

**ALTRONIC, INC.
712 TRUMBULL AVE.
GIRARD, OHIO 44420**

**ALTRONIC II-CPU IGNITION SYSTEM
"D" VERSION
INCLUDING 281 550-2 24 VDC CONVERTER**

IMPORTANT SAFETY NOTICE

PROPER INSTALLATION, MAINTENANCE, REPAIR AND OPERATION OF THIS EQUIPMENT IS ESSENTIAL. THE RECOMMENDED PRACTICES CONTAINED HEREIN SHOULD BE FOLLOWED WITHOUT DEVIATION. AN IMPROPERLY INSTALLED OR OPERATING IGNITION SYSTEM COULD CAUSE PERSONAL INJURY TO OPERATORS OR OTHER NEARBY PERSONNEL.

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1.0 ALTRONIC II-CPU - SYSTEM DESCRIPTION

The Altronic II-CPU ignition system is a microcircuit-based, capacitor discharge system. The system requires two signals from external magnetic pick-ups: (1) counts from a crankshaft-mounted gear or drilled holes in the engine flywheel; (2) a reset pulse once per revolution.

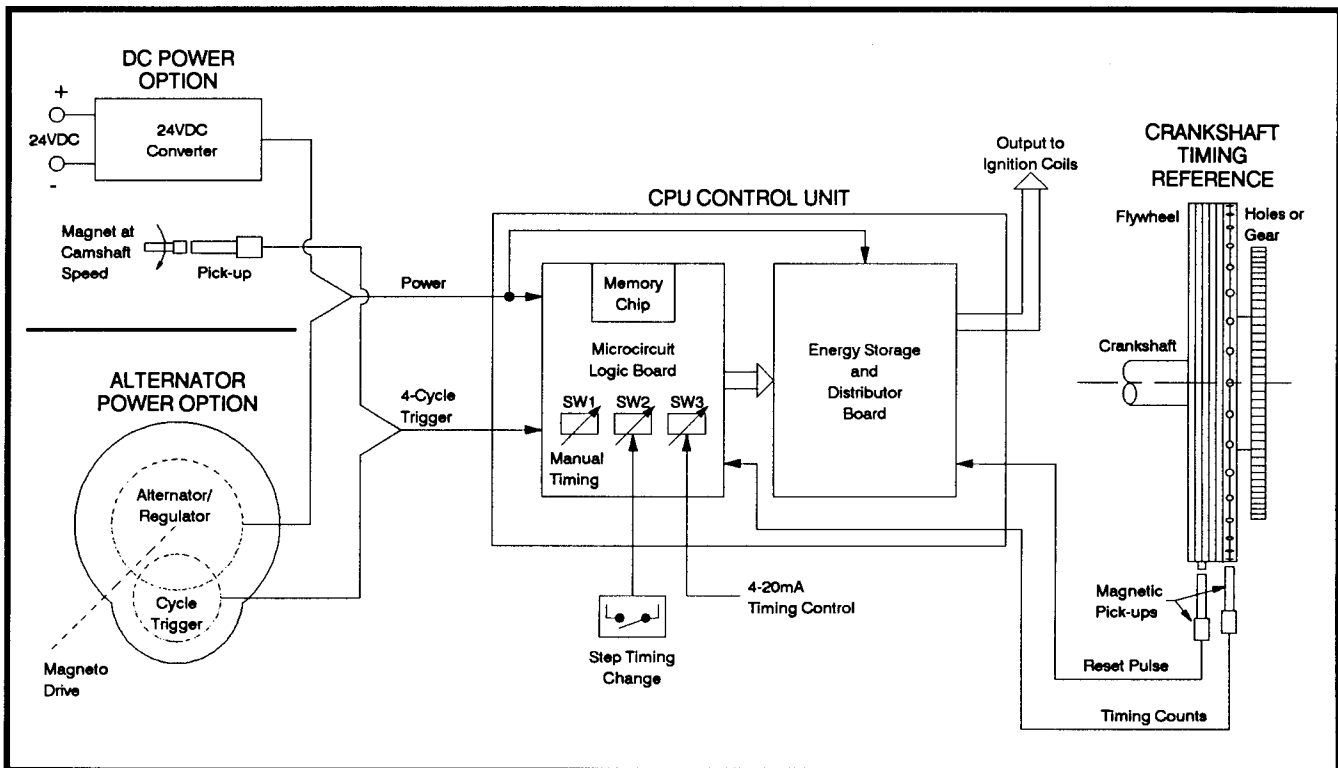
Referring to the diagram below, the system consists of a power source unit (either an Alternator or 24 VDC Converter) which provides power for the basic operation of the CPU Control Unit and charges the energy storage capacitors. The Alternator consists of a 12-pole permanent-magnet alternator, a transistor regulator and a cycle trigger to reference the compression stroke on 4-cycle applications. When the DC Converter is used, a separate Hall-effect pick-up with a camshaft-referenced magnet is required on 4-cycle installations.

The CPU Control Unit consists of a microcircuit logic board and an energy storage/distributor board. The memory chip is programmed with the engine firing angle sequence and the number of reference teeth or holes. The logic board outputs precisely timed trigger pulses to the solid state distributor board which routes the stored primary energy to the ignition coils in sequence.

The Altronic II-CPU system implements timing changes by counting pulses from the reference holes or teeth. The timing change increment is equal to $360/2N$ where N = the number of reference teeth or holes. With 180 teeth as recommended for test purposes, the timing change increment is one degree.

Three ways are provided to vary ignition timing:

- Manual timing adjustment with SW1, an internal 16-position switch;
- Step-change timing adjustment set with SW2, a second 16-position switch;
- Control from an external 4-20 ma current loop signal.



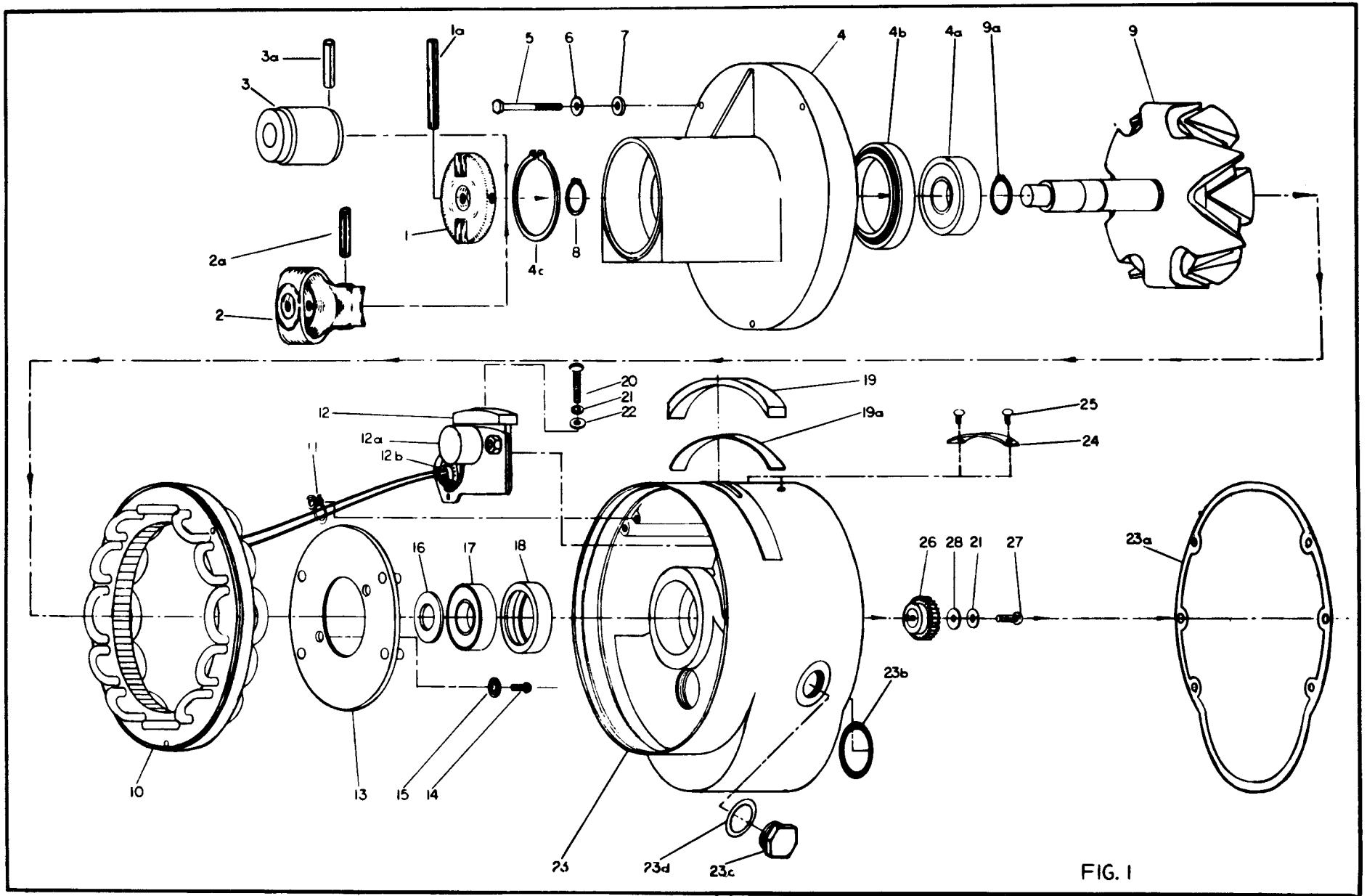


FIG. 1

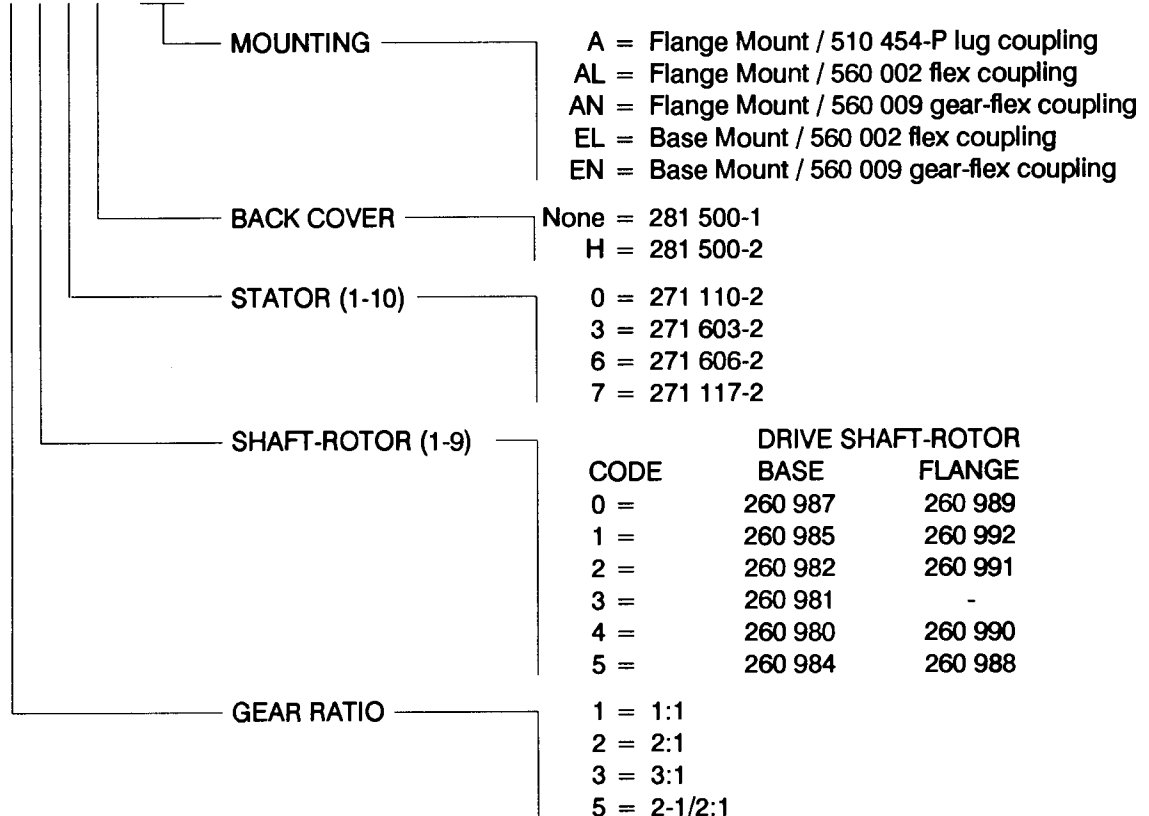
2.0 PARTS IDENTIFICATION AND SPECIFICATION

2.1 PARTS LIST - ALTRONIC II-CPU ALTERNATOR: 290 xxx-x

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1-1	510 454-P	Coupling w/pin	-15	900 427	Lockwasher #10
-1a	902 478	Spring pin 2-1/8" lg.	-16	210 495	Spacer
-2	560 002	Flex coupling w/pin	-17	510 452	Bearing
-2a	902 475	Spring pin 1-1/8" lg.	-18	510 459	Bearing cover
-3	560 009	Gear coupling w/pin	-19	260 003	Slide bar w/gasket
-3a	902 475	Spring pin 1-1/8" lg.	-19a	210 266	Gasket - slide bar
-4	260 002	Front housing - base	-20	902 453	Screw - 1/4"-20
	260 010	Front housing - flange	-21	901 008	Lockwasher 1/4"
-4a	210 282	Bearing	-22	901 344	Washer
-5	902 457	Screw 10-24	-23	260 005-3	Intermediate housing
-6	901 004	Lockwasher #10	-23a	210 265	Gasket - housing
-7	504 073	Washer - fibre	-23b	210 284	O-ring
-8	902 485	Snap ring	-23c	210 274	Plug
-9	See below	Shaft-rotor ass'y.	-23d	210 275	Seal
-9a	902 485	Snap ring	-24	202 003	Nameplate
-10	See below	Stator	-25	902 456	Drive pin
-11	264 001	Wire guide ass'y.	-26	210 148	Drive gear 2:1
-12	261 400	Socket arm assembly		210 171	Drive gear 1:1
-12a	--	Not used in CPU system		210 173	Drive gear 2.5:1
-12b	204 601	Connector socket		210 175	Drive gear 3:1
-13	--	Not used in CPU system	-27	902 440	Screw 1/4"-20
-14	902 439	Screw 10-32	-28	901 332	Washer

2.1.1 PART NO. DESIGNATION

2 9 0 0 2 6 H - E N



NOTE: For service of Alternator, see Altronic II service manual form All SM.

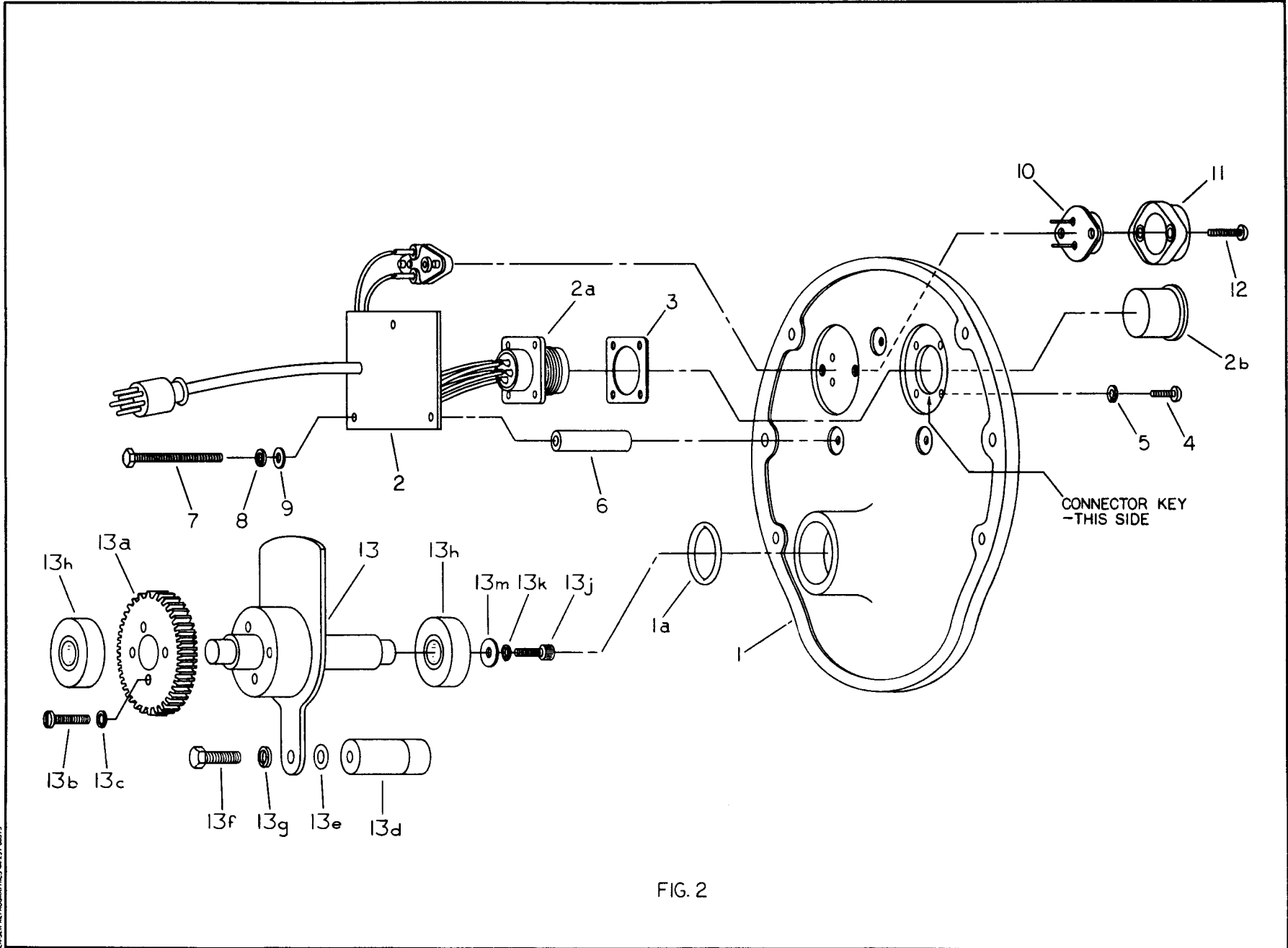


FIG. 2

2.2 PARTS LIST - CPU BACK COVER: 281 500-1, 281 500-2

FIGURE & REF. NO.	QTY.	PART NO.	DESCRIPTION
2-1	1	210 621	Cover casting
-1a	1	210 612	O-ring
-2	1	272 500-1	Circuit board ass'y. (281 500-1)
		272 500-2	Circuit board ass'y. (281 500-2)
-2a	1	504 150	Connector
-2b	1	510 540	Cap - connector
-3	1	501 335	Gasket
-4	4	902 064	Screw 6-32
-5	4	901 000	Lockwasher #6
-6	3	510 634	Spacer
-7	3	902 581	Screw 8-32
-8	3	900 944	Lockwasher #8
-9	3	902 562	Washer
-10	1	601 347	Transistor
-11	1	610 163	Cover - transistor
-12	2	902 073	Screw 6-32
-13	1	280 601-1	Distributor shaft assembly - 1:1 gear
		280 601-2	Distributor shaft assembly - 2:1 gear
		280 601-3	Distributor shaft assembly - 3:1 gear
		280 601-5	Distributor shaft assembly - 2.5:1 gear
		-13a	1
		510 358	Driven gear 2:1
		510 360	Driven gear 3:1
		510 446	Driven gear 2.5:1
-13b	4	902 500	Screw 6-32
-13c	4	901 000	Lockwasher #6
-13d	1	260 602	Magnet assembly
-13e	AR	902 521	Washer-shim
-13f	1	902 472	Screw 10-24
-13g	1	901 004	Lockwasher #10
-13h	2	210 283	Bearing
-13j	1	902 465	Screw 8-32
-13k	1	900 944	Lockwasher #8
-13m	1	901 326	Washer #8

NOTE: To change transistor (-10), remove only screws (-12). To change circuit board assembly (-2), remove screws (-4), (-7) and (-12). For service of distributor shaft assembly (-13), see Altronic II service manual form All SM.

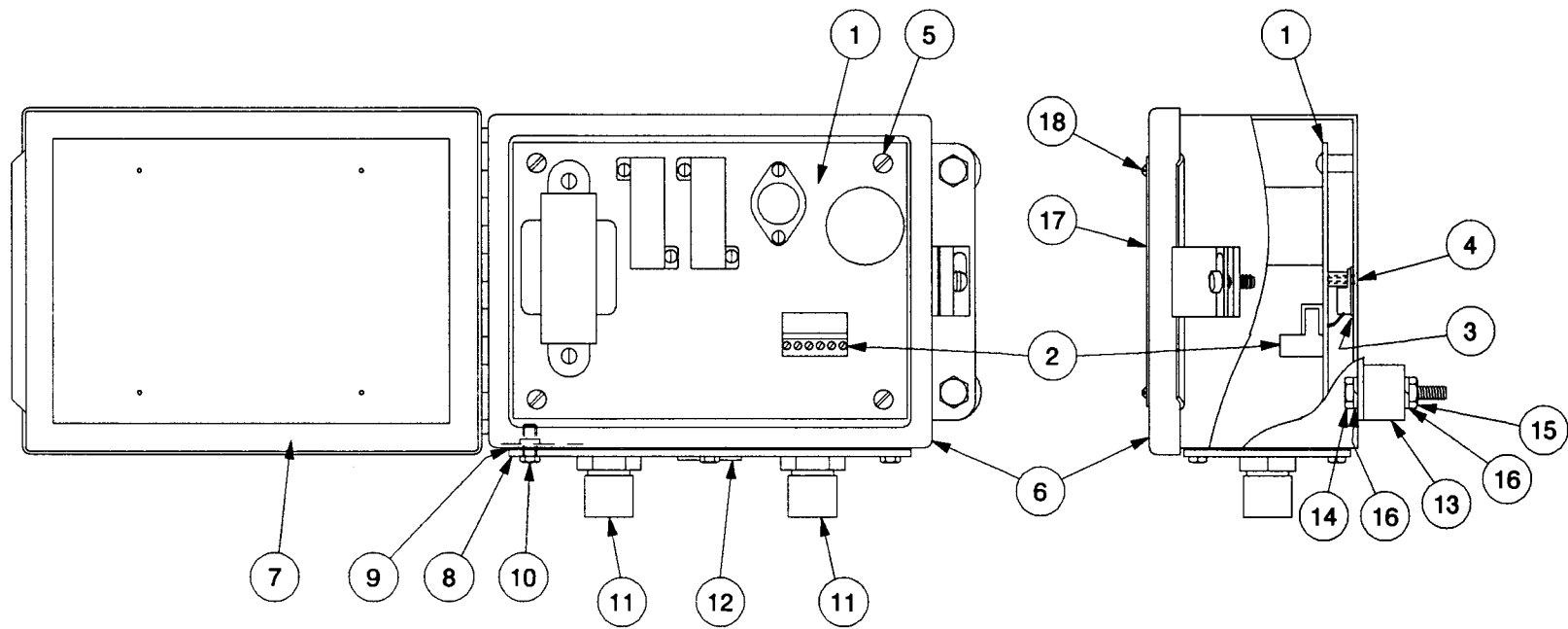


FIG. 3

2.3 PARTS LIST - DC CONVERTER: 281 550-2

FIGURE & REF. NO.	QTY.	PART NO.	DESCRIPTION
3-1	1	272 002	Circuit board ass'y.
-2	1	204 015	Socket - 6-pin
-3	1	610 193	Insulator
-4	1	902 595	Screw 6-32 - plastic
-5	4	902 439	Screw 10-32
-6	1	210 627	Enclosure
-7	1	610 516	Gasket - cover
-8	1	210 622	Plate - entry
-9	1	210 625	Gasket - plate
-10	6	902 599	Screw 10-24
-11	2	510 527	Conduit fitting
-12	1	310 416	Plug
-13	4	610 165	Shock mount
-14	4	902 593	Bolt 5/16-18
-15	4	902 469	Nut 5/16-18
-16	8	901 010	Lockwasher 5/16
-17	1	202 120A	Nameplate
-18	4	902 578	Screw 4-40

NOTE: To change circuit board assembly (-1), remove plastic screw (-4) and four screws (-5). Check the condition of insulator (-3), gaskets (-7), (-9) and shock mounts (-13); replace if necessary. Install new hardware where needed.

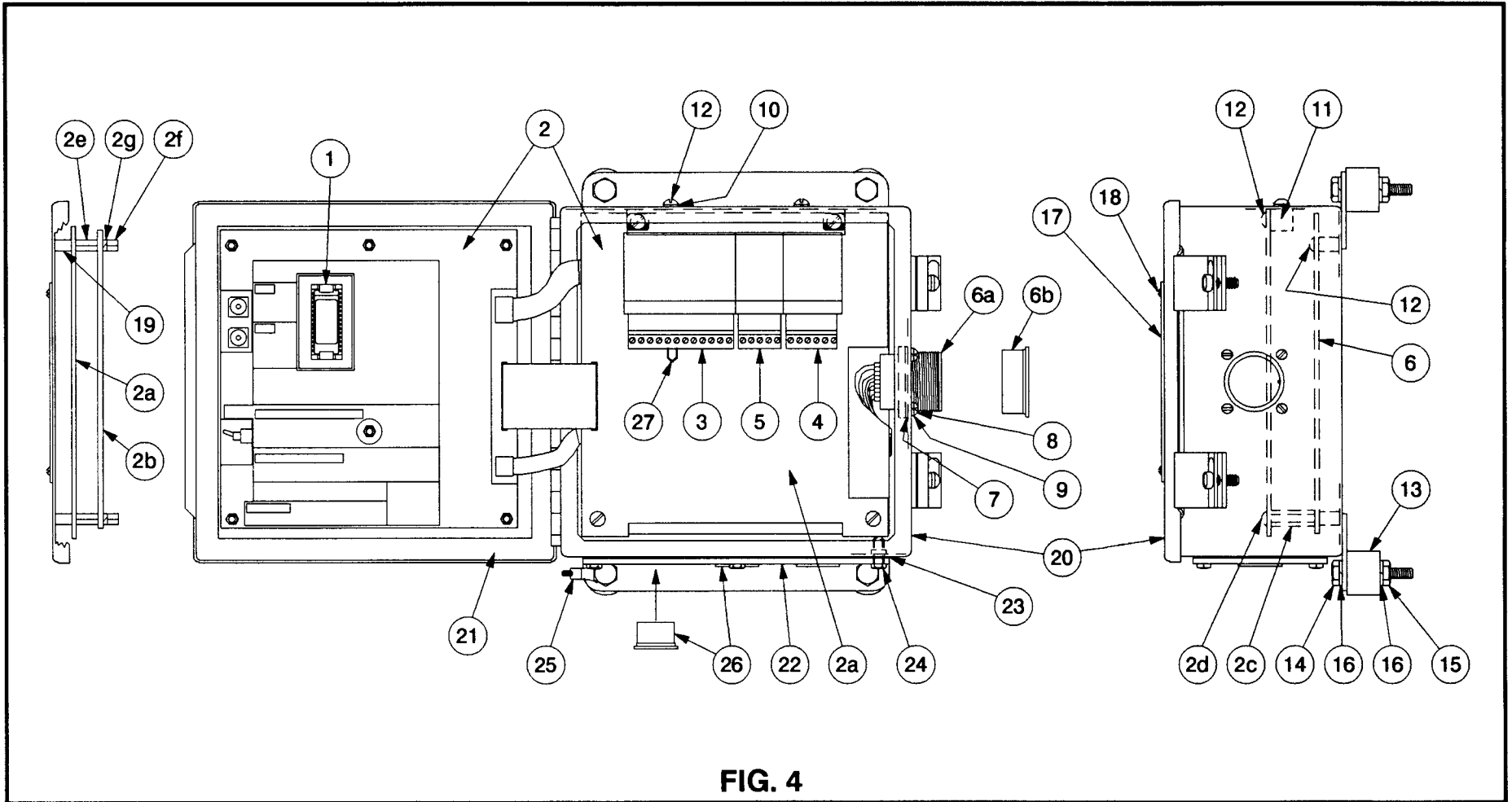


FIG. 4

2.4 PARTS LIST - CPU CONTROL UNIT: 281 508-x, 281 512-x, 281 516-x

FIGURE & REF. NO.	QTY.	PART NO.	DESCRIPTION
4-1	1	601 507	Memory chip
		601 507-S	Memory chip - non-standard
-2	1	272 502R	Logic board retrofit assembly
-2a	1	272 502	Logic board assembly
-2b	1	202 501	Shield board ass'y.
-2c	2	210 631	Standoff 10-32
-2d	2	902 439	Screw 10-32
-2e	6	210 630	Standoff 8-32
-2f	6	610 075	Nut 8-32
-2g	6	900 944	Lockwasher #8
-3	1	204 014	Socket - 12-pin
-4	1	204 015	Socket - 6-pin
-5	1	204 016	Socket - 5-pin
-6	1	272 508-2	Distributor board ass'y. (281 508-2 unit)
		272 508-2A	Distributor board ass'y. (281 508-2A unit)
		272 512-2	Distributor board ass'y. (281 512-2 unit)
		272 512-2A	Distributor board ass'y. (281 512-2A unit)
		272 516-2	Distributor board ass'y. (281 516-2 unit)
		272 516-2A	Distributor board ass'y. (281 516-2A unit)
-6a	1	504 055-T	Connector
-6b	1	510 517	Cap - connector
-7	1	501 222	Gasket - connector
-8	4	902 064	Screw 6-32
-9	4	901 000	Lockwasher #6
-10	2	901 004	Lockwasher #10
-11	1	210 623	Mounting bar
-12	6	902 439	Screw 10-32
-13	4	610 165	Shock mount
-14	4	902 593	Bolt 5/16-18
-15	4	902 469	Nut 5/16-18
-16	8	901 010	Lockwasher 5/16
-17	1	202 113A	Nameplate
-18	4	902 578	Screw 4-40
-19	6	610 041	Spacer
-20	1	210 624	Enclosure
-21	1	610 512	Gasket - cover
-22	1	210 622	Plate - entry
-23	1	210 625	Gasket - plate
-24	6	902 599	Screw 10-24
-25	1	610 386	Ground strap assembly
-26	3	510 540	Cap
-27	1	503 242	Lead - jumper

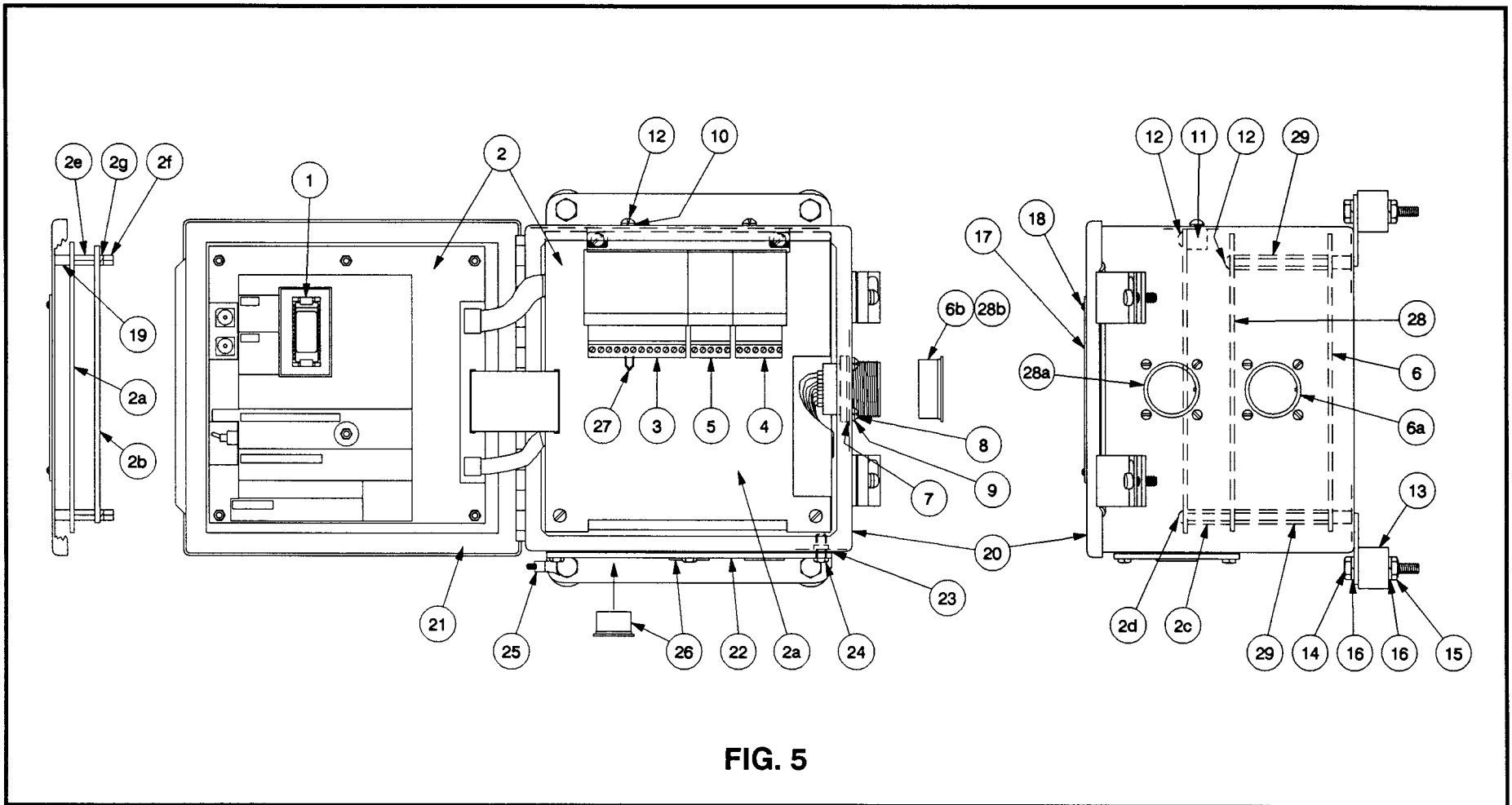


FIG. 5

2.5 PARTS LIST - CPU CONTROL UNIT: 281 624-x, 281 632-x

FIGURE & REF. NO.	QTY.	PART NO.	DESCRIPTION
5-1	1	601 507	Memory chip
		601 507-S	Memory chip - non-standard
-2	1	272 502RA	Logic board retrofit assembly
-2a	1	272 502	Logic board assembly
-2b	1	202 501	Shield board assembly
-2c	2	210 637-2	Standoff 10-32
-2d	2	902 439	Screw 10-32
-2e	6	210 630	Standoff 8-32
-2f	6	610 075	Nut 8-32
-2g	6	900 944	Lockwasher #8
-3	1	204 014	Socket - 12-pin
-4	1	204 015	Socket - 6-pin
-5	1	204 016	Socket - 5-pin
-6	1	272 512-2	Lower distributor board ass'y. (281 624-2 unit)
		272 512-2A	Lower distributor board ass'y. (281 624-2A unit)
		272 516-2	Lower distributor board ass'y. (281 632-2 unit)
		272 516-2A	Lower distributor board ass'y. (281 632-2A unit)
-6a	1	504 055-T	Connector
-6b	1	510 517	Cap - connector
-7	2	501 222	Gasket - connector
-8	8	902 064	Screw 6-32
-9	8	901 000	Lockwasher #6
-10	2	901 004	Lockwasher #10
-11	1	210 623	Mounting bar
-12	6	902 439	Screw 10-32
-13	4	610 165	Shock mount
-14	4	902 593	Bolt 5/16-18
-15	4	902 469	Nut 5/16-18
-16	8	901 010	Lockwasher 5/16
-17	1	202 113A	Nameplate
-18	4	902 578	Screw 4-40
-19	6	610 041	Spacer
-20	1	210 635	Enclosure
-21	1	610 512	Gasket - cover
-22	1	210 622	Plate - entry
-23	1	210 625	Gasket - plate
-24	6	902 599	Screw 10-24
-25	1	610 386	Ground strap assembly
-26	3	510 540	Cap
-27	1	503 242	Lead - jumper
-28	1	272 521-2	Upper distributor board ass'y. (281 624-2 unit)
		272 521-2A	Upper distributor board ass'y. (281 624-2A unit)
		272 522-2	Upper distributor board ass'y. (281 632-2 unit)
		272 522-2A	Upper distributor board ass'y. (281 632-2A unit)
-28a	1	504 055-T	Connector
-28b	1	510 517	Cap - connector
-29	4	210 637-1	Standoff 10-32

4.0 TESTING PROCEDURE - BACK COVER ASSEMBLY: 281 500-1, 281 500-2; DC CONVERTER: 281 550-2

- 4.1 VOLTAGE OUTPUT TEST, ALTERNATOR - Operate the Alternator at 300 RPM with the 5-pin connector harness disconnected. The voltage between the "B" pin (-) and "A" pin (+) should be:
 281 500-1 Back Cover - 330 +/- 15 VDC
 281 500-2 Back Cover - 400 +/- 20 VDC
- 4.2 VOLTAGE OUTPUT TEST, DC CONVERTER - Connect the DC Converter to a source of 24 VDC with the output terminals disconnected. The voltage between the H.V.OUT (-) and the GND (+) output terminals should be:
 281 550-2 Converter - 400 +/- 20 VDC

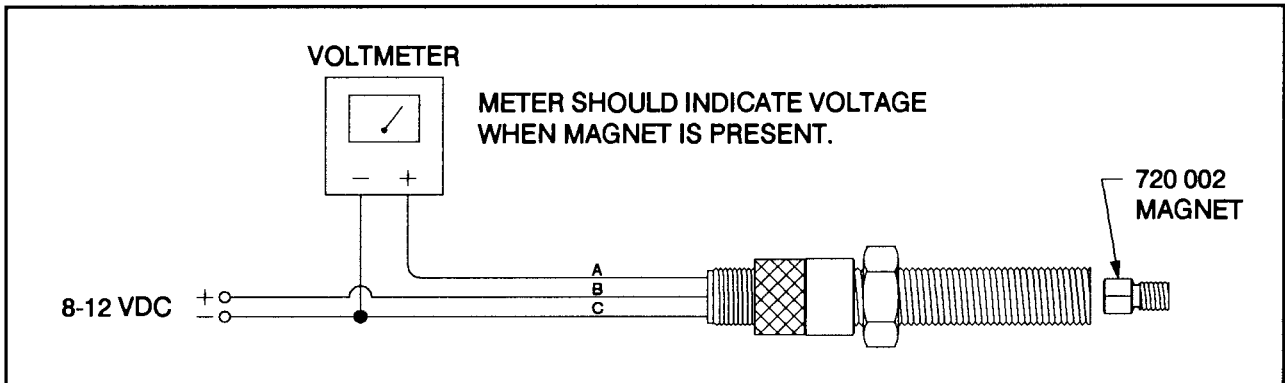
5.0 TESTING PROCEDURE - CPU CONTROL UNIT: 281 5xx-x, 281 6xx-x

- 5.1 OPERATIONAL TEST - With the system completely connected, operate the test stand (180-tooth gear) at the speed indicated for each step. When testing 24 or 32-output units, the output connectors may be connected one at a time to the test stand coils. NOTE: It is recommended that these tests be performed with the CPU Control Unit heated to a temperature of 150° F. (65° C.).

180 TOOTH GEAR RPM	TEST
75 RPM	All outputs fire a 7mm gap.
300 RPM	All outputs fire a 15mm gap.
300 RPM	<p>Each cylinder fires consistently in sequence; timing as follows starting with output "A" and proceeding in alphabetical sequence A-B-C-D-E-F-G-H-J-K-L-M-R-S-T-U.</p> <p>Unit 281 508-2; Memory H4A180.DA: 0-90-180-270-0-90-180-270</p> <p>Unit 281 508-2A; Memory H2N180.DA: 0-0-60-60-180-180-240-240</p> <p>Unit 281 512-2; Memory L4A180.DA: 0-60-120-180-240-300-0-60-120-180-240-300</p> <p>Unit 281 512-2A; Memory L2R180.DA: 0-0-60-60-120-120-180-180-240-240-300-300</p> <p>Unit 281 516-2; Memory P4A180.DA: 0-45-90-135-180-225-270-315-0-45-90-135-180-225-270-315</p> <p>Unit 281 516-2A; Memory P2N180.DA: 0-0-40-40-90-90-130-130-180-180-220-220-270-270-310-310</p> <p>Unit 281 624-2; Memory X4L180.DA: 0-36-120-156-240-276-0-36-120-156-240-276 (upper connector) 4-40-124-160-244-280-4-40-124-160-244-280 (lower connector)</p> <p>Unit 281 632-2; Memory Z4L180.DA: 0-36-90-126-180-216-270-306-0-36-90-126-180-216-270-306 (upper connector) 4-40-94-130-184-220-274-310-4-40-94-130-184-220-274-310 (lower connector)</p>
300 RPM	<p>Check timing change on output "A".</p> <p>Timing switch SW1: 1 degree per switch step = 15 degrees total span</p> <p>Timing switch SW2: 1 degree per switch step = 15 degrees total span</p> <p>Current loop timing control (SW3 open): 48 degrees change from 4-20 ma (1-5 VDC) input</p>

6.0 TESTING PROCEDURE - HALL-EFFECT PICK-UP: 591 014-x

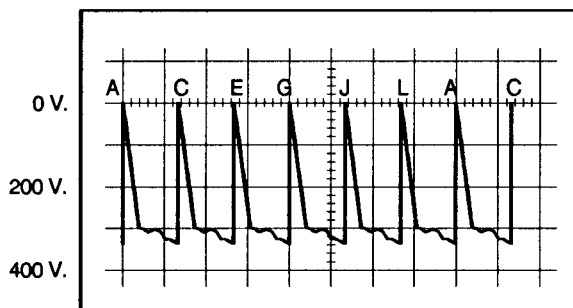
- 6.1 OPERATIONAL TEST - A source of 8-12 volts DC is required in addition to an ohmmeter. The DC source may be a small battery or a commercial power supply. Use one of the trigger magnets 260 604 or 720 002 and follow the test hook-up shown below.



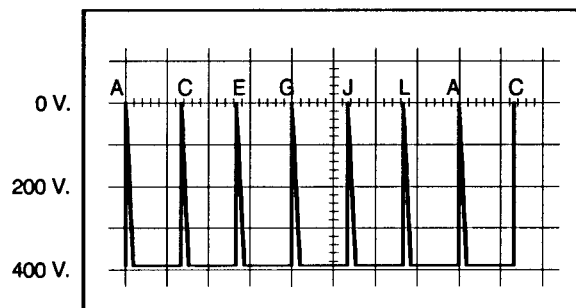
7.0 OSCILLOSCOPE TESTING

- 7.1 TEST SET-UP - Two 100:1 oscilloscope probes are required. NOTE: The signals being monitored are 300-400 volts, negative polarity. The system should be completely connected with the test stand (180-tooth gear) operating at 300 RPM. It is recommended that these tests be performed with the CPU Control Unit heated to a temperature of 150° F. (65° C.).
- 7.2 STORAGE CAPACITOR VOLTAGE PATTERN
- A. The trigger input of the oscilloscope should be connected to the "A" primary coil lead. NOTE: This is a 300 volt, negative polarity signal.
- B. Connect the oscilloscope reading probe to the "N" lead of the output connector. All Altronic II-CPU systems have dual storage capacitors. Therefore, half the outputs (A, C, E, etc.) appear on the "N" pin; the other half (B, D, F, etc.) on the "V" pin. Normal capacitor patterns are shown below for both alternator and DC converter powered systems.

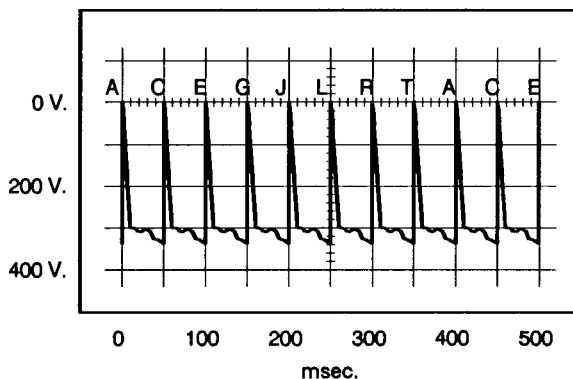
ALTERNATOR - 330V. OUTPUT SHOWN
12-CYL. MEMORY L4A180.DA



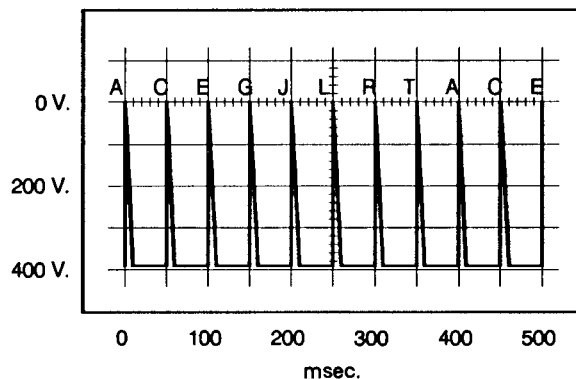
DC CONVERTER - 390V. OUTPUT
12-CYL. MEMORY L4A180.DA



ALTERNATOR - 330V. OUTPUT SHOWN
16-CYL. MEMORY P4A180.DA



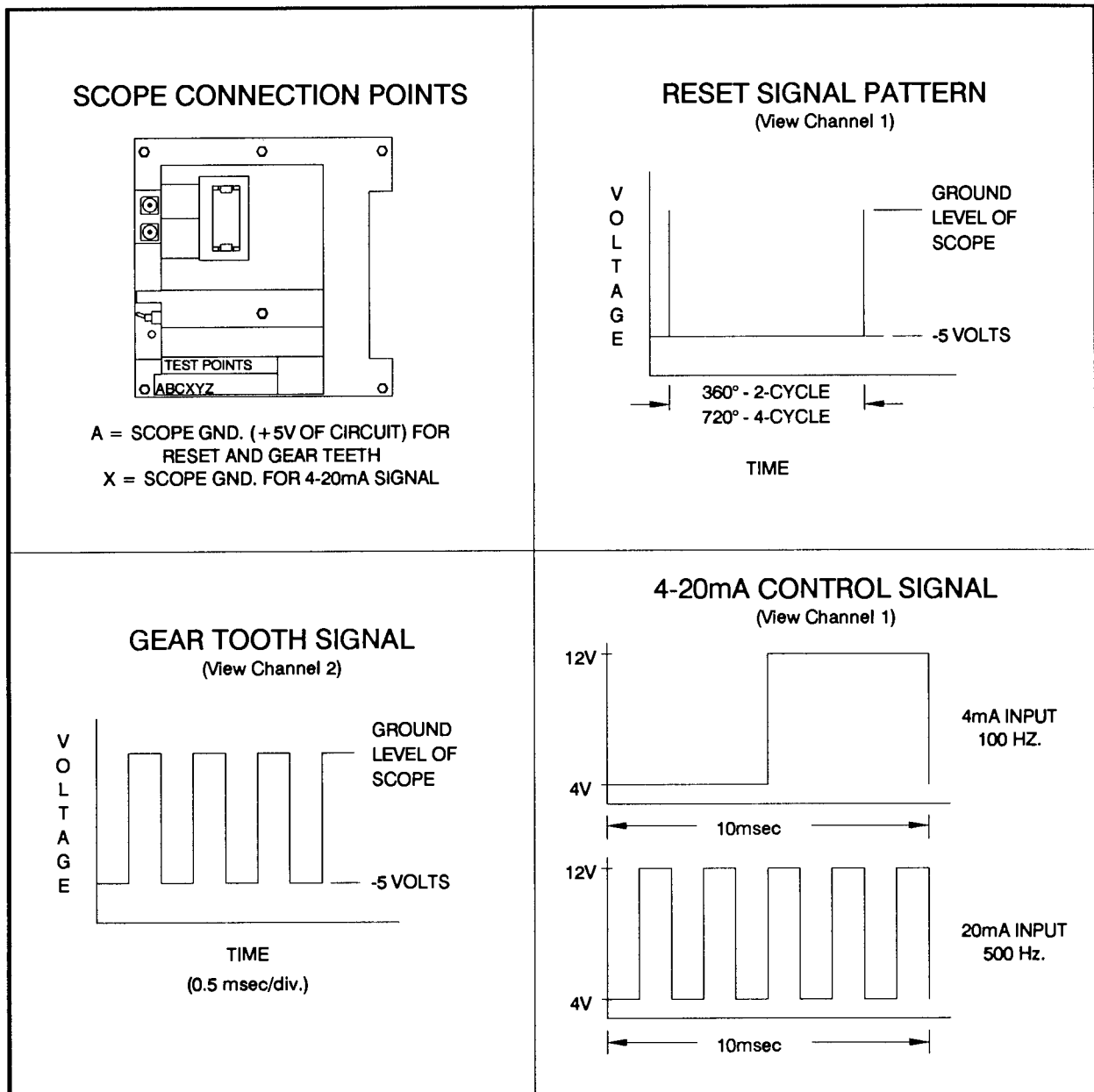
DC CONVERTER - 390V. OUTPUT
16-CYL. MEMORY L4A180.DA



7.3 OTHER TEST POINTS - The chart below gives the oscilloscope settings for the various system tests. A dual trace scope is required.

TEST	CHANNEL 1	CHANNEL 2	SCOPE GRD.	TRIGGER
Reset	Point "B" 2 volts/div.	Not used	Point "A"	Channel 1 Normal
Gear teeth	Point "B" 2 volts/div.	Point "C" 2 volts/div.	Point "A"	Channel 1 Normal
4-20ma signal	Point "Y" 2 volts/div.	Not used	Point "X"	Channel 1 Normal

NOTE: If any pattern deviates from that shown below, change the logic board assembly (-2a). This assumes that the two pick-ups and loop power source are known to be good.



8.0 TROUBLESHOOTING

Perform all tests with the test stand operating at 300 RPM. The following chart assumes a properly functioning Alternator section and properly installed magnetic pick-ups.

PROBLEM	TEST	TEST INDICATION	CORRECTIVE ACTION
No output	Section 4.1 (Back Cover)	Low voltage	Replace transistor (2-10); Replace cover circuit board ass'y (2-2)
No output	Section 4.2 (DC Converter)	Low voltage	Replace circuit board ass'y (3-1)
No output	Section 7.2 (Alternator)	300 + VDC	Check cycle trigger magnet arm line-up
No output	Section 7.2 (CPU Unit)	0-50 VDC 300 + VDC	Replace distributor board ass'y. (-6) Replace logic board ass'y. (-2)
One output does not fire	Section 5.1 / 7.2	Missing discharge on stand or scope	Replace distributor board ass'y. (-6)
Only one output fires or one output fires constantly	Section 5.1 / 7.2	One spark gap only is firing	Replace distributor board ass'y. (-6)
Timing varies	Section 5.1	Timing other than as shown	Replace logic board ass'y. (-2)

9.0 BOARD REPLACEMENT PROCEDURE - CPU CONTROL UNIT

9.1 DISASSEMBLY PROCEDURE (refer to Fig. 4 or 5)

- A. Un-plug the 4-pin and 3-pin connectors at the right hand side of the cover.
- B. To remove the logic board assembly (-2), remove nut (-2f), shield board (-2b) and standoff (-2e). The logic board (-2a) on the cover can then be removed. Then remove screws (-2d) and two screws (-12) behind the terminal strip assemblies; this allows the connection board assembly (which is tied by ribbon cable to the component board) to be removed.
- C. Remove standoffs (-2c) and two screws (-12) directly securing the upper end of the distributor board.
- D. In 281 624 and 281 632 units only: To remove upper distributor board assembly (-28), remove four connector screws (-8) and push the connector (-28a) back inside the box. The upper distributor board assembly (-28) can then be removed from the box. Remove four standoffs (-29).
- E. To remove the distributor board assembly (-6), remove four connector screws (-8) and push the connector (-6a) back inside the box. The distributor board assembly (-6) can then be removed from the box.

9.2 ASSEMBLY PROCEDURE (refer to Fig. 4 or 5)

- A. Check the condition of gaskets (-7), (-21), (-23) and shock mounts (-13); replace if necessary. Install new hardware where needed.
- B. To install the distributor board assembly (-6), set the board into place in the box. Install connector gasket (-7) in place and insert connector (-6a) through the hole with the keyway facing the bottom of the box. Install screws (-8) and lockwashers (-9) and tighten securely.
- C. In 281 624 and 281 632 units only: Install and tighten four standoffs (-29). To install the upper distributor board assembly (-28), set the board into place in the box. Install connector gasket (-7) in place and insert connector (-28a) through the hole with the keyway facing the bottom of the box. Install screws (-8) and lockwashers (-9) and tighten securely.
- D. Install and tighten two screws (-12) and two standoffs (-2c) through the distributor board assembly.
- E. To install the logic board assembly (-2), install the logic board (-2a) onto the cover studs and install and tighten standoffs (-2e). Install the shield board (-2b), lockwashers (-2g) and nuts (-2f); tighten securely. Then install the connection board assembly into place over the distributor board in the box and secure with four screws (-12) and (-2d).
- F. Plug in the 4-pin and 3-pin connectors at the right hand side of the cover.
- G. Retest the completely assembled unit per sections 5.0 and 7.0 to insure correct operation.