both the gunner's day and thermal sight and the commander's thermal sight verified satisfactory operation of the TTS system while exercising various load switching functions and radio transmitting frequencies. The target signature presentation of the TTS system, for all operations, was clear and without distortion.
2. Transient Test:
 - A. Visual Observations:
 1. Day Sight: The target signature presentation of the daylight sight was not affected by any transient conditions.

TEST REPORT

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2. Thermal Sight: Both sights provide momentary washout or image fading and a slight reticle and target image tilt whenever the hydraulic power pack and/or turret blower motors are activated. The observed anomaly was independent of engine operation and/or battery condition. The tilt condition remains for the duration of the power pack and/or motor operation cycle. This reticle and image tilt did not cause the TTS system to lose target boresight and was not a distraction in the operation of the TTS system.

B. Voltage Transients Levels: The most severe low voltage transient occurred for the conditions of power pack and/or turret blower operation, with the engine idling and the batteries disconnected or the engine off with the batteries at a low charge state. For these conditions, the voltage input at the TTS power converter dropped to 13 vdc for the first condition and 13.5 vdc for the second. These negative going transients are of short duration (10 milliseconds) and the voltage returned to an acceptable supply level for the remainder of the power pack/blower motor cycle.

The next most severe transient was the result of the switching of the TTS system from standby to the on condition. This switching was reflected on both the voltage and the current measuring points. The current switching transient recorded indicated a momentary current surge to 35 amps, then returning to a normal TTS system current drain of 10 amps. The voltage recorded for this load switching was a sharp 5.0 vdc drop in the supply voltage to the TTS power converter, with a return to normal operating voltage (24 vdc) after the initial power surge. The above switching transients (worst case) were achieved with the battery disconnected and idling at 750 rpm. Both this transient and all other transients, which were considered to be minor in nature, did not visibly and/or functionally affect the operation of the TTS system.

3. Silent Watch Test:

A. Full Charge Batteries: The silent watch on the full charge batteries lasted for a period of nine hours. The vehicle under test obtained an engine restart at the completion of the nine hour watch period, with the specific gravity of the batteries still at 50% of full charge level. This data indicates that the TTS system operating within a vehicle that has a set of batteries at the full charge state would be able to perform an eight hour silent watch mission.

B. Quarter Charge Batteries: The silent watch testing on the vehicle battery system at a quarter of full charge (with TTS laid on target) was performed for two hours. At the completion of this watch period, an engine restart was achieved. The specific gravity reading prior to engine restart was 1.125. The battery discharge was continued to a specific gravity level of 1.120, an engine restart was not accomplished at this specific gravity level. The vehicle batteries were allowed to rest for a period of one hour; at the end of this rest period, an engine restart was accomplished. The specific gravity prior to engine restart was 1.125. Therefore, given the same conditions, TTS current, battery temperature, and cranking current, a two hour TTS silent watch mission is possible when the batteries are at a 25% state of charge.

4.0 RECOMMENDATIONS

Additional engineering studies are recommended to:

1. Determine if the momentary washout and the reticle tilt condition caused by the power pack/turret blower motor operation is detrimental to satisfactory TTS system operation.
2. Determine a means to correct/minimize this washout/tilting condition.

5.0 TEST DISCUSSION

Test Configuration

The test vehicle utilized for this test was the M60A1-P1 tank designated PQ-1. The current sensors/shunts and the interconnecting cabling were installed into the vehicle wiring network as shown in Figure 1. The received measurement signals were conditioned as shown in Figure 2 and recorded on magnetic tape. Data reduction was accomplished via oscillograph recordings. (Strip Chart)

Test Equipment

14 Channel Tape Recorder Sangamo MDS Sabre VI

Current Sensor 1000 amp FW Bell MDL IA5021

Current Sensor 2000 amp FW Bell MDL IA5021

Shunt 100 amp, 50 millivolt

Power Supply, Kepco MDL SC-325

Power Supply, HP, Model 6205 B

Digital Voltmeter, Fluke Model 8000A

Oscilloscope, Tektronix, 214 Dual Trace

Oscillograph Recorder

Battery Hydrometer Specific Gravity Reading

Thermometer, Electrolyte Temperature

Buffer Amplifier, Chrysler Built

Interconnecting Cabling

TEST REPORT

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Test Procedure

1. Electromagnetic compatibility (EMC) of tank/TTS system, with vehicle batteries at a full charge condition, specific gravity of $1.280 \pm .015$.
2. Electrical transient test, with vehicle batteries at a full charge, specific gravity of $1.280 \pm .015$, engine at idle and performing test procedure Table II while visually monitoring the gunner's day sight for movement.
3. Electrical transient test, with vehicle batteries at full charge, engine at idle and performing test procedure with visual monitor of both commander's and gunner's thermal sight (Table II).
4. Electrical transient test with vehicle batteries at full charge and engine OFF. Performed test procedure with visual monitor of gunner's day sight (Table II).
5. Electrical transient test with vehicle batteries at full charge and engine OFF. Performed test procedure with visual monitor of both commander's and gunner's thermal sight (Table II).
6. Electrical transient test with vehicle batteries at 25% of full charge, specific gravity of $1.190 \pm .015$, engine idle and performing test procedure (Table II) with visual monitor of the gunner's day sight for any movement.
7. Electrical transient test with vehicle batteries at 25% of full charge and engine at idle. Performed test procedure (Table II) with visual monitor of both the commander's and gunner's thermal sight.
8. Electrical transient test with vehicle batteries disconnected and the engine at idle, performed test procedure (Table II) with visual monitor of the gunner's day sight.
9. Electrical transient test with the vehicle batteries disconnected and the engine at idle condition, performed test procedure (Table II) while visually monitoring both the commander's and gunner's thermal sight.
10. Electrical transient test with vehicle batteries at 25% of full charge with the engine OFF, performed test procedure (Table II) while visually monitoring the gunner's day sight.
11. Electrical transient test with the vehicle batteries at 25% of full charge and the engine OFF, performed test procedure (Table II) with visual monitoring of both the commander's and gunner's thermal sight.
12. Electrical transient test with vehicle batteries at 25% of full charge, the engine OFF, and while the turret hydraulic power pack is running, perform test procedure (Table III) with visual monitoring of gunner's day sight.

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13. Electrical transient test with vehicle batteries at 25% of full charge, the engine OFF, and the turret hydraulic power is running, performed test procedure (Table III) with visual monitoring of both the commander's and gunner's thermal sight.
14. Silent watch test, with TTS ON, target acquisition achieved and the batteries at a full charge of $1.280 \pm .015$. Determine the ability of batteries to start vehicle after a 9 hour silent watch.
15. Silent watch test, with TTS ON, target acquisition achieved and the batteries at 25% of full charge. Determine the ability of the batteries to start the vehicle after a 2 hour silent watch.
16. Determine the electromagnetic compatibility of the TTS system with that of the tank radio transmitter while the transmitter is operating.

Test Results

The voltage/current waveforms for all test sequence were reviewed for significant load switching transients. The oscillograph records for the load switching transients (worst case condition) are shown in Figures 3 through 29. All other recorded data (strip chart) or load switching transients, not enclosed in this report, were of the minor to non-existent nature. A color movie film representative of this noted washout/tilting is available for visual presentation.

TABLE I

EMC TEST PROCEDURE

TEST SEQUENCE EMC	VEHICLE FUNCTION	
1	Master switch ON.	_____
2	TTS in standby mode.	_____
3	TTS ON.	_____
4	Start engine and adjust RPM (not in test A or C).	_____
5	Computer ON.	_____
6	Press HEP switch.	_____
7	Stat/moving switch to MOVING.	_____
8	Boresight/norm. switch to NORM.	_____
9	Manual/rangefinder switch to RANGE-FINDER.	_____
10	Press reset button.	_____
11	Mode select switch to TEST.	_____
12	Repeatedly press reset button to obtain 1850 m.	_____
13	Personnel heater switch to ON.	_____
14	Personnel heater switch to OFF.	_____
15	Cupola power ON.	_____
16	Cupola gun safety switch ON.	_____
17	Cupola power OFF.	_____
18	Intercom amp ON.	_____
19	Radio ON.	_____
20	Key transmitter (ON/OFF).	_____
21	Radio OFF.	_____

TABLE I (continued)

EMC; TEST PROCEDURE - Continued

TEST SEQUENCE EMC	VEHICLE FUNCTION
22	Intercom OFF.
23	Turret blower ON.
24	Turret blower OFF.
25	Turret power ON.
26	Depress main gun and rotate turret until deck clearance actuates.
27	Stab system ON.
28	Rotate turret until main gun is pointed forward and depressed.
29	After a minimum of three power pack cycles, turn stab OFF.
30	Turret power OFF.
31	Turn dump valve to drop hydraulic pressure or move handles.
32	Simultaneously turn ON turret power and turret blower switches.
33	Turret blower switch OFF.
34	Personnel heater switch ON.
35	Stab ON.
36	Intercom amp switch ON.
37	Radio ON.
38	Cupola power OFF.
39	Turret blower ON.
40	Key transmitter ON/OFF.
41	Rotate turret until deck clearance actuates.
42	Rotate turret gun is over front.

TABLE I (continued)

EMC; TEST PROCEDURE - Continued

TEST SEQUENCE EMC	VEHICLE FUNCTION	
43	Turret blower OFF.	_____
44	Cupola power OFF.	_____
45	Radio OFF.	_____
46	Intercom amp. switch OFF.	_____
47	Personnel heater OFF.	_____
48	Stab. OFF	_____
49	Turret power OFF	_____
50	Computer OFF	_____
51	Engine OFF.	_____
52	Turret power ON.	_____
53	Stab system ON.	_____
54	Rotate turret until main gun is pointed forward and depressed.	_____
55	After a minimum of three power pack cycles, place the turret blower ON and record three more cycles.	_____
56	Turret blower switch OFF.	_____
57	Stab. OFF.	_____
58	Turret power OFF.	_____
59	TTS OFF.	_____
60	Master switch OFF.	_____

TABLE II
TRANSIENT TEST PROCEDURE

<u>TEST SEQUENCE TRANSIENT</u>	<u>VEHICLE FUNCTION</u>	
1	Master switch ON.	_____
2	TTS in standby mode.	_____
3	TTS ON.	_____
4	Start engine and adjust RPM (not in test A or C).	_____
5	Computer ON.	_____
6	Press HEP switch.	_____
7	Repeatedly press reset button to obtain 1850 m.	_____
8	Personnel heater switch to ON.	_____
9	Cupola power ON.	_____
10	Cupola gun safety switch ON.	_____
11	Intercom amp ON.	_____
12	Radio ON.	_____
13	Stab system ON.	_____
14	Turn dump valve to drop hydraulic pressure or move handles.	_____
15	Simultaneously turn ON turret power and turret blower switches.	_____
16	Turret blower switch OFF.	_____

TABLE II (continued)
TRANSIENT TEST PROCEDURE

<u>TEST SEQUENCE TRANSIENT</u>	<u>VEHICLE FUNCTION</u>	
17	Cupola power OFF.	_____
18	Radio OFF.	_____
19	Intercom amp. switch OFF.	_____
20	Personnel heater OFF.	_____
21	Stab. OFF	_____
22	Turret power OFF	_____
23	Computer OFF	_____
24	Engine OFF.	_____
25	Turret power ON.	_____
26	Stab system ON.	_____
27	Rotate turret until main gun is pointed forward and depressed.	_____
28	After a minimum of three power pack cycles, place the turret blower ON and record three more cycles.	_____
29	Turret blower switch OFF.	_____
30	Stab. OFF.	_____
31	Turret power OFF.	_____
32	TTS OFF.	_____
33	Master switch OFF.	_____

TABLE III

TRANSIENT TEST PROCEDURE

TEST SEQUENCE TRANSIENT	VEHICLE FUNCTION	
1	Master switch ON.	_____
2	TTS in standby mode.	_____
3	TTS ON.	_____
4	Turn dump valve to drop hydraulic pressure or move handles.	_____
5	Simultaneously turn ON turret power and turret blower switches.	_____
6	Master switch OFF.	_____
7	Turret blower switch OFF.	_____
8	Turret power OFF	_____
9	TTS OFF.	_____

TABLE IV TTS TEST CONDITIONS

	A	B	C	D	E
Batteries:					
(1) High ($1.280 \pm .015$)	X	X	•		
(2) Low ($1.190 \pm .015$)			X	X	
(3) Disconnected					X
Engine Speed:					
(4) Off	X		X		
(5) Idle		X		X	X

- (1) Specific gravity avg. $1.280 \pm .015$
(approximate full charge)
- (2) Specific gravity avg. $1.190 \pm .015$
(approximate 1/4 charge)
- (3) Batteries disconnected
- (4) Without alternator support
- (5) With alternator support

TABLE V TEST MATRIX

Tests	1	2	3	4	5	6	7	8	9	10	11	12	12A	12B	13	14	15	16	17
Test Procedure																			
Table I EMC	X																		
Table II Transient				X	X	X	X	X	X	X	X		X						
Table III Transient														X					
Silent Watch																X			X
Engine Condition																			
Off																			
Idle				X	X	X	X	X	X	X	X		X						X
Battery Condition																			
S.P. 1.280 + .015				X	X	X	X	X	X	X	X		X						
S.P. 1.190 + .015				X	X	X	X	X	X	X	X		X						
S.P. Temperature Disconnected				X	X	X	X	X	X	X	X		X						
Recorded Data																			
Generator Current				X	X	X	X	X	X	X	X		X						
System Current				X	X	X	X	X	X	X	X		X						
TTS Current				X	X	X	X	X	X	X	X		X						X
TTS Voltage				X	X	X	X	X	X	X	X		X						X
Battery Voltage				X	X	X	X	X	X	X	X		X						X
Visual Monitor																			
Gunners Day Sight				X	X	X	X	X	X	X	X		X						
Gunners Thermal Sight				X	X	X	X	X	X	X	X		X						X
Cmndr Thermal Sight				X	X	X	X	X	X	X	X		X						X
Film Record				A/R	A/R	A/R	A/R	A/R	A/R	A/R	A/R		A/R						A/R

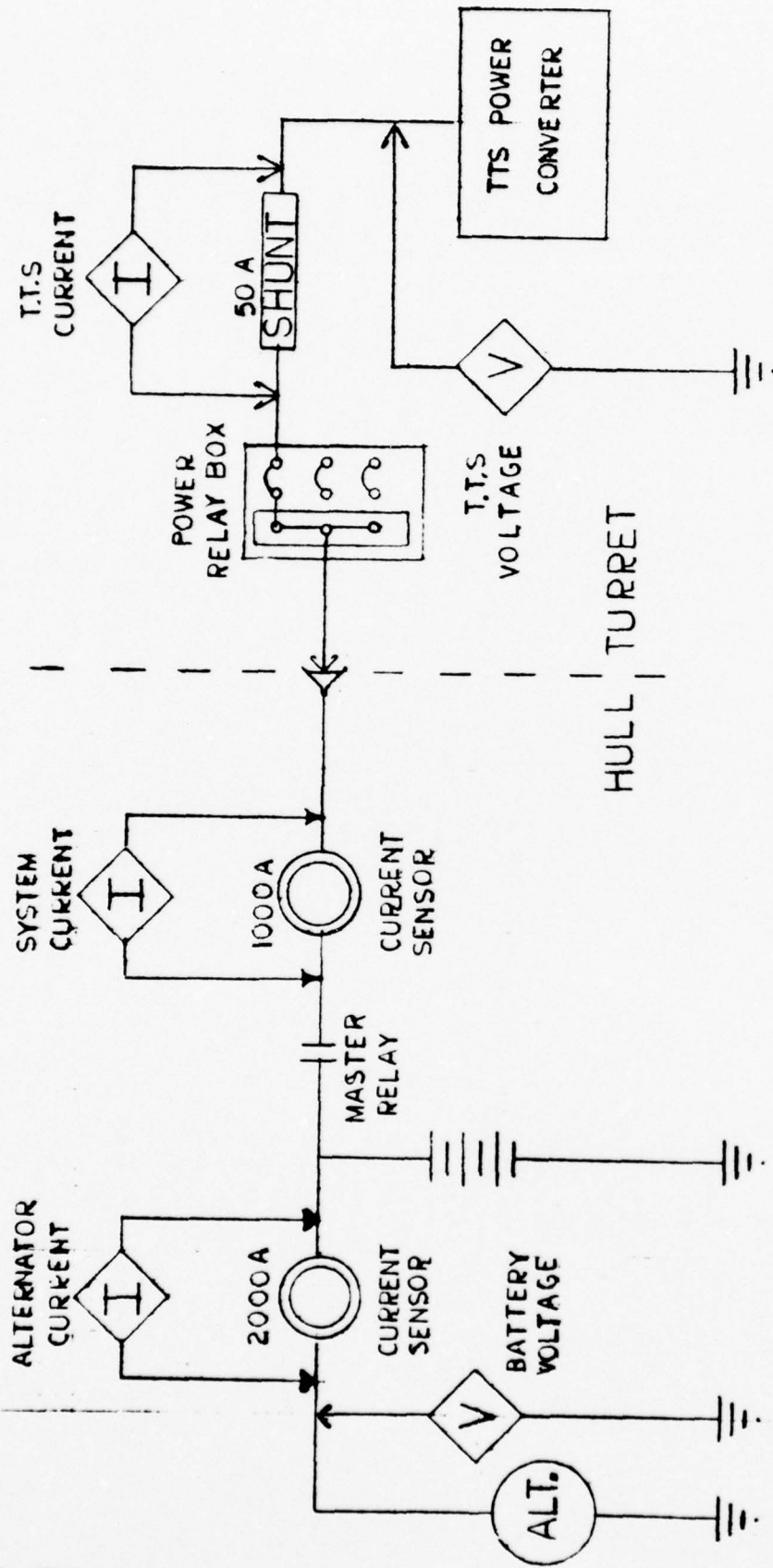


FIGURE 1
VEHICLE TEST POINTS

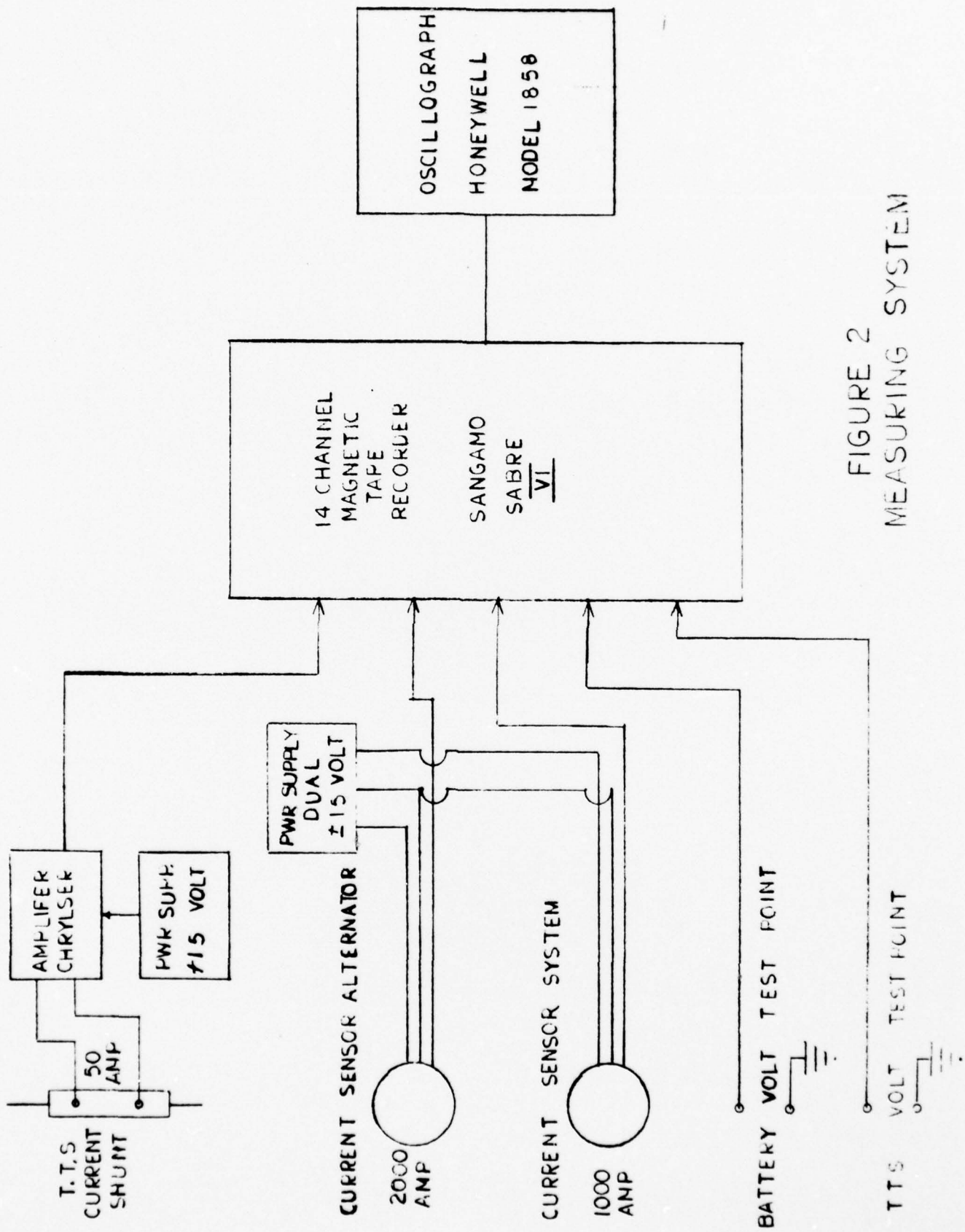


FIGURE 2
MEASURING SYSTEM

TEST # 3

TEST CONDITIONS

BATTERY SPECIFIC GRAVITY 1.275
BATTERY ELECTROLYTE TEMP 76°F
ENGINE

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: STEP 2
VEHICLE FUNCTION: TTS in Standby mode



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FIGURE 3

TEST #3

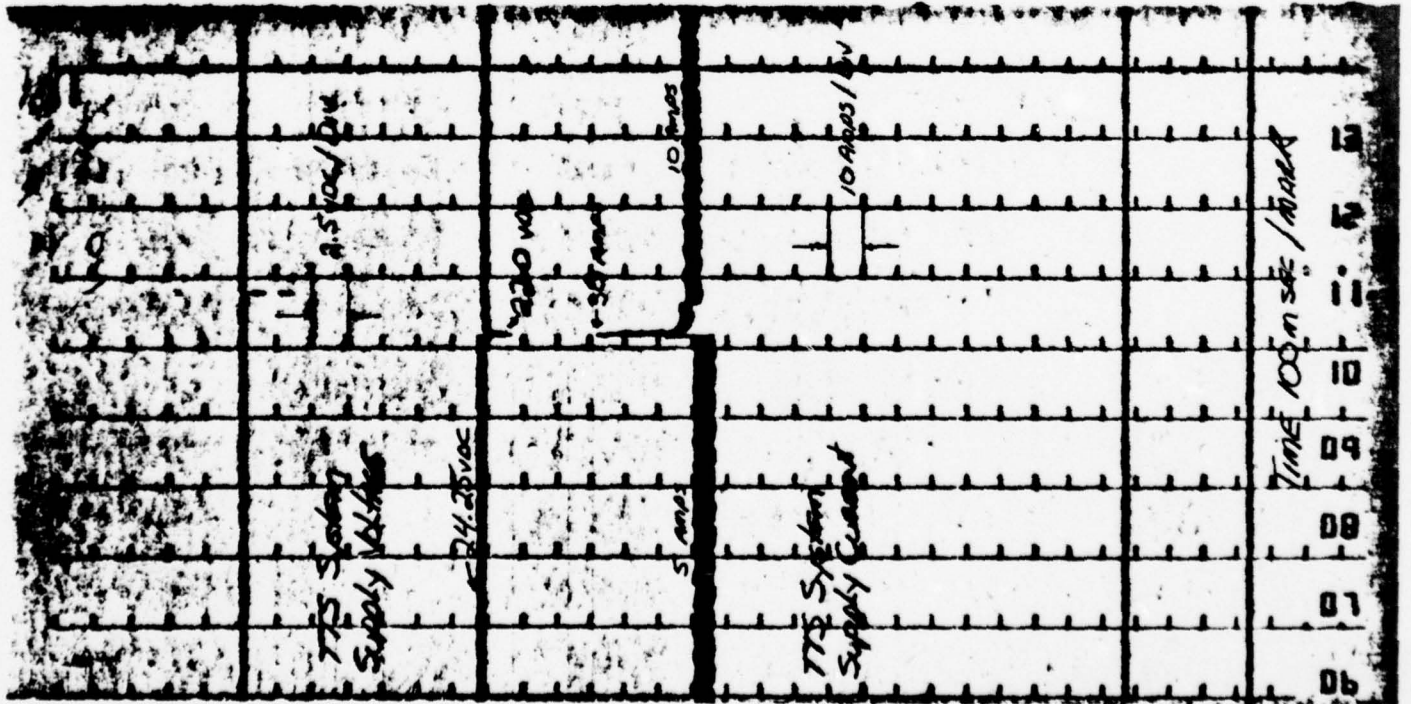
TEST CONDITIONS

BATTERY SPECIFIC GRAVITY 1.275
BATTERY ELECTROLYTE TEMP 76 OF
ENGINE OFF

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: STEP 3

VEHICLE FUNCTION: T.T.S. ON



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FIGURE 4

TEST # 3

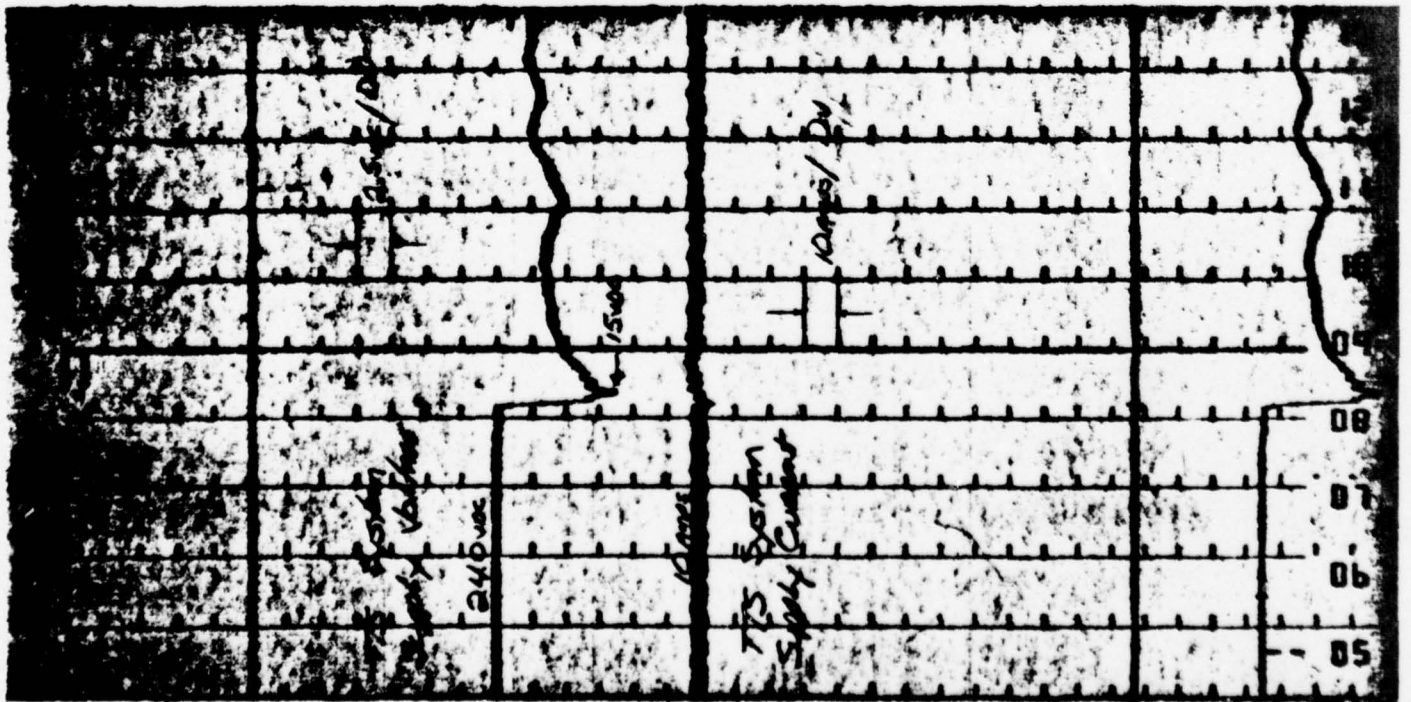
TEST CONDITIONS

BATTERY SPECIFIC GRAVITY 1.275
BATTERY ELECTROLYTE TEMP 76°F
ENGINE OFF

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: STOP

VEHICLE FUNCTION: START ENGINE & ADJUST
RAMP.



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FIGURE 5

TIME 100 msec/Mark

TEST # 3

TEST CONDITIONS

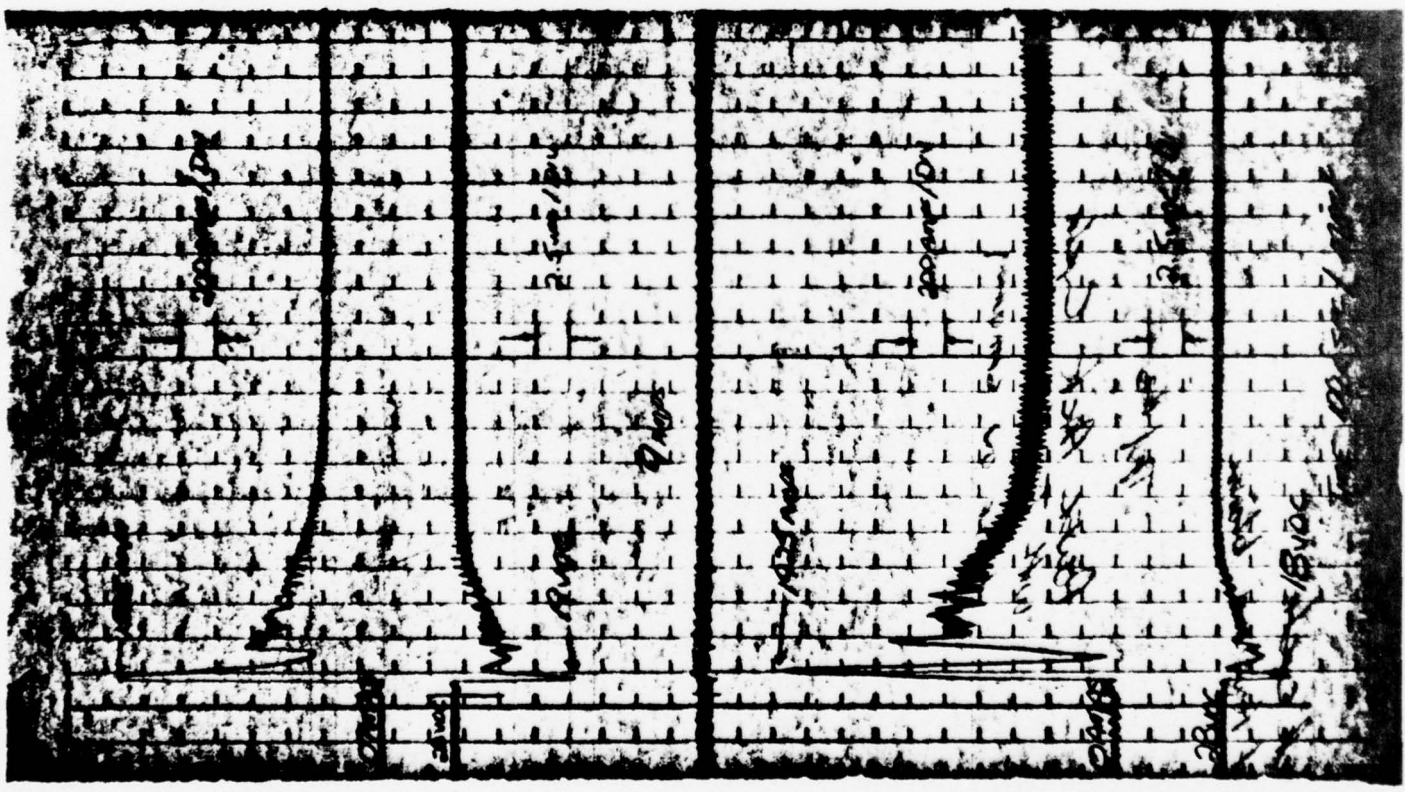
BATTERY SPECIFIC GRAVITY 1.275
BATTERY ELECTROLYTE TEMP 70°F
ENGINE AT IDLE ~ 700 RPM

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: STEP 15

SIMULTANEOUSLY TURN
ON TURBO PUMP &
TURBO BLOWER SWITCHES

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FIGURE 6



System Current

TTS System Supply Voltage

TTS System Supply Current

Generator Current

BATTERY VOLTAGE

TEST #3

TEST CONDITIONS

BATTERY SPECIFIC GRAVITY

1.275

BATTERY ELECTROLYTE TEMPERATURE

76 OF

ENGINE OFF

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: SMO. 28

BUSS BAR WITH

INVEST BLOWER OFF

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FIGURE 7



System Current

TTS System Supply Voltage

TTS System Supply Current

BATTERY-1 VOLTAGE

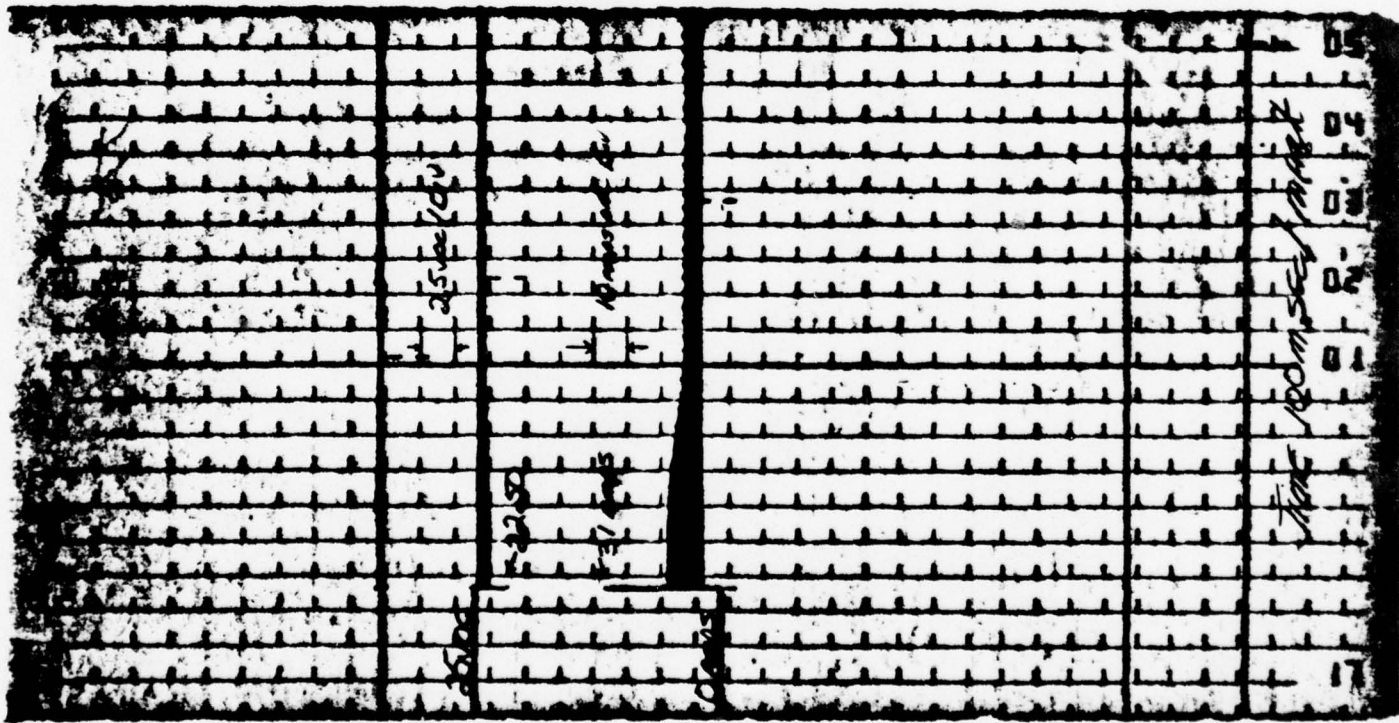
TEST # 6

TEST CONDITIONS
BATTERY SPECIFIC GRAVITY 1.275
BATTERY ELECTROLYTE TEMP 77°F
ENGINE OFF

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: STEP 2
VEHICLE FUNCTION: TTS IN
STANDBY MODE

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FIGURE 9



TTS System
Supply Voltage

TTS System
Supply Current

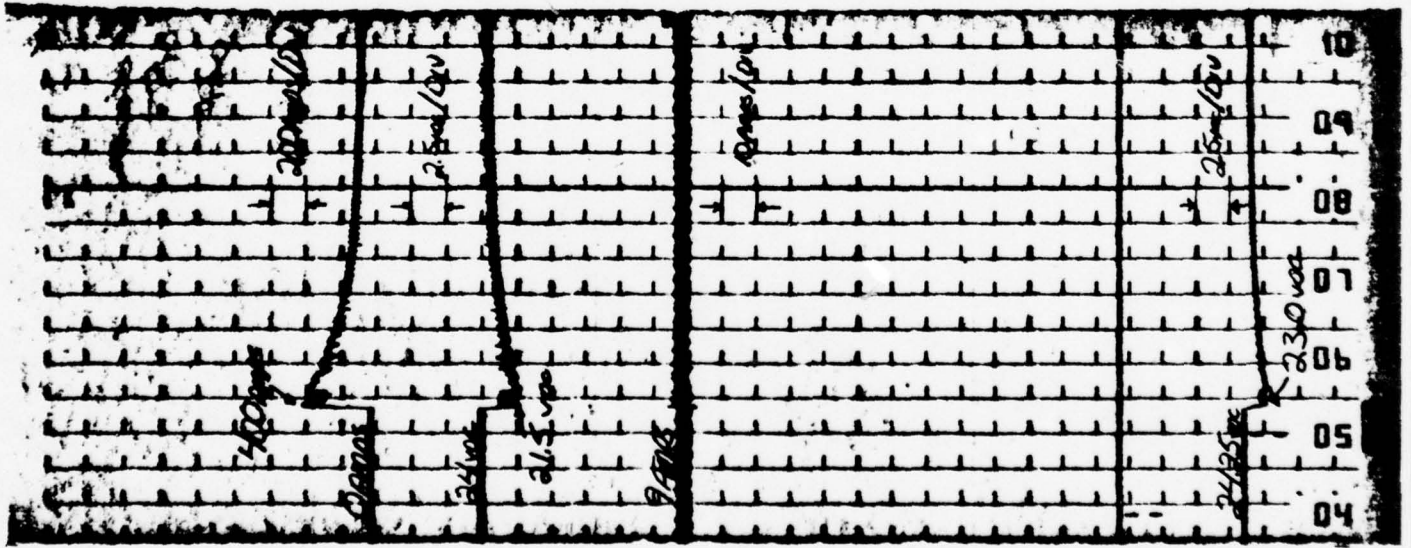
Test # 3

Test Conditions
Battery Specific Gravity 1.275
Battery Electrolyte Temp 76°F
Engine OFF

Transient Test Procedure
Test Sequence: Step 29
Turbost blower switch ON

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Figure 8



System Current

TTS System Supply Voltage

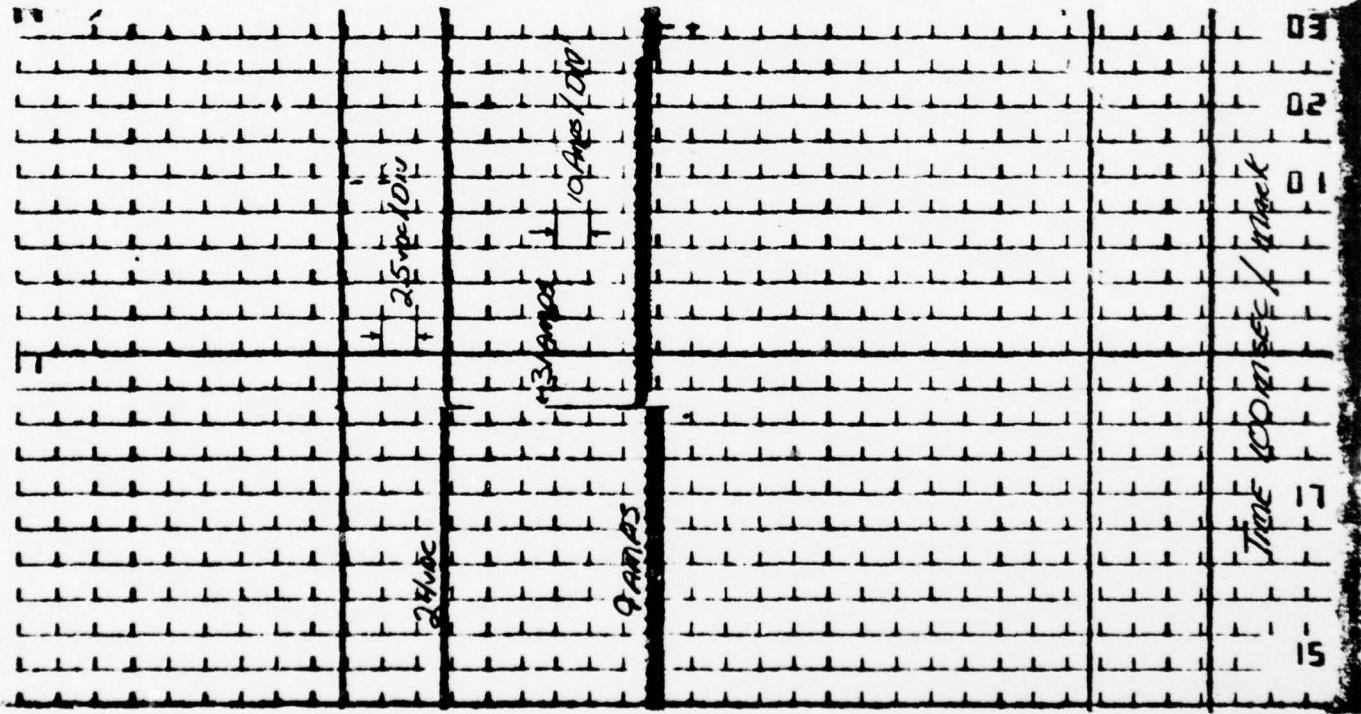
TTS System Supply Current

Battery Voltage

TEST # 6

TEST CONDITIONS
BATTERY SPECIFIC GRAVITY: 1.275
BATTERY ELECTROLYTE TEMP: 77°F
ENGINE: OFF

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: STEP 3
VEHICLE FUNCTION: TTS ON



TTS System
Supply Voltage

TTS System
Supply Current

FIGURE 10

TEST # 6

TEST CONDITION

BATTERY SPECIFIC GRAVITY 1.275

BATTERY ELECTROLYTE TEMP 76 OF

ENGINE OFF

TRANSFERR TEST PROCEDURE

TEST SEQUENCE: STOP IS SIMULTANEOUSLY TURN ON FUEL POWER & THROTTLE BLOWER SWITCHES

FIGURE 11

TIME 100 msec/mark



System Current

TTS System Supply Voltage

TTS System Supply Current

BATTERY VOLTAGE

Test #6

Test Conditions

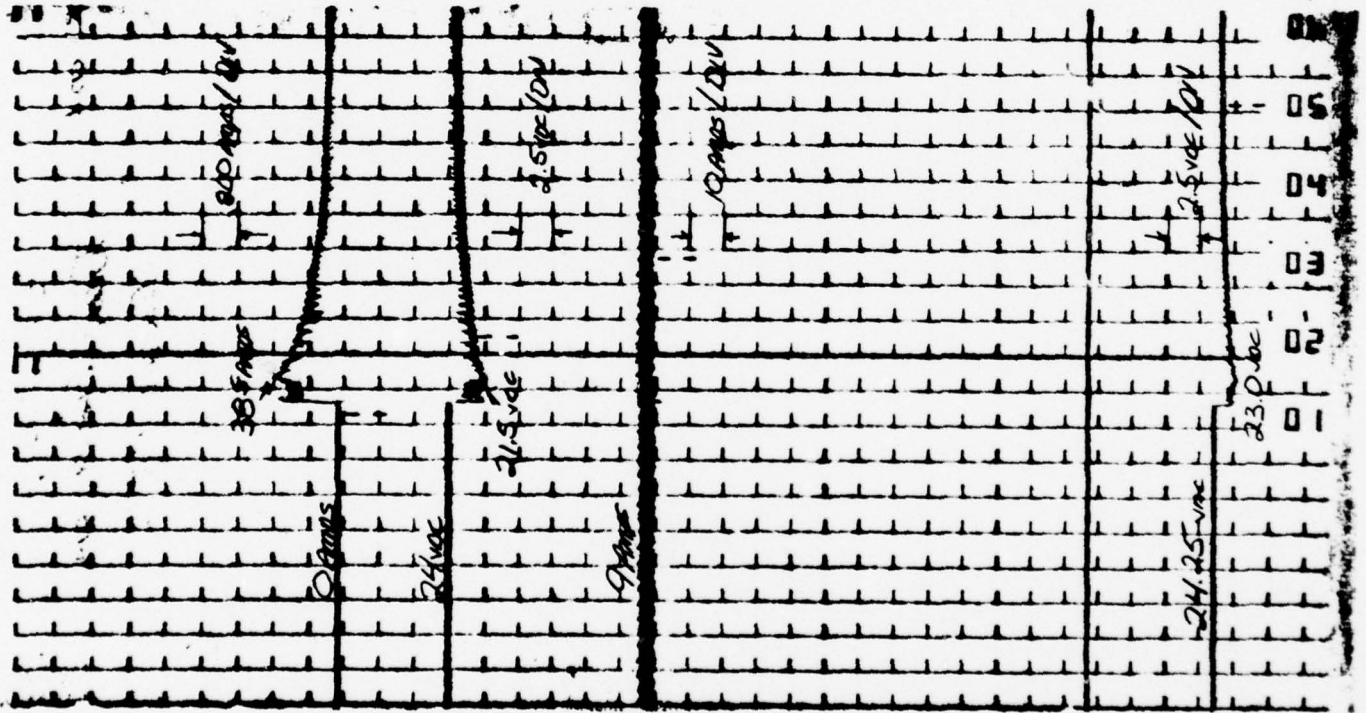
Battery Specific Gravity: 1.275

Battery Electrolyte Temp: 76 °F

Engine: OFF

Transient Test Procedure

Test Sequence: 5 to 16



System Current

TTS System Supply Voltage

TTS System Supply Current

Battery Voltage

FIGURE 12

TIME 100msec/mark

TEST #6

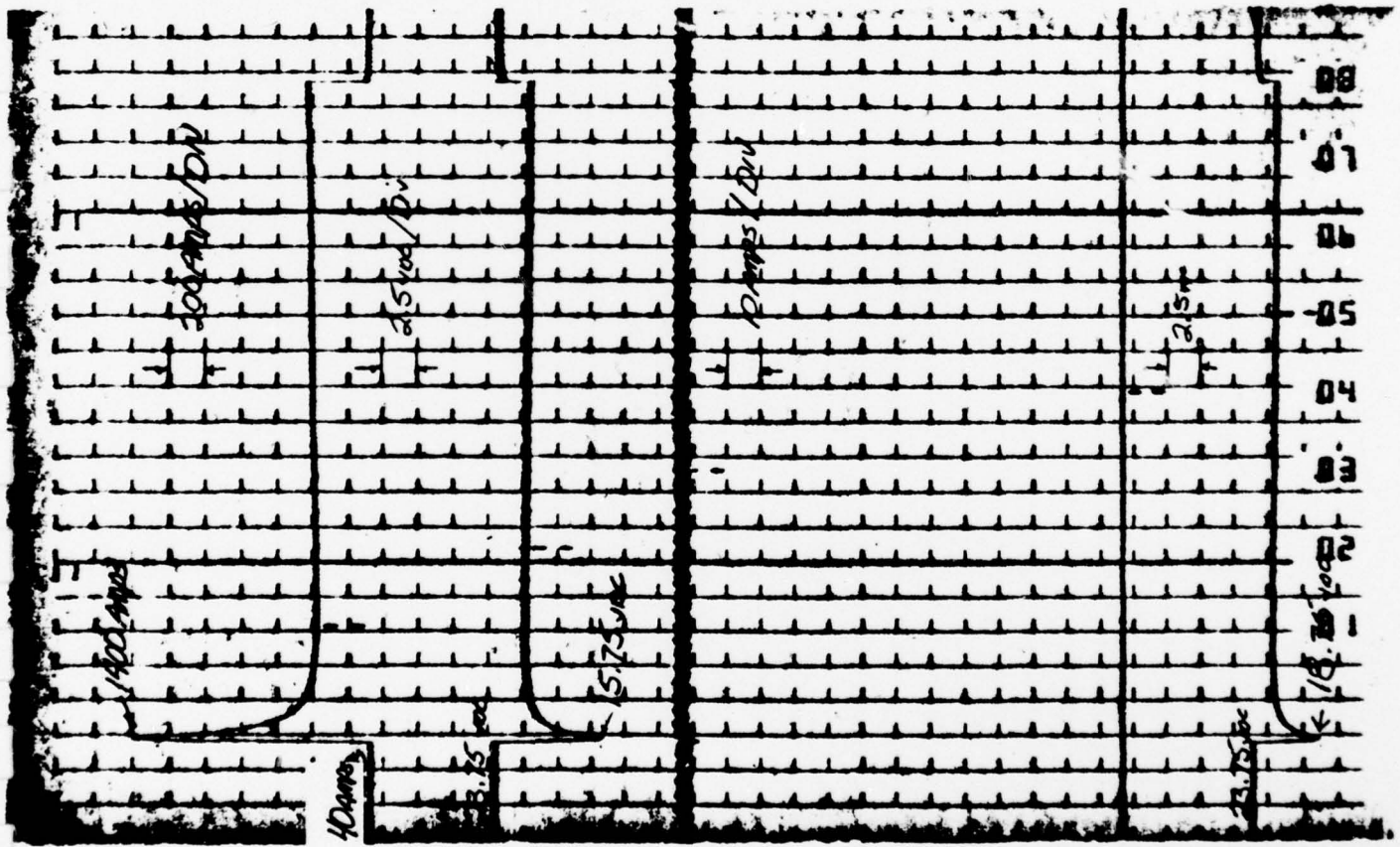
TEST CONDITIONS
BATTERY SPECIFIC GRAVITY 1.275
BATTERY ELECTROLYTE TEMP 76°F

ENGINE: OFF

TRANSIENT TEST PROGRAM
TEST SEQUENCE: 28
POWER PACK CYCLE
WITH TEST BLOWN
ON.

FIGURE 13

TIME 100 nsec / MAJX



System Current

TTS System Supply Voltage

TTS System Supply Current

BATTERY VOLTAGE

TEST # 6

TEST # 6
BATTERY SPECIFIC GRAVITY
1.275
BATTERY ELECTROLYTE TEMP
76°

ENGINE OFF

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: 28
POWER PAK CYCLE
WITH FUELS BLOWSE
OFF



System
Current

TTS System
Voltage Supply

TTS System
Supply Current

Vehicle's Battery
Voltage

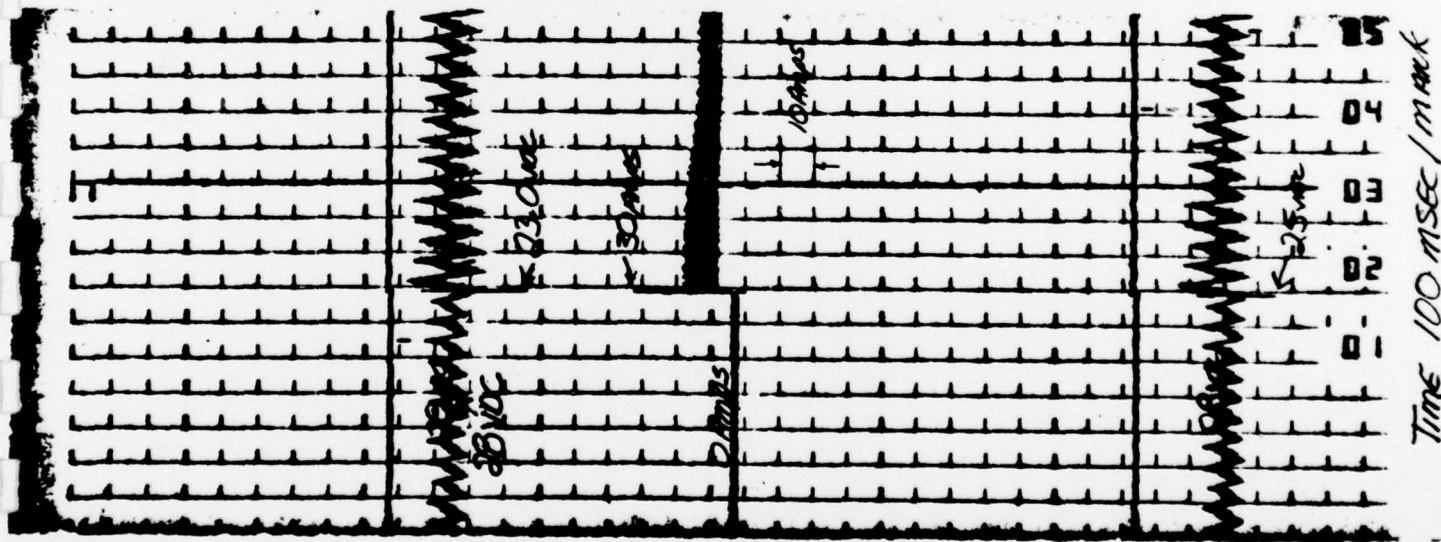
FIGURE 14

TIME 100 msec / MACK

TEST # 10

TEST CONDITIONS
BATTERY DISCONNECTED
ENGINE AT IDLE ~ 750 RPM

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: STEP 2
VEHICLE FUNCTION: TTS to standby
MODE.



TTS System
Supply Voltage

TTS System
Supply Current

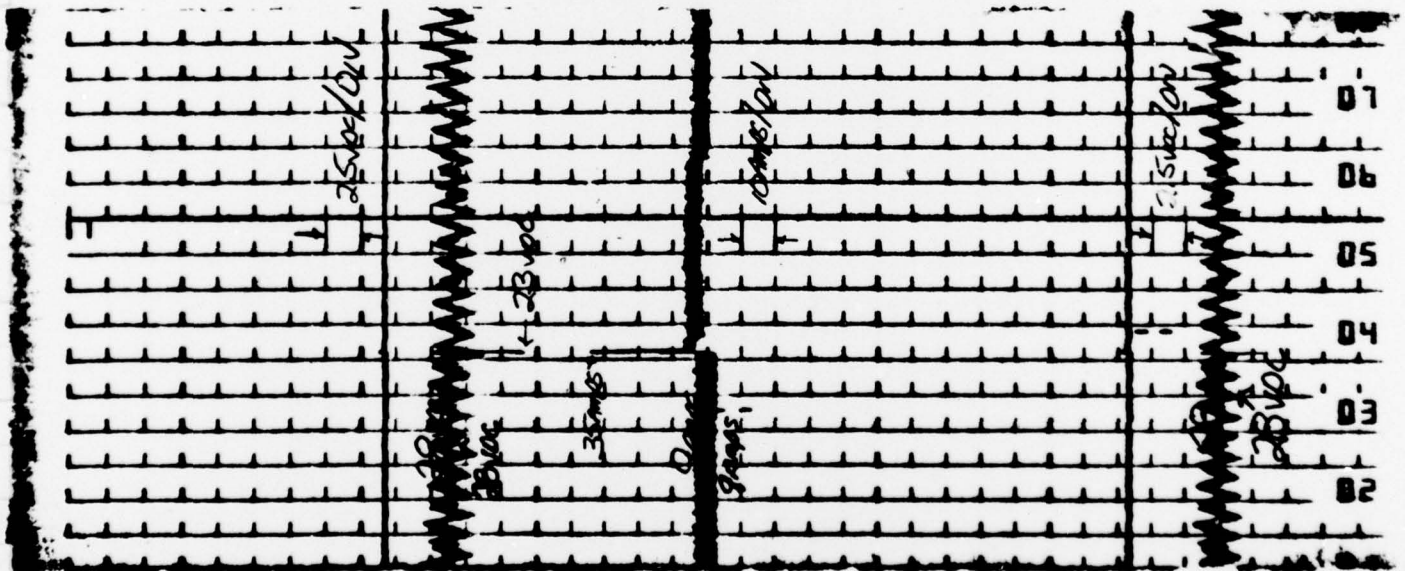
Vehicle's Battery
Voltage

FIGURE 15

TEST # 10

TEST CONDITIONS
BATTERY DISCONNECTED
ENGINE AT IDLE ~ 750 RPM

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: STEP 3
VEHICLE FUNCTION: TTS 16 ON



TTS System
supply voltage

TTS System
supply current

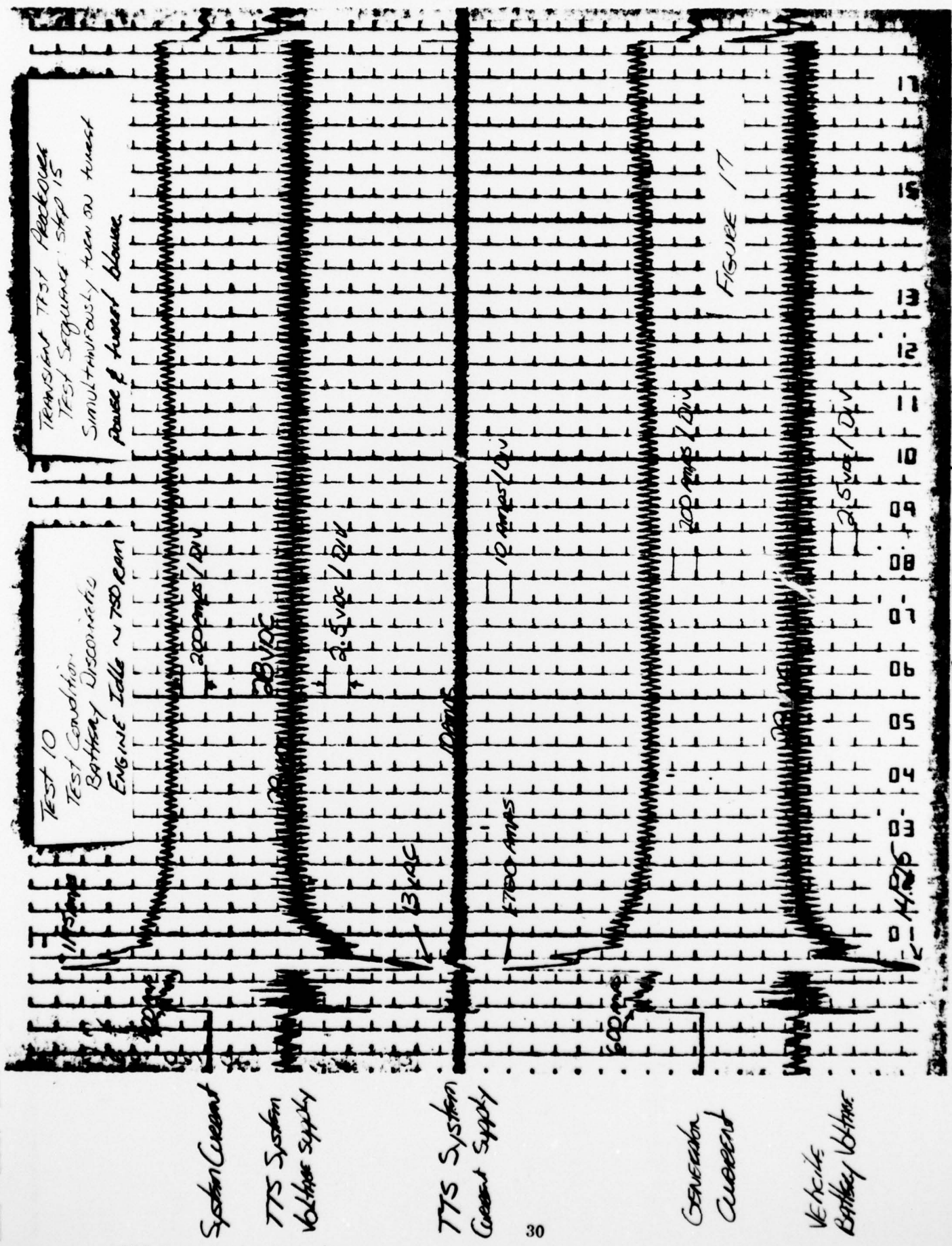
Vehicle Battery
voltage

FIGURE 16

Time 100ms/div

TRANSIENT TEST PROTOCOL
 TEST SQUARE STEP 15
 SIMULTANEOUSLY TURN ON TURBO
 PUMP & HEAT BLOWER

TEST 10
 TEST CONDITION
 BATTERY DISCONNECTED
 ENGINE IDLE ~ 750 RPM



System Current
 TTS System
 Voltage Supply

TTS System
 Current Supply

GENERATOR
 CURRENT

VEHICLE
 BATTERY VOLTAGE

FIGURE 17

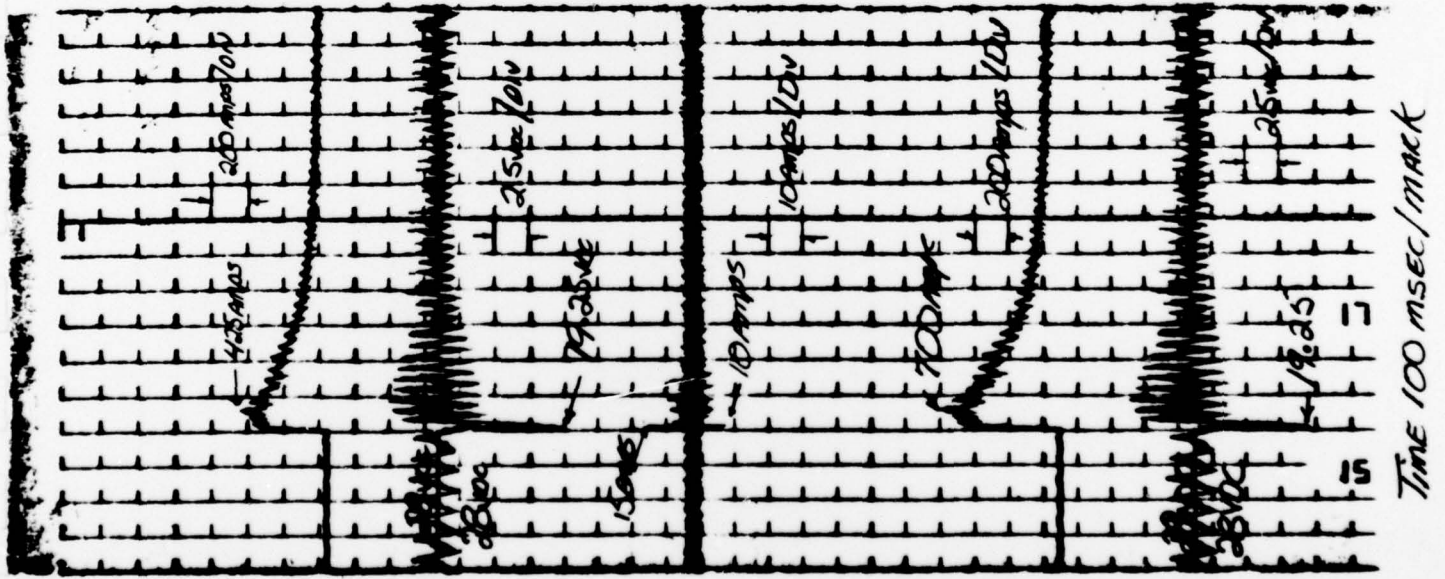
TIME 100 mSEC / MARK

TEST # 10

TEST CONDITIONS
BATTERY DISCONNECTED
ENGINE AT IDLE ~ 750 RPM

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: STEP "26"
VEHICLE FUNCTION: TURBET BLOWER
ON.

FIGURE 18



System Current

TTS System Voltage Supply

TTS System Current Supply

Generator Current

Vehicle Battery Voltage

TEST # 10

TEST CONDITIONS

BATTERY DISCONNECTED

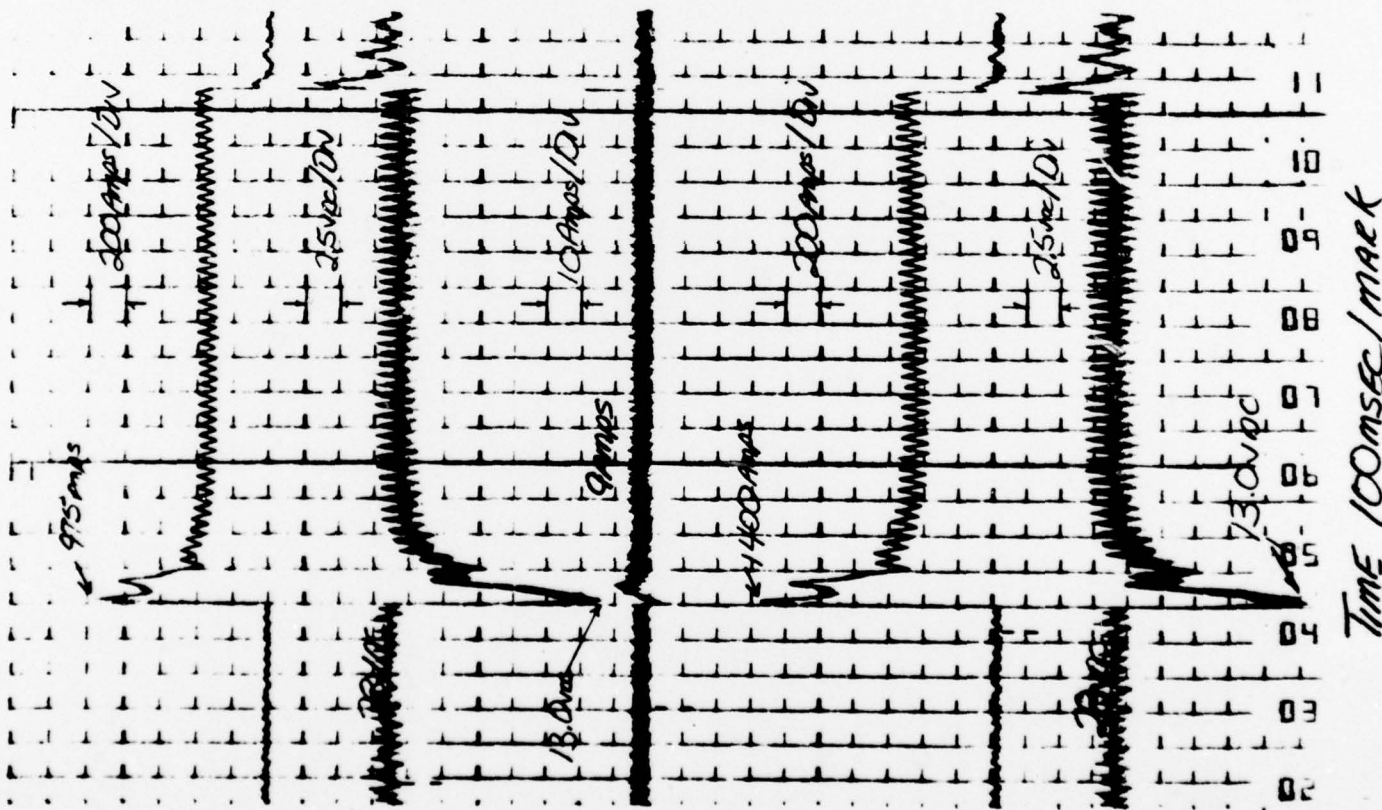
ENGINE AT IDLE ~ 700 RPM

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: STOP

VEHICLE FUNCTION: POWER

BACK CYCLE WITH TURRENT BLOWER ON



System Current

TTS System Supply Voltage

TTS System Supply Current

Generator Current

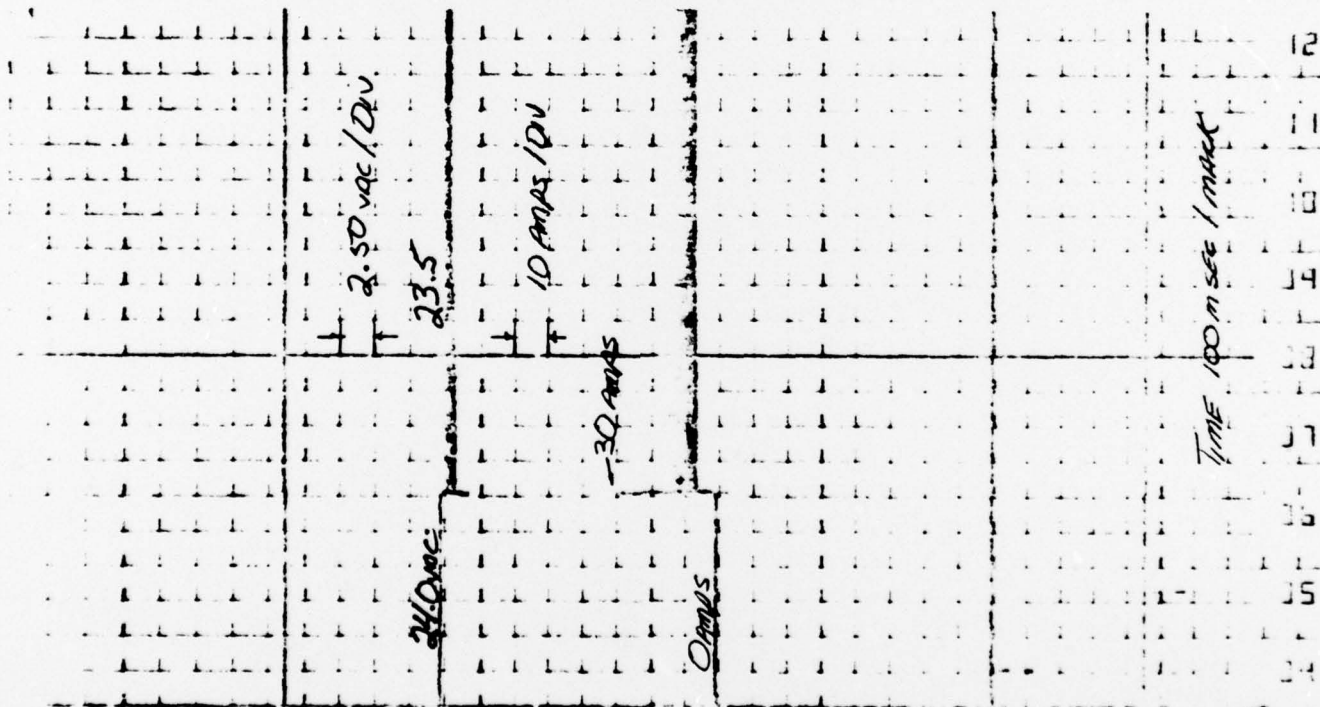
Vehicle Battery Voltage

FIGURE 19

TEST # 12

Test Conditions:
Battery Specific Gravity 1.175
Battery Electrolyte Temp. 78°
Engine: OFF

Terminal Test Procedure
Test Sequence: Step 2
Vehicle Function TTS IN
Standard made.



TTS System
supply voltage

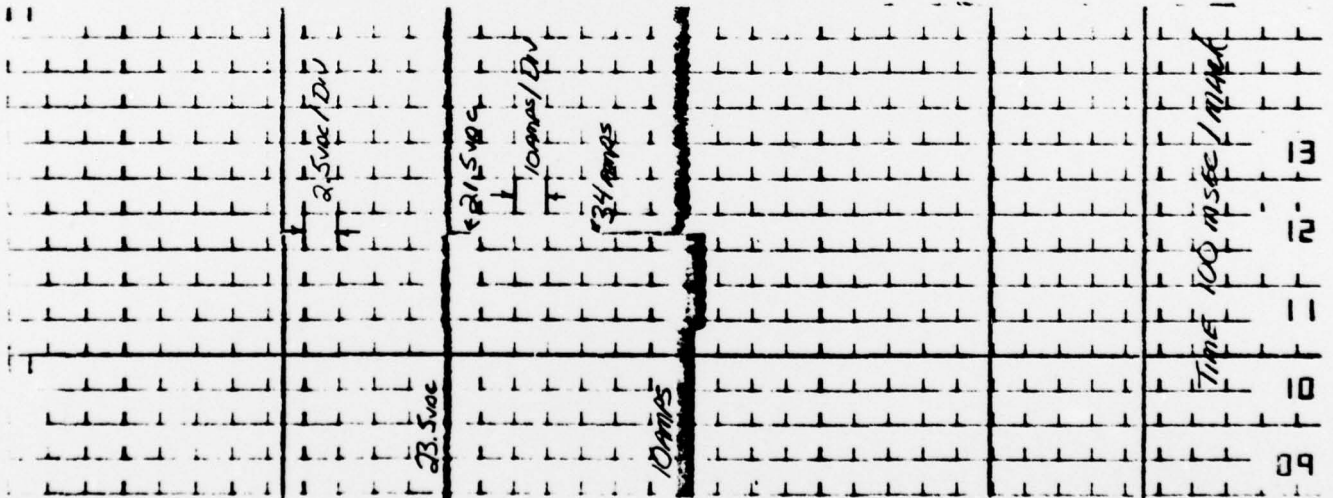
TTS System
supply current

FIGURE 20

TEST # 12

TEST CONDITIONS
BATTERY SPECIFIC GRAVITY 1.175
BATTERY ELECTROLYTE TEMP 78°
ENGINE OFF

TRANSFER TEST PROCEDURE
TEST SEQUENCE: STEP 3
VEHICLE FUNCTION: TTS ON



TTS SYSTEM
SUPPLY VOLTAGE

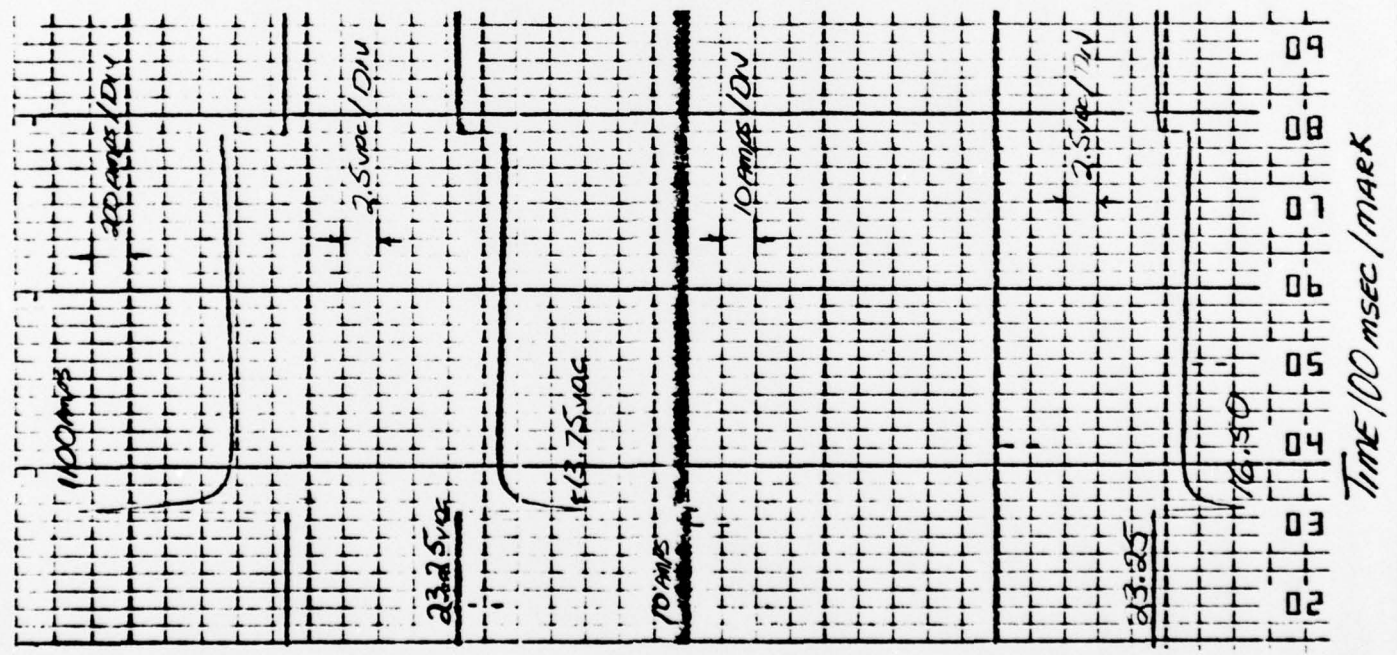
TTS SYSTEM
SUPPLY CURRENT

FIGURE 21

TEST # 12

TEST CONDITIONS
BATTERY Specific Gravity 1.175
BATTERY Electrolyte Temp 78°
ENGINE off

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: 28
POWER PEEK CYCLE
WITH TURRET BLOWER OFF



System Current

TTS System Voltage Supply

TTS System Supply Current

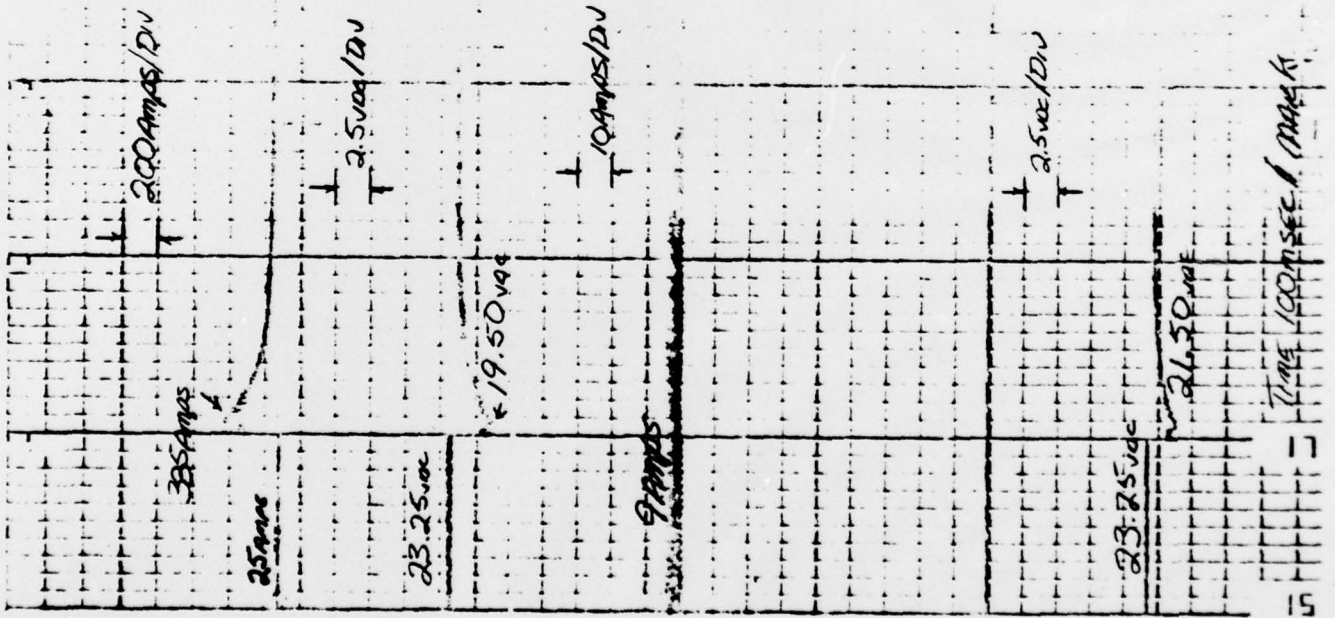
Vehicle Battery Voltage

FIGURE 22

TEST # 12

TEST CONDITIONS
BATTERY SPECIFIC GRAVITY 1.175
BATTERY ELECTROLYTE TEMP 78.9F
ENGINE OFF

TRANSIENT TEST PROGRAM
TEST SEQUENCE STEP 16
VEHICLE FUNCTION: TUCREST
BLOWER ON



System Current

TTS System Supply Voltage

TTS System Supply Current

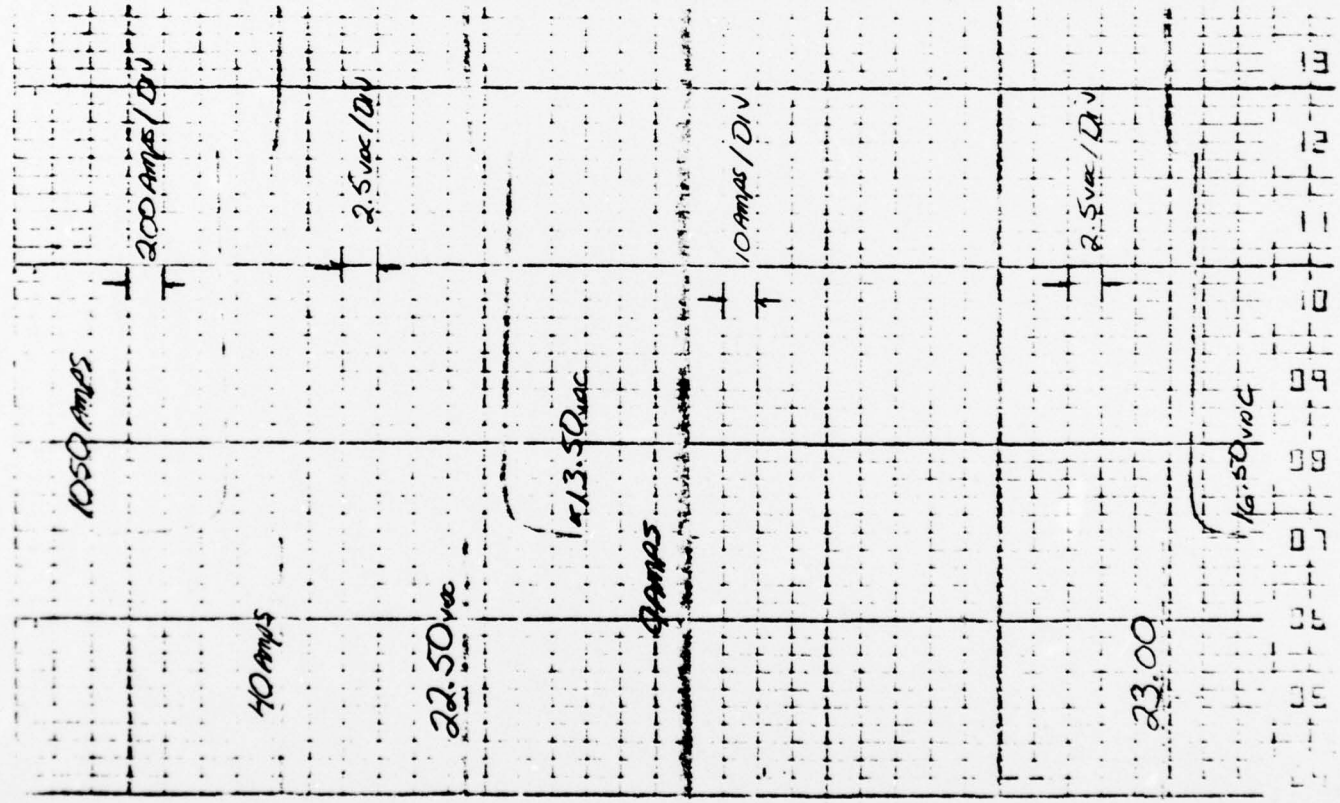
Battery Voltage

FIGURE 23

TEST # 12

TEST Condition
BATTERY SPECIFIC GRAVITY 1.175
BATTERY Electrolyte Temp 78°F
ENGINE: OFF

TRANSIENT TEST PROCEDURE
TEST SEQUENCE: 2B
Vehicle function: POWER
pilot cycle with fuel
blower ON



System Current

TTS System supply Voltage

TTS System supply Current

Vehicle Battery Voltage

FIGURE 24

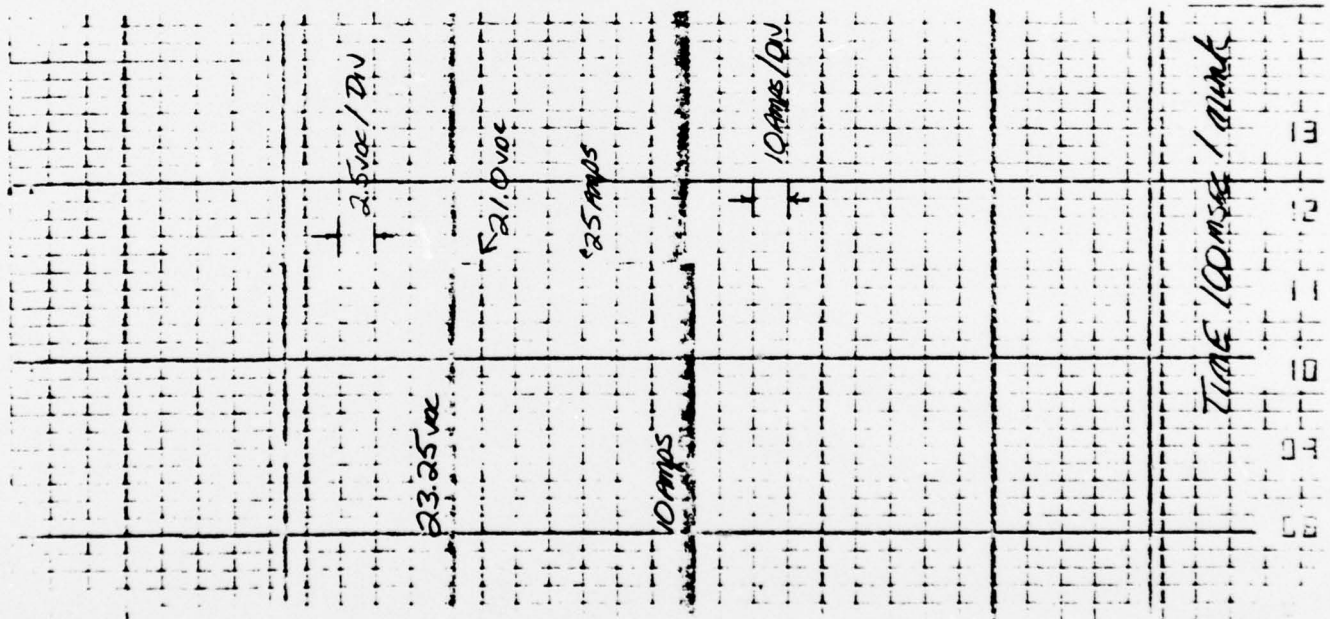
BEST AVAILABLE COPY

TEST # 2 b

Test Conditions
Battery Specific Gravity 1.175
Battery Electrolyte Temp 79.9F
ENGINE OFF

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: STAGE 3
Vehicle function: TTS ON



TTS System
Supply Voltage

TTS System
Supply Current

FIGURE 25

TEST # 126

TEST CONDITIONS

BATTERY SPECIFIC GRAVITY 1.175
BATTERY ELECTROLYTE TEMP 79°F
ENGINE: OFF

TRANSFERRING TEST PROCEDURE

TEST SEQUENCE: skip 3
Vehicle function: TTS
to Standby mode

TTS System
Supply Voltage

TTS System
Supply Current

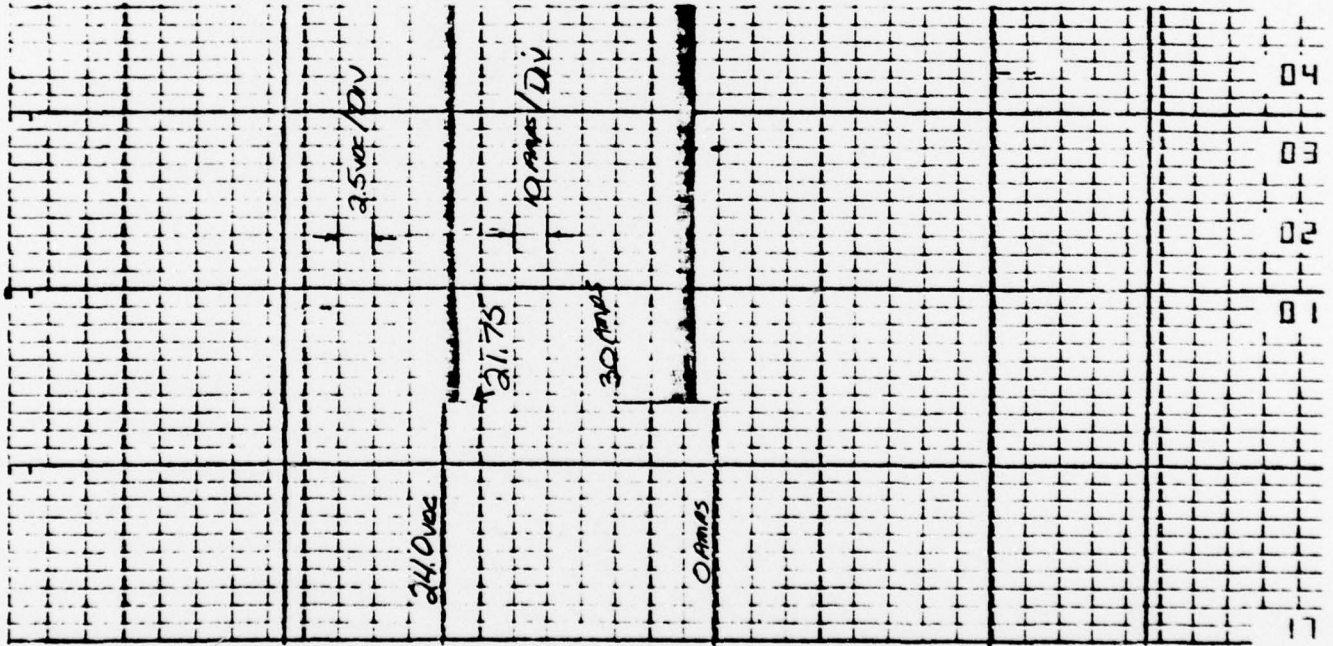


FIGURE 26

TEST # 12b

TEST CONDITIONS

BATTERY SPECIFIC GRAVITY

1.175

BATTERY ELECTROLYTE TEMP

79°F

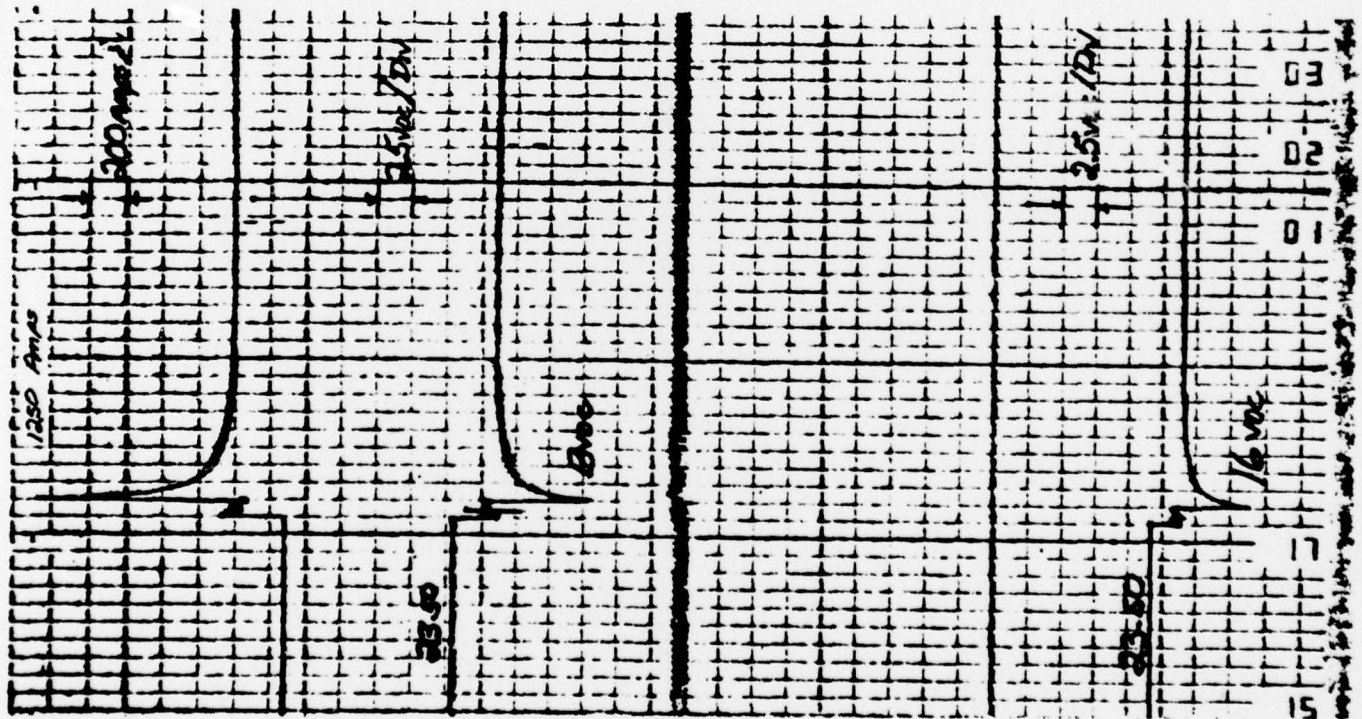
ENGINE: 0 FT

TRANSIENT TEST PROCEDURE

TEST SEQUENCE: STEP 15

VEHICLE FUNCTION: SIMULTANEOUSLY
TURN ON CURRENT POWER & START
BLOWER.

FIGURE 27



System Current

TTS System
Supply Voltage

TTS System
Supply Current

Vehicle Battery
Voltage

Time 100 msec/mark