



1978 Car Shop Manual

Volume 3, 4, & 5

Electrical, Body, & Maintenance





1978 Car Shop Manual Volume 3 Electrical



IDENTIFICATION CODES GROUP 30

CHARGING SYSTEM

GROUP 31 (10000)

LIGHTING SYSTEM

GROUP 32 (13000)

INSTRUMENTS, AND CONTROLS GROUP 33 (10000-19000)

IDENTIFICATION CODES 30-01

ALTERNATOR — Electro-Mechanical Regulator 31-40

— Electronic Regulator 31-43

— Transistorized Regulator 31-42

BATTERIES 31-02

CHARGING SYSTEM 31-01

G.P.D. ALTERNATOR — Rear Terminal 31-10

— Side Terminal 31-12

AUTOMATIC HEADLAMP DIMMER 32-15

HEADLAMP COVERS — Standard 32-06

HEADLAMP SYSTEM 32-02

ILLUMINATED ENTRY 32-80

INTERIOR LAMPS 32-60

LAMP DELAY SYSTEM (AUTOLAMP) 32-12

LIGHTING SYSTEM — General Service 32-01

PARKING, REAR AND MARKER LAMPS 32-20

TURN SIGNAL AND HAZARD FLASHER 32-40

CHARGE INDICATOR — Ammeter 33-11

— Lamp 33-10

CLOCK 33-05

FUEL ECONOMY INDICATING SYSTEM 33-60

FUEL INDICATING SYSTEM 33-20

IGNITION SWITCH 33-70

INSTRUMENT CLUSTER AND PRINTED CIRCUIT 33-50

OIL PRESSURE INDICATOR — Gauge 33-31

— Lamp 33-30

SPEEDOMETER 33-01

TACHOMETER 33-03

TEMPERATURE INDICATOR 33-40



GROUP AND PART INDEX (CONT'D.)

VOLUME 3 ELECTRICAL

FUSES AND CIRCUIT BREAKERS	34-30
WIRING HARNESS — Dash-to-Headlight Junction	34-10
— Dash Panel-to-Engine	34-20
— Instrument Panel-to-Dash	34-01

ANTENNA — Power	35-21
— Standard	35-10
ASH RECEPTACLES AND CIGAR LIGHTER	35-40
HORNS	35-80
MIRRORS — Inside and Outside	35-50
RADIO AND STEREO TAPE PLAYER	35-01
SPEAKERS	35-30
WINDSHIELD WASHERS	35-70
WINDSHIELD WIPERS — Electric	35-60

AIR CONDITIONING BASIC THEORY	36-31
A/C GENERAL SERVICE — Refrigerant Systems	36-32
AUTOMATIC TEMPERATURE CONTROL — Ford, Mercury and Lincoln Continental	36-71
— Granada and Monarch	36-72
— LTD II, Cougar, Thunderbird and Continental Mark V	36-74
— Versailles	36-73
COMPRESSOR — Six-Cylinder	36-34
— Two-Cylinder	36-35
HEATED REAR WINDOW SYSTEM	36-86
HEATER-A/C SYSTEM — Ford and Mercury	36-41
— Fairmont and Zephyr	36-43
— Granada and Monarch	36-40
— LTD II, Cougar, and Thunderbird	36-45
— Mustang II, Pinto and Bobcat	36-44
HEATING — General Service	36-10
HEATING SYSTEM — Cougar, LTD II and Thunderbird	36-12
— Fairmont and Zephyr	36-13
— Ford and Mercury	36-11
— Granada and Monarch	36-16
— Mustang II, Pinto and Bobcat	36-14
REAR WINDOW DEFOGGER	36-80
VENTILATING SYSTEMS	36-01

HARNESSES, CONNECTORS & CIRCUIT PROTECTION GROUP 34 (14000)

AUXILIARY EQUIPMENT GROUP 35 (17000 & 18000)

VENTILATING, HEATING & A/C GROUP 36 (18000 & 19000)

SPEED CONTROL SYSTEM	37-01
SURE-TRACK BRAKE SYSTEM	37-20

SPEED CONTROL GROUP 37 (19000)

foreword...

This 1978 Car Shop Manual has been prepared to provide information covering normal service repairs and maintenance for 1978 Ford Passenger Cars manufactured in the United States and Canada. It is divided into five volumes, each covering a specific major area:

Volume 1 — Chassis
Volume 2 — Engine

Volume 3 — Electrical
Volume 4 — Body

Volume 5 — Maintenance and
Lubrication.

Information in each volume is divided into Groups covering a general system. The table of contents on the cover of each volume indicates the Group title, number, and volume in which each Group is located.

For 1978, the basic part number for components covered in the Groups is also included in parenthesis after the Group number.

Example:

<u>Cooling System</u>	<u>Group 27</u>	<u>(8000)</u>
General System Covered in Group	Group Number	Basic Part Number for Cooling System Components

Some components covered within a Group do not have the same basic part number. In these cases, more than one part number will appear on the Group index.

Example:	<u>Gasoline Engines</u>	<u>Group 21</u>	<u>(6000</u>	<u>&</u>	<u>9000)</u>
	General System Covered in Group		Basic Part Number for Gasoline Engine Components		Intake and Exhaust Manifold Basic Part Number Only

For easy reference, information in each Group has been divided into smaller units or Parts. There is one Part for each component in the system, as well as a General Service Part in some Groups to cover procedures common to several components within the Group. In general, each Part contains the Description, Operation, Diagnosis and Testing, Removal and Installation and Disassembly and Assembly procedures for the component covered in the Part. Diagnosis Charts are also included in some Parts to help you systematically locate and service conditions encountered. In most cases, specifications are included at the end of each Part.

To aid in locating specific items in this manual, the index at the front of each volume provides an alphabetical listing, with page number, for all Parts in the volume. The tab locator on the right side of this index will help you find the first page of each Group.

On the first page of each Group there is an index listing the Part title and Part number for each component covered within the Group. The first page of each Part contains an index to locate service operations covered in that Part. This Group-Part breakdown is also indicated in the page number located at the top of each page.

Example: 11-02-21 = (Group) 11 — (Part) 02 — (Page) 21

Metric conversion tables have been included at the back of each volume to aid in converting specifications in this manual to the metric equivalent.

The descriptions and specifications in this manual were in effect at the time this manual was approved for printing. Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design without notice and without incurring obligation.



Ford Parts and Service Division
Training and Publications Department

IDENTIFICATION CODES

GROUP
30

Car Identification Codes

PART
30-01

GENERAL DESCRIPTION

OFFICIAL VEHICLE IDENTIFICATION NUMBER

The official Vehicle Identification Number (VIN) (Fig. 1) for title and registration purposes is stamped on a metal tab that is fastened to the instrument panel close to the windshield on the driver's side of the car and is visible from outside.

VEHICLE CERTIFICATION LABEL

The Vehicle Certification Label (V.C. Label) (Fig. 1) is affixed on the left front door lock face panel or door pillar. The upper half of the label contains the name of manufacturer, month and year of manufacture, Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating (GAWR), and the certification statement.

The V.C. label also contains the Vehicle Identification Number. This number is also used for warranty identification of the vehicle. The first number indicates the model year. The letter following the model year number indicates the manufacturing assembly plant. The next two numbers designate the Body Serial Code followed by a letter expressing the Engine Code.

The last six digits of the Vehicle Identification Number indicate the Consecutive Unit Number of each unit built at each assembly plant. The Consecutive Unit Numbers begin as follows:

100,001—Ford, LTD II, Ranchero, Mustang II, Thunderbird, Granada, Fairmont and Pinto.

500,001—Mercury, Cougar, Zephyr, Monarch and Mercury Bobcat.

800,001—Lincoln Continental and Continental Mark V.

The remaining information on the V.C. Label consists of the following vehicle identification codes:

The BODY code is two numerals and a letter identifying the body style.

The COL (color) code is a number and letter indicating the exterior paint color code and vinyl roof type and color (if equipped).

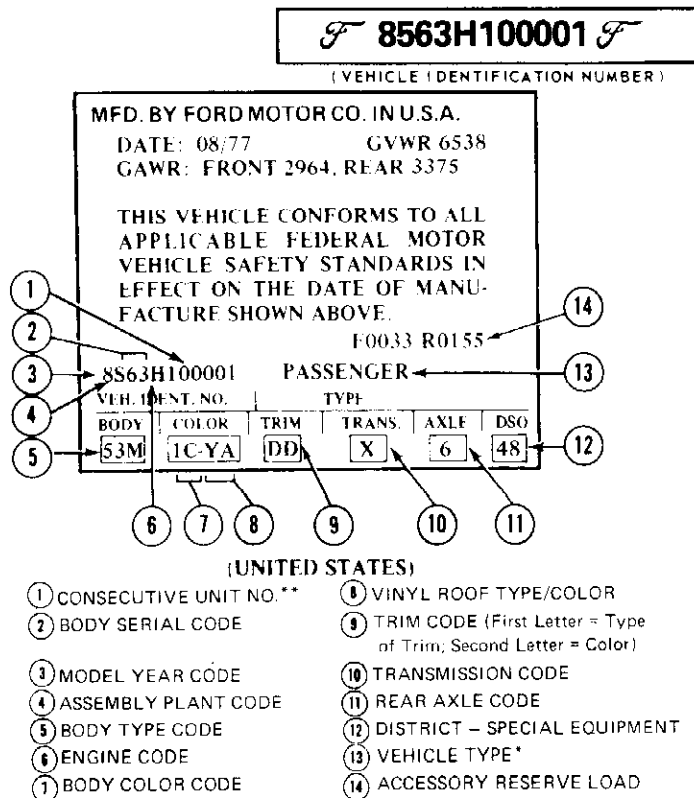
The TRIM code consists of a two-letter or a letter-number combination designating the interior trim.

The AXLE code is a number or letter indicating the rear axle ratio and standard or locking type axles.

The TRNS. code is a number or letter indicating the type of transmission.

The DSO code, consisting of two numbers, designates the district in which the car was ordered and may appear in conjunction with a Domestic Special Order or Foreign Special Order number when applicable. Ford of Canada DSO codes consist of a letter and number.

The following charts provide the various codes and their respective identification:



* 1978 BUILD MODELS DESIGNATED 1977 MODELS WILL HAVE "PASS 1977" IN THIS SPACE.

** 1978 BUILD MODELS DESIGNATED 1977 MODELS WILL HAVE ALTERED CONSECUTIVE NUMBERING AS FOLLOWS:

PINTO/MUSTANG II - 400001 THRU 499999
 BOBCAT - 750001 THRU 799999

MFD. BY FORD MOTOR CO. IN U.S.A.

DATE: 08/77 GVWR 5892
 GAWR: FRONT 2964 REAR 2928

THIS VEHICLE MANUFACTURED FOR EXPORT ONLY ON DATE SHOWN ABOVE.

8563H100002 PASSENGER

VEH. IDENT. NO.		TYPE			
53H	1C-CA	D	X	6	90

(EXPORT)

MFD. BY FORD MOTOR CO. OF CANADA LTD.

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VEH. IDENT. NO.		TYPE			
BODY	COLOR	TRIM	TRANS.	AXLE	DSO
MADE IN CANADA					

(CANADA)



FIG. 1 Vehicle Identification and Certification Labels

IDENTIFICATION CODES

ASSEMBLY PLANT CODES

Code Letter	District
A	Atlanta
B	Oakville (Canada)
E	Mahwah
F	Dearborn
G	Chicago
H	Lorain
J	Los Angeles
K	Kansas City
P	Twin Cities
R	San Jose
S	Allen Park (Pilot)
T	Metuchen
U	Louisville
W	Wayne
X	St. Thomas
Y	Wixom
Z	St. Louis

ENGINE CODES

Codes	No. of Cyls.	Displacement Litres	CID
A	8	7.5	460-4V
C	8	7.5	460-4V (Police Interceptor)
F	8	5.0	302-2V
H	8	5.8	351-2V
L	6	4.1	250-1V
S	8	6.6	400-2V
T	6	3.3	200-1V
Y	4	2.3	139-2V (2.3L)
Z	6	2.8	169-2V (2.8L)

TRANSMISSION CODES

Codes	Type
1	MANUAL
5	3 Speed
6	4 Speed Overdrive
7	4 Speed @
	4 Speed (b)
V	AUTOMATIC
W	XP (C-3)
X	XP (C-4)
U	FMX
Z	XPL (C-6)
	XPL (Special)
@ Borg-Warner (b) Hummer	

EXTERIOR PAINT COLOR CODES

Code	Ref. #	Color
1C	1724	Black
1G	5299	Silver Met.
1N	5476	Dove Gray
1P	5523	Med. Gray Met. (Tie Tone only)
1Q	5527	Med. Silver Met.
2M	3413	Dark Red
2R	5440	Brt. Red
2U	5455	Lipstick Red
3G	5094	Brt. Dk. Blue Met.
3U	5467	Lt. Blue
31	5499	Midnight Blue
34	5041	Med. Blue
46	5328	Dk. Jade Met.
47	5404	Lt. Green
4V	5233	Dk. Yellow Green Met.
5Q	5477	Dk. Brown Met.
6E	5080	Brt. Yellow
6P	5406	Cream
6U	5441	Lt. Tan

DISTRICT CODES
LINCOLN-MERCURY

Code	District
00	Special
11	Boston
15	New York
16	Philadelphia
17	Washington
21	Atlanta
22	Dallas
23	Jacksonville
26	Memphis
31	Buffalo
32	Cincinnati
33	Cleveland
34	Detroit
41	Chicago
42	St. Louis
46	Twin Cities
51	Denver
52	Los Angeles
53	Oakland
54	Seattle
84	Home Off. Reserve
90's	Export

FORD OF CANADA

Mercury Code	Region	Ford Code
A1	Central	B1
A2	Eastern	B2
A3	Atlantic	B3
A4	Midwestern	B4
A6	Western	B6
A7	Pacific	B7
12	Export	12

REAR AXLE RATIO CODES

Conventional Lock		Ratio
Y		3.08
B		2.47
1	J	2.50
8		2.73
2		2.75
3		2.79
6	0	3.00
4		3.18
7		3.40

DISTRICT CODES
FORD

Code	District
00	Special
11	Boston
12	Buffalo
13	New York
14	Pittsburgh
15	Newark
16	Philadelphia
17	Washington
21	Atlanta
22	Charlotte
23	Memphis
24	Jacksonville
25	Richmond
26	New Orleans
28	Louisville
41	Chicago
42	Cleveland
43	Milwaukee
45	Lansing
46	Indianapolis
47	Cincinnati
48	Detroit
52	Dallas
53	Kansas City
54	Omaha
55	St. Louis
56	Davenport
57	Houston
58	Twin Cities
71	Los Angeles
72	San Jose
73	Salt Lake City
74	Seattle
75	Phoenix
76	Denver
83	Government
84	Home Off. Reserve
85	American Red Cross
86	Recreational Veh. Pool
87	Body Company
89	Transportation Services
90's	Export

BODY SERIAL AND STYLE CODES

Vehicle	Body Serial Code	Body Style Code	Body Type	Model	Vehicle	Body Serial Code	Body Style Code	Body Type	Model
PINTO	10	62B	2-Dr. Sedan	Base	COUGAR	92	53D	4-Dr. Pillar Hardtop	Cougar
	11	64B	3-Dr. Sedan	Base		91	65D	2-Dr. Hardtop	Cougar
	12	73B	Wagon	Base		93	65L	2-Dr. Hardtop	Cougar XR-7
BOBCAT	20	64H	3-Dr. Sedan	U.S.A. & Canada	THUNDERBIRD	87	60H	2-Dr. Pillar Hardtop	Base
	22	73H	Wagon	U.S.A. & Canada					
	23	62B	2-Dr. Sedan	Canada Only	FORD	52	60D*	2-Dr. Pillar Hardtop	Custom 500
	24	64B	3-Dr. Sedan	Canada Only		53	53D	4-Dr. Pillar Hardtop	Custom 500
	25	73B	Wagon	Canada Only		62	60H	2-Dr. Pillar Hardtop	LTD
MUSTANG II	02	60F	2-Dr.	Base		63	53H	4-Dr. Pillar Hardtop	LTD
	03	69F	3-Dr.	Base		64	53L	4-Dr. Pillar Hardtop	LTD Landau
	04	60H	2-Dr.	Ghia		65	60L	2-Dr. Pillar Hardtop	LTD Landau
	05	69R	3-Dr.	Mach I		72	71D	Custom 500/LTD II	Wagon
GRANADA	82	54H	4-Dr. Sedan	Base		74	71H	LTD	Wagon
	81	66H	2-Dr. Sedan	Base	MERCURY	62	53H	4-Dr. Pillar Hardtop	Marquis (FLD)
MONARCH	34	54H	4-Dr. Sedan	Base		61	65H	2-Dr. Hardtop	Canada Only
	33	66H	2-Dr. Sedan	Base		66	53L	4-Dr. Pillar Hardtop	Grand Marquis
VERSAILLES	84	54M	4-Dr. Sedan	Base		65	65L	2-Dr. Hardtop	Grand Marquis
						64	53K	4-Dr. Pillar Hardtop	Marquis Brougham
LTD II	25	65B	2-Dr. Hardtop	LTD II S		63	65K	2-Dr. Hardtop	Marquis Brougham
	27	53B	4-Dr. Pillar Hardtop	LTD II S		74	71K	Marquis**	Wagon
	30	65D	2-Dr. Hardtop	LTD II	CONTINENTAL MARK V	89	65D	2-Dr. Hardtop	Base
	31	53D	4-Dr. Pillar Hardtop	LTD II					
	43	71K	LTD II Squire	Wagon	LINCOLN CONTINENTAL	81	60B	2-Dr. Pillar Hardtop	Base
	47	97D	500	LTD II		82	53B	4-Dr. Pillar Hardtop	Base
	48	97R	GT	Ranchero	ZEPHYR	32	54D	4-Dr. Sedan	Base
	49	97K	Squire			31	66D	2-Dr. Sedan	Base
FAIRMONT	92	54B	4-Dr. Sedan	Base		35	36R	2-Dr. Sedan	Sport Coupe
	91	66B	2-Dr. Sedan	Base		36	74D	Wagon	
	93	66R	2-Dr. Sedan	Sport Coupe					
	94	74B	Wagon						

CY1615-2E

VINYL ROOF TYPE AND COLOR IDENTIFICATION

Code	Vinyl Type	Code	Vinyl Type	Code	Vinyl Color	Code	Vinyl Color
W	Lugano Full	Z	Valino Front Half	A	Black	F	Cordovan
X	Lugano Half	T	Valino Coach	B	Blue, Medium	K	Cordovan, Light
K	Lugano Front Half	B	Crosshatch Full	S	Blue, Midnight		Gold, Galveston
M	Lugano Coach	R	Crosshatch Half	5	Blue, Wedgewood	E	Gray, Dove
D	Milano Full	S	Levant Full	T	Brown, Dark	R	Jade, Dark
E	Milano Half	E	Levant Half Rear (Mustang Dev.)	V	Camel, Lt.	M	Jade, Light
F	Milano Halo			Y	Camel, Medium	4	Jade, Medium
Q	Cayman Full	G	Odense Full	U	Chamois	3	Jade, Wedgewood
U	Cayman Half	N	Odense Half	6	Champagne, Light	D	Red/Russet
V	Valino Full	A	Odense Front Half	J	Champagne, Midnight	P	Silver
Y	Valino Half					W	White

When a Vinyl Roof is installed the type and color codes will be reflected after the two digit Exterior Paint Color Code.
 Example: Code - 1CYA = 1C-Black Car, YA-Valino Black Half Roof.

CY1615-2E1

CHARGING SYSTEM

GROUP
31

PART TITLE	PART NO.	PART TITLE	PART NO.
Alternator Electro-Mechanical Regulator	31-40	Charging System General Service	31-01
Alternator Electronic Regulator	31-43	EED Rear Terminal Alternator	31-10
Alternator Transistorized Regulator	31-42	EED Side Terminal Alternator	31-12
Batteries	31-02		

Charging System General Service

PART
31-01

Applies to All Models

SUBJECT	PAGE	SUBJECT	PAGE
DESCRIPTION AND OPERATION		Fuse Link Continuity Test	01-9
Charging System	01-1	On-Vehicle Tests	01-5
Fuse Link	01-1		
DIAGNOSIS	01-3	REMOVAL AND INSTALLATION	
		Fuse Link Replacement	01-9
TESTING		REPAIR PROCEDURES	
Bench Tests	01-8	Fuse Link General Repairs	01-10

DESCRIPTION AND OPERATION

CHARGING SYSTEM

The alternator charging system is a negative ground system, and consists of an alternator, regulator, charge indicator, storage battery, fuse link and associated wiring. Refer to the Wiring Diagram Manual, Form 7795P-78 for schematics and locations of wiring harnesses.

FUSE LINK

The fuse link is a short length of insulated wire integral with the engine compartment wiring harness. It is several wire gages smaller than the circuit which it protects. Production fuse links are the color of the circuit being supplied by the fuse link. Service fuse links

are green or black depending on usage. All fuse links have a flag moulded on the wire or on the terminal insulator. Color identification of the flag or connector is Red—18 Ga. wire, Orange—16 Ga. wire, or Green—14 Ga. wire. Fig. 1 shows fuse link installations.

When heavy current flows, such as when a booster battery is connected incorrectly or when a short to ground occurs in the wiring harness, the fuse link burns out and protects the alternator or wiring.

A burned out link may have bare wire ends protruding from the insulation, or it may only have expanded or bubbled insulation with illegible identification. When it is hard to determine if the link is burned out, perform a continuity test.

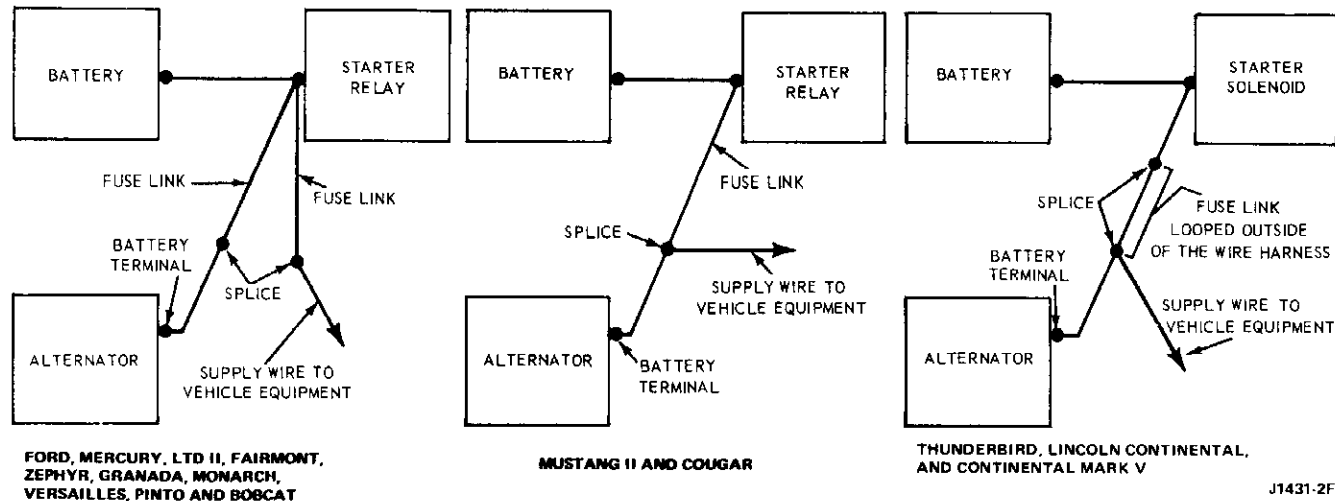


FIG. 1 Fuse Link Installation

J1431-2F

DIAGNOSIS

CHARGING SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSE	RESOLUTION
Battery does not stay charged — engine starts OK	- Battery - Loose or worn alternator belt - Damaged wiring or cables - Alternator - Regulator - Other vehicle electrical systems	- Test battery, replace if necessary - Adjust or replace belt - Service as required - Test, repair or replace as required - Test, replace if necessary - Check other systems for current draw. Repair as required
Alternator noisy	- Loose or worn alternator belt - Bent pulley flanges - Alternator	- Adjust or replace belt - Replace pulley - Service or replace alternator
Battery uses excessive water — lights and/or fuses burn out frequently	- Damaged wiring - Alternator regulator - Battery	- Service as required - Replace if necessary - Test, replace if necessary
Charge indicator light stays on after engine starts	- Loose or worn alternator belt - Alternator - Regulator	- Adjust or replace - Service or replace - Replace
Charge indicator lights flickers while vehicle is being driven	- Loose or worn alternator belt - Loose or improper wiring connections - Alternator - Regulator	- Adjust or replace belt - Service as required - Service or replace - Service or replace
Charge indicator gauge shows discharge. (If constant high reading, see "Battery uses excessive water").	- Loose or worn alternator belt - Damaged wiring (Battery to alternator for ground or open) - Alternator - Regulator - Charge indicator gauge wiring and connections - Damaged gauge - Other vehicle electrical systems malfunction	- Adjust or replace belt - Service or replace wiring - Service or replace - Replace - Service as required - Replace gauge - Service as required

GENERAL CHARGING SYSTEM TEST

PRELIMINARY CHECKS

- FUSE LINK
- BATTERY TERMINALS AND CABLE CLAMPS
- WIRING CONNECTIONS AT ALTERNATOR, REGULATOR AND ENGINE
- ALTERNATOR BELT TENSION

- CONNECT VOLTMETER TO BATTERY POSTS. READ BATTERY VOLTAGE – THIS IS BASE READING.

NO-LOAD TEST

- START ENGINE – RUN AT 1500 RPM UNDER NO LOAD EXCEPT IGNITION. VOLTAGE SHOULD INCREASE, BUT NOT MORE THAN 2.0 VOLTS.

NO INCREASE

INCREASES, BUT NOT MORE THAN 2.0 VOLTS

INCREASES MORE THAN 2.0 VOLTS

- DISCONNECT REGULATOR
- CHECK RESISTANCE BETWEEN "F" TERMINAL OF REGULATOR WIRING CONNECTOR AND ALTERNATOR GROUND.
- RESISTANCE SHOULD BE 4 – 250 OHMS.

LOAD TEST

- INCREASE ENGINE RPM TO 2000
- TURN WIPER, BLOWER, AND HEADLIGHTS ON HIGH.
- VOLTAGE SHOULD READ A MINIMUM OF 1/2 VOLT OVER BASE READING.

DISCONNECT REGULATOR. SEE IF OVERVOLTAGE CONDITION GOES AWAY.

LESS THAN 4 OR OVER 250 OHMS

4-250 OHMS

LESS THAN 1/2 VOLT

1/2 VOLT OR MORE

SERVICE GROUNDED OR OPEN FIELD CIRCUIT. NOTE. IF FIELD CIRCUIT IS GROUNDED, IT WILL BE NECESSARY TO REPLACE REGULATOR ALSO.

- DISCONNECT REGULATOR.
- JUMPER "A" TO "F" TERMINALS AT REGULATOR WIRING CONNECTOR.
- VOLTAGE SHOULD READ A MINIMUM OF 1/2 VOLT OVER BASE READING WITH SAME LOAD TEST CONDITIONS STILL IN EFFECT.

ALTERNATOR AND REGULATOR ARE OK. PROBLEM CAN STILL BE BATTERY DRAIN. TURN OFF IGNITION. INSTALL VOLTMETER IN SERIES WITH POS. BATTERY CABLE AND CHECK TO ISOLATE PROBLEM CIRCUIT. *

OVER VOLTAGE DOES NOT GO AWAY.

SERVICE SHORTED HARNESS BETWEEN ALTERNATOR AND REGULATOR. ALSO REPLACE REGULATOR

OVER VOLTAGE GOES AWAY.

CHECK GROUND AT REGULATOR.

NOT OK

SERVICE GROUND.

OK

REPLACE REGULATOR.

LESS THAN 1/2 VOLT

1/2 VOLT OR MORE SHUT OFF ALL LOAD

VEHICLES WITH ALTERNATOR WARNING LIGHT ENGINE AT IDLE

VEHICLES WITH AMMETER ENGINE OFF – IGNITION SWITCH ON

- REMOVE JUMPER FROM "A" AND "F" TERMINALS BUT LEAVE REGULATOR DISCONNECTED.
- JUMPER "BAT" TO "FLD" TERMINALS AT ALTERNATOR.
- VOLTAGE SHOULD READ A MINIMUM OF 1/2 VOLT OVER BASE READING WITH SAME LOAD TEST CONDITIONS STILL IN EFFECT.

WITH JUMPER STILL ON TERMINALS "A" AND "F", CHECK FOR POWER TO THE "S" AND "I" TERMINALS. VOLTAGE AT THE "S" TERMINAL SHOULD BE ABOUT 1/2 OF THE VOLTAGE AT "I".

CHECK FOR POWER TO "S" TERMINAL ON REGULATOR CONNECTOR.

NOT OK

SERVICE "S" CIRCUIT (IGNITION SWITCH TO REGULATOR CONNECTOR).

OK

REPLACE REGULATOR.

NOT OK
SERVICE "S" OR "I" CIRCUITS.

OK

REPLACE REGULATOR.

LESS THAN 1/2 VOLT 1/2 VOLT OR MORE

MOVE POS. VOLTMETER LEAD TO BAT. TERM. OF ALTERNATOR.

SERVICE "A" OR "F" CIRCUITS.

LESS THAN 1/2 VOLT 1/2 VOLT OR MORE

SERVICE OR REPLACE ALTERNATOR.

SERVICE "BAT." WIRE.

* IF NO DRAIN, CHECK BATTERY CAPACITY AND/OR PERFORM CELL COMPARISON TESTS.

CK3394-2C

TESTING

A voltmeter (0 to 20 volt scale), ohmmeter, jumper wire and a test light (12 volt) are the only tools required to perform an accurate check of the complete charging system. The meters should be calibrated once a year and the date of calibration stamped on the meter face. It is recommended that this practice be followed by all technicians to maintain their meters at acceptable accuracy.

The tests are divided into On Vehicle and On Bench Test procedures.

Troubleshooting or diagnosis is required before actual repairs can be made in the electrical system. Even where an obvious fault makes the replacement of a unit necessary, find out why the unit failed. When a trouble is diagnosed correctly, unnecessary repairs are prevented, the time the vehicle is out of service will be decreased, and the repairs that are made will be permanent.

ON VEHICLE TESTS

Before performing charging system tests on the vehicle, note the complaint such as: slow cranking; battery dead or using an excessive amount of water; top of battery wet; ammeter shows charge at all times or no charge; alternator warning lamp does not come on or never goes out. This information will aid in isolating the part of the system causing the problem.

Visual Inspection

1. Check the fuse link (Fig. 1) located between the starter relay and the alternator. If burned, determine cause, repair system and replace fuse link.
2. The battery must be in proper state of charge (at least 1.200 specific gravity). Check the battery posts and battery cable terminals for clean and tight connections. Remove the battery cables (if corroded), clean and install them securely.
3. Check for clean and tight wiring connections at the alternator, regulator and engine.
4. Check the alternator belt tension and tighten to specification (if necessary).

Battery Drain Test

1. Connect a 12-volt test light in-series with the positive terminal of the battery. Test with all switches OFF. Do not be misled by clock-winding current. Touch cable clamp to terminal to wind clock.
2. If light glows, pull fuses, one at a time, and check each circuit for short. Repair wiring harnesses or components as required.

Indicator Light Test

Normal Charge Indication—Charge Indicator (Alternator)

With Ignition switch **off** —Charge indicator (Alternator) lamp is **off**.

With ignition switch **on** (engine not running)—Charge indicator (Alternator) lamp is **on**.

With ignition switch **on** (engine running) charge indicator—(Alternator) lamp is **off**.

1. If the charge indicator lamp does not come on with the ignition key in the on position and the engine not running, check the I wiring circuit (ignition switch to regulator I terminal), for an open circuit or burned out charge indicator lamp.
2. If the charge indicator light does not come on, disconnect the wiring plug connector at the regulator and connect a jumper wire from the I terminal of the regulator wiring plug to the negative battery post cable clamp.
3. The charge indicator lamp should go on with the ignition key turned to the on position.
4. If the charge indicator bulb does not go on, check the bulb for continuity and replace (if burned out).
5. For models without the new electronic regulator, if the bulb is not burned out, an open circuit exists between the ignition switch and the regulator.

Electro Mechanical and Transistorized Regulators.

A good indication of a problem in the I wiring circuit (ignition switch to regulator I terminal) will show when the charge indicator light goes out only when engine RPM is high. This is caused by an open circuit in the 15 ohm resistor wire (connected in parallel with the indicator light) generally at the terminal point (either end of the resistor wire).

6. For models with the new electronic regulator, there is a 500-ohm resistor across the charge indicator lamp on Fairmont, Zephyr, Lincoln Continental and Continental Mark V. On Mustang, there is an ammeter and a resistor is not needed.

Ammeter Test

Normal Charge Indication

With ignition switch **off** and no electrical load—Ammeter should show **0** or center scale.

With ignition switch **on** and engine running (fully charged battery).—Needle deflects toward charge and returns toward center scale in time.

With ignition switch **off** and headlamps on—Ammeter should show a discharge. If ammeter does not register a discharge, check for loose connections at the ammeter prior to replacing gauge.

General Charging System Tests

When performing charging system tests with a voltmeter, turn OFF all lights and electrical components. Place the transmission in neutral and apply the parking brake.

Base Voltage Test

1. Connect the negative lead of the voltmeter to the negative battery cable clamp.
2. Connect the positive lead of the voltmeter to the positive battery cable clamp.
3. Record the battery voltage reading shown on the voltmeter scale (base voltage).
4. Connect tachometer to the engine.

No Load Test

1. Then, start the engine and increase speed to approximately 1500 rpm. With no other electrical load (foot off brake pedal and car doors closed), the voltmeter pointer should move upward (increase) but not more than 2 volts above the base voltage; the first recorded battery voltage reading. The reading should be taken when the voltmeter pointer stops rising. It may take a few minutes to reach this point. If not, make over-voltage or low-voltage tests below.

Load Test

1. With the engine running, turn the heater or air conditioner blower motor on (high speed) and headlights on (high beam).
2. Increase the engine speed to 2000 rpm. The voltmeter should indicate a minimum of 0.5 volt above the base voltage. If not, make the low voltage test below.

If the above tests indicate proper voltage readings, the charging system is operating normally. Use test light and check for battery drain.

Over-Voltage Tests

1. If the voltmeter reading indicates more than 2.0 volts above base battery voltage, connect a jumper wire between regulator base and alternator frame. Repeat No Load Test. This will check the ground connections between the regulator and alternator and/or regulator to engine if over voltage condition disappears. Clean and tighten connections securely.
2. **If over voltage condition still exists**, disconnect the regulator wiring plug from the regulator and repeat the No Load Test.
3. **If over voltage condition disappears** (voltmeter reads base voltage), replace voltage regulator.
4. **If over voltage still exists** with the regulator wiring plug disconnected, repair the short in the wiring harness between the alternator and regulator. Then, replace the regulator and connect the regulator wiring plug to the regulator.

Under Voltage Tests

1. If the voltmeter does not indicate more than 1/2 volt above base voltage. Disconnect wiring plug from regulator and connect an ohmmeter from "F" terminal of plug to ground. Meter should indicate more than 3 ohms. If less than 3 ohms is indicated repair grounded field circuit and repeat Load Test. Refer to Fig. 2.
2. If ohmmeter indicates more than 3 ohms connect a jumper wire from the A to F terminals of the plug (Fig. 3) and repeat the Load Test. If voltmeter now indicates more than 1/2 volt above base voltage, the regulator or wiring is defective. Make the regulator I and S circuits Tests.
3. If the voltmeter still indicates a problem of under voltage, remove the jumper wire from the regulator plug and leave the plug disconnected from the regulator. Then, connect a jumper wire to the FLD

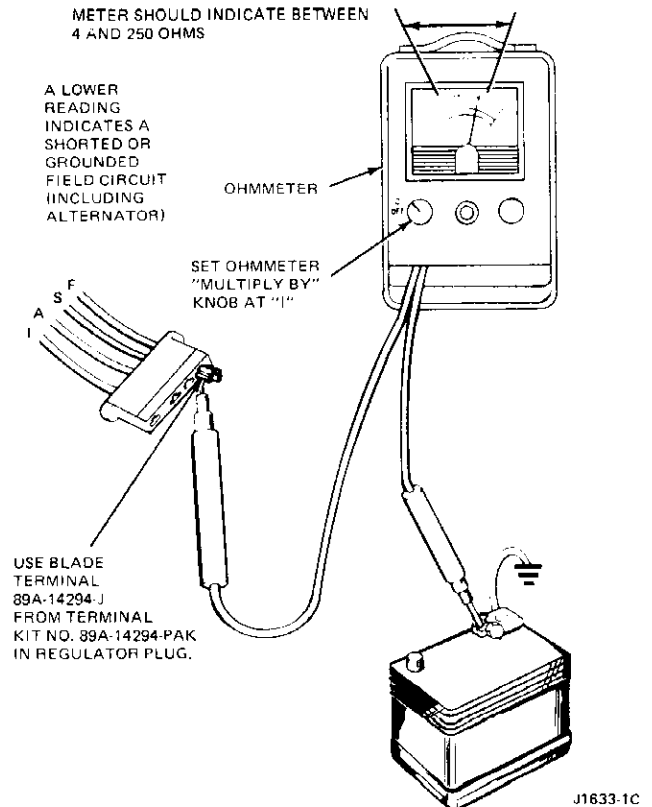


FIG. 2 Field Circuit Test

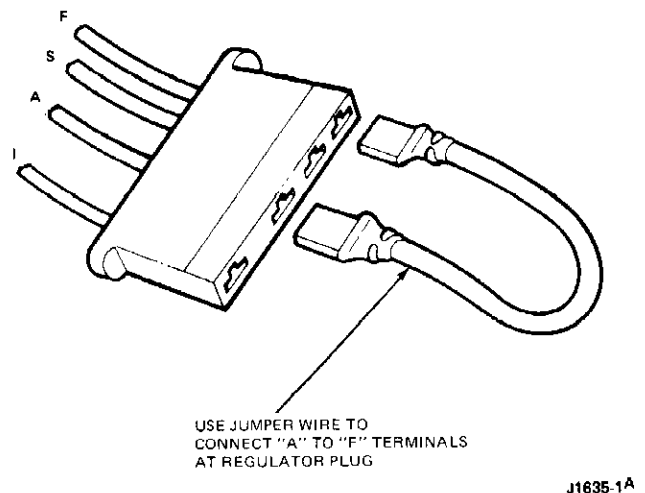


FIG. 3 Regulator Plug Jumper Wire Connections

and BAT terminals on the alternator (Fig. 4) and repeat the Load Test.

4. If the voltmeter now indicates 1/2 volt or more increase above base voltage, repair the wiring harness from the alternator to the regulator.
5. If voltmeter still indicates under voltage, stop engine and move positive voltmeters lead to "bat" terminal of alternator.
6. If voltmeter now indicates base volts, repair alternator. If voltmeter indicates zero volts, repair "bat" wire (circuit 38).

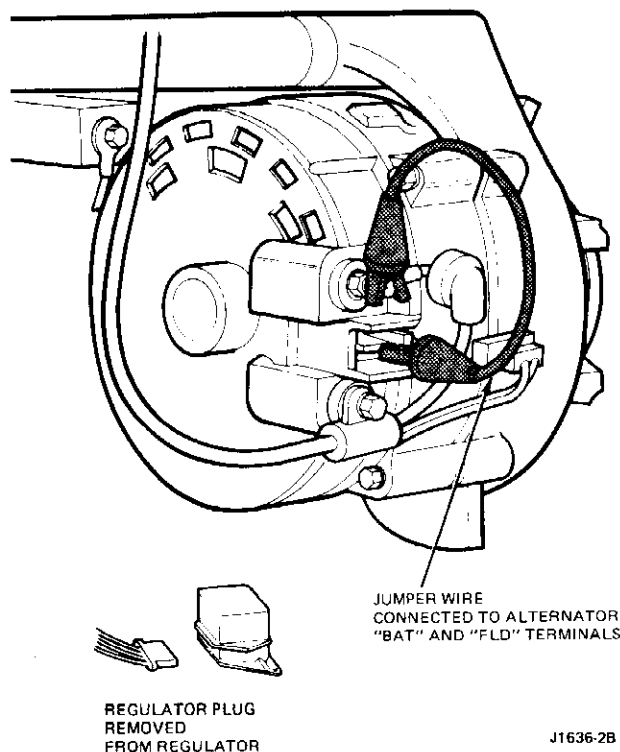
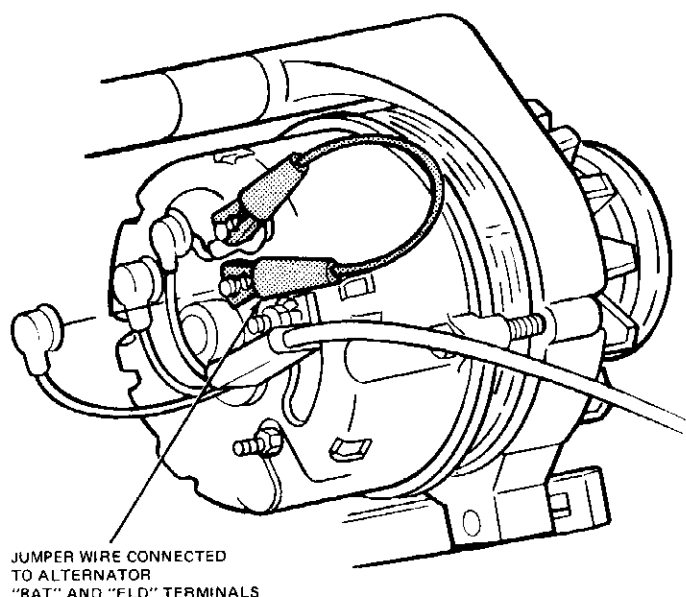


FIG. 4 Jumper Wire Connections

Regulator I and S Circuit Tests

S Circuit With Ammeter

1. Connect the positive lead of the voltmeter to the S terminal of the regulator wiring plug. Then, turn the ignition switch to the **ON** position. **Do not start the engine.**
2. The voltmeter should indicate battery voltage.
3. If there is **no** voltage reading, repair the S wire lead from the ignition switch to the regulator wiring plug.
4. Connect the positive voltmeter lead to the positive battery cable terminal, connect the regulator wiring plug to the regulator, and repeat the Load Test.

S and I Circuit—With Indicator Light

1. Disconnect the regulator wiring plug and install a jumper wire between the A and F terminals (Fig. 3).
2. With the engine idling, connect the positive lead of the voltmeter to the S terminal and then to the I terminal of the regulator wiring plug. The voltage of the S circuit should read approximately 1/2 of the I circuit.
3. If no voltage is present, repair the wiring circuit at fault. Reconnect the positive voltmeter lead to the positive battery cable terminal.
4. If the above circuit tests are satisfactory, install a new regulator.
5. Then, remove the jumper wire from the regulator wiring plug and connect the wiring plug to the regulator. Repeat the Load Test.

Diode Test—On Vehicle

1. Disconnect the electric choke.

2. Disconnect voltage regulator wiring plug.
3. Connect a jumper between A and F terminal of voltage regulator wiring plug.
4. Connect voltmeter to battery cable clamps.
5. Start engine—let engine run at idle.
6. Read and record system voltage.
7. Move positive voltmeter lead to S terminal of alternator.
8. Note voltmeter reading.
9. Run engine as described under Voltmeter Test Procedure.

Test Results

1. If voltmeter reads 1/2 of system voltage, diodes are OK.
2. If voltmeter reads approximately 1.5 volts, alternator has shorted **negative** diode, or a grounded stator winding.
3. If voltmeter reads approximately 1.5 volts less than system voltage, alternator has shorted **positive** diode.
4. If voltmeter reads about 1.5 volts less than 1/2 battery voltage, alternator has an **open positive** diode.
5. If voltmeter reads about 1.0 to 1.5 volts more than 1/2 battery voltage, alternator has an **open negative** diode.
6. Connect the electric choke into the circuit after the test is completed.