# INSTRUMENT PANEL - STANDARD

1991 Mazda Miata

1990-92 SAFETY EQUIPMENT
Instrument Panels - Analog

B2200, B2600i, Miata, MPV, MX-6, Navajo,
Protege, RX7, 323, 626, 929

## DESCRIPTION & OPERATION

Instrument panel contains a speedometer, fuel gauge and coolant temperature gauge. Some models may also have a tachometer, voltmeter, oil pressure gauge and/or turbo boost meter. The fuel and temperature gauges operate on 7 volts, supplied by a cluster-mounted voltage regulator. The sending units are variable-resistance type.

## TESTING

NOTE: Checker (49-0839-285), which induces various resistances, is available for testing gauges and meters. If checker is not available, gauges may be tested with specific resistors listed in various resistance specifications tables.

### BOOST METER (RX7 TURBO)

Operation Check

1) Ensure boost meter registers at less than zero position when engine is idling or vehicle is moving at very slow speeds.

2) Ensure pointer moves to higher than zero position when pressure in intake manifold increases (when turbocharger is operating or when engine speed increases).

### FUEL GAUGE

NOTE: On B2200, B2600i and Navajo, remove fuel tank from vehicle for access to fuel gauge sending unit.

B2200 & B2600i

1) Ensure fuse and wiring are okay. To test fuel gauge, remove fuel tank and disconnect fuel gauge sending unit connector.

2) Connect Red wire lead of Checker (49-0839-285) to "Y" terminal (harness side) of sending unit connector. See Fig. 1. Connect checker Black wire lead to "B" terminal.

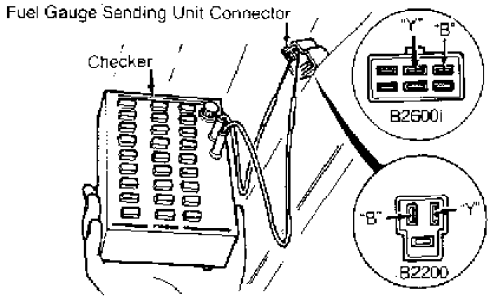



Fig. 1: Testing Fuel Gauge Using Checker (B2200 & B2600i)
Courtesy of Mazda Motors Corp.

3) Set checker to resistance values shown in FUEL GAUGE RESISTANCE table. Turn ignition switch to ON position and ensure

needle position corresponds to resistance measurement. See Fig. 2.

4) Allow 2 minutes for needle to stabilize. Allowable limit of needle deflection is twice width of needle.

5) If gauge needle readings are as specified in FUEL GAUGE RESISTANCE table, replace sending unit. If gauge readings are not as specified, check wiring. If wiring is okay, replace gauge.

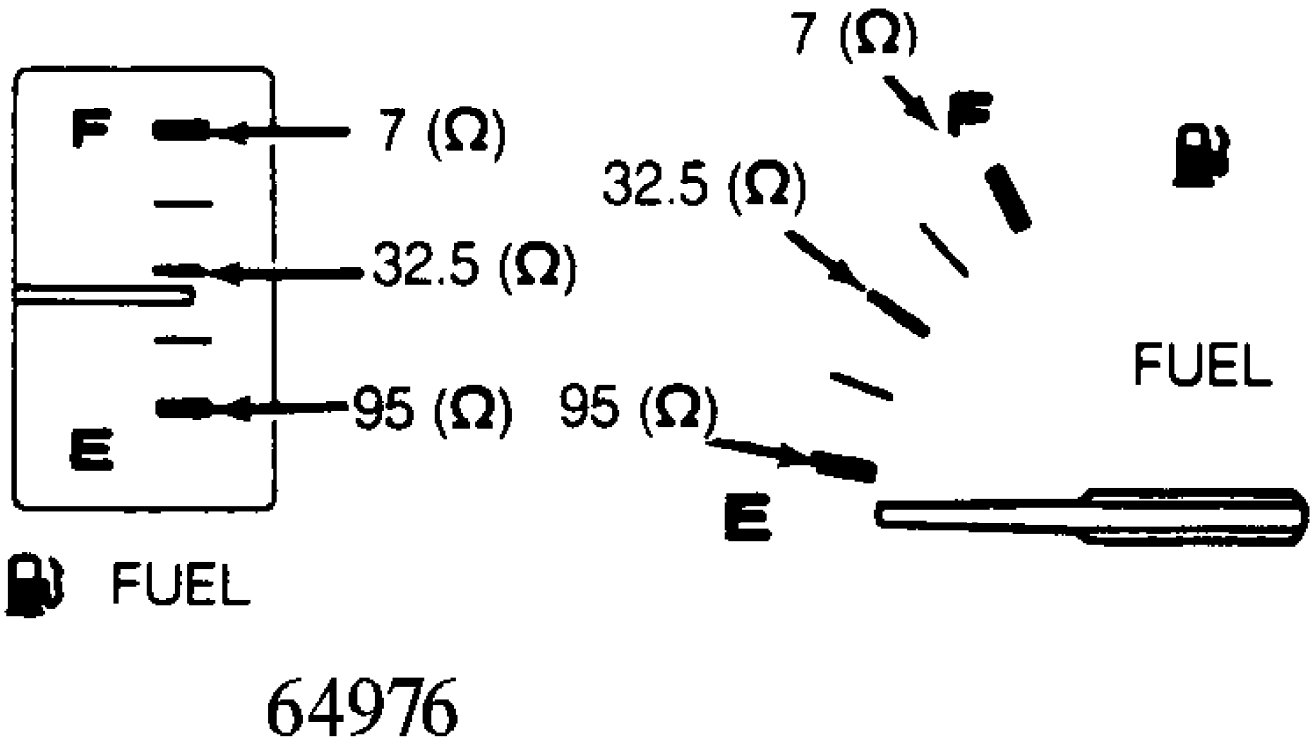



Fig. 2: Identifying Fuel Gauge Needle Positions & Resistances
Courtesy of Mazda Motors Corp.

FUEL GAUGE RESISTANCE

| Needle Position | Ohms |
|---|---|
| Except Navajo | |
| "F" (Full) | 7 |
| Half | 32.5 |
| "E" (Empty) | 95 |

Miata, MPV, MX-6, Protege, 323, 626 & 929

1) Ensure fuse and wiring are okay. To test fuel gauge, disconnect fuel gauge sending unit connector at fuel tank.

2) Connect Red wire lead of Checker (49-0839-285) to "Y" terminal (harness side) of sending unit connector. See Fig. 3. Connect checker Black wire lead to body ground.

3) Set checker to various resistance values shown in FUEL GAUGE RESISTANCE table. Turn ignition switch to ON position and ensure needle position corresponds to resistance measurement. See Fig. 2.

4) Allow 2 minutes for needle to stabilize. Allowable limit of needle deflection is twice width of needle.

5) If gauge needle readings are as specified in FUEL GAUGE RESISTANCE table, replace sending unit. If gauge readings are not as specified, check wiring. If wiring is okay, replace gauge.

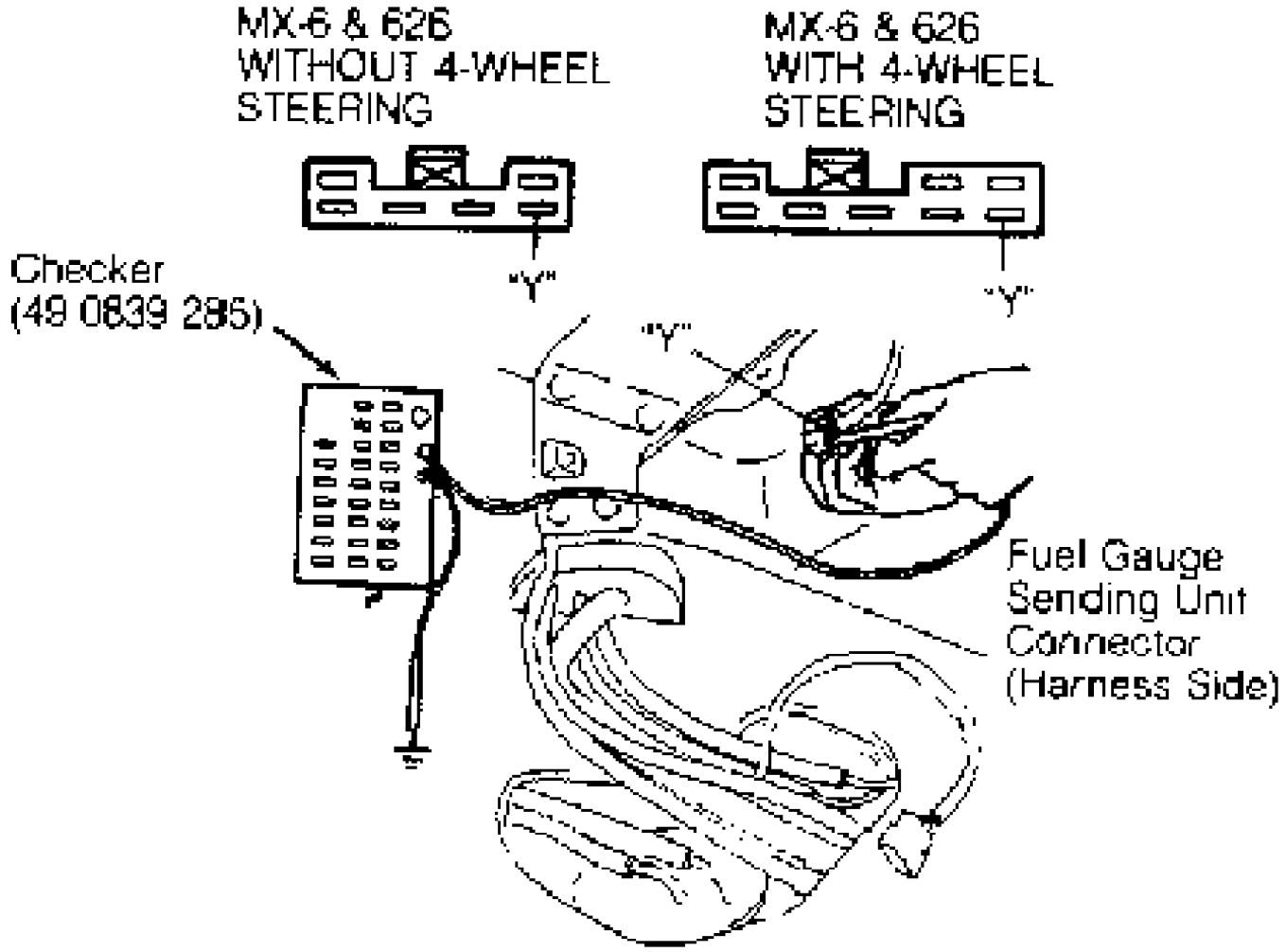



Fig. 3: Testing Fuel Gauge Resistance (All Are Similar)
Courtesy of Mazda Motors Corp.

Navajo

1) Ensure fuse and wiring are okay. To test fuel gauge, remove fuel tank and disconnect fuel gauge sending unit connector.

2) Connect Red wire lead of Checker (49-0839-285) to Yellow/White wire of sending unit connector (harness side). Connect Black wire lead of checker to body ground.

3) Set checker to 22-ohm position. Turn ignition on. Allow 2 minutes for needle to stabilize. If gauge indicates "E", go to step 5). If gauge indicates inaccurately, turn ignition off. Remove instrument cluster.

4) Remove slosh module located on back of instrument cluster. Connect a jumper wire from Red lead of checker to fuel gauge terminal

"S" (Yellow/White wire). Turn ignition on. If gauge does not indicate "E", replace gauge. If gauge indicates "E", replace slosh module.

5) Turn ignition off. Set checker to 145-ohm position. Turn ignition switch to ON position. Allow 2 minutes for needle to stabilize. If gauge indicates "F", check sender circuit wiring for shorts or opens using an ohmmeter. If gauge indicates inaccurately, remove instrument cluster.

6) Inspect printed circuit to ensure loop connecting fuel sender input to fuel gauge is cut. If loop is not cut, correctly cut printed circuit at loop. Remove slosh module from rear of instrument cluster, and connect jumper wire from Red lead of checker to gauge terminal "S" (Yellow/White wire).

7) Reconnect cluster connector, and recheck gauge. If gauge does not read "F", replace gauge. If gauge reads "F", replace slosh module.

RX7

1) Ensure fuse and wiring are okay. To test fuel gauge, disconnect fuel gauge sending unit connector at fuel tank.

2) Connect Red wire lead of Checker (49-0839-285) to White/Green wire terminal (harness side) of sending unit connector. See Fig. 4. Connect checker Black wire lead to body ground.

3) Set checker to resistance values shown in FUEL GAUGE RESISTANCE table. Turn ignition switch to ON position and ensure needle position corresponds to resistance measurement. See Fig. 2.

4) Allow 2 minutes for needle to stabilize. Allowable limit of needle deflection is twice width of needle.

5) If gauge needle readings are as specified in FUEL GAUGE RESISTANCE table, replace sending unit. If gauge readings are not as specified, check wiring. If wiring is okay, replace gauge.

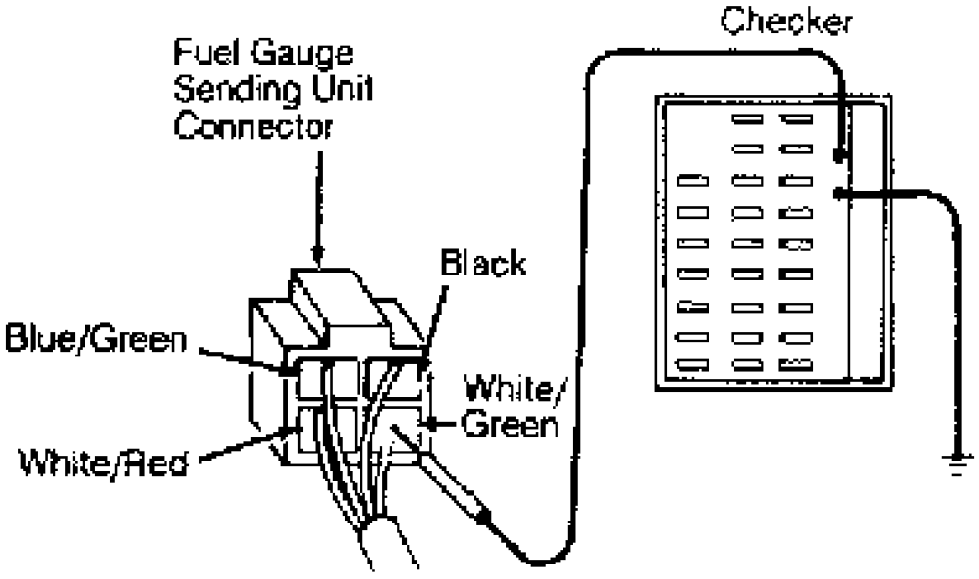



Fig. 4: Testing Fuel Gauge Resistance (RX7)
Courtesy of Mazda Motors Corp.

## FUEL GAUGE SENDING UNIT

CAUTION: When working with fuel-injected models, be careful when removing fuel gauge sending unit. Relieve fuel pressure before removing sending unit. Fuel could spray from tank.

NOTE: On B2200, B2600i and Navajo, remove fuel tank from vehicle for access to fuel gauge sending unit.

1) Disconnect fuel gauge sending unit connector. Connect ohmmeter between sending unit harness connector terminals.
2) Check resistance readings at indicated float positions. See FUEL GAUGE SENDING UNIT RESISTANCE table. If resistance is not as specified, replace fuel gauge sending unit.

FUEL GAUGE SENDING UNIT RESISTANCE (1)

| Float Position | Ohm |
|---|---|
| B2200, B2600i, MX-6 & 626 | |
| Fully Raised | 1-5 |
| Midrange | 29-37 |
| Fully Lowered | 103-117 |
| Miata | |
| Fully Raised | 2.4-3.6 |
| Three-Quarters | 15.2-16.4 |
| Midrange | 31.8-33.2 |
| One-Quarter | 62.7-65.7 |
| Fully Lowered | 107.5-112.5 |
| MPV | |
| Fully Raised | 1-5 |
| Three-Quarters | 28-36 |
| One-Quarter | 89-101 |
| Fully Lowered | 103-117 |
| Navajo | |
| Fully Raised | 154-163 |
| Fully Lowered | 14-18 |
| Protege 2WD, RX7 & 323 | |
| Fully Raised | 3 |
| Midrange | 33 |
| Fully Lowered | 110 |
| Protege 4WD | |
| Fully Raised | 0-2.5 |
| Midrange | 7.3-13.3 |
| Fully Lowered | 30-36 |
| 929 | |
| Fully Raised | 1-5 |
| Three-Quarters | 28-36 |
| One-Quarter | 45-57 |
| Fully Lowered | 103-117 |
| 929 (1992) | |
| Fully Raised | 6 |
| Three-Quarters | 33 |
| One-Quarter | 97 |

(1) - Resistance readings and float positions are approximations.

## OIL PRESSURE GAUGE

NOTE: When checking gauge readings, allow 2 minutes for reading to stabilize. Allowable indication error is twice width of needle.

Resistance Test (Miata)

1) Remove instrument cluster. Apply 12 volts to terminal 2K, and ground terminal 2J of instrument cluster connector. See Fig. 5.

2) Connect Red lead of Checker (49-0839-285) to terminal 2B of instrument cluster connector and Black lead to ground. Set checker to specified resistance values and ensure oil pressure gauge gives proper indication. See OIL PRESSURE GAUGE RESISTANCE table.

3) If gauge does not function as described, replace gauge. If gauge is functioning normally, repair wiring harness or sending unit. Measure resistance of oil pressure sending unit. With engine off, sending unit resistance should be 110-130 ohms. With engine running, resistance should be 13-55 ohms. Replace sending unit if not to specification.

OIL PRESSURE GAUGE RESISTANCE

| Ohms | psi |
|---|---|
| Miata | |
| 52 | 0 |
| 41 | 30 |
| 16 | 90 |
| RX7 | |
| Infinite | 0 |
| 200 | 30 |
| 110 | 60 |
| 80 | 110 |

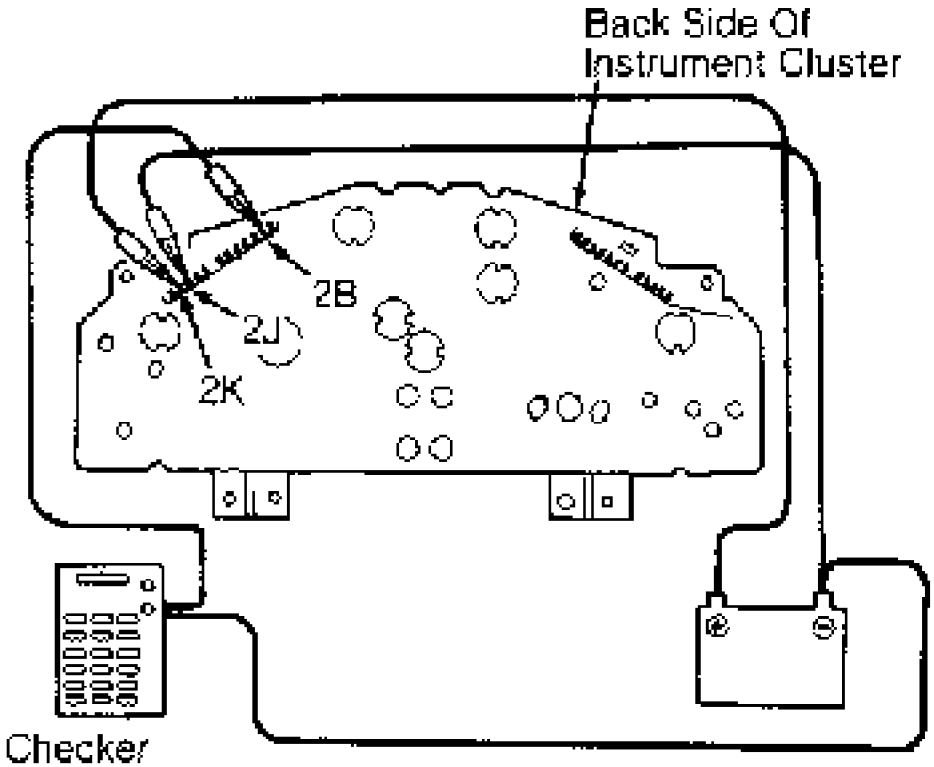



Fig. 5: Checking Oil Pressure Gauge (Miata)
Courtesy of Mazda Motors Corp.

Resistance Test (Navajo)

1) Disconnect oil pressure sending unit. Connect Red lead of

Checker (49-0839-285) to wire and Black wire to chassis ground.

2) Move checker switch to 73-ohm position. If gauge does not move, go to next step. If gauge reads "L", set checker to 9.7-ohm position. If gauge reads about midrange on scale, replace sender. If gauge does not read about midrange on scale, go to next step.

3) Check sender circuit wiring for shorts and opens using ohmmeter. If wiring is okay, replace gauge. If wiring is shorted or open, repair wiring as necessary. See appropriate chassis wiring diagram in WIRING DIAGRAMS.

Resistance Test (RX7)

1) Disconnect wiring harness connector from oil pressure gauge sending unit. Connect Red lead of Checker (49-0839-285) to wiring harness connector and Black lead to ground.

2) Set checker to specified resistance values and ensure oil pressure gauge gives proper indication. See OIL PRESSURE GAUGE RESISTANCE table.

3) If gauge does not function as described, check wiring harness. If harness is okay, remove instrument cluster and check gauge. If gauge is okay, replace sending unit.

NOTE: On RX7 models, oil pressure is slightly lower when engine is cold because eccentric shaft by-pass valve operates.

## SPEEDOMETER

NOTE: Tire size, wear and incorrect inflation can affect speedometer reading and odometer measurement.

Variance Test

1) If a speedometer tester is used, follow manufacturer's procedures. Allowable tolerance is about 1/2 MPH for every 10 MPH actual speed.

2) If speedometer is inoperative or indicator fluctuates excessively, remove speedometer cable for inspection. If cable is functional with no signs of wear or damage, replace speedometer.

## TACHOMETER

NOTE: No testing information is available for Navajo.

Variance Test (Except Navajo)

Connect a test tachometer to negative terminal of ignition coil. Start engine and compare vehicle tachometer with test tachometer. Vehicle tachometer performance is acceptable if unit is within allowable range. See TACHOMETER VARIATION SPECIFICATIONS table. If tachometer performance is not within specifications, replace tachometer.

TACHOMETER VARIATION SPECIFICATIONS

| Standard Indication | Allowable Range |
|---|---|
| B2200 & B2600i | |
| 1000 RPM | 910-1090 RPM |
| 2000 RPM | 1910-2090 RPM |
| 3000 RPM | 2910-3090 RPM |
| 4000 RPM | 3880-4120 RPM |
| 5000 RPM | 4850-5150 RPM |
| 6000 RPM | 5820-6180 RPM |
| Miata & MPV | |
| 2000 RPM | 1850-2150 RPM |
| 3000 RPM | 2760-3280 RPM |

| | |
|---|---|
| 4000 RPM | 3700-4300 RPM |
| 5000 RPM | 4640-5360 RPM |
| MX-6 & 626 | |
| 1000 RPM | 880-1060 RPM |
| 2000 RPM | 1880-2120 RPM |
| 3000 RPM | 2850-3150 RPM |
| 4000 RPM | 3820-4180 RPM |
| 5000 RPM | 4790-5210 RPM |
| 6000 RPM | 5760-6240 RPM |
| Protege & 323 & 1992 929 | |
| 1000 RPM | 880-1060 RPM |
| 2000 RPM | 1970-2150 RPM |
| 3000 RPM | 3000-3180 RPM |
| 4000 RPM | 4000-4240 RPM |
| 5000 RPM | 5000-5300 RPM |
| 6000 RPM | 6000-6360 RPM |
| 7000 RPM | 7000-7420 RPM |
| 8000 RPM | 8000-8480 RPM |
| RX7 | |
| 1000 RPM | 940-1120 RPM |
| 2000 RPM | 1880-2120 RPM |
| 3000 RPM | 2850-3150 RPM |
| 4000 RPM | 3820-4180 RPM |
| 5000 RPM | 4790-5210 RPM |
| 6000 RPM | 5760-6240 RPM |
| 7000 RPM | 6727-7273 RPM |
| 929 | |
| 1000 RPM | 940-1120 RPM |
| 2000 RPM | 1850-2030 RPM |
| 3000 RPM | 2820-3000 RPM |
| 4000 RPM | 3760-4000 RPM |
| 5000 RPM | 4700-5000 RPM |
| 6000 RPM | 5640-6000 RPM |

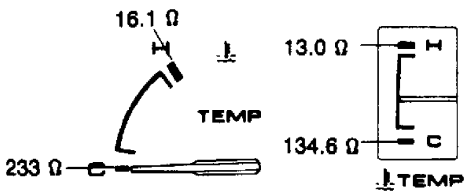
## TEMPERATURE GAUGE

NOTE: Temperature gauge sending units have single-blade connectors and are located on or near thermostat housings.

1) If temperature gauge needle does not move, check for blown fuse or loose harness connector.

2) To test temperature gauge, disconnect temperature gauge sending unit connector wire. Connect Red wire lead of Checker (49-0839-285) to sending unit connector and Black wire lead to ground.

3) Turn ignition switch to ON position. Ensure needle position corresponds to resistance measurement. See TEMPERATURE GAUGE RESISTANCE table. See Fig. 6.




Courtesy of Mazda Motors Corp

Fig. 6: Identifying Temperature Gauge Needle Positions & Resistances Courtesy of Mazda Motors Corp.

4) Allow 2 minutes for needle to stabilize. Allowable limit of needle deflection is twice width of needle.

5) If gauge readings are as specified in TEMPERATURE GAUGE RESISTANCE table, replace sending unit. If gauge readings are not as specified, check wiring. If wiring is okay, replace gauge.

TEMPERATURE GAUGE RESISTANCE

| Needle Position | Ohms |
|---|---|
| B2200 & B2600i | |
| Circular Gauge (1) | |
| HOT | 12 |
| COLD | 154 |
| Vertical Gauge (1) | |
| HOT | 12 |
| COLD | 133 |
| Miata | |
| HOT | 20 |
| COLD | 183 |
| MPV | |
| HOT | 19 |
| COLD | 153 |
| MX-6 & 626 | |
| HOT | 8 |
| Normal | 35 |
| COLD | 215 |
| Navajo | |
| HOT | 9.7 |
| COLD | 73 |
| Protege & 323 | |
| With Tachometer | |
| HOT | 15.2 |
| COLD | 148 |
| Without Tachometer | |
| HOT | 19 |
| COLD | 153 |
| RX7 | |
| HOT | 13 |
| COLD | 154 |
| 929 | |
| HOT (Danger) | 18 |
| HOT (Normal Range) | 23 |
| COLD (Normal Range) | 103 |
| COLD (Lowest Range) | 215 |
| 929 (1992) | |
| HOT | 18 |
| COLD | 181 |

(1) - See Fig. 6.

## TEMPERATURE GAUGE SENDING UNIT

NOTE: Testing information for Navajo temperature sending unit is not available.

Except Navajo

1) Remove temperature gauge sending unit from engine. Place temperature gauge sending unit in a pan of water with a thermometer. Gradually heat water.

2) Ensure resistance of temperature gauge sending unit is 49-58 ohms at 176°F (80°C) on B2200, B2600i, MX-6, RX7 and 626; 103 ohms at 140°F (60°C) on 929; or 190-260 ohms at 122°F (50°C) on Miata, MPV, Protege and 323. Replace temperature gauge sending unit if resistance

is not within specification.

### VOLTMETER

Variance Test (Navajo, RX7 & 929)
Connect a calibrated voltmeter to battery and compare reading with vehicle voltmeter. If readings differ significantly, replace voltmeter. Allowable voltmeter tolerance is twice width of indicator needle.

NOTE: For exploded views of instrument clusters, see Figs. 12-17. Exploded view for Navajo instrument cluster is not available.

### INSTRUMENT CLUSTER R & I

Removal & Installation (B2200 & B2600i)
Remove steering wheel and column covers. Remove screws and instrument cluster cover. See Fig. 7. Remove instrument cluster mounting screws. Disconnect harness connector and speedometer cable. Remove instrument cluster. To install, reverse removal procedure.

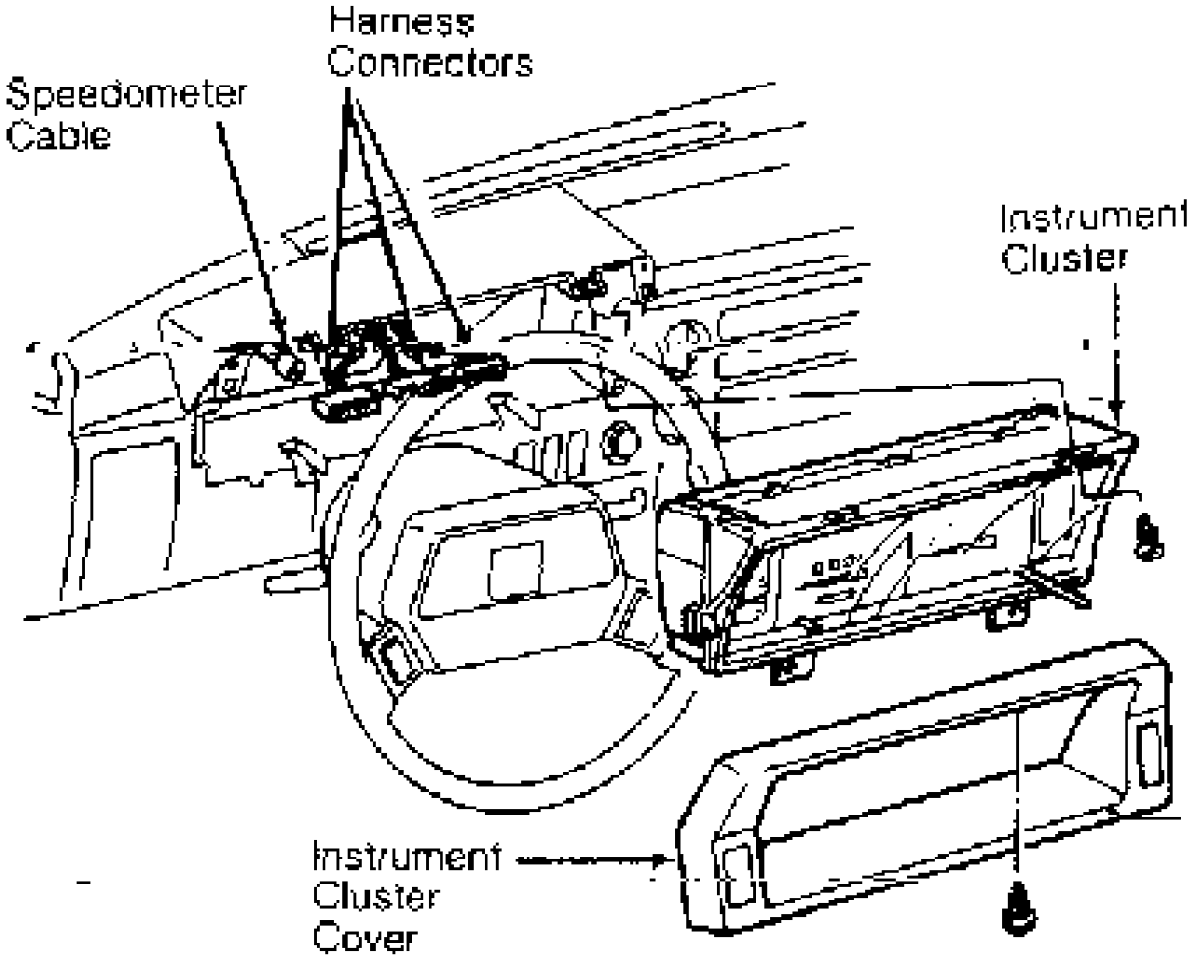



Fig. 7: Removing Instrument Cluster (B2200 & B2600i)
Courtesy of Mazda Motors Corp.

WARNING: Miata is equipped with air bag restraint system. See AIR BAG RESTRAINT SYSTEM article for warnings and safety precautions.

Removal & Installation (Miata)

Remove steering column mounting bolts. Lower steering wheel. Remove instrument cluster cover. Remove instrument cluster mounting screws. Disconnect harness connectors and speedometer cable. Remove instrument cluster. See Fig. 8. To install, reverse removal procedure.

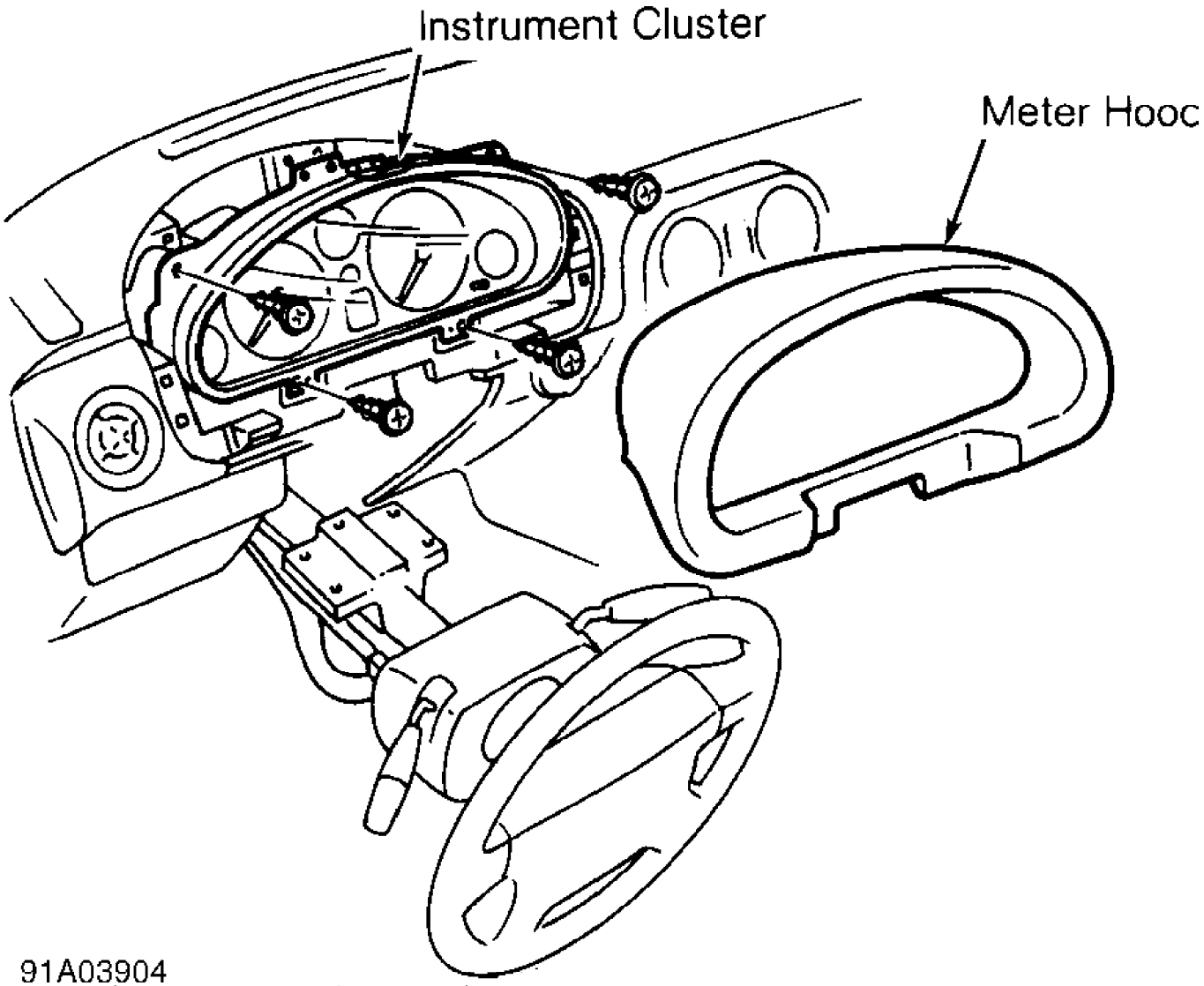



Fig. 8: Removing Instrument Cluster (Miata)
Courtesy of Mazda Motors Corp.

Removal & Installation (MPV)

1) Remove steering wheel and column covers. Remove small cover from top of cluster assembly. See Fig. 9. Remove screw below cover. Remove 2 screws from bottom of cluster assembly.

2) Remove 4 instrument cluster screws. Pull instrument cluster far enough from dash to disconnect harness connector and speedometer cable. Remove instrument cluster. To install, reverse removal procedure.

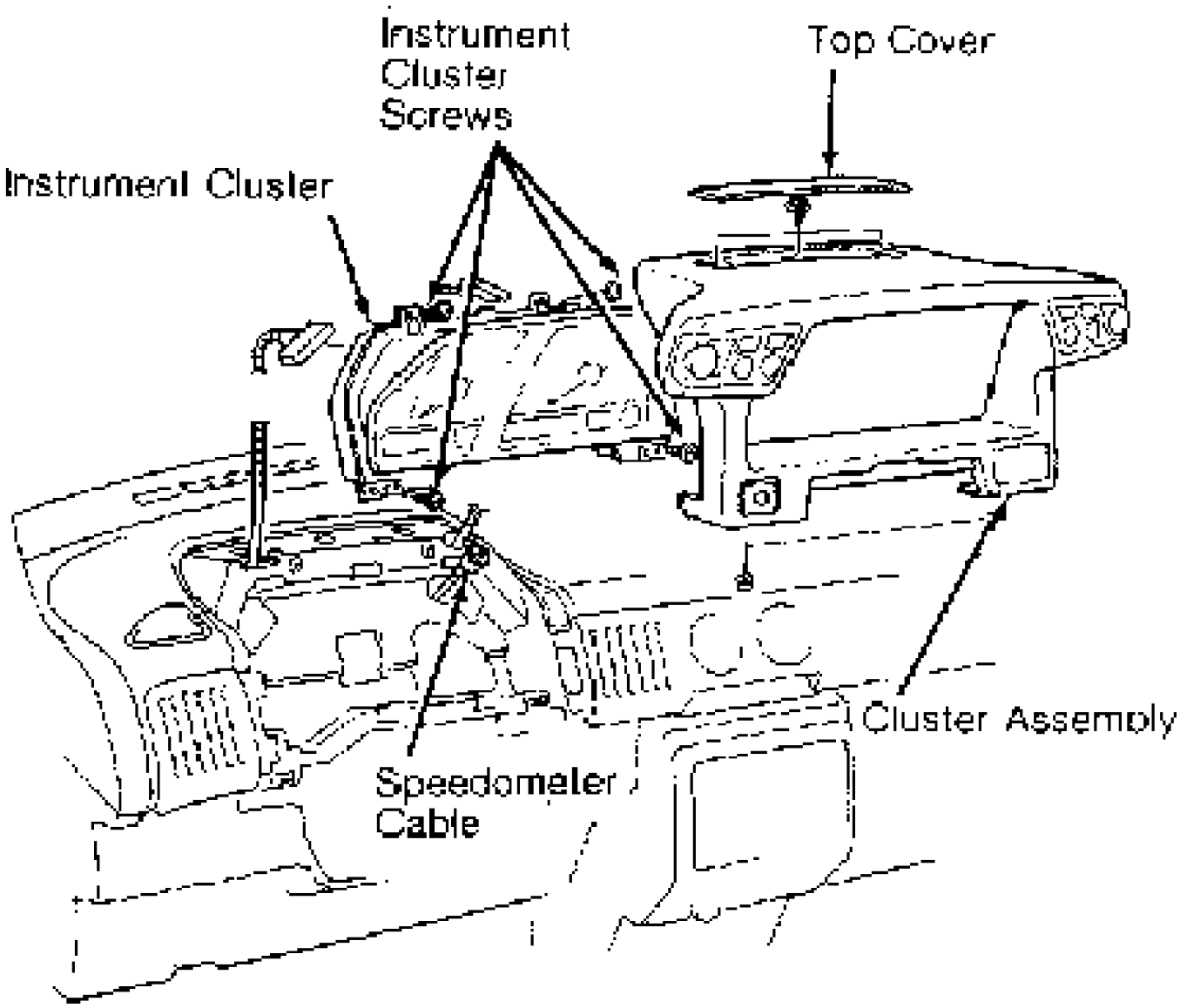



Fig. 9: Removing Instrument Cluster (MPV)
Courtesy of Mazda Motors Corp.

Removal & Installation (MX-6 & 626)

1) Remove steering wheel, column covers and lower cover. Unsnap cluster assembly side cover with vent lever, and remove screw behind it. Remove remaining cluster assembly screws and cluster assembly.

2) Remove instrument cluster screws. Pull instrument cluster far enough from dash to disconnect harness connector and speedometer cable. Remove instrument cluster by pulling out lower edge and unsnapping top. To install, reverse removal procedure.

Removal & Installation (Navajo)

1) Disconnect negative battery cable. Remove column covers. Tilt steering wheel down (if equipped with tilt wheel) or remove steering wheel. Remove lower instrument panel cover. Remove instrument cluster cover. Remove instrument cluster mounting screws. See Fig. 10. Pull cluster slightly away from dash.

2) On A/T models, remove 2 PRNDL indicator screws-to-cluster

screws. Slide PRNDL indicator down and out of cluster. On all models, disconnect harness connectors and speedometer cable.

3) Disconnect bulbs from sockets, and remove instrument cluster. To install, reverse removal procedure.

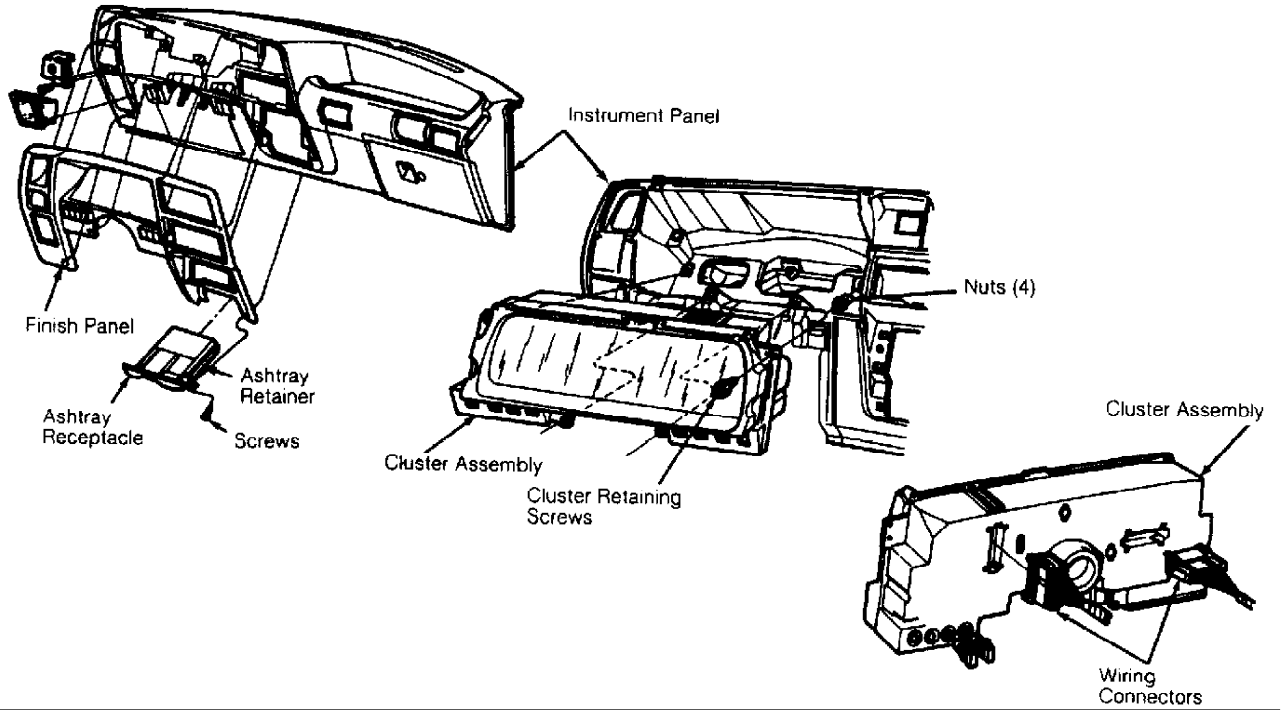



Fig. 10: Removing Instrument Cluster (Navajo)
Courtesy of Mazda Motors Corp.

Removal & Installation (Protege & 323)

1) Remove steering wheel and column covers. See Fig. 11. Remove combination switch. Remove meter hood. Remove screws attaching instrument cluster to dash.

2) Pull instrument cluster far enough forward to disconnect speedometer cable. Disconnect wiring harness connectors, and remove instrument cluster. To install, reverse removal procedure.

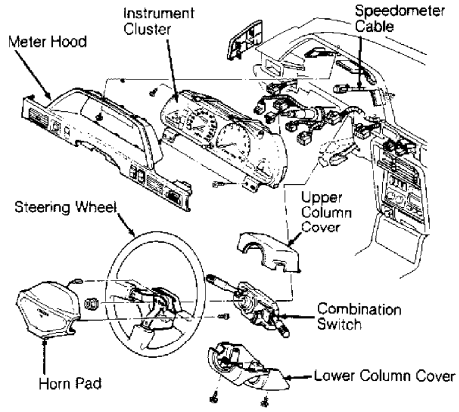



Fig. 11: Removing Instrument Cluster (Protege & 323)
Courtesy of Mazda Motors Corp.

WARNING: RX7 convertible models are equipped with an air bag restraint system. See AIR BAG article for warnings and

safety precautions.

Removal & Installation (RX7)

1) Remove steering wheel, column covers and lower cover (if necessary). Remove cluster switch panel screws, and unplug cluster switch panel. Remove self-tapping screws.

2) Pull instrument cluster far enough from dash to disconnect harness connector and speedometer cable. Remove instrument cluster. To install, reverse removal procedure.

Removal & Installation (929)

Pry off horn pad ornament. Remove steering wheel and column covers. Remove 7 switch panel screws and switch panel. Remove 7 meter hood screws and meter hood. Remove 6 screws and instrument cluster. To install, reverse removal procedure.

WARNING: 1992 929 is equipped with an air bag restraint system. See AIR BAG article for warnings and safety precaution.

Removal & Installation (1992 929)

1) Remove steering wheel and column covers. Remove screws attaching instrument cluster cover to instrument cluster. Remove screws attaching instrument cluster to instrument panel. See Fig. 12.

2) Pull instrument cluster far enough forward to disconnect speedometer cable. Disconnect wiring harness connectors, and remove instrument cluster. To install, reverse removal procedure.

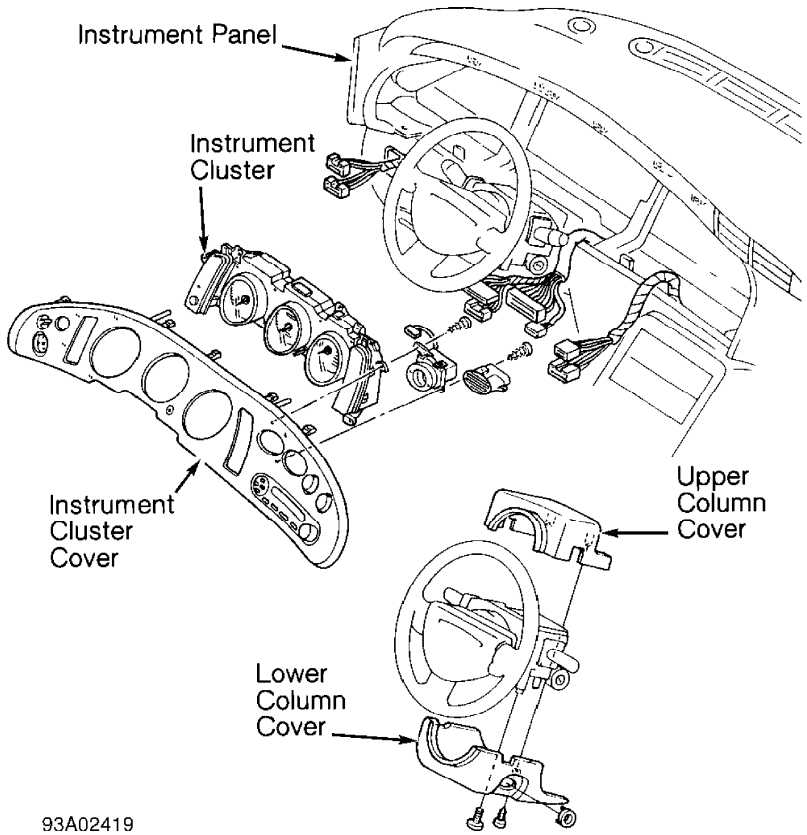



Fig. 12: Removing Instrument Cluster (1992 929)
Courtesy of Mazda Motors Corp.

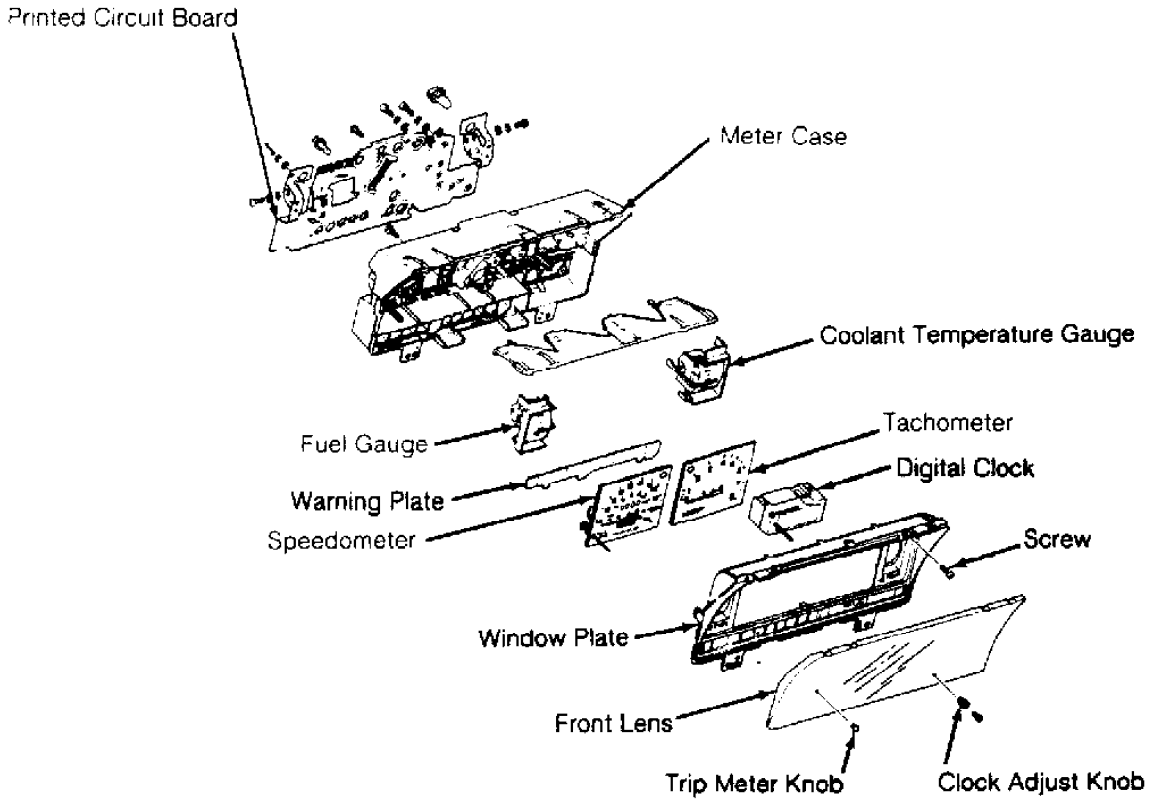



Fig. 13: Exploded View of Instrument Cluster (B2200 & B2600i "A")
Courtesy of Mazda Motors Corp.

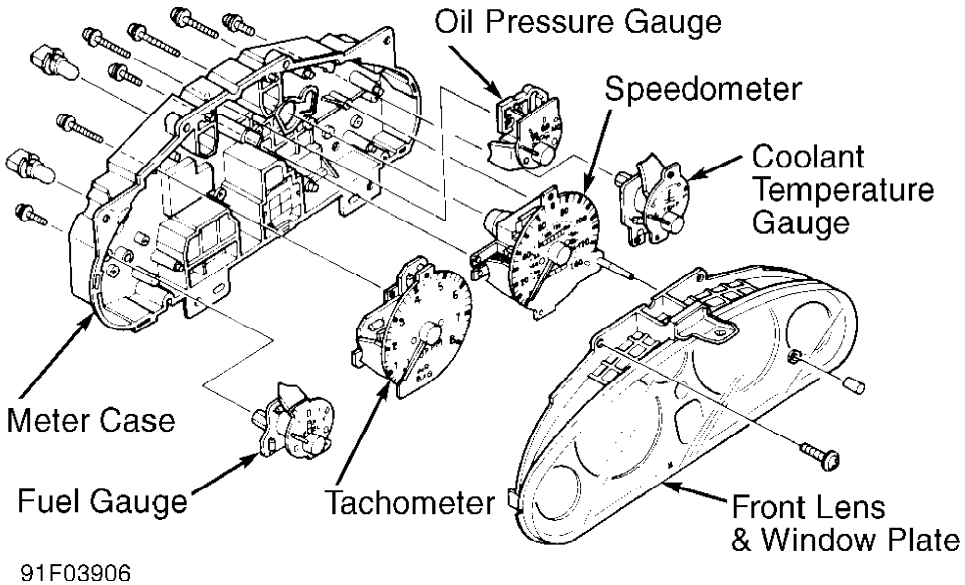



Fig. 14: Exploded View of Instrument Cluster (Miata)
Courtesy of Mazda Motors Corp.

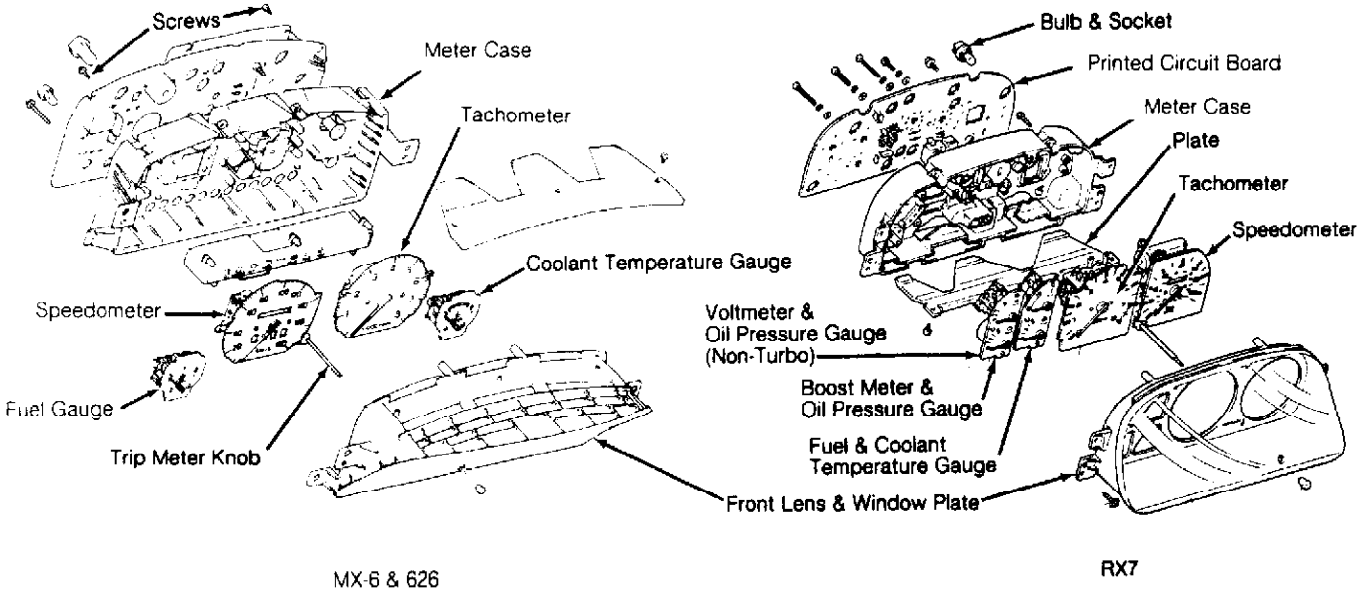



Fig. 15: Exploded View of Instrument Clusters (MX-6, 626 & RX7)
Courtesy of Mazda Motors Corp.

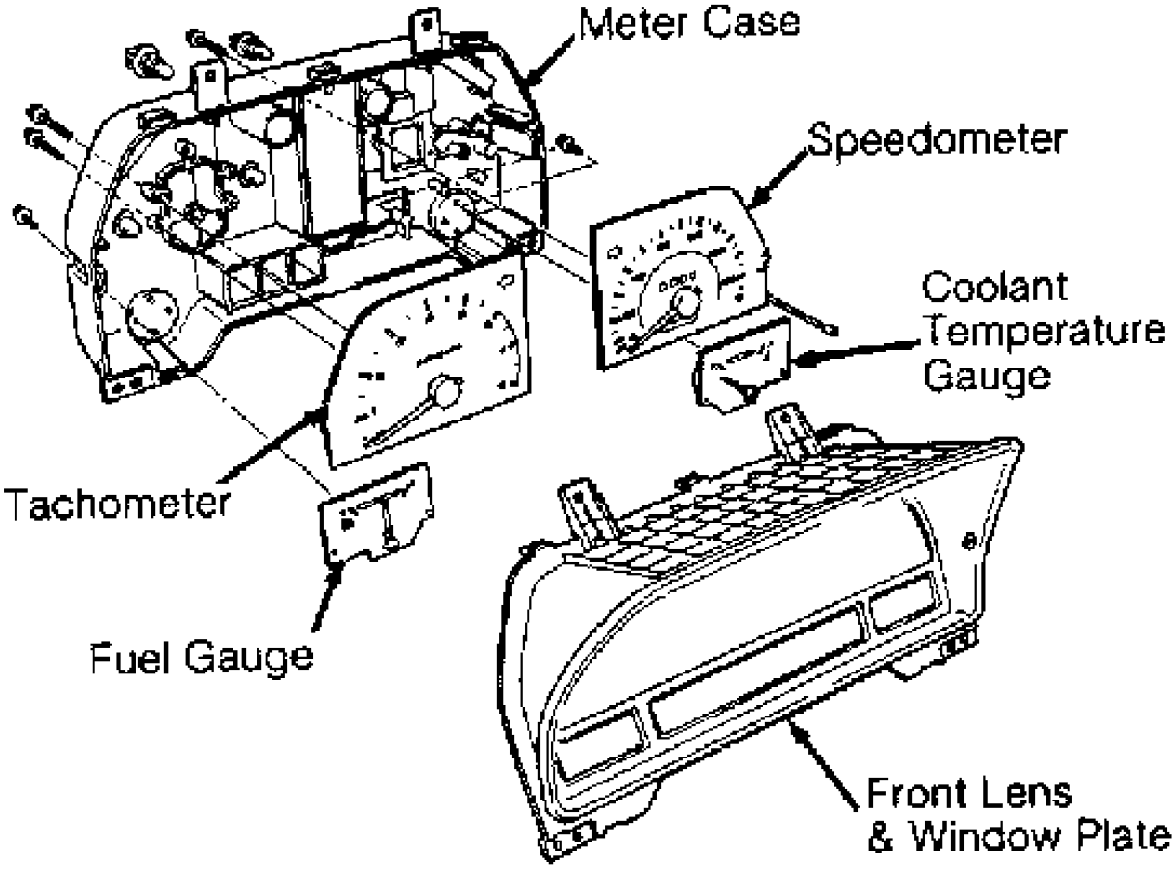



Fig. 16: Exploded View of Instrument Cluster (MPV)
Courtesy of Mazda Motors Corp.

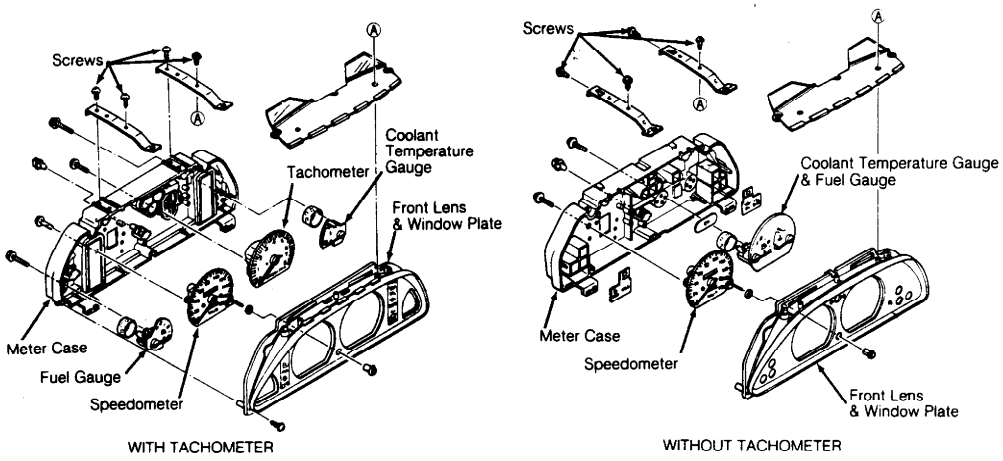



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Fig. 17: Exploded View of Instrument Clusters (Protege & 323)
Courtesy of Mazda Motors Corp.

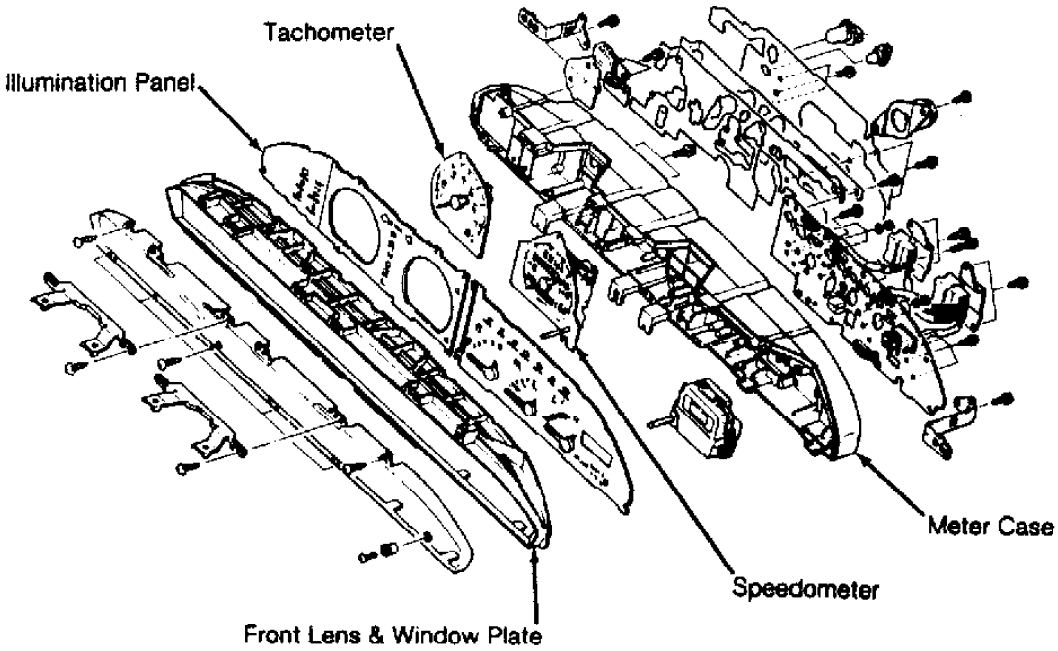


Fig. 18: Exploded View of Instrument Cluster (929)
Courtesy of Mazda Motors Corp.

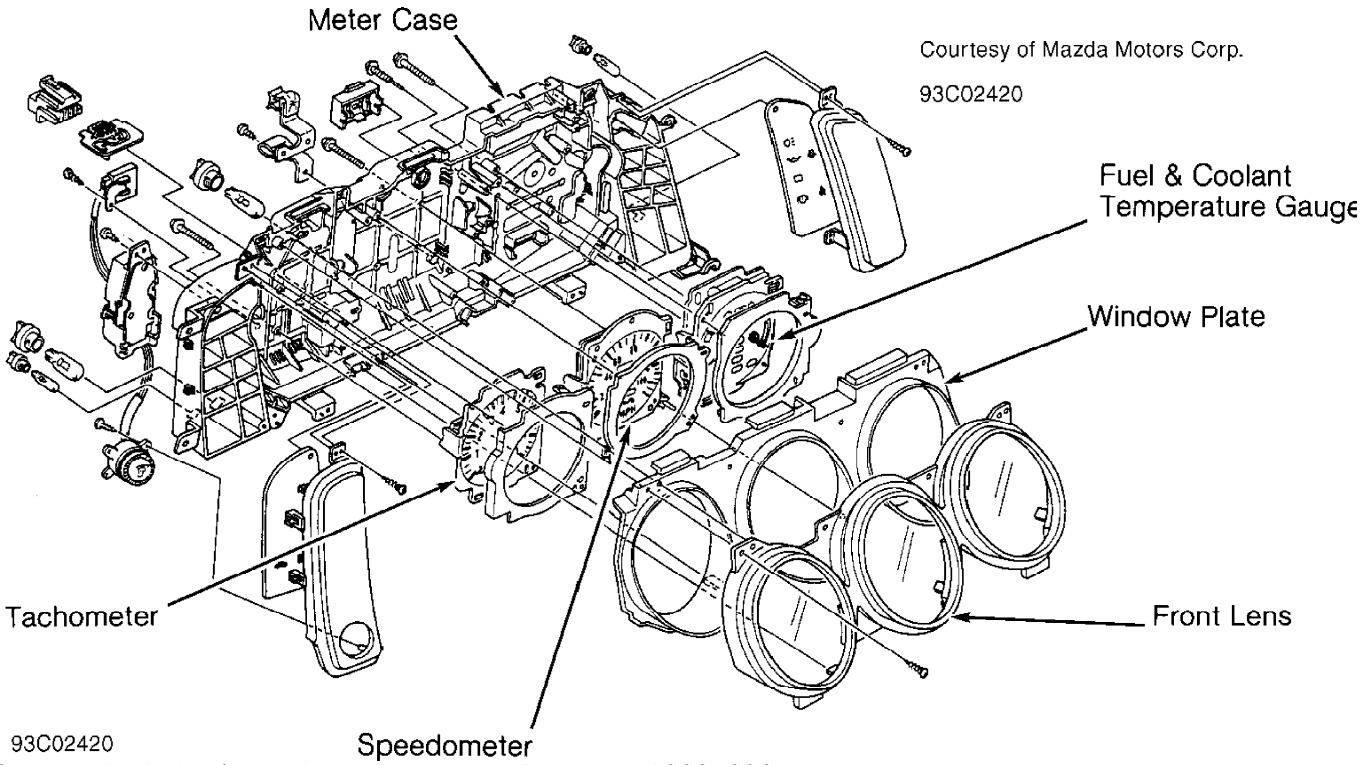

Fig. 19: Exploded View of Instrument Cluster (1992 929)
Courtesy of Mazda Motors Corp.

## WIRING DIAGRAMS

See appropriate chassis wiring diagram in WIRING DIAGRAMS.