

# Shop Tips

MAY-JUNE, 1965

# FROM FORD

VOL. 3, NO. 4

Technical parts and service information published by Ford Division to assist servicemen in Service Stations, Independent Garages and Fleets.

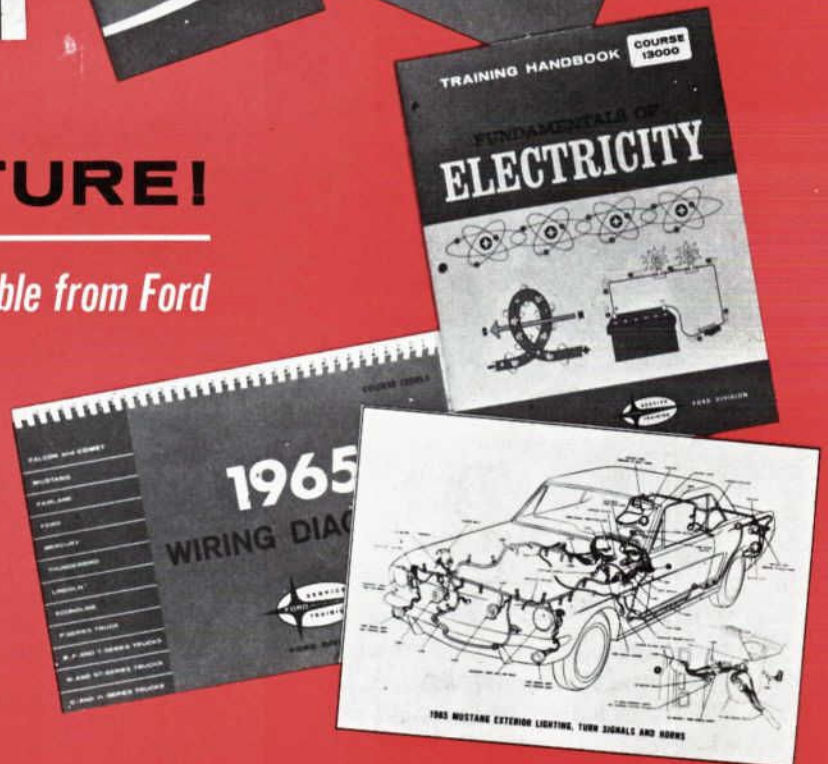


## SPECIAL FEATURE!

*New service publications now available from Ford*

### ALSO...

- Air Conditioner Diagnosis And Servicing . . . 8
- Spark Plugs—Removal, Cleaning, Inspection and Installation . . . 14
- Wheel Bearing End Play Adjustment On Vehicles With Disc Brakes . . . 14
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Be sure to file this and future bulletins for ready reference. If you have any suggestions for additional information that you would like to see included in this publication please write to: Ford Division of Ford Motor Company, Parts and Service Promotion and Training Dept., P.O. Box 658, Dearborn, Michigan, 48121.

From Your Ford Dealer



# SERVICE TRAINING AIDS and PUBLICATIONS FROM FORD

Now, Ford Motor Company is making available to independent service personnel its complete line of service training aids and service publications to assist in the repair and servicing of Ford products.

As a garage, service station or fleet operator, body shop specialist, or other service outlet, you will want to own these informative, service aids to help you gain a more thorough knowledge of the Ford products you service.

These materials are written with clear concise step-

by-step explanations and diagrams of all the major assemblies and components in Fords, Fairlans, Falcons, Mustangs, Thunderbirds, and Ford Trucks. Each of these publications is conveniently organized and clearly referenced in full detail for quick referral.

By obtaining an order form from your local Ford Dealer, you can order any or all of these service aids and publications directly from Ford Service Publications. All Order Forms must be validated by a Ford Dealer.



## SHOP MANUALS

Contain servicing information and specifications on cars and trucks of the year and model to which they apply. They are illustrated with pictures and charts and are divided into groups of related systems and components. For quick reference, the manuals utilize three separate indexes:

- The Group Index appears on the title page of each manual.
- A Section Index is found at the introduction to each part.
- A complete Index is located at the end of each manual.

## SHOP MANUAL SUPPLEMENTS

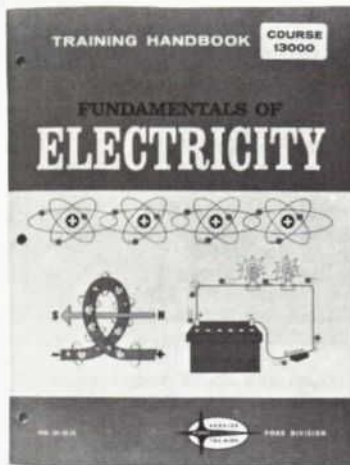
Generally contain repair and adjustment information only on components that were changed or were new to that particular model year. For complete information, it is necessary to refer to the manual of the preceding model year(s).

## WIRING DIAGRAMS

This handy reference manual is devoted exclusively to electrical equipment and wiring diagrams. Complete schematic diagrams and cutaway illustrations help in the servicing of electrical components in all of the following vehicles:

Falcon/Comet	Mustang
Fairlane	Econoline
Ford/Mercury	P-Series Trucks
Thunderbird	B-F-T Series Trucks
Lincoln	N-NT Series Trucks
C-CT-H-HT Series Tilt Cab Trucks	





### TRAINING HANDBOOKS

Individually bound 8½ x 11 manuals covering a single subject or automotive component. These informative handbooks provide service technicians with the basic fundamentals and complete service information on varied subjects.



### SPECIFICATION BOOKLETS

Are handy pocket size booklets listing repair and adjustment specifications necessary to service Ford cars and trucks for the indicated model year. These service specifications are considered the most frequently used by technicians engaged in the maintenance and testing of Ford automotive products.



### DIAGNOSTIC WHEEL

Similar to a circular slide rule. When the small inner wheel is dialed to a specific problem on the large outer wheel, the possible causes appear in small windows cut in the inner wheel. This diagnostic aid is designed for a specific component such as the transmission or rear axle and can help eliminate guess work and unnecessary repairs.



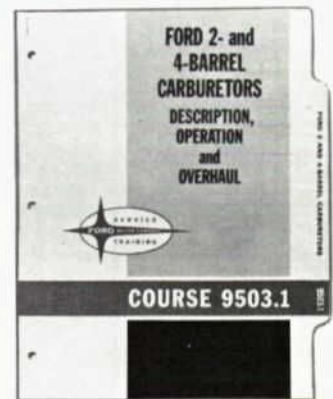
### SUGGESTED TIME SCHEDULE

Contains information that applies to the complete line of Ford products and lists suggested times that were obtained from studies conducted on vehicles and may be used as a guide to assist in establishing labor charges for services performed on customer vehicles.



### OWNERS or OPERATORS MANUALS

Contain complete information on operation of the vehicle, driver care of the vehicle, and valuable hints on proper servicing and care of the vehicle to which they apply.



### ALSO AVAILABLE

**Instructor's Notes** – to aid in instruction of the various service operations and components . . . **Flip Charts**—large charts to hang on the wall as a supplement to the Instructor's Notes . . . **Slidefilms**—detailed film treatment of many of the operations and components dealing with the Ford line . . . **Film Digests**—a summary of the accompanying slidefilm to serve as a refresher of the information featured in the film.

See your Ford dealer today and pick up an order blank to receive these helpful publications. He will be pleased to assist you in filling it out.

FORM NO.	YEAR	DESCRIPTION	PRICE	FORM NO.	YEAR	DESCRIPTION	PRICE
7098	1949 thru 1951	Ford Car Shop Manual	\$3.00	7099	1957	Truck Shop Manual	\$4.00
7098	1952	Ford Car Shop Manual	3.00	7099	1958	Truck Shop Manual	4.50
7098	1953*	Ford Car Shop Manual Supplement	1.50	7099	1959	Truck Shop Manual	4.50
7098	1954	Ford Car Shop Manual needs 7098—52 for full coverage	1.50	7099	1960	Truck Shop Manual	4.50
7098	1955	Ford Car Shop Manual	3.00	7099A	1961	Truck Shop Manual (Series 100 thru 800)	4.50
7098	1956	Ford Car Shop Manual	3.00	7099A	1962-63*	Truck Shop Manual Supplement (Series 100-800)	2.50
7098	1957	Ford Car Shop Manual	4.50	7099A	1964	Truck Shop Manual (Series 100 thru 350)	5.00
7098	1958	Ford Car Shop Manual	4.50	7099	1965	Truck Shop Manual—3 Volumes	8.00
7098	1959	Ford Car Shop Manual	4.50	7099B	1961	Truck Shop Manual (Series 850 thru 1100)	4.50
7098	1960	Ford Car Shop Manual	4.50	7099B	1962-63*	Truck Shop Manual Supplement (Series 850 thru 1100)	2.50
7098	1961	Ford Car Shop Manual	4.50	7099B	1964*	Truck Shop Manual (Series 850-1100 Supplement)	3.50
7098	1962	Ford Car Shop Manual	4.50	7099C	1964	Truck Shop Manual (Series 500-800)	5.75
7098	1963*	Ford Car Shop Manual Supplement	3.00	7766	1961	Econoline Truck Shop Manual	3.50
7098	1964	Ford Car Shop Manual	4.75	7766	1962-63*	Econoline Truck Shop Manual Supplement	2.00
7098	1965	Ford Car Shop Manual	4.75	7766	1964*	Econoline Shop Manual Supplement	2.50
7760	1960	Falcon Shop Manual	3.50	7766	1965	Econoline and Falcon Bus Shop Manual	4.00
7760	1961-62	Falcon Shop Manual	3.50	7802	1963	Truck Shop Manual (3500-7000 Diesel)	5.00
7760	1963*†	Falcon Shop Manual Supplement	2.75	R009066-464		Dagenham Diesel Manual	4.50
7760	1964	Falcon Shop Manual	4.00	7785	1961	Truck Shop Manual (850-1100 Diesel)	4.75
7760	1965	Falcon-Fairlane-Mustang Shop Manual	5.00	7785	1963	Truck Shop Manual (850-1100 Diesel)	4.75
7750	1958	Thunderbird Shop Manual	4.00	<b>CUMMINS ENGINE MANUAL</b>			
7750	1959	Thunderbird Shop Manual	4.00	983559		All Series—Operation and Maintenance	2.00
7750	1960	Thunderbird Shop Manual	4.00	983570		V. Series—Overhaul	2.00
7750	1961	Thunderbird Shop Manual	4.00	983584		N-NH Series—Overhaul	2.00
7750	1962	Thunderbird Shop Manual	4.00				
7750	1963*	Thunderbird Shop Manual Supplement	2.25				
7750	1964	Thunderbird Shop Manual	4.50				
7750	1965	Thunderbird Shop Manual	4.50				
7780	1962	Fairlane Shop Manual	4.00				
7780	1963*	Fairlane Shop Manual Supplement	2.25				
7780	1964*	Fairlane Shop Manual Supplement	2.75				
7099	1955	Truck Shop Manual	3.50				

### LINCOLN-MERCURY MAINTENANCE MANUALS

FORM NO.	YEAR	DESCRIPTION	PRICE	FORM NO.	YEAR	DESCRIPTION	PRICE
6077	1954	Mercury Repair and Adjustment Manual	\$3.00	6076	1956	Lincoln Maintenance Manual	\$3.00
6077	1956	Mercury Maintenance Manual	3.75	6076	1957*	Lincoln and Continental Mark II Service Information Manual Sup.	2.00
6077	1957	Mercury Maintenance Manual	4.00	6076	1958	Lincoln and Continental Mark III Maintenance Manual	4.00
6077	1958	Mercury Maintenance Manual	4.00	6076	1959	Lincoln and Continental Mark IV Maintenance Manual	4.00
6077	1959	Mercury Maintenance Manual	4.00	6076	1960	Lincoln and Continental Mark V Maintenance Manual	5.75
6077	1960	Mercury Maintenance Manual	4.00	6076	1961	Lincoln and Continental Maintenance Manual	4.00
6077	1961	Mercury Maintenance Manual	4.00	6076	1962-63*	Lincoln and Continental Maintenance Manual Supplement	4.50
7098	1962-63*	Mercury Monterey Maintenance Manual Supplement	3.00	6076	1964	Lincoln Continental Maintenance Manual	6.25
7098	1964	Mercury Maintenance Manual	4.75	6076	1965	Lincoln Continental Maintenance Manual	6.25
7098	1965	Mercury Maintenance Manual	4.75	5703	1958	Edsel Service Manual	4.00
10249	1960	Comet Maintenance Manual	4.00	5703	1959	Edsel Maintenance Manual	4.00
10249	1961	Comet Maintenance Manual	4.00	5703	1960	Edsel Maintenance Manual	4.00
7760	1962-63*†	Comet Maintenance Manual Supplement	2.75	5705	1958	Edsel Automatic Transmission	2.75
7760	1964	Comet Maintenance Manual	4.00				
7760	1965	Comet Maintenance Manual	5.00				
7149	1962	Meteor Maintenance Manual	4.00				
7780	1963*	Meteor Maintenance Manual Supplement	2.25				
6076	1954	Lincoln Repair and Adjustment Manual	2.75				

\*Previous year model manual must be ordered with this supplement to obtain complete coverage.

†Does not include information on V-8 Engine—Use 1964 Manual.

### OWNER'S OR OPERATOR'S MANUALS

FORM NO.	YEAR	DESCRIPTION	PRICE	FORM NO.	YEAR	DESCRIPTION	PRICE
3692	*1954-1965	Ford Car Owner's Manual	\$.50 each	7808	*1963-1964	Truck Operator's Manual (Series 500-800)	\$.50 each
7779	*1962-1965	Fairlane Owner's Manual	.50 each	7808	1965	Truck Operator's Manual (Series 500-1100)	1.00 each
7759	*1960-1965	Falcon Owner's Manual	.50 each	7764	*1961-1964	Truck Operator's Manual (Series 850-1100)	.80 each
7833	1965	Mustang Owner's Manual	.65 each	7809	*1963-1964+	Diesel Operator's Manual (Series 3500-7000)	1.50 each
7513	*1955-1965	Thunderbird Owner's Manual (except '55 and '61)	.75 each	7786	*1963-1964+	Diesel Operator's Manual (Series 850-1100)	1.75 each
7767	*1961-1965	Econoline Owner's Manual	.60 each				
3651	*1956-1965	Truck Operator's Manual (Series 100-350)	.50 each				

\*Order the individual year desired.

+1965 Diesel instructions included in Form 7808 and 3651.

## MISCELLANEOUS SERVICE PUBLICATIONS

FORM NO.	YEAR	DESCRIPTION	PRICE	FORM NO.	YEAR	DESCRIPTION	PRICE
7256	1955	Fordomatic	\$1.50	7202	1963	Ford Service Specifications	\$ .55
7256	1956-1957	Fordomatic	1.50	7202	1964	Ford Service Specifications	.60
7557	1958	Air Conditioning	.65	7202	1965	Ford Service Specifications	.50
7746	1958	Transmatic (Ford)	.65	7189	*1958-1963	Time Schedules	1.25
24		Model T	.50	7189	1964	Time Schedules	2.05
1940		Model A	.65	7189	1965	Time Schedules Car and Truck	3.60
7745	1957	Retractable	.50	7189	1965	Time Schedules Car	3.10
7749	1958	Air Suspension (Ford)	.50			Time Schedule Binders	
7748	1957	Supercharger Manual	2.00			7-Ring (Thru 1963)	3.25
4613	1958	Lincoln and Mercury Turbo Drive Transmission Service Manual	1.75			6-Ring (1964 and Later) and Separators	3.50
7202	*	Ford Service Specifications (1959 thru 1962)	.50				

\*Order the individual year desired.

## FORD SERVICE TRAINING AIDS

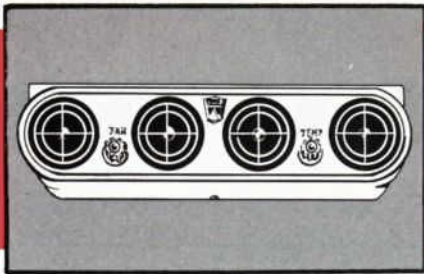
COURSE TITLE	COURSE NO. & PKG. PRICE	INSTRUCTOR'S NOTES	FLIP CHARTS	WALL CHARTS	TRAINING HANDBOOK	SLIDEFILM & RECORD	FILM DIGEST
<b>PERFORMANCE ADJUSTMENTS</b>							
	Vibration And Noise Analysis	1860.1 \$4.19				\$3.65	\$ .65
<b>BRAKES</b>							
PRINCIPLES OF OPERATION	Hydraulic And Vacuum Hydraulic	2000.1 \$17.75	\$3.20	\$11.15		\$3.65	
	Air-Hydraulic And Full-Air	2000.2 \$14.85	\$4.60	\$10.40			
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Hydraulic And Vacuum Hydraulic	2001.1 \$12.10	\$4.45	\$7.85			
OVERHAUL AND MAJOR REPAIR	Hydraulic And Hydraulic Brake Components	2002.1 \$9.15	\$2.65	\$5.15	\$1.60		
<b>SUSPENSION, STEERING, WHEELS AND TIRES</b>							
PRINCIPLES OF OPERATION	Car Suspension And Conventional Steering	3000.1 \$11.75	\$2.60	\$5.25		\$3.65	\$ .65
	Truck Front Suspension And Conventional Steering	3000.2 \$9.45	\$2.40	\$7.25			
	Car And Truck Power Steering	3000.3 \$11.60	\$2.30	\$9.45			
	Car And Truck Front Wheel Alignment And Balance	3000.5 \$7.45	\$2.55	\$5.10			
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Car Suspension And Conventional Steering	3001.1 \$8.45	\$2.90	\$5.70			
	Truck Front Suspension And Conventional Steering	3001.2 \$8.40	\$3.15	\$5.45			
	Car Power Steering	3001.3 \$17.90	\$4.70	\$9.30		\$3.65	\$ .65
	Car And Truck Front Wheel Alignment And Balance	3001.5 \$9.40	\$3.25	\$6.30			
OVERHAUL AND MAJOR REPAIR	Car Suspension And Conventional Steering	3002.1 \$27.90	\$7.65	\$15.40	\$1.60	\$3.65	
	Car Power Steering	3003.1 \$25.45	\$8.70	\$16.90			
	Truck Rear Suspension	3004.1 \$1.60			\$1.60		
	Truck Front Suspension And Conventional Steering	3005.1 \$7.75	\$2.80	\$5.10		Refer to 3004.1	
<b>REAR AXLE &amp; DRIVE SHAFT</b>							
PRINCIPLES OF OPERATION	Rear Axle And Drive Line	4000.1 \$5.04			\$1.60	\$3.65	
	Heavy Truck Drive Line Alignment	4000.5 \$6.55	\$2.05	\$4.65			
	Rear Axle Inspection And Failure Analysis	4001.1 \$3.90	\$3.90	\$9.50			

COURSE TITLE	COURSE NO. & PKG. PRICE	INSTRUCTOR'S NOTES	FLIP CHARTS	WALL CHARTS	TRAINING HANDBOOK	SLIDEFILM & RECORD	FILM DIGEST
<b>OVERHAUL AND MAJOR REPAIR</b>	Car & Light Truck Ford Axles	4002.1	\$3.20	\$8.25			
	Tandem Axles And Power Dividers	4005.1	\$17.20	\$11.60			
	Axle Shift Systems	4007.1	\$10.35	\$3.40	\$7.10		
<b>ENGINES</b>							
<b>PRINCIPLES OF OPERATION</b>	Gasoline Engines	6000.1	\$11.75	\$2.00	\$4.80	\$1.60	\$3.65
	Diesel Engines	6000.2	\$13.25	\$2.55	\$5.85	\$1.60	\$3.65* \$ .65*
<b>DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR</b>	Gasoline Engines	6001.1	\$10.70	\$3.70	\$7.15		
	Diesel Engines	6001.2	\$8.00	\$2.70	\$5.45		
<b>DESCRIPTION AND OVERHAUL</b>	200 Six Cylinder Engine	6002.1	\$2.90	\$8.00			
	240 And 300 6-Cylinder Engines	6003.1	\$12.00	\$4.25	\$7.95		
	289 V-8 Engines	6004.1	\$10.75	\$3.15	\$6.35	\$1.60	
	MD And HD V-8 Truck Engines	6005.1	\$11.85	\$3.65	\$8.35		
	352" And 390" V-8 Engines	6006.1	\$10.65	\$3.45	\$7.35		
	SD V-8 Engines	6007.1	\$3.40	\$8.25			
<b>CLUTCH AND MANUAL SHIFT TRANSMISSIONS</b>							
<b>PRINCIPLES OF OPERATION</b>	Truck 4- And 5-speed Manual Shift Transmissions	7000.2	\$13.10	\$3.85	\$9.45		
	Car 4-Speed Manual-Shift Transmission	7000.3	\$7.35	\$2.30	\$5.20		
	3-Speed Manual-Shift Transmissions And Overdrive	7000.4	\$10.35	\$3.30	\$7.20		
<b>DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR</b>	Car And Truck 3-Speed Overdrive And 4-Speed Transmissions	7001.3	\$10.00	\$3.25	\$6.95		
		7001.4					
<b>OVERHAUL AND MAJOR REPAIR</b>	New Process 4-Speed Transmissions	7005.1	\$5.20	\$1.55	\$3.80		
<b>AUTOMATIC TRANSMISSIONS</b>							
	Automatic Transmissions	7500	\$1.60			\$1.60	
<b>OVERHAUL AND MAJOR REPAIR</b>	C4 Cruise-O-Matic Transmission	7500.1	\$22.35	\$4.75	\$14.95	\$2.10	(coloring book available \$1.10)
	Cruise-O-Matic Transmission	7500.3	\$19.50	\$6.35	\$13.30		
	Transmatic Transmission	7500.4	\$7.05	\$2.15	\$5.10		
<b>DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR</b>	Cruise-O-Matic Transmission	7501.1	\$8.30	\$2.75	\$5.70		
	Transmatic Transmission	7501.2	*	*	*		
	C4 Cruise-O-Matic Transmission	7501.3	\$11.80	\$2.65	\$5.20		(Diagnosis \$3.65 wheel available \$.70)
<b>OVERHAUL AND MAJOR REPAIR</b>	Cruise-O-Matic Transmission	7503.1	\$7.65	\$2.60	\$5.30		
	Transmatic Transmission	7504.1	*	*	*	\$1.60	
	C4 Cruise-O-Matic Transmission	7505.1	\$10.10	\$1.90	\$8.40		
<b>COOLING SYSTEM</b>							
	Car And Light Truck	8001.1	\$5.00			\$1.60	\$3.65

\*Available After May 1, 1965

COURSE TITLE		COURSE NO. & PKG. PRICE	INSTRUCTOR'S NOTES	FLIP CHARTS	WALL CHARTS	TRAINING HANDBOOK	SLIDEFILM & RECORD	FILM DIGEST
<b>FUEL SYSTEM</b>								
PRINCIPLES OF OPERATION	Carburetors And Fuel Pumps	9500.1 \$4.19					\$3.65	\$ .65
	Ford Diesel Fuel System	9500.2 \$7.20	\$2.35	\$5.00				
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Carburetors And Fuel Pumps	9501.1 \$9.45	\$3.00	\$6.65				
	Ford Diesel Fuel System	9501.3 \$14.05	\$4.60	\$9.65				
	Single Barrel Carburetors	9502.1 \$11.25	\$3.70	\$7.65				
OVERHAUL AND MAJOR REPAIR	Ford 2- And 4-Barrel Carburetors	9503.1 \$13.65	\$4.65	\$9.10				
	Holly 2- And 4-Barrel Carburetors	9504.1 \$12.35	\$4.15	\$8.35				
	Carter 4-Barrel Carburetor	9507.1 \$11.70	\$2.15	\$9.75				
<b>CHARGING AND STARTING SYSTEMS</b>								
PRINCIPLES OF OPERATION	AC Generators And Regulators	10000.2 \$14.55	\$3.45	\$6.15		\$1.60	\$3.65	
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	D. C. Charging Systems	10001.1 \$8.70	\$3.15	\$5.75				
	Alternator Charging System	10001.2 10003.1 \$18.20	\$4.55	\$9.75	REFER TO 10001.3		\$3.65	\$ .65
	Starting System	10001.3 \$8.55	\$2.35	\$5.00		\$1.60		
<b>IGNITION SYSTEM</b>								
PRINCIPLES OF OPERATION	Ignition Systems	12000.1 \$5.04				\$1.60	\$3.65	
	Transistorized Ignition System	12000.2 \$11.25	\$3.90	\$7.50				
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Ignition Systems	12001.1 \$18.70	\$1.70	\$17.20				
	Governors	12001.2 \$7.65	\$2.50	\$5.30				
OVERHAUL AND MAJOR REPAIR	Load-O-Matic Distributor	12002.1 \$9.75	\$1.40	\$4.50			\$3.65	
	Dual Advance Distributor	12002.3 \$5.70	\$1.40	\$4.50				
<b>ELECTRICAL . . . LIGHTS, HORNS, WIRING, AND CONTROLS</b>								
PRINCIPLES OF OPERATION	Electricity	13000 *	*	*		\$1.60*	\$3.65*	
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Lights, Horns, Wiring And Controls	13001.1 \$1.60				\$1.60		
	Electrical Circuits	13001.1 \$16.12	1963, Wiring Diagram Book, Price \$3.70 1964, Wiring Diagram Book with supplement, Price \$5.25 1965, Wiring Diagram Book, Price \$7.95					
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Heaters Wiring And Controls	17001.1 \$23.80	\$6.70	\$17.30				
<b>AIR CONDITIONING</b>								
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	Air Conditioner	19001.1 \$16.35	\$3.25	\$9.70			\$3.65	
INSTALLATION	Air Conditioner Installation	19002.1 \$9.20	\$2.75	\$6.65				
<b>BODY</b>								
DIAGNOSIS ADJUSTMENT AND LIGHT REPAIR	General Body	20001.1 \$5.49				\$1.60	\$3.65	\$ .65
	Ford And Mercury Body	20101.1 \$14.10	\$4.95	\$9.35				
	Falcon, Comet And Mustang Body	20201.1 \$15.55	\$4.20	\$11.55				
	Thunderbird Body	20301.1 \$11.55	\$2.55	\$9.20				
	Fairlane Body	20401.1 \$12.20	\$2.95	\$9.45				
	Convertible Tops	20801.1 \$19.30	\$7.85	\$11.55				

\*Available After May 1, 1965



# AIR CONDITIONER DIAGNOSIS and SERVICING

This article is designed to aid service personnel in the preliminary diagnosis and servicing of Ford Air Conditioners. Included in the following pages is a list of the necessary tools, precautions and instructions for proper diagnosis and light repair of Ford Air Conditioning Units.

All Service Personnel should recognize that the use of the right tool for the job will save time and improve the quality of the service. The following tools plus the normal complement of common hand tools should enable the technician to make a quick, accurate diagnosis of the system and perform the necessary operations effectively.

## THE MANIFOLD GAUGE SET

All Common service operations performed on the refrigeration portion of the air conditioner system involve the use of a manifold gauge set. Two gauges, a manifold, two valves, and the necessary hoses and fittings make up the standard set. The low-pressure gauge is usually calibrated to read pressures from 0 to 150 psi and vacuum readings from 0 to 30 inches. This side of the manifold gauge set is connected to the low pressure or inlet side of the compressor.

The high-pressure gauge is usually calibrated to read from 0 to 300 psi, and the hose from this side of the manifold is connected to the discharge or high-pressure side of the compressor.

A T-fitting is incorporated in the center portion of the manifold. Hoses from this fitting are connected to the refrigerant tank and to the vacuum pump when the system is being charged or evacuated. During system discharge, one or both of these hoses can be used as an exhaust outlet.

Two valves, one at either side of the manifold, are designed to open or close a passage from the low-pressure hose to the manifold on the one side and from the high-pressure hose to the manifold on the other side. These valves shut the manifold off from the high- and low-pressure hoses.

Neoprene O-rings are used in the hose connectors to provide a vapor-tight seal.

## SAFETY PRECAUTIONS

*Always wear safety goggles to prevent the possibility of refrigerant contacting the eyes. Should liquid refrigerant come in contact with the eyes, it could cause blindness.*

*Do not allow refrigerant gases to contact an open flame. Such contact will produce toxic phosgene gas. By the same token, fumes from the flame-type leak detector may be toxic, and the technician must not breathe these fumes.*

*Do not expose the system to high*

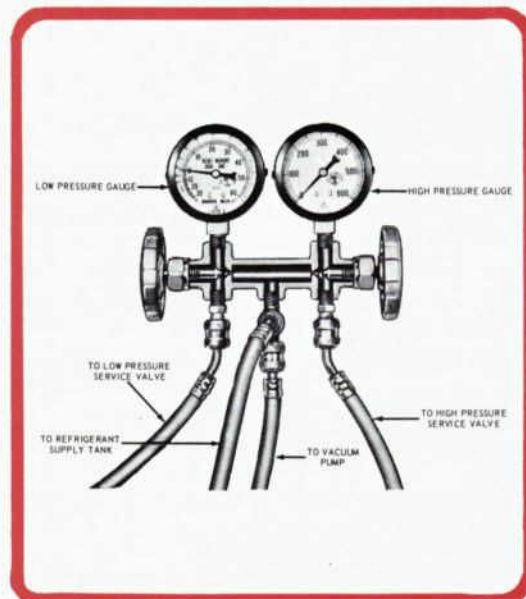
*temperatures from welding, steam cleaning, paint baking, and similar operations.*

*Always carry and store refrigerant containers in an upright position and out of the direct rays of the sun.*

*Ventilate the working area properly to avoid the possibility of dangerous concentrations of refrigerant vapor. Such concentrations can affect leak testing.*

*Lines, fittings and valves in the system must be opened slowly and carefully to release pressures gradually*

- **MANIFOLD GAUGE SET**—Is used to read systems pressures, charge, discharge or evacuate the system.
- **THERMOMETER**—Is used to check the discharge air temperatures; a special thermometer is available to check the temperature of the evaporator core.
- **LEAK DETECTOR**—Is used to detect leaks in the system. Too little refrigerant can greatly lessen the efficiency of the system.
- **VACUUM PUMP**—Is used to remove air from the system whenever the system is opened.
- **REFRIGERATION WRENCHES**—Minimizes the possibility of rounding off line fittings and valve stems when adjusting.
- **BELT TENSION GAUGE**—Accurately measures drive belt tension.



and safely. Avoid damage to valve stems and fittings by using the proper refrigeration wrenches.

*Be certain the refrigerant enters the system through the low-pressure service valve as a vapor. Keep the refrigerant tank upright and do not use a flame to heat the tank. Always evacuate the hoses and manifold prior to charging.*

*Discharge the system slowly to avoid discharging the compressor oil with the refrigerant, and discharge into an exhaust outlet.*



# DIAGNOSIS

With the possible exception of the vacuum control system, trouble-shooting techniques for integral air conditioning systems follow a conventional pattern. In general, a visual test is performed first, and the more obvious problems detected and corrected prior to making more detailed and time-consuming tests.

Most operational difficulties on the air conditioner unit fall into two classifications. These are *Insufficient Cooling* or *No Cooling*.

Since the failure or maladjustment of almost any com-

ponent will reduce the effectiveness of the air conditioner or cause complete failure of the unit, a systematic check of each component part must be made to determine the cause of the malfunction.

A system that is in a state of partial charge must be leaking at some point, and unless the cause of the leak is corrected, merely charging the system will provide only a temporary solution to the problem.

Careful attention to test procedures and safety precautions will help produce a fast, safe and effective repair.

## PRELIMINARY CHECKS

Whenever an owner complains of insufficient or no cooling, a number of preliminary checks should be performed as the initial step in the trouble diagnosis.

The results of the first two checks will isolate the causes of the complaint to the refrigeration system or the air distribution system.

## DISCHARGE AIR VOLUME CHECK

1. Start the engine and operate it at about 1500 rpm.
2. Set all air conditioner controls to the maximum position.
3. Hold your hand in front of the register(s).
4. Compare the discharge air volume with that of a known good unit.

## DISCHARGE AIR TEMPERATURE CHECK

1. Operate the engine at 1500 rpm for 20 minutes, with all the controls set for maximum cooling.
2. Hold the thermometer in the discharge air stream, as close as practicable to the evaporator.
3. If the temperature is not within specifications, the refrigeration system is not operating properly.

## AIR VALVE OPERATION

If the discharge air volume is not within design limits, check all air doors and valves to be certain these valves or doors are in the correct positions.

## CONDENSER AIR PASSAGES

Air flow over the condenser passages must be unobstructed. Dust, leaves, paper, dried mud, or other foreign matter will reduce the heat transfer from the condenser to the air. This causes excessively high system temperatures and pressures and a loss in the overall cooling efficiency of the unit. Clean the condenser air passages with a stiff brush and compressed air.

## DRIVE BELT TENSION

A loose drive belt will slip and the compressor will not operate at the correct speed. Too tight a drive belt will reduce belt life and damage the compressor, water pump, or generator bearings.

Use a Drive Belt Tension Gauge to adjust the drive belt to the recommended tension.



## CLUTCH BRUSH AND SLIP RING CONDITION

Worn, cracked, chipped or sticking brushes will not conduct enough current to the clutch to engage it properly. A scored or otherwise rough slip ring will wear the brushes very quickly. Inspect the brushes and slip ring, and replace the parts as necessary.

## LINE ROUTING

Improperly routed lines can cause chafing or will kink the lines. In some cases, the line may be routed too close to an exhaust manifold or pipe and be damaged by excessive heat. Visually inspect the line routing and relocate and/or secure, as necessary.

## SERVICE VALVE POSITIONING

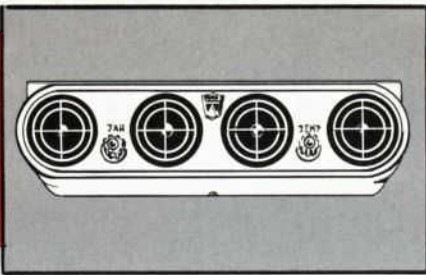
Service valves must be back-seated whenever the system is operational. Turn both valves counterclockwise (as viewed from the end of the stem) until both valves are firmly seated.

## REFRIGERANT CHARGE

When there is too little refrigerant in the system, bubbles, foam, or froth will be seen in the sight glass.

If the system is completely empty, the sight glass will have an oily appearance.

1. Leak test the system and correct the cause of the leak.
2. Add refrigerant until the sight glass is free of bubbles, then add another one-half pound of refrigerant.
3. Check system pressures, back-seat the valves, remove the gauge set, and replace the valve and gauge port caps.



# AIR CONDITIONER DIAGNOSIS and SERVICING

continued

## ELECTRICAL CHECKS

All air conditioner units in the Ford Product line make use of an electromagnetic clutch to connect the compressor to the engine, and an electric motor to provide air circulation. The clutch and the blower motor will not operate properly if the current draw is not within specifications. Two electrical checks must be performed.

### CLUTCH ELECTRICAL CHECK

1. Disconnect the magnetic clutch brush set feed wire at the bullet connector near the clutch.
2. Connect an ammeter in series with the clutch brush lead and the battery positive terminal. A sharp click should be heard as the circuit is completed.
3. Read the current draw on the ammeter. If the current draw is not within specifications, isolate the cause of the trouble and repair or replace parts, as necessary.

### BLOWER MOTOR CURRENT DRAW

1. Disconnect the blower motor lead at the connector closest to the blower.
2. Connect an ammeter in series with the leads.

3. Turn the ignition switch on. Be certain the thermostatic control is off.
4. Read the current draw with the blower motor switch in each of the switch positions.
5. Compare the readings with the specifications. If the current draw is not within specifications, check each component in the circuit and repair or replace the defective parts, as necessary.

## CONTROL CHECKS

Both the expansion valve and the thermostatic switch are considered refrigeration system controls. Evaporator pressure is the determining factor in expansion valve operation. The expansion valve will close and shut off the metered flow of refrigerant to the evaporator when the pressure in the evaporator reaches a predetermined point. Evaporator temperature is sensed by the thermostatic control or switch.

When the evaporator temperature rises above a predetermined figure, the thermostatic control switch points close and energize the magnetic clutch. Pressure in the evaporator is lowered by the pumping action of the compressor. When the evaporator pressure falls below the setting of the expansion valve, the valve opens, additional refrigerant is metered into the evaporator, and the evaporator temperature is lowered.

## EXPANSION VALVE CHECK

1. Make up an adapter to fit the refrigerant tank and the expansion valve.
2. Connect the expansion valve inlet to the tank with the adapter.
3. Hold the expansion valve so the discharge opening is away from the person.
4. Crack the tank valve. Refrigerant vapor should flow through the valve. If the vapor does not flow from the discharge opening, the valve is defective.

## THERMOSTATIC CONTROL CHECK

1. Fill a container (tray, water tumbler, etc.) with crushed ice and water.
2. Set the control to the maximum position and place the sensing tube in the crushed ice and water. Stir the ice and water.
3. Slowly move the control away from the maximum position. After about a 30° movement, the points should "click" open.
4. Move the control back to the maximum position. The points should stay open.
5. Remove the sensing tube from the ice water. In air temperature of 70-75° F, the points should "click" closed in about 5 seconds. If the thermostatic control fails to function as outlined, it is defective.

## USE OF THE MANIFOLD GAUGE SET

By connecting the manifold gauge set to the system, to the vacuum pump, and to the refrigerant tank, system pressures can be checked, a discharged system can be evacuated, and a full or partial charge made simply by changing valve positions.

When making system pressure checks, the gauge valves, refrigerant tank valve, and vacuum pump valve are in the closed position. Prior to evacuating the system with the vacuum pump, system pressures must be completely discharged. If the vacuum pump valve is opened while the system is still under pressure, the vacuum pump will be damaged. In most cases, the pressure will blow the cover

off the pump. It is very important that the system be thoroughly evacuated to remove all traces of air or moisture.

Service and manifold gauge valve positions for a complete charge are the same as for making a partial charge. The high-pressure gauge valve is closed, the low-pressure gauge valve is opened, both service valves are in the mid-position, the refrigerant tank valve is opened, and the vacuum pump valve is closed. The system is not evacuated prior to making a partial charge, but is necessary to purge the air from the gauge hoses.

Air is purged from the hoses by opening the refrigerant tank valve and loosening the high-pressure gauge hose at

the service valve for a few seconds. Tighten the fitting, close the high-pressure gauge valve, and loosen the low-pressure gauge hose at the service valve for a few seconds.

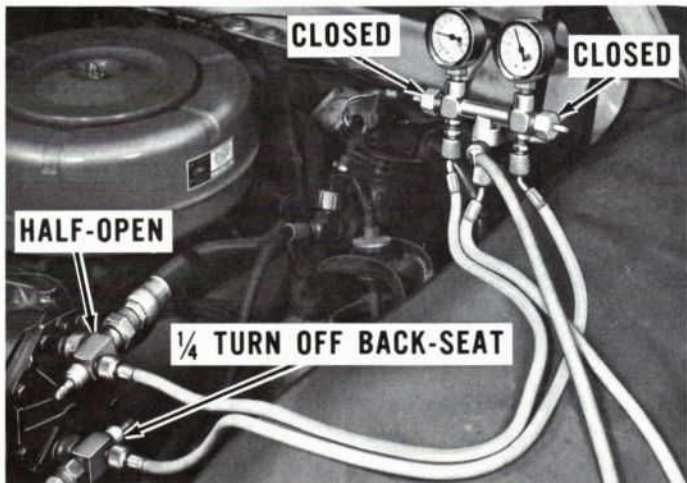
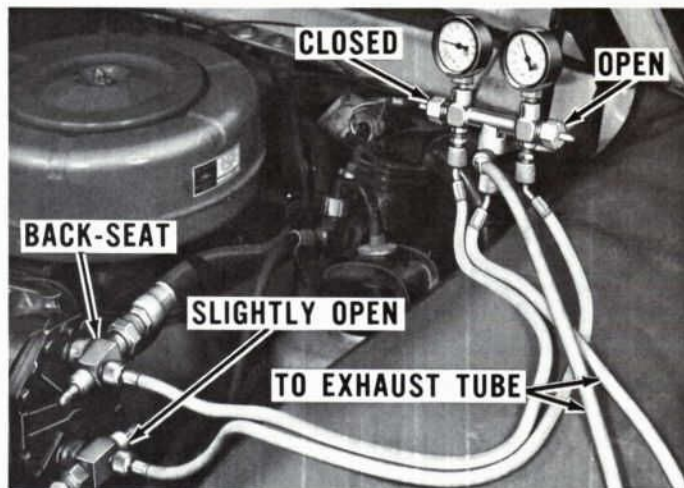
Tighten the hose fitting and proceed with the charging. Always close the high-pressure gauge valve when charging the system.

## DIAGNOSIS PROCEDURE

The manifold gauge set is used to check system pressures as part of the diagnostic procedure and in bleeding, discharging, evacuating, and charging the system.

### PRESSURE TESTING

1. Back-seat the service valves and remove the gauge port caps.
2. Attach the low-pressure gauge hose to the low-pressure service valve and the high-pressure gauge hose to the high-pressure service valve.
3. Close both gauge valves, turn the low-pressure valve to the mid-position, and the high-pressure valve about  $\frac{1}{4}$ -turn open.
4. Read the system pressures. If the high-pressure gauge needle fluctuates, close the high-pressure service valve slightly.



### SYSTEM DISCHARGING

With the gauge hoses attached as for pressure testing:

1. Place the hoses leading from the center of the manifold into an exhaust outlet.
2. Back-seat both service valves.
3. Close the low-pressure gauge valve and open the high-pressure gauge valve.
4. Open the high-pressure service valve slightly.

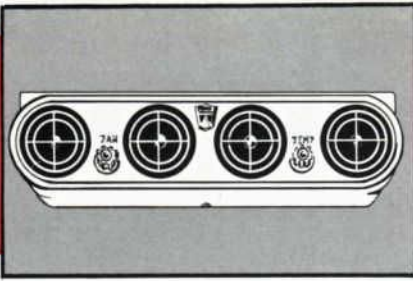
Do not allow the refrigerant to discharge too rapidly, as the compressor oil will be discharged with the refrigerant vapor. During the discharging, check the open ends of the hoses, and if oil is being blown out, reduce the discharge rate. When the system has been completely discharged, back-seat the high-pressure service valve and close the high-pressure gauge valve to prevent the entry of air and

moisture into the system.

If there is no exhaust outlet in the work area, run the hoses out an open window. Never discharge a system directly into the work area, and always wear safety goggles when performing any service operation on the refrigerating system.

## VALVE POSITIONING

Service operations involving pressure testing, evacuating, bleeding, or charging the system can be performed with the manifold gauge set, scale, refrigerant tank, and vacuum pump attached to the system. Valve positions for each of the operations are as follows:



# AIR CONDITIONER DIAGNOSIS and SERVICING

continued

## SYSTEM PRESSURE CHECK

Close both manifold gauge set valves, turn the low-pressure service valve to the mid-position, open the high-pressure service valve slightly, close the refrigerant tank valve and the vacuum pump valve.

## EVACUATING THE SYSTEM

With the system pressure released, open both manifold gauge set valves, turn both service valves to the mid-position, close the refrigerant tank valve, and open the vacuum pump valve.

## CHARGING THE SYSTEM

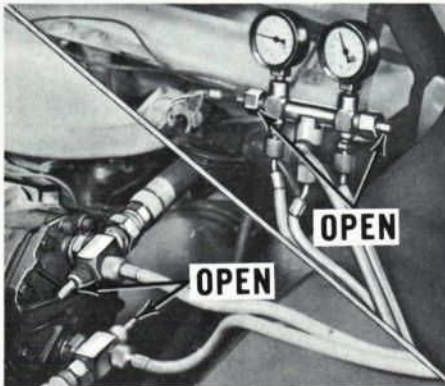
Close the high-pressure manifold gauge valve, open the low-pressure manifold gauge valve, set both service valves to the mid-position, close the vacuum pump valve, and open the refrigerant tank valve.

## BLEEDING THE SYSTEM

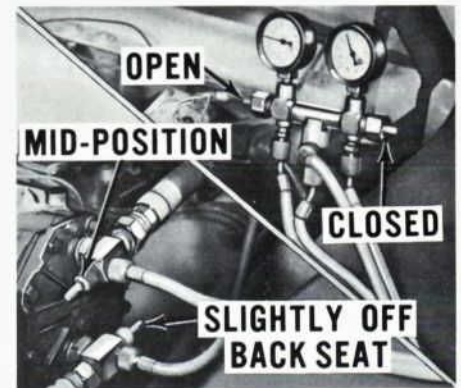
Close both manifold gauge set valves, set both service valves to the mid-position, close the refrigerant tank valve, and close the vacuum pump valve.

## DISCHARGING THE SYSTEM

For discharging the system, the two center-hoses are disconnected from the refrigerant tank and the vacuum pump. Close the low-pressure manifold gauge valve, open the high-pressure manifold gauge valve, set the low-pressure service valve to the mid-position, and open the high-pressure service valve slightly.



**EVACUATING**



**CHARGING**

## SYSTEM SERVICE

Prior to the removal of any refrigerant-carrying component other than the compressor, the refrigerant must be discharged from the system. Whenever possible, two wrenches should be used to avoid twisting the tubing and breaking or deforming the service valve.

Use special tubing wrenches when removing or replacing tube fittings. These special wrenches do not tend to crush the fittings as is the case when open-end wrenches are used.

### HOSE REMOVAL

1. Discharge the system.
2. Hold the valve with the proper size wrench and loosen the tubing nut from the valve. Loosen the nut slowly to avoid a sudden rush of refrigerant, in the event some pressure remains in the system.
3. Hold the expansion valve with the proper size wrench; loosen and remove the hose from the expansion valve.

If the hose is not to be replaced immediately, put a cap over the expansion valve inlet and front seat the high-pressure service valve to prevent the entry of air and moisture into the system.

### EXPANSION VALVE REMOVAL

1. Discharge the system.
2. Use a sharp knife to cut through the insulating material around the valve and peel this material from the valve.
3. Remove the clip securing the sensing bulb to the evaporator discharge tube. If an externally balanced valve is used, disconnect the balance tube.
4. Hold the evaporator inlet tube fitting with a wrench of the proper size and unscrew the valve from the fitting.



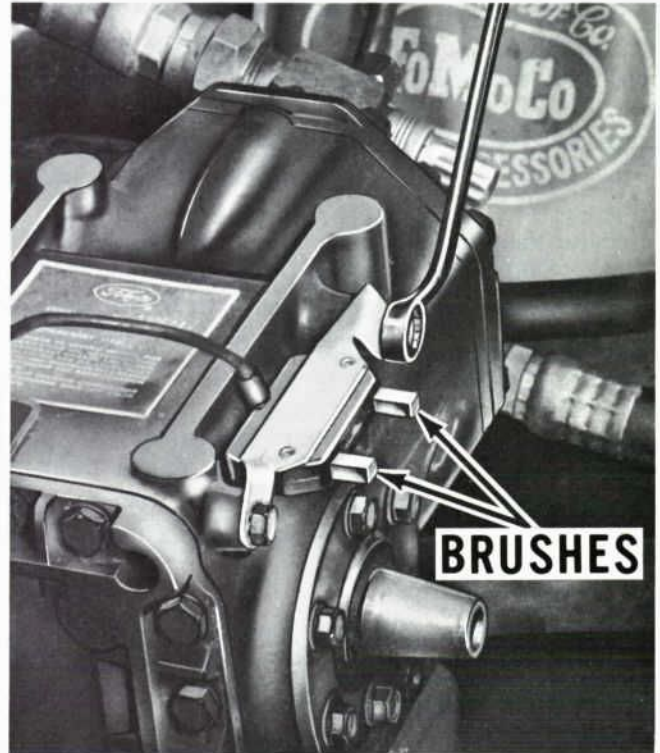
### MAGNETIC CLUTCH REMOVAL

1. Energize the clutch and remove the clutch retaining bolt and washers.
2. Thread a  $\frac{5}{8}$ " x 11" bolt in the clutch drive shaft hole and, with the clutch still energized, tighten the bolt to loosen the clutch from the crankshaft.
3. Disconnect the clutch wire lead and remove the clutch and drive belt. Inspect the compressor crankshaft and key for dirt, burrs, nicks, or scratches, and correct any of these conditions.

### BRUSH REMOVAL

Brushes and the brush holders used on current units are attached to the compressor body with two  $\frac{1}{4}$ -inch cap screws. These screws serve no other function and it is not necessary to isolate the compressor before removing the two cap screws.

1. Remove the clutch.
2. Remove the two slip ring brush assembly retaining screws and remove the brush assembly.



## AIR CONDITIONER SPECIFICATIONS

### BLOWER MOTOR CURRENT DRAW

#### FORD-MERCURY

At Low Speed	2-4 Amperes at 12 Volts
At Medium Speed	4-6 Amperes at 12 Volts
At High Speed	6-8 Amperes at 12 Volts*

\*When in A/C position 8.4-8.9 amperes at 12 volts on Select-Aire and Deluxe Air Conditioner. 6.5-7.5 amperes at 12 volts on Ford and Mercury Air Conditioners.

#### THUNDERBIRD

At Low Speed	2-4 Amperes at 12 Volts
At Medium Speed	4-5 Amperes at 12 Volts
At High Speed	6.3-7.5 Amperes at 12 Volts*

#### COMET, FALCON, FAIRLANE, MUSTANG

At Low Speed	3-4 Amperes at 12 Volts
At Medium Speed	4.5-5.5 Amperes at 12 Volts
At High Speed	6.5-7.5 Amperes at 12 Volts

\*When in A/C position 13.2 Amperes at 12 volts.

### AIR CONDITIONER COMPRESSOR

#### FORD-MERCURY, FALCON, FAIRLANE, MUSTANG, COMET

Location	Torque (ft.-lb.)	
Cylinder Head	14-18	
Front Seal Plate	13-17	
Service Valve (Rotolock)	35 Max.	
Mounting Bolt	14-17	
Oil Filler Plug	18-22	
Clutch Mounting	15-22	
Base Plate	7-11	
Back Plate	7-10	
Oil Capacity	$\frac{7}{8}$ " 11 ounces	$\frac{3}{4}$ " 10 ounces
Refrigerant Capacity	$2\frac{1}{2}$ pounds	$2\frac{1}{2}$ pounds

#### THUNDERBIRD

Cylinder Head	20-24
Front Seal Plate	6-10
Service Valve (Rotolock)	35 Max.
Mounting Bolt	14-17
Oil Filler Plug	18-22
Clutch Mounting	15-22

### DRIVE BELT TENSION

Between Fan Pulley and Air Conditioner Compressor

All Engines.....	New Belt	120-150
	Used Belt	90-120

Belt operated for a minimum of 10 minutes is considered used.



# SPARK PLUGS

- REMOVAL
- CLEANING
- INSPECTION
- INSTALLATION

1. Disconnect the spark plug wires by grasping the terminal or boot, not the wires; then loosen each plug one or two turns, using a deep-well socket of the correct size, and extension, if required, and a ratchet handle.
2. Remove all dirt from each plug to prevent dirt from entering the cylinder when the plugs are removed.
3. Remove the plugs and place them in a row on a fender cover in the order in which they were removed. This will aid in the inspection and analysis of any unusual conditions which might be attributed to a malfunction in another part.
4. Clean the spark plugs with an approved spark plug cleaner. Be certain that all surfaces of the insulator are clean and white. Remove any rust from the plug threads. Also, clean the exterior surface of the insulator with solvent.
5. File the electrodes with a small point file. Open the gap slightly to permit proper filing. Be sure that the parallel electrode surfaces are bright and clean.
6. Reset the electrode gap to specifications. Do not bend or apply pressure to the center electrode. Use the bending tool to adjust gap to its proper setting, keeping the

surfaces of the electrode parallel. Plier-type gapping tools are not recommended.

7. Prior to spark plug installation, wipe the spark plug seats in the cylinder head with a clean cloth. If the seats are rusted, clean them with a wire brush. If necessary, clean the spark plug hole threads with a thread tap of the proper size. Install new gaskets on gasket type spark plugs and screw the plugs into the head finger-tight.
8. Use a torque wrench with the correct deep-well socket, tighten the plugs to the specifications listed below:

HEX. SIZE INCHES	PLUG THREAD SIZE	TORQUE-FT. LBS.	
		CAST IRON HEADS	ALUMINUM HEADS
5/8	10 MM	15	10
13/16	14 MM	30	25
7/8*	18 MM**	40	35
15/16	7/8"-18	45	40

\*13/16—tapered seat

\*\*Torque tapered seat spark plugs 15 to 20 Ft. Lbs.

9. Connect the spark plug wires and check the condition of the wire and boots. Dried-out wires and boots can be a source of spark failure and should be replaced.

## WHEEL BEARING END PLAY ADJUSTMENT ON VEHICLES WITH DISC BRAKES

In reference to the article on Disc Brakes in December, 1964 Shop Tips, the footnote which appeared with disc brake specifications on page 9 should be supplemented with the following information.

When adjusting bearing end play to the prescribed specifications (.0005" to .0065") the following procedure should be used:

1. While rotating the wheel, hub, and rotor assembly, torque the adjusting nut to 17-25 ft-lbs to seat the bearings.
2. Locate the nut lock on the adjusting nut so that the castellations on the lock are aligned with the cotter pin hole in the spindle.
3. Using a 1 1/8 inch box wrench, back off both adjusting nut and nut lock together until the next castellation on

the nut lock aligns with the cotter pin hole in the spindle.

4. Install the new cotter pin, and bend the ends of the cotter pin around the castellated flange of the nut lock.

Carefully following this procedure will produce proper bearing end play tolerance when servicing Ford vehicles with disc brakes.



WITH ROTOR AND WHEEL ROTATING, TORQUE THE ADJUSTING NUT TO 17 - 25 ft. lbs.



INSTALL LOCK ON NUT SO THAT CASTELLATIONS ARE ALIGNED WITH COTTER PIN HOLE.



BACK OFF NUT AND NUT LOCK ONE CASTELLATION INSTALL COTTER PIN

# SPECIAL D.S.O. IDENTIFICATION TAG ON HEAVY DUTY TRUCKS

To help you in servicing special order Ford heavy duty trucks with varying combinations of part assemblies, a patent plate has been added as a part reference source. The patent plate consists of a plastic card attached to the inside panel of the left hand door containing information for identifying dealer special order part (D.S.O.) assemblies on each truck. It should be noted that this patent plate is in addition to the special equipment parts list located in the glove compartment of every truck. When in need of parts or information in servicing special order truck parts the patent tag will help you order the correct component from your Ford Dealer's Parts Department.

Be sure to supply your Ford Parts Dealer with all the D.S.O. information for quick delivery of your order. As shown in the illustration, the information on the patent plate is arranged in four columns. Following is an explanation of each column:

Ford			
ITEM	MAKE	MODEL	PART NO.
TRANS	SPICER	80163A	C5TS7003B
DRSHFT	DANA	204517103	C4TS4964T
SPEEDO	CABLE		C5TA17260BF
AXLE	ROCKWELL	SSHD	C5TS4001A
4.625.1	RATIO		
AXLE	ROCKWELL	SSHD	C4TS4301C
4.625.1	RATIO		

- ITEM** This column provides the name of the D.S.O. assembly.
- MAKE** This is the identification of the manufacturer of the D.S.O. assembly.
- MODEL** This is identification of the vendor model number and identifying marks.
- PART NUMBER** This is the Ford part number for the D.S.O. assembly, extremely important in ordering parts through your Ford dealer.



## May-June **SPOTLIGHT SPECIAL** features **FoMoCo Brake Cylinder Repair Kits**

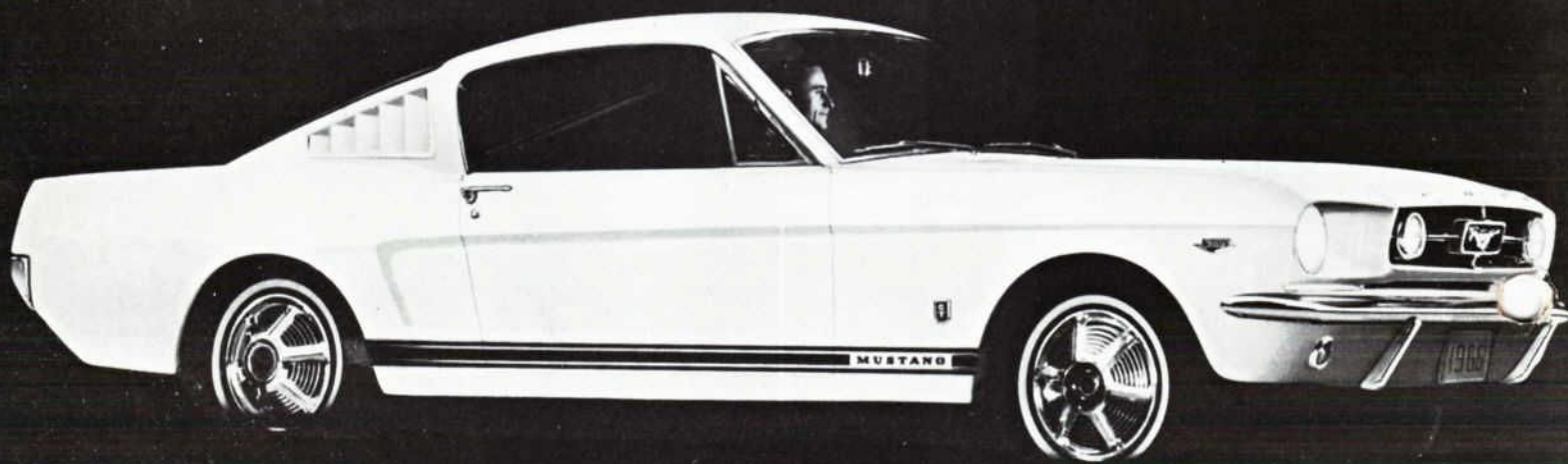
During May-June, participating Ford Dealers Parts Departments are offering wholesale accounts an extra big discount on FoMoCo Brake Cylinder Repair Kits . . . an extra 40¢ off the wholesale price of each set of four purchased or 10¢ off on single sets. This is in addition to the regular trade discount offered every month and can mean more profit on each brake repair job you do. Take advantage of this timely special to stock up on these

fast moving items, and to build brake service profits.

Your Ford Dealer also stocks a complete line of brake repair parts including: Master Cylinder Repair Kits, Reconditioned Brake Shoe and Lining Kits, New Wheel and Master Brake Cylinders, Brake Hose, and Power Brake Booster Repair Kits. See him for the complete line at special trade discounts. See him for all your parts needs.

**FORD SPECIAL PRICES MEAN MORE PROFITS FOR YOU!**

*Watch For This Emblem!*



*It Signifies*  
*The New Mustang*  *Performance Group*

**This great new performance package includes:**

- 225-hp Challenger Special V-8
- Fully Synchronized 3-Speed Manual Floor Shift
- Dual Exhaust with Flared Chrome Tail Pipe Extensions
- Special Handling Package
- Front Disc Brakes
- Fog Lamps and Grille Bar
- New Instrument Cluster
- GT Fender Badges
- Metal Hood Accent Moulding
- GT Triple Stripe

*At Ford Dealers... Now!*