

A Few Fundamentals About Semiconductors

The diode, one of the simplest of semiconductor devices, functions as a low-resistance conductor to current flowing in one direction and as a virtually "open" conductor for current flowing in the opposite direction.

Diodes are most commonly made by growing materials with p-type impurities on materials with n-type impurities to form what is known as a pn junction.

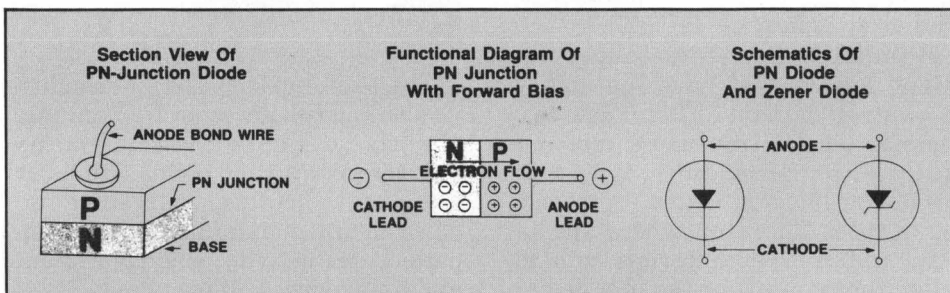
These devices are said to be forward-biased when conventional current flows from the anode, or p-type material, across the junction to the cathode, or n-type material, with a positive-voltage connected to the p-side and a negative voltage connected to the n-side. (This is the same as saying that forward-biased electrons flow easily from the cathode to the anode.)

In the reverse- or backward-bias condition with a positive voltage on the n-type material (cathode), diodes become good insulators and their resistance may be $1M\Omega$ or more. In this instance, electrons can't flow easily across the junction, because a high potential barrier or depletion region exists. The diode is the same as a check valve in a waterline, allowing water (or current) to flow in only one direction.

Diodes may be made of germanium, silicon or gallium arsenide, and the electrical characteristics of the diode depend on the physical properties of these materials.

The most useful property of the diode is its ability to convert alternating current to direct current by a process called rectification. It is also used to demodulate or detect radio-frequency signals, clamp or limit signal levels and bypass current to ground.

Signal-level diodes are those capable of handling up to 1 watt of power, but there are also many specialized diodes, such as those listed below.



Rectifiers—power diodes used primarily for power rectification in half-wave and full-wave bridge configurations. High-power rectifiers are usually packaged in metal cases to permit the rapid dissipation of heat.

Zener Diodes—designed for normal reverse-bias operation. This diode is made so that when the voltage applied reaches a specified value, the device breaks down in a nondestructive manner.

Thus, after achieving the breakdown voltage, the voltage across the zener remains essentially constant for any further increase of reverse current up to a preset limit.

Zener diodes are used for voltage regulation, overvoltage protection and voltage reference. Two "back to back" zeners may be used to limit alternating-current voltage levels or suppress voltage transients on an ac line.

Commercial zener diodes are available across the power range of .25 to 50 watts. Breakdown voltages may be between 1.8 and 200 volts. Thus, there are both signal-level and power zeners.

Varactors—the voltage-variable capacitor diode, or varactor, is intended for tuning applications in radio and TV circuits. When the diode is reverse-biased, its barrier width, or depletion region, at the pn junction can be controlled by varying the bias.

Since the depletion region acts as a dielectric between two conducting plates, the varactor acts as a capacitor whose capacitance value depends on the applied reverse voltage.

TVs or radios may be tuned to channels or stations manually by turning a knob that changes the position of capacitor plates with respect to one another. They use a manually altered air variable tuner. The same result may be obtained by changing the voltage on a varactor, perhaps with the use of a pushbutton panel or remote control.

PIN Diodes—are specialized microwave diodes and are called PIN diodes with reference to their layers of p-type, intrinsic-type and n-type silicon. When the PIN diode is reverse-biased, it has a high impedance at microwave frequencies. However, when it is forward-biased, it has a very low impedance at these frequencies. The impedance can be varied continuously by gradually changing the dc bias. We can also vary the bias with an audio or video frequency signal to modulate a microwave carrier.

A switching PIN diode acts like a capacitor paralleled by a variable resistor. The capacitance value remains relatively constant with changes in the applied voltage, while the ability of the resistor to conduct current is proportional to the charge

stored in the diode.

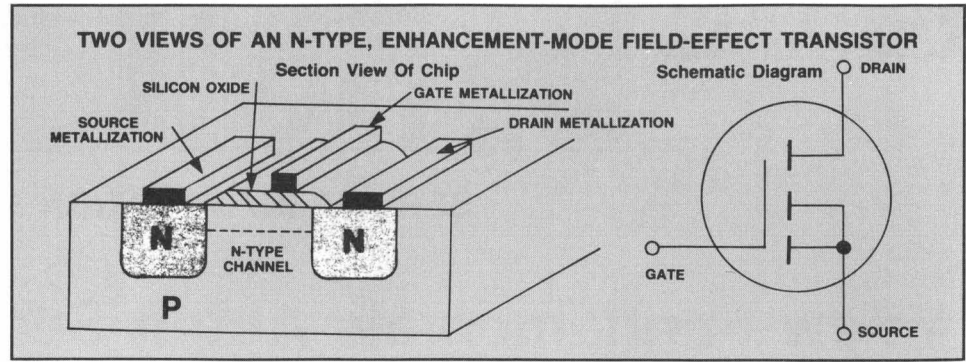
Therefore, by changing the bias on the PIN diode from reverse to forward, usually by high-speed digital signals, the PIN diode is able to act as a high-speed switch.

These diodes are rated for use at different frequency ranges such as VHF, UHF and SHF (superhigh frequency). VHF PIN diodes are used for general-purpose switching, but UHF and SHF PIN diodes are used in attenuators and modulators as well as switches.

Bipolar Transistors—three-terminal devices that have the ability to control current. There are two common bipolar transistors: npn and pnp, with p representing p-type semiconductor material and n representing n-type. The area where the p-type and n-type materials join is called the pn junction, as in a diode.

Conventional current flows into the base and collector of an npn transistor and out of the emitter. Current flow in a pnp transistor is opposite to the npn: current flows into the emitter and out of the base and collector (note that it is in the direction of the arrows on the transistor symbols). Although they have differences in current and electron flow, both npn and pnp bipolar transistors can function as amplifiers and switches.

The base-emitter junction of a transistor acts like a diode. Under normal operation of an npn transistor, for example, current flows forward into the base and out of the emitter, but does not flow in the reverse direction from emitter to base. At the same time, the collector-base junction also acts as a diode, but supply voltage is always applied to it in the reverse direction. Although it is very small, some reverse current flows from this junction.



The term bipolar refers to conduction through both n- and p-type materials. There are many characteristics that define a bipolar transistor including current gain, noise figure, maximum current dissipation, conductivity, leakage current and breakdown voltage.

Another characteristic, operating speed, indicates the switching speed or operating frequency of the transistor. The transition frequency or f_T is the highest frequency at which the transistor can operate and still provide effective amplification. This is especially important in radio-frequency amplifiers.

Field-Effect Transistors—or FETs, depend on majority carrier current for their operation; that is, the carriers stay in the same kind of material when passing from source to drain. A FET has a conductive channel of either n- or p-type semiconductor material whose conductivity is controlled by the application of a voltage to a gate terminal.

There are two kinds of FETs—the junction-gate FET, or JFET, and the insulated-gate FET, or MOSFET. Both are considered unipolar devices.

JFETs are further classified as either p- or n-channel-depletion types,

while MOSFETs may be either p- or n-channel-depletion or p- or n-channel-enhancement types.

Current carriers are injected at one terminal (the source) and pass to the other (the drain).

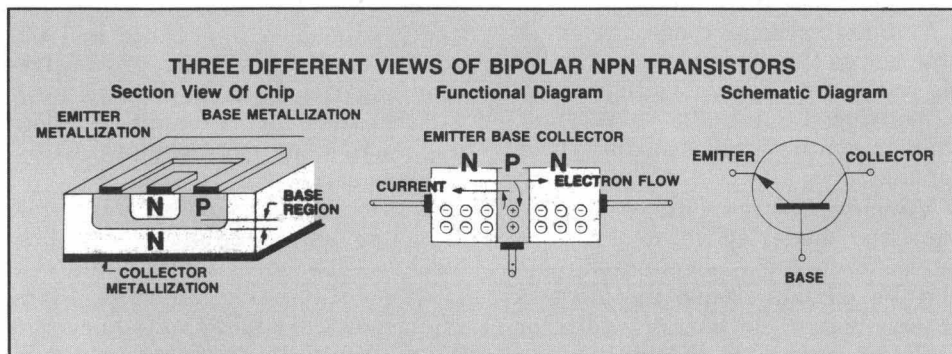
The ability of this channel to conduct the carriers depends on the condition of the depletion region. The external bias signal applied to the gate alters the conductivity of the channel, making it either more or less difficult for current to pass. Like the conventional vacuum tube, the junction-gate FET is basically an on device and must be biased part-way off to set the operating point in a position for amplification.

The source (terminal) of the FET corresponds to the emitter, the drain corresponds to the plate and the gate corresponds to the base of the bipolar transistor. When no control signal is applied to the gate, current cannot flow from source to drain.

This is similar to the situation that occurs in a bipolar transistor when no signal is applied to the base.

A significant difference between the bipolar transistor and the FET, however, is that current applied to the transistor base controls the transistor, but voltage applied to the gate controls the FET.

Thus, the term "field effect" refers to the effect of an electric field within the device created by the gate voltage. The term "metal-oxide semiconductor" describes the construction of the device—a metal gate, an oxide layer and a semiconductor channel. □



Replacement Part Cross Reference

When selecting replacement parts for your HP products, you may notice that many manuals list only an HP part number for the part, even though it appears that this part is manufactured by one of the large semiconductor manufacturers...

It is recommended that HP replacement parts be used to ensure that original performance of the product will be retained. While some parts used in HP instruments are identical to those that can be purchased at a local electronics distributor...

such as gain, bandwidth, capacitance, etc. There may also be slight mechanical differences, such as the shaping or length of leads. In some cases special quality checks are used to ensure that high reliability parts are used at the factory and at HP field offices.

Therefore, we suggest obtaining replacement parts from HP to maintain the quality that you have paid for in your instrument. There may be situations however, where HP replacement parts are not in stock and substituting parts will allow you to return the product to service immediately...

will work in the circuit. Perhaps an HP part could be ordered and installed at some later date.

To help you in these situations, here is a cross-reference of HP part numbers to JEDEC numbers for transistors and diodes.

NOTE

This is not a comprehensive list. Many semiconductors are made exclusively for Hewlett-Packard and there are no substitutes. If the part number you are looking for is not listed here, it does not have a JEDEC number and must be replaced with the same HP part number.

Manufacturers Code Number Cross Reference

No. Manufacturer

Table with columns: No., Manufacturer, and a multi-column list of manufacturer codes and numbers (e.g., NEC ELECTRONICS INC, UNITEDROE CORP, ROHM CORP, etc.).

No. Manufacturer

Table with columns: No., Manufacturer, and a multi-column list of manufacturer codes and numbers (e.g., SOLID STATE DEVICES INC, INTERSIL INC, KERTRON INC, etc.).

HP P/N Mfr. Desc.

Table mapping HP Part Numbers (HP P/N) to Manufacturer (Mfr.) and Description (Desc.) for various components like LM103-2.4, CA3026, CA3018, etc.

Table mapping Manufacturer (Mfr.) and Description (Desc.) to HP Part Numbers (HP P/N) for components like 2N1370, 2N1396, 2N1358, etc.

Table mapping Manufacturer (Mfr.) and Description (Desc.) to HP Part Numbers (HP P/N) for components like 2N600, M4440A, MP603, etc.

HP P/N Mfr. Desc.

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 1854-0474 02037 2N5551
 1854-0476 01921 2N3879
 1854-0477 02682 2N2222A
 1854-0478 02237 2N4046
 1854-0492 02037 MFS3643
 1854-0514 02037 MPS-U02
 1854-0518 02037 2N5877
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 1854-0556 01698 2N2432A
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 1854-0566 01921 2N3771
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 1854-0577 01921 2N6259
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 1854-0581 02037 MFS-A18
 1854-0583 02037 MJE182
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 1854-0621 01698 BF258
 1854-0622 02037 MJE340
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 1854-0625 01698 TIP-A1
 1854-0626 02037 MJE802
 1854-0628 02037 MFS-H17
 1854-0632 03334 BFR91
 1854-0633 02037 MJE800
 1854-0634 02037 MFS-U01
 1854-0635 04550 D4H55
 1854-0637 02037 2N219A
 1854-0639 01921 RCP-703C
 1854-0640 02037 MJE2801K
 1854-0642 02037 MFS-A17
 1854-0643 01921 2N3585
 1854-0644 01921 29C
 1854-0646 03406 LM114AH
 1854-0647 02037 MJE2102
 1854-06

HP P/N	Mfr.	Desc.	HP P/N	Mfr.	Desc.	HP P/N	Mfr.	Desc.
1854-0752	02037	MMCS2369	1854-1004	02037	ED415	1855-0020	02037	SFF6793
1854-0754	02037	MJE244	1854-1005	02037	BUF508A	1855-0021	01971	2N1671B
1854-0755	01921	2N6254	1854-1006	02037	BU406	1855-0027	04550	2N2647
1854-0756	02037	2N6315	1854-1007	02037	2N5943(SEL)	1855-0028	02763	2N3922
1854-0758	02037	2N5427	1854-1008	00039	NE-41635	1855-0040	01698	2N3819
1854-0761	02037	2N2060	1854-1009	00039	NE21935	1855-0052	02237	2N4360
1854-0762	01921	2N5039	1854-1010	02037	MD918A	1855-0055	02883	2N4339
1854-0763	01698	TIP 141	1854-1014	02037	MMBT6429	1855-0056	02237	2N4342
1854-0764	02037	MFS 1-10	1854-1015	02037	MJ16012	1855-0065	01698	2N4891
1854-0765	01921	2N6292	1854-1016	02037	MD2369A	1855-0071	02569	2N5544
1854-0766	02037	2N5428	1854-1018	02037	BU406	1855-0077	01971	2N1571C
1854-0767	01921	2N6306	1854-1019	03334	BUL12A	1855-0095	01921	40468
1854-0768	02037	MJE1661	1854-1020	02037	MMBC132105	1855-0096	02037	2N5485(SEL)
1854-0769	02062	35821E	1854-1022	02037	MRF581	1855-0098	03714	IT1700
1854-0770	02037	2N3904 CHIP	1854-1023	02037	TIP112	1855-0099	02037	2N4853
1854-0771	03406	2N4384 CHIP	1854-1027	02037	MMBR931	1855-0204	02037	2N4852
1854-0774	01921	2N6056	1854-1028	02037	2N3904	1855-0205	02883	VCR3P
1854-0775	03334	BUX-80	1854-1029	04507	LTI1839-1	1855-0206	02883	E111
1854-0777	02237	PT50	1854-1032	02037	MRF581	1855-0207	03406	2N3955
1854-0780	03334	BUX-83	1854-1033	02062	HXTR-3675	1855-0208	02883	2N4117
1854-0784	02037	2N3866A	1854-1035	02037	MD1132	1855-0213	03406	2N5912
1854-0785	02037	2N6305	1854-1036	03334	BFR94	1855-0215	09283	SD211DE(SELECTED)
1854-0786	02037	2N2540	1854-1037	02037	MMBT3904	1855-0224	01698	2N3824
1854-0787	02037	2N6545	1854-1039	02037	2N4401	1855-0226	02037	2N5460
1854-0792	02237	2N2920	1854-1041	06354	2SC2878	1855-0232	02883	2N5655
1854-0793	01921	2N5671	1854-1042	02037	MRF571(SEL)	1855-0235	02037	U310(SELECTED)
1854-0794	02037	MJE243	1854-1043	02037	2N5179(SEL)	1855-0241	02910	SD215
1854-0795	02037	MFSH10	1854-1044	00039	NE21935	1855-0244	03406	2N4857
1854-0797	01698	BUL05	1854-1045	02037	BFR94	1855-0250	01698	3N225
1854-0798	02037	MFS-U45	1854-1046	07050	MFS1278-69	1855-0251	02037	2N6659
1854-0799	02037	TIP41C	1854-1047	02037	MRF587	1855-0256	02037	2N4416A CHIP
1854-0802	02037	MM5262	1854-1048	02037	2N3904RLR2	1855-0257	03406	2N5247
1854-0803	01698	TIP75B	1854-1049	02037	BFR96	1855-0258	03406	2N5949
1854-0804	03038	IR5062	1854-1050	03334	BFR91A	1855-0263	02883	VMP-1
1854-0805	02037	BD139	1854-1051	02037	2N3772(SEL)	1855-0265	02883	VCR2N
1854-0806	01698	TIP51	1854-1052	02037	MMBT5550	1855-0268	02883	J309
1854-0808	02037	MJE241	1854-1053	02037	MMBT2222A	1855-0269	02910	SD214
1854-0809	02037	2N2359A	1854-1054	03334	BFR94	1855-0272	02037	MFE3004
1854-0810	04200	CT-1058	1854-1055	03334	BFR93	1855-0274	02883	E232
1854-0813	02037	2N3501S	1854-1056	02037	MJ14000	1855-0275	02883	VN656F
1854-0817	02037	MFS-U05	1854-1060	02037	MJ13091	1855-0276	02037	2N4416A
1854-0819	02037	MJE2801T	1854-1061	02037	2N3904	1855-0277	02037	2N5268
1854-0825	02062	HXTR-5002	1854-1062	02037	2N5681	1855-0278	03714	2N5116
1854-0826	03406	LM-3948H	1854-1063	02037	BFR96	1855-0279	03714	3N190
1854-0827	02037	MJE-13009	1854-1064	02037	MFSW01	1855-0280	02883	E107
1854-0828	01698	TIP-122	1854-1066	00039	NET7416D	1855-0283	02763	2N5396
1854-0829	02037	JAM TXV 2N2222A	1854-1067	03291	AT-41435-5	1855-0285	01698	2N5246
1854-0830	03406	LM394	1854-1069	02037	TIP50	1855-0286	02883	2N3966
1854-0831	02037	2N6429A	1854-1071	02037	MJ16018	1855-0288	02883	2N5556
1854-0834	01921	2N6033	1854-1072	02037	MJ16018	1855-0289	02883	J177
1854-0836	02037	MFS-U02	1854-1083	02037	MMR5179	1855-0290	02037	2N5476
1854-0837	01921	2N6289	1854-1084	02037	2N3904	1855-0291	02883	2N3631
1854-0838	02037	TIP47	1854-1085	01921	2N5239	1855-0292	03406	2N5432
1854-0839	02037	2N6497	1854-1086	02037	D40D4	1855-0293	02883	2N6658
1854-0840	02037	TIP100	1854-1089	00039	NE85633	1855-0296	03038	IRF300
1854-0842	02037	2N3014	1854-1091	00039	NE02133L	1855-0297	03406	2N2608
1854-0845	02037	MJ11012	1854-1092	02037	MRF962	1855-0298	02883	J2472
1854-0847	02037	MJE12007	1854-1093	02062	HXTR-3102	1855-0301	02883	2N5198
1854-0848	01698	2N6584	1854-1094	02037	MMBT2369	1855-0305	02883	2N4117A
1854-0849	02037	MRF515	1854-1095	02037	MMBT2369	1855-0308	01921	3N128
1854-0851	02037	2N4428	1854-1099	01698	TIP1762A	1855-0307	01921	3N153
1854-0860	00039	2SC2334	1854-1100	02037	MXR5943	1855-0309	02037	2N4352
1854-0861	02062	HXTR-6001	1854-1101	02037	MJT3904	1855-0314	04550	2N6027
1854-0862	02062	HXTR-5002	1854-1102	02037	MMBT24	1855-0322	03334	2N5105
1854-0863	02062	HXTR-2101	1854-1104	02062	HXTR-3002	1855-0323	03714	3N172
1854-0864	02062	HXTR-6105	1854-1107	02037	MRF965	1855-0327	01698	2N4416
1854-0865	03038	IR5066	1854-1108	02037	MMBR901	1855-0332	01921	3N138
1854-0866	02037	MFSB34	1854-1109	02037	MAT-02PH	1855-0341	02883	2N4338
1854-0867	02237	FW3568	1854-1110	03406	2N3904	1855-0346	04550	2N6028
1854-0868	06592	BFR 36	1854-1111	00039	NE68135	1855-0347	01921	3N142
1854-0869	03287	GX52220A	1854-1112	00039	2SC2718	1855-0371	02037	2N4092
1854-0871	01921	2N6678	1854-1113	00039	2SC2987A	1855-0379	02037	2N5474
1854-0872	04550	D44411	1854-1114	02037	MRF544	1855-0380	02037	2N4351
1854-0877	02037	MFS-U07	1854-1115	00039	2SC2690	1855-0386	02037	2N4392
1854-0878	02062	HXTR-5104	1854-1117	06354	2SC3281	1855-0387	02037	2N3993
1854-0879	02037	MJE6043	1854-1118	00039	2SC2987	1855-0390	03714	2N3382
1854-0880	02037	TIP140	1854-1119	00039	2SC2275	1855-0393	01698	2N3330
1854-0883	02037	MM3904	1854-1120	03334	A400(SEL)	1855-0395	02883	FN2645
1854-0884	01921	2N6488	1854-1121	02037	ED415	1855-0398	02883	2N5149
1854-0886	02037	MJE3302	1854-1122	02037	2N6037	1855-0400	02883	2N5905
1854-0887	02037	MJ11016	1854-1123	02062	HXTR-5102	1855-0402	02883	2N5115
1854-0889	02037	2N6499	1854-1124	01921	2N3771	1855-0404	02883	2N5115
1854-0890	02037	MRF904	1854-1125	02037	MRF5711L	1855-0406	03714	IT110
1854-0891	06023	BUX82	1854-1126	02037	2N4401	1855-0413	03406	2N5116
1854-0906	02037	MJ12010	1854-1127	02037	MJE521K	1855-0414	02883	2N4393
1854-0917	01921	2N6292	1854-1128	02037	TIP1122	1855-0420	02883	2N4391
1854-0920	02037	MJE15030	1854-1129	02037	2N5836	1855-0421	02883	2N5114
1854-0929	02037	MMBT918	1854-1132	03334	2SC1623	1855-0423	02883	VN10RM
1854-0940	06344	2SC4229 (SEL)	1854-1133	02037	A3604	1855-0429	03406	J108
1854-0941	02037	MJ12003	1854-1134	02037	MJE13005	1855-0425	03406	J3004
1854-0942	03334	BFR34	1854-1136	00746	2SD786	1855-0427	02883	M100
1854-0944	02062	HXTR-3101	1854-1137	02037	MMBT5088T1	1855-0430	03714	2N3685
1854-0946	00039	NE02135	1854-1138	02037	MMBT412WT1	1855-0431	03714	IVN5001ANF
1854-0948	02037	MJ10006	1854-1139	02037	MFSH10	1855-0432	02883	3N163
1854-0957	03714	ITL20A-TOT1	1854-1140	02037	MFS6543	1855-0434	03714	IT500
1854-0960	01698	TIP1753A	1854-1141	02037	MFS3646	1855-0436	03406	U1897E
1854-0964	02037	MJ12004	1854-1142	02037	MFS571	1855-0437	03406	J270
1854-0965	02037	MJE805	1854-1143	02037	MRF580A	1855-0440	09283	SD213
1854-0967	02037	TIP41C(SELECTED)	1854-1144	02037	2N41400	1855-0442	01973	ITS4066
1854-0968	02037	SJ7076	1854-1145	02037	2N6340	1855-0445	02883	J107
1854-0969	02037	MJ12005	1854-1147	03171	2N3441	1855-0446	02883	J112
1854-0970	01698	TIP102	1854-1148	02037	MMBT910	1855-0454	03038	IRF43
1854-0971	02062	2N6741	1854-1149	02037	MRF870	1855-0461	03038	IRF520
1854-0972	02037	BFR909	1854-1150	02037	BCW65C	1855-0478	02037	MIM15W50
1854-0973	02037	MFS8098	1854-1157	02037	BU426	1855-0484	03038	IRF9130
1854-0977	02037	MFS-A14	1854-1158	06338	SGSIF444	1855-0488	03038	IRF610
1854-0978	04550	CE3416	1854-1159	02037	MRF604	1855-0489	03714	IVN5201TNF
1854-0979	02037	MFS2369	1854-1161	02037	MJE15030	1855-0490	02037	MM10M10 SELECTED
1854-0980	02037	MRF961	1854-1163	03334	A3604	1855-0492	03038	IRF530
1854-0981	02037	MFS5179	1854-1165	02037	BU807	1855-0493	03038	IRF930
1854-0982	01698	TIP642	1854-1166	02037	BUW11A	1855-0494	03038	IRF130
1854-0983	02037	MJ12005(SELECTED)	1854-1167	02037	MPS44RLR1A	1855-0495	02037	MM10M15
1854-0984	02037	MJ16002(SELECTED)	1854-1168	02037	MRF531(SEL)	1855-0497	02037	MTP2N90
1854-098								

HP P/N Mfr. Desc.

1855-0714 03799 HMF-0620
 1855-0715 02037 MMFR4393
 1855-0719 03799 HMF-0310-100
 1855-0720 03291 AT-8160
 1855-0721 02037 2N5266
 1855-0722 02883 VP1008B
 1855-0723 02883 SD214DE
 1855-0724 02883 YN66AD
 1855-0725 02883 WFP3055A
 1855-0726 03038 IRF9220
 1855-0727 02037 2N7000
 1855-0729 02883 IRFD123
 1858-0004 01921 CA3049
 1858-0008 02037 SPQ526K
 1858-0009 02037 MHQ2221
 1858-0010 02037 MPQ2906
 1858-0020 02037 SH6401PC
 1858-0021 01921 CA3083
 1858-0022 03793 SQ3811N
 1858-0023 01921 CA3081E
 1858-0032 01921 CA3146E
 1858-0034 02037 MPQ3725
 1858-0036 03285 AD821(SPEC)
 1858-0037 04200 ULN2082A
 1858-0040 01921 CA3127E
 1858-0045 03406 LM3018AH
 1858-0046 01921 CA3097E
 1858-0047 04200 ULN-2003A
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 1858-0058 02037 MPQ3906
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 1858-0062 02037 MPQ3762
 1858-0063 01921 CA3102E
 1858-0064 01921 CA3055H
 1858-0065 04200 ULN-2815A-2
 1858-0066 03714 IH40LA
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 1858-0069 04200 ULN-2803A
 1858-0071 02037 MPQ3798
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 1858-0075 02037 MPQ3546
 1858-0076 02037 MPQ2907F
 1858-0077 02037 MPQ2222P
 1858-0081 03811 CT254
 1858-0082 04200 ULN-2804A
 1858-0083 04200 TPQ002
 1858-0084 04200 ULN-2804A
 1858-0085 04200 UDN2580A
 1858-0086 02037 MPQ6700
 1858-0087 02037 MPQ3904
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 1858-0092 02037 MPQ3799
 1858-0093 02037 MPQ6700
 1858-0094 02037 MPQ6002
 1858-0095 00046 FC7900C
 1858-0096 01921 CA3183E
 1858-0097 04200 ULN-2023A
 1858-0099 04200 ULN-2003A(SEL)
 1858-0100 02037 MPQ2369
 1858-0101 01590 SL2364C
 1858-0102 02037 MPQ6426
 1858-0104 02910 ULN2003D
 1858-0105 07221 VMI10686
 1858-0106 02037 MPQ3799
 1858-0107 02037 MPQ7014
 1858-0108 04200 ULQ2804A
 1858-0109 12010 FT5755M
 1858-0110 02180 MAT04FY
 1858-0111 02037 MPQ3799-2
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 1858-0113 02037 MPPQ2907A
 1858-0114 02037 MPPQ-3906
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 1858-0116 02883 VQ1001J
 1858-0117 08700 QD4220
 1858-0118 01921 CA3096E
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 1858-0121 04200 ULQ-2823A
 1858-0122 02037 MPPQ3799
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 1900-0004 02865 1N76
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 1900-0018 02788 1N23C
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 1900-0025 02062 5082-0049
 1900-0030 02865 DM6553
 1900-0031 02865 DMJ705 SELECTED
 1900-0032 02865 DSG 647H-44
 1900-0033 02062 5082-0008
 1900-0034 04507 A4X665
 1900-0035 02062 HSCH-5510
 1900-0036 04507 ASS092 SELECTED
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 1900-0039 02037 MMBD352
 1900-0040 02788 MA-NH02ZL
 1900-0041 02788 MA-NH035
 1900-0042 04507 ASX1046
 1900-0043 04507 A2X2118
 1900-0045 02788 MA4P485
 1900-0046 02865 CLA3132-86
 1900-0047 05695 MA-NP203-287
 1900-0048 08852 MMX1735
 1900-0050 08852 MMD830-E20
 1900-0053 02865 DDC4655D
 1900-0054 08852 MSS-40-155-E20
 1900-0056 02865 DDC4582D
 1900-0057 02062 5082-0001 SELECTED
 1900-0059 02865 DMJ4768
 1900-0060 02062 5082-0009
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 1900-0062 02865 DME6553

1900-0065 02062 HSCH-6332
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 1900-0070 02062 HSCH-5512
 1900-0071 02062 HSCH-5312
 1900-0072 02062 HSMS2820
 1900-0074 02062 HSMS2810
 1900-0075 02062 MSS-39-254-E20
 1900-0076 02062 HSCH-5336 (SELECTED)
 1900-0077 02062 HSCH-6530
 1900-0078 02062 HSMS-2800
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 1900-0080 08852 MMD830-E20 SELECTED
 1900-0082 08852 MX-2844
 1900-0083 02062 5082-2831
 1900-0084 08852 MX-2860
 1900-0085 08852 MSS40-141-B10 SELECTED
 1900-0086 08852 MX2946
 1900-0087 02062 5082-2831
 1900-0088 02062 5082-2794
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 1900-0094 02062 HSMS-0012
 1900-0095 08852 MX3141
 1900-0096 02062 HSMP-3830-T30
 1900-0099 02062 5082-3140
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 1901-0002 01921 HI3-0302-5
 1901-0003 01921 1N1200A
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 1901-0006 02037 1N1566A
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 1901-0019 02086 1N1344
 1901-0021 04550 1N538
 1901-0022 03334 BA220
 1901-0025 00046 1N645
 1901-0032 02037 1N3209
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 1901-0038 02237 1N3064
 1901-0040 00046 1N4148
 1901-0041 00046 1N4607
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 1901-1107 04507 AX21501
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1901-1207	03287	1.5KE120C	1902-0977	02037	1N5352	1902-1456	02037	MLL5240
1901-1208	03287	MPTE-15	1902-0978	02037	1N5346	1902-1457	02037	MLL5241
1901-1209	03287	MPTE-15C	1902-0980	02037	5M302S2	1902-1458	02037	MLL5242
1901-1210	03287	LCE7-0	1902-0981	02037	5M232S2	1902-1459	02037	MLL5243
1901-1211	03287	5KP5-0A	1902-0982	02037	5M282S2	1902-1460	02037	MLL5244
1901-1213	02037	MHD501	1902-0983	01691	1N4621	1902-1461	02037	MLL5245
1901-1214	02037	MUR160	1902-0986	02037	1N6270A	1902-1462	02037	MLL5248
1901-1216	02037	MUR415	1902-0987	02037	1N5291	1902-1463	02037	MLL5250
1901-1218	00046	USD840	1902-0988	02037	5M272S2	1902-1464	02037	MLL5251
1901-1220	05088	VSK530	1902-0989	02037	5M202S2	1902-1465	02037	MLL5252
1901-1223	03334	BYV36C	1902-0990	02037	MZC5-6B2	1902-1466	02037	MLL5254
1901-1224	03334	BAV74	1902-0991	02803	1N4577	1902-1467	02037	MLL5256
1901-1225	02037	MMD914	1902-0993	03287	1.5KE7-5C	1902-1468	02037	MLL5257
1901-1227	02237	BAS16	1902-0994	02037	4M8-221	1902-1469	02037	MLL5258
1901-1228	02037	MMD914MT1	1902-0995	02037	1N5373B	1902-1470	02037	MLL5259
1901-1230	03334	BYV26C	1902-0996	02037	1N5336B	1902-1471	02037	MLL5260
1901-1232	02062	5082-1006	1902-0997	02037	JANTXV1N3020B	1902-1472	02037	MLL5261
1901-1233	02037	MUR4100	1902-0999	02037	1N3933A	1902-1473	02037	MLL5262
1901-1237	02713	RGF15-15	1902-1000	02037	1N5366B	1902-1474	02037	MLL5263
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1901-1252	04200	TMPD150	1902-1217	02037	1N3998RA	1902-1482	02713	1N5954B
1901-1253	03334	BAH82	1902-1226	02037	1N3996A	1902-1486	02037	1N5388B
1901-1254	11708	BAR42	1902-1228	02037	1N2988RB	1902-1487	03334	BZXB4-C12
1901-1255	04550	DE131	1902-1232	02037	1N3997RA	1902-1488	04486	LL4747A
1902-0003	02037	1N754	1902-1234	02037	1N4000A	1902-1489	04486	LL4744A
1902-0018	02037	1N941	1902-1259	02037	1N5357B	1902-1490	04486	LL4740A
1902-0021	02037	1N2992RB	1902-1260	02037	1N5252C	1902-1491	04486	LL4733A
1902-0027	02037	SZ1521-250	1902-1276	02037	1N2809B	1902-1492	04486	LL4742A
1902-0028	02037	1N5994A	1902-1278	02037	1N5348B	1902-1493	02037	1N5949B
1902-0030	02037	1N2988B	1902-1286	02037	1N5342B	1902-1494	02037	1N5252B
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1902-0042	02037	1N1608	1902-1295	02883	CL4720	1902-1502	02037	1N5939B
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1902-0094	02037	1N705A	1902-1336	02037	1N6001B	1902-1510	02037	1N5367B
1902-0095	02037	1N746	1902-1338	02037	1N4574A	1902-1512	02037	BZXB4CV75
1902-0121	02763	CD36191	1902-1340	02037	1N5355B	1902-1515	02037	1N5334BRL
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1902-0245	02037	1N4099	1902-1347	02037	5M222S2	1902-1523	11708	BZWB50-56B
1902-0246	02037	1N4105	1902-1352	04507	LVA 456A	1902-1524	02037	MMD25230
1902-0517	02037	SZ1521-3-48	1902-1356	02037	1N4753ARL	1902-1529	11708	1.5KE250CA
1902-0522	02037	1N5340B	1902-1374	02037	BZXB3A5V1	1902-1534	03287	SAL1A
1902-0526	02037	1N5305	1902-1380	11708	1N5318A	1902-1535	02037	MMD25257B
1902-0528	02037	1N5524D	1902-1384	02037	1N5252C	1902-1536	02037	1N5368B
1902-0549	02037	1N5365A	1902-1385	02664	SK43	1902-1537	03287	1.5KE91V
1902-0570	02688	DZ70302N	1902-1387	02037	1N5524C	1902-1539	10818	BZXB7V5
1902-0584	02037	SZ030590	1902-1388	02037	1N4697	1902-1540	02037	1N4697
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1902-0627	02037	1N5312	1902-1392	02037	1N5256(SELECTED)	1906-0006	05088	VEN48
1902-0630	02037	1N5236B	1902-1394	02037	1N5378B	1906-0007	02037	MDA2502
1902-0631	02037	1N5351B	1902-1396	02037	1N5355B	1906-0008	02037	MDA2500
1902-0632	02037	1N5354B	1902-1397	02037	1N5673A	1906-0016	02037	MDA2506
1902-0640	02037	1N5847A	1902-1398	02037	1N8210	1906-0017	02037	MDA 990-3
1902-0643	02037	1N2979B	1902-1399	02037	1N5244	1906-0023	02037	MMDA922-4
1902-0645	02037	1N2997RB	1902-1400	02037	1N5244	1906-0025	02037	MMD1000
1902-0680	02037	1N827	1902-1402	02037	1N5244	1906-0026	02037	MMD7000
1902-0686	02037	1N825	1902-1401	02037	1N2835A	1906-0027	02037	MDA922-6
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1902-0759	02037	1N2983B	1902-1405	02037	1N751A(SELECTED)	1906-0032	02037	MDA980-3
1902-0761	02037	1N821	1902-1406	03406	LM103-3.0	1906-0035	00046	673-2
1902-0772	02037	1N935	1902-1407	04507	1N4626	1906-0037	02037	MDA990-1
1902-0777	02037	1N925	1902-1408	02037	1N5243(SELECTED)	1906-0039	02664	SCPA2
1902-0785	02037	1N936	1902-1409	02037	1N2989B	1906-0040	02664	SCDA2
1902-0786	02037	1N937	1902-1410	02037	1N6283A	1906-0049	02037	MDA980-6
1902-0787	02037	1N938	1902-1411	02037	1N4574A	1906-0052	05088	VH148
1902-0788	02037	1N3154	1902-1423	02037	1N5338A	1906-0056	02037	MSD 7000-2
1902-0789	02037	1N3155	1902-1424	10881	BZXB4C5V6	1906-0058	02037	MDA990-0
1902-0791	02037	1N942	1902-1425	02037	1N5359B	1906-0067	05088	R754
1902-0793	02037	1N944	1902-1426	02037	1N5230(SELECTED)	1906-0071	02664	SCPA05F
1902-0795	02037	1N992B	1902-1427	02037	1N2805A	1906-0072	02664	SCBA2F
1902-0796	02037	1N989B	1902-1430	02037	4M6-22Z10	1906-0074	02237	FA3157P
1902-0905	04507	1V466A	1902-1431	02037	1N4690	1906-0079	05088	VJ148X
1902-0906	04507	1V466B	1902-1432	02037	1N5381B	1906-0082	02662	5082-2826
1902-0907	04507	1V466C	1902-1433	02037	1N3998RA	1906-0085	05088	VJ348RTT
1902-0909	02037	1N2972A	1902-1436	02037	MMDZ-5232	1906-0088	05088	RT128
1902-0910	02037	1N2984RB	1902-1437	02037	MMDZ-5241	1906-0090	00046	698-1
1902-0916	02037	MZ5556	1902-1438	02037	1N5944B	1906-0092	04200	ND946
1902-0918	02037	5M172S2	1902-1439	02037	1N2835RA	1906-0093	02037	MDA3501
1902-0919	02037	5M182S2	1902-1440	02037	1N5274	1906-0094	02037	MDA-104
1902-0920	02037	1N5345B	1902-1441	02037	MLL5221	1906-0096	02037	MDA202
1902-0923	02037	1N5337A	1902-1442	02037	MLL5223	1906-0100	02883	DPAD 100
1902-0924	02037	1N5272	1902-1443	02037	MLL5225	1906-0201	02713	KBU4G
1902-0925	02037	1N4740A	1902-1444	02037	MLL5226	1906-0202	01698	TID130
1902-0927	02037	1N5349	1902-1445	02037	MLL5227	1906-0203	05131	FK10
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JDEC	Mfr.	HP P/N			
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2N3468	02037	1853-0574	2N4401	02037	1854-1126	2N5954	01921	1853-0277
2N3478	01921	1854-0325	2N4403	02037	1853-0271	2N5956	02037	1853-0303
2N3494	02037	1853-0071	2N4403	02037	1853-0419	2N596	02713	1850-0052
2N3501S	02037	1854-0813	2N4403	02037	1853-0565	2N5962	02237	1854-0714
2N3553	01921	1854-0308	2N4403	02037	1853-0600	2N5963	02237	1854-0548
2N3563	02237	1854-0418	2N4405	02037	1853-0650	2N597	02713	1850-0417
2N3565	02237	1854-0060	2N4410	02037	1854-0365	2N5987	02037	1853-0378
2N3583	01921	1854-0282	2N4416	01698	1855-0327	2N600	02713	1850-0418
2N3585	01921	1854-0643	2N4416A	02037	1855-0276	2N6027	04550	1855-0314
2N3631	02883	1855-0291	2N4416A CHIP	02037	1855-0556	2N6028	04550	1855-0346
2N3633	01921	1854-0315	2N4428	02037	1854-0851	2N6033	01921	1854-0834
2N3634	02037	1853-0028	2N4852	02037	1855-0204	2N604	02713	1850-0110
2N3635	02037	1853-0462	2N4853	02037	1855-0099	2N6049	02037	1853-0413
2N3638	02037	1853-0638	2N4857	03406	1855-0244	2N6051	02037	1853-0391
2N3640RLRA1	02037	1853-0665	2N4860	02037	1855-0632	2N6053	02037	1853-0351
2N3642	02237	1854-0255	2N4891	01698	1855-0065	2N6053	02037	1853-0362
2N3646	02237	1854-0432	2N4900	02037	1853-0323	2N6055	02037	1854-0611
2N3663	01973	1854-0219	2N4902	02037	1853-0223	2N6056	01921	1854-0774
2N3685	03714	1855-0430	2N4904	02037	1853-0426	2N6057	02037	1854-0669
2N3688	02237	1854-0231	2N4912	02037	1854-0399	2N6078	01921	1854-0599
2N3694	02237	1854-0203	2N4917	02237	1853-0089	2N6107	01921	1853-0371
2N3703	01698	1853-0023	2N4917	02237	1853-0091	2N6107 (SEL)	01921	1853-0538
2N3710	01698	1854-0064	2N4917	02237	1853-0597	2N6107 (SEL)	02037	1853-0667
2N3711	01698	1854-0081	2N4917	02237	1853-0640	2N6109	02037	1853-0469
2N3713	02037	1854-0252	2N4918	02037	1853-0084	2N6124	02037	1853-0661
2N3714	02037	1854-1018	2N4919	02037	1853-0222	2N6211	01921	1853-0328
2N3715	02037	1854-0264	2N4920	02037	1853-0204	2N6213	02037	1853-0670
2N3724A	01698	1854-0350	2N4922	02037	1854-0389	2N6248	01921	1853-0439
2N3725	01698	1854-0547	2N4923	02037	1854-0347	2N6249	01921	1854-0598
2N3725A	01698	1854-0687	2N4959	02037	1853-0420	2N6254	01921	1854-0575
2N3737	02037	1854-0998	2N4966	01698	1854-0397	2N6258	01921	1854-0576
2N3739	02037	1854-0324	2N5022	02237	1853-0373	2N6259	01921	1854-0577
2N								

JDEC

Mfr. HP P/N

Table listing various HP part numbers and their manufacturers. Columns include part numbers, manufacturers, and HP part numbers. The list is organized in three columns, with the third column containing a long list of manufacturers and their part numbers.

JDEC	Mfr.	HP P/N						
MMD6100	02037	1906-0025	MR2H06	02037	1901-1121	RFL1N08L	01921	1855-0619
MMD6150	02037	1906-0024	MR2H06F	02037	1901-1137	RF1N012	01921	1855-0672
MMD7000	02037	1906-0020	MR501	02037	1901-1081	RF1N012	01921	1855-0565
MMD830-E20	08852	1900-0050	MR502	02037	1901-0870	RF1N015	01921	1855-0676
MMD830-E20 SELECTED	08852	1900-0080	MR503	02037	1901-1000	RF1N015	01921	1855-0677
MMD830-E20	02037	1901-0289	MR508	02037	1901-0889	RF1N2008L	01921	1855-0629
MMPQ-3906	02037	1858-0114	MR510	02037	1901-0839	RF1N2008L	01921	1855-0618
MMPQ2222A	02037	1858-0112	MR751	02037	1901-0662	RF2N212	01921	1855-0665
MMPQ2907A	02037	1858-0113	MR752	02037	1901-0788	RF2N215	01921	1855-0708
MMPQ3799	02037	1858-0122	MR754	02037	1901-0767	RF2N215	01921	1855-0623
MMPQ3904	02037	1858-0120	MR754	02037	1901-0781	RF2N215	01921	1855-0621
MMT3960	02037	1854-0555	MR756	02037	1901-0787	RF2N215	01921	1855-0617
MMT3960A	02037	1854-0587	MR758	02037	1901-1188	RF2N215	01921	1855-0617
MMX1735	08852	1900-0048	MR818	02037	1901-1148	RGF-10M	02713	1901-0847
MP312-78-69	07050	1854-1046	MR820	02037	1901-1086	RGF15-15	02713	1901-1237
MP358	07050	1853-0619	MR822RL	02037	1901-0685	RGF15M	02713	1901-0997
MP603	02037	1850-0440	MR850	02037	1901-0789	RUR810	02713	1906-0333
MP833-1004	07050	1855-0515	MR852	02037	1901-0692	RUR810	01921	1901-0987
MPD200	01973	1901-0866	MR854	02037	1901-0719	S10925	01921	1901-1113
MPD400	01973	1901-1034	MR856	02037	1901-1087	S17843	02526	1901-1154
MPP6660	02037	1855-0675	MR862R	02037	1901-1122	S2F	02237	1854-0022
MPP960	02037	1855-0594	MR881R	02037	1901-1035	S2F	02664	1901-0646
MPN3401	02037	1901-0844	MR891R	02037	1901-1037	S32248	02637	1853-0058
MPN3500	02037	1901-0975	MRF331 (SEL)	02037	1854-1168	S4F	02264	1901-0669
MPQ2222P	02037	1858-0077	MRF344	02037	1854-1114	SA100CA	03287	1902-1522
MPQ2369	02037	1858-0055	MRF345	02037	1853-0625	SAL1A	03287	1902-1534
MPQ2369	02037	1858-0100	MRF371 (SEL)	02037	1854-1042	SAS17	01979	1850-0156
MPQ2484	02037	1858-0091	MRF511L	02037	1854-1125	SB160	02713	1901-1165
MPQ2906	02037	1858-0010	MRF580A	02037	1854-1143	SB1660	02713	1906-0300
MPQ2907P	02037	1858-0076	MRF581	02037	1854-1022	SB560	02713	1901-1163
MPQ3546	02037	1858-0075	MRF581	02037	1854-1032	SCAJ1	02664	1901-0526
MPQ3725	02037	1858-0034	MRF581 (MOD)	02037	1854-1184	SCBA2F	02664	1906-0072
MPQ3762	02037	1858-0062	MRF586	02037	1854-1175	SCDA2	02664	1906-0040
MPQ3798	02037	1858-0071	MRF587	02037	1854-1047	SCFA05F	02664	1906-0071
MPQ3799	02037	1858-0092	MRF5006	02037	1854-1359	SCFA2	02664	1906-0039
MPQ3799-2	02037	1858-0111	MRF630	02037	1854-0990	SD-241	01691	1906-0239
MPQ3904	02037	1858-0087	MRF670	02037	1854-1149	SD-41	01691	1901-1100
MPQ3906	02037	1858-0058	MRF800	02037	1854-0890	SD103C	04486	1901-0999
MPQ6002	02037	1858-0090	MRF911	02037	1854-1178	SD210DE	02883	1855-0647
MPQ6100	02037	1858-0074	MRF962	02037	1854-1092	SD211DE (SELECTED)	09283	1855-0215
MPQ6426	02037	1858-0102	MRF965	02037	1854-1107	SD213	09283	1855-0440
MPQ6700	02037	1858-0086	MSD 7000	02037	1906-0056	SD214	02910	1855-0269
MPQ6700	02037	1858-0093	MSD6101	02037	1901-0358	SD214DE	02883	1855-0723
MPQ6842	02037	1820-1804	MSS-30, 254-E20	08852	1900-0075	SD215	02910	1855-0241
MPQ7041	02037	1858-0107	MSS-40, 135-E20	08852	1900-0054	SD306 (SEL)	09283	1855-0557
MPQ7051	02037	1858-0106	MSS100, 141-E10 SELECTED	08852	1900-0085	SE5055	02237	1854-0388
MPQ7091	02037	1858-0088	MTML0M10 SELECTED	02037	1855-0490	SES560ACR	00046	1906-0259
MPQ918	02037	1858-0094	MTML0M15	02037	1855-0495	SFF793	02037	1855-0020
MPS 6523	02037	1853-0043	MTML2M06	02037	1855-0593	SFR0	02664	1901-0998
MPS A12	02037	1854-0560	MTML5M50	02037	1855-0478	SG3821N	03793	1858-0022
MPS A18	02037	1854-0691	MTP2P45	02037	1855-0527	SGS126	06338	1853-0642
MPS U-10	02037	1854-0764	MTP3N35	02037	1855-0705	SGS1F444	06338	1854-1158
MPS U-60	02037	1853-0423	MTP6M006	02037	1855-0697	SH6401PC	02237	1858-0020
MPS-404A	02037	1853-0217	MTP10M25	02037	1855-0673	SH6501PC	02237	1821-0006
MPS-A14	02037	1854-0472	MTP12M06	02037	1855-0542	SJ7076	02037	1854-0968
MPS-A14	02037	1854-0992	MTP12M10	02037	1855-0506	SL2364C	01590	1858-0011
MPS-A17	02037	1854-0642	MTP12M18	02037	1855-0563	SMPFR30K	02664	1901-0199
MPS-A18	02037	1854-0583	MTP14M05A	02037	1855-0630	SPPR39	02037	1855-0687
MPS-A42	02037	1854-0575	MTP1N100	02037	1855-0664	SPQ1678	02037	1858-0052
MPS-A64	02037	1853-0416	MTP2N90	02037	1855-0497	SPQ526K	02037	1858-0008
MPS-A66	02037	1853-0483	MTP3055A	02037	1855-0725	SFS 233	02037	1854-0246
MPS-A70	02037	1853-0395	MTP3M60	02037	1855-0608	SFS 3627	02037	1854-0270
MPS-D54	02037	1853-0467	MTP4N40	02037	1855-0607	ST3011	06632	1854-0690
MPS-H17	02037	1854-0628	MTP4N50	02037	1855-0606	STB55-2A	01973	1901-0460
MPS-U01	02037	1854-0634	MURI05	02037	1901-1129	STB567	00046	1901-0701
MPS-U02	02037	1854-0514	MURI115	02037	1901-0070	SW3	02664	1902-1385
MPS-U05	02037	1854-0836	MURI140	02037	1901-1244	SZ11213-48	02037	1901-0157
MPS-U07	02037	1854-0817	MURI150	02037	1901-1189	SZ1521-250	02037	1902-0027
MPS-U07	02037	1854-0877	MURI160	02037	1901-1214	SZ3030590	02037	1902-0584
MPS-U45	02037	1854-0798	MURI620CT	02037	1906-0321	T1D778	00046	1901-0979
MPS-U51	02037	1853-0326	MURI620CT OPTION T0220-C	02037	1906-0338	T1P-33	01698	1854-0594
MPS-U52	02037	1853-0476	MUR3020PT	02037	1906-0329	T1P140	01698	1854-0663
MPS-U55	02037	1853-0353	MUR410	02037	1901-1239	TG-10	05088	1901-0995
MPS-U57	02037	1853-0496	MUR4100	02037	1901-1233	TID130	01698	1906-0202
MPS-U95	02037	1853-0449	MUR115	02037	1901-1216	TIP 115	01698	1853-0377
MPS2369	02037	1854-0979	MUR160	02037	1901-1199	TIP 141	01698	1854-0763
MPS2907A	02037	1853-0626	MUR860A	02037	1901-1130	TIP-122	01698	1854-0828
MPS3640	02037	1853-0244	MURC115	02037	1901-1169	TIP-126	01698	1854-0424
MPS3643	02037	1854-0492	MX-2844	08852	1900-0082	TIP-127	01698	1853-0468
MPS3646	02037	1854-1141	MX-2860	08852	1900-0084	TIP-134	01698	1853-0350
MPS4250A	02037	1853-0587	MX1098	08852	1901-0977	TIP-15A	01698	1854-0593
MPS4356	02237	1853-0488	MX2946	08852	1900-0086	TIP-141	01698	1854-0625
MPS4379	02037	1854-0981	MX3141	08852	1900-0095	TIP100	02037	1854-0840
MPS571	02037	1854-1142	MKR5583	02037	1853-0610	TIP102	01698	1854-0970
MPS6531	02037	1854-0740	MKR5943	02037	1854-1106	TIP105	02037	1853-0463
MPS6534	02037	1853-0536	MKT222A	02037	1854-0994	TIP106	01698	1853-0454
MPS6543	02037	1854-1140	MKT2907A	02037	1853-0609	TIP107	02037	1853-0490
MPS6543 SELECTED	02037	1854-0296	MKT3904	02037	1854-1101	TIP110	01698	1853-0670
MPS6562	02037	1853-0318	MKT3906	02037	1853-0613	TIP112	02037	1854-1023
MPS8098	02037	1854-0973	MZ2361	02037	1901-1196	TIP122	02037	1854-1128
MPS834	02037	1854-0866	MZ5556	02037	1902-0916	TIP140	01698	1854-0700
MPSA18RLRAL	02037	1854-1179	MZC4,7A10	02037	1902-1480	TIP140	02037	1854-0880
MPSA44RLRAL	02037	1854-1167	MZC5, 6B2	02037	1902-0990	TIP142	02037	1854-0985
MPSA55	02037	1853-0608	MZC6, 8A3	02037	1902-1500	TIP145	02037	1853-0498
MPSA65	02037	1853-0412	MZTR5548	02037	1902-1505	TIP31F	01698	1854-1169
MPSA76	02037	1853-0572	ND946	04200	1906-0092	TIP32C	03406	1853-0537
MPSA92	02037	1853-0336	NE-41635	00039	1854-1008	TIP32F	01698	1853-0654
MPSC404A	02037	1853-0555	NEO2133L	00039	1854-1091	TIP36-2	01698	1853-0453
MPSH10	02037	1854-0795	NEO2135	00039	1854-0946	TIP41A	01698	1854-0456
MPSH10	02037	1854-0993	NE21935	00039	1854-1009	TIP41C	02037	1854-0799
MPSH10	02037	1854-1139	NE21935	00039	1854-1044	TIP41C (SELECTED)	02037	1854-0967
MPSH54	02037	1853-0662	NE64535	00039	1854-1002	TIP42	01698	1853-0356
MPSH81	02037	1853-0448	NE68111	00039	1854-1111	TIP42A	01698	1853-0234
MPSH81	02037	1853-0639	NE71000	00039	1855-0569	TIP42C	02037	1853-0431
MPSP01	02037	1854-1064	NET1084-06	00039	1855-0636	TIP47	02037	1854-0838
MPSP06	02037	1854-0997	NET3460	00039	1854-1066	TIP50	02037	1854-1069
MPSW1	02037	1853-0660	NE800199	00039	1855-0637	TIP51	01698	1854-0806
MPSW55	02037	1853-0559	NE85633	00039	1854-1089	TIP62	01698	1854-0982
MPSW56	02037	1853-0552	NE90115	00039	1853-0578	TIP647	01698	1853-0543
MPTE-15	03287	1901-1208	NEL2301-53	00039	1854-1170	TIP75B	01698	1854-0803
MPTE-15C	03287	1901-1209	NS3000	02619	1901-0663	TIPL753A	01698	1854-0960
MR1-1400	02037	1901-0885	FAD5	02883	1901-0842	TIFL762A	01698	1854-1099
MR1033A	02037	1901-0411	FF5101 (SELECTED)	03406	1855-0529	TIFP115	01698	1853-0668
MR1035A	02037	1901-0413	FC1900C	00046	1858-0095	TIR011B	01698	1906-0213
MR1120	02037	1901-0495	FK10	05131	1906-0203	TIR201B	01698	1906-0214
MR1120R	02037	1901-0585	FW3568	02237	1854-			

UES-1106	09914	1901-1106
UES1105	09914	1901-1110
UES1303	09914	1901-1111
UES1305	09914	1901-1108
UES1306	09914	1901-1109
UES2602R	00046	1906-0254
UES2603	00046	1906-0304
UES2605	00046	1906-0277
UES601R	00046	1901-0953
UES803	00046	1901-1127
UES803R	00046	1901-0961
UES804	00046	1901-0904
UF4004	02713	1901-1149
ULN-2003A	04200	1858-0047
ULN-2003A(SEL)	04200	1858-0099
ULN-2023A	04200	1858-0061
ULN-2033A	04200	1858-0097
ULN-2033A	04200	1858-0067
ULN-2803A	04200	1858-0069
ULN-2804A	04200	1858-0082
ULN-2804A	04200	1858-0084
ULN-2805A	04200	1858-0073
ULN-2813A	04200	1858-0072
ULN-2815A-2	04200	1858-0065
ULN2003D	02910	1858-0104
ULN2082A	04200	1858-0037
ULQ-2823A	04200	1858-0121
ULQ2804A	04200	1858-0108

USD 745C		
USD840		
USD945		
V334X		
V336X		
VBI0X		
VCR2N		
VCR3P		
VER48		
VG-2X		
VH148		
VHE140A		
VHE240A		
VHE2404		
VJ148X		
VJ848		
VJB48TT		
VK248		
VKP 248		
VL447		
VM28X		
VMP-1		
VN0104N3		
VN0106N6		
VN0300L		
VN0300M		
VN0300M		
VN0610L		

00046	1906-0265
00046	1901-1218
00046	1901-1156
05088	1901-0848
05088	1901-0882
05088	1901-1105
02883	1855-0265
02883	1855-0205
05088	1906-0006
05088	1901-0845
05088	1906-0052
05088	1901-1157
05088	1906-0270
05088	1906-0301
05088	1906-0079
05088	1906-0309
05088	1906-0085
05088	1906-0205
05088	1906-0264
05088	1906-0216
05088	1906-0289
02883	1855-0263
07221	1855-0546
07221	1858-0105
02883	1855-0555
02883	1855-0525
02883	1855-0582
02883	1855-0684

VN10KE		
VN10RM		
VN10LE		
VN222LL		
VN222LL		
VN66AD		
VN66AF		
VP0300L		
VP0300L		
VP0300M		
VP1008B		
VP1204N2		
VQ1000J		
VQ1001J		
VQ1001P		
VQ1006P		
VQ2001P		
VS148		
VSK12		
VSK231		
VSK304OT		
VSK530		
VSK540		
VSK71		
VX30		
W02M		
X45281		
ZSK533		

02883	1855-0545
02883	1855-0423
02883	1855-0560
02883	1855-0556
02883	1855-0598
02883	1855-0724
02883	1855-0275
02883	1855-0550
02883	1855-0686
02883	1855-0526
02883	1855-0722
07221	1855-0649
02883	1855-0591
02883	1858-0116
02883	1855-0585
02883	1855-0620
02883	1855-0650
05088	1906-0240
05088	1906-0263
05088	1906-0278
05088	1906-0238
05088	1901-1220
05088	1901-0976
05088	1901-0960
00046	1901-0984
02713	1906-0256
04550	1853-0363
00039	1855-0571

Reader's Comment

Irv Barditch, of Baltimore Maryland, requested clarification on how the Rotary Pulse Generator, described in the previous 2nd Quarter issue of *Bench Briefs*, actually determined rotational direction. Figure 1 and the timing diagram did not clearly show how the RPG determined direction, and the text stated only that, "The shaft encoder was designed such that A and B transitions were always shifted by 90 degrees."

The fundamental Rotary Pulse Generator I described is shown in Figure 2 as an artist's conception. It contains a light source, a light shield with two windows a precise distance apart, a round disc with slots of equal size and spacing (sometimes called a shutter), and two phototransistors. The shield is in a fixed position between the light source and rotating disc, which is attached to the knob. The phototransistors are lined up behind the shutter and in line with their respective windows in the shield. (We'll call them windows A and B.) The windows are offset so that as the disc rotates between the shield and phototransistors, light shines directly through one window first, through the disc and onto one phototransistor. So, as an example, when you rotate the shaft counterclockwise, light shines through window B, the shutter and onto phototransistor Q1. Q1 conducts and turns on Q2, which causes the Schmitt trigger output B to go high. A moment later the shutter's rotation allows light to pass through from window A and shine on phototransistor Q3, which causes output A to go high. As the shutter continues CCW, the light is cut off first from

Q1 causing output B to go low, then Q3 causing output A to go low.

Therefore, as the shaft is rotated CCW, Q1 conducts first, then Q3 conducts. Then Q1 turns off followed by Q3. When you rotate the shaft

clockwise, Q3 conducts first followed by Q1 and so on. The spacing between the windows in the light shield and the alignment of the shutter to these windows determines the 90 degrees difference in output transitions. □

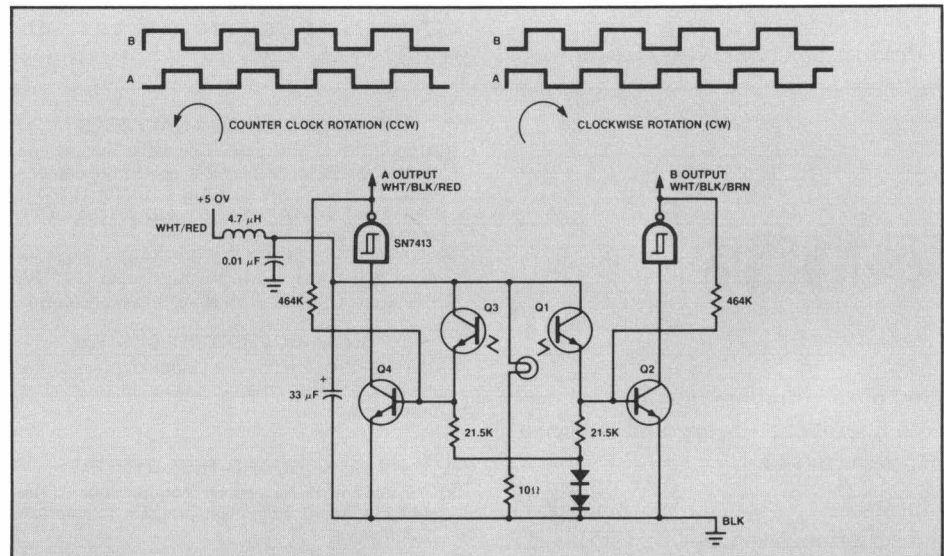


Figure 1

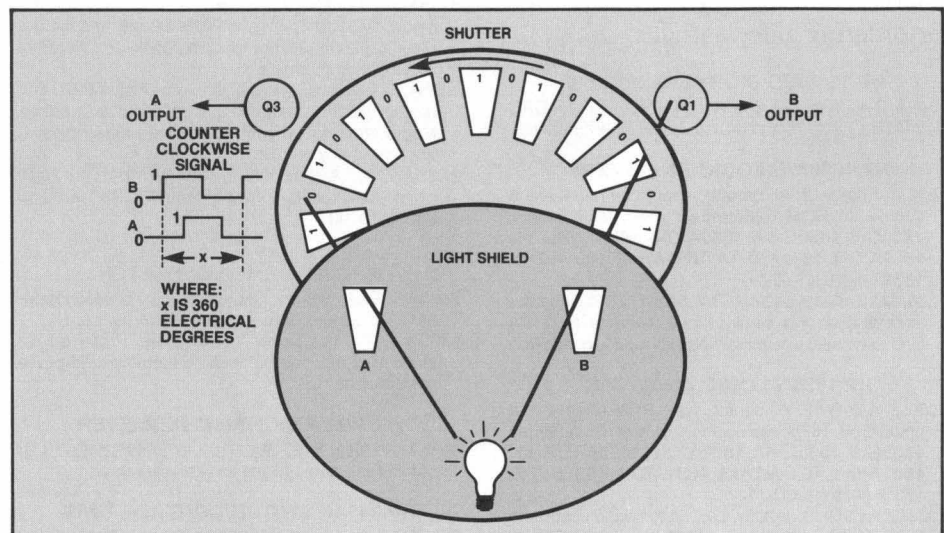


Figure 2

Safety-Related Service Notes

Service notes from HP relating to personal safety and possible equipment damage are of vital importance to our customers. To make you more aware of these important notes, they are printed on paper with a red border, and the service note number has a "S" suffix. In order to make you immediately aware of any potential safety problems, we are highlighting safety-related service notes here with a brief description of each problem. Also, in order to draw your attention to safety-related service notes on the service note order form at the back of Bench Briefs, each appropriate number is highlighted by being printed in color.

HP 3552A Transmission Test Set

Product Safety Service Note 3552A-

15-S describes a possible safety hazard that may exist if an incorrectly rated fuse has been installed because of incorrect information on the power module information label.

Check the information label on the power module of HP 3552s with serial numbers 2615U06154 to 2615U06443 to ensure that it shows the correct fuse ratings as follows:

110/120V — 250mA

220/240V — 125mA

If a unit has an incorrect label, replace it with HP P/N 7124-2372. Also make sure the correctly rated fuse is installed for the selected line voltage. Replacement fuses are:

250mA slow blow 250V

HP P/N 2110-0201

125mA slow blow 250V

HP P/N 2110-0318

HP 3709A Constellation Display

A situation may occur on HP 3709As with serial numbers

2722U00260 and below where the POWER on/off switch contacts could weld together.

Note that this hazard applies only to service personnel when the instrument's protective covers are removed. There is no hazard to the operator.

For more information, please order Product Safety Service Note 3709A-4-S from this issue of Bench Briefs.

HP 61001A DC Power Supply Unit

Some power supplies from serial numbers 2504A00101 through 250400900 may have the line or neutral conductors and the earth conductor reversed on one or more of the internal power output cables. This may cause accessible parts on the connected PC Instruments modules to be at line potential.

If you wish to inspect the System Power Unit yourself, order Product

continued on page 16

supplement to BENCH BRIEFS SERVICE NOTE INDEX

The part numbers for the service note microfiche library and subscription service are:

Library— 5951-6511
Subscription service— 5951-6517

Contact your local HP Sales Office for ordering information. □

HP 1349A/D DIGITAL DISPLAYS

1349A/D-4. All serials. Preferred replacement for DAC in A1U3, U4, U15 and U16 to improve performance.

HP 1630A/D LOGIC ANALYZERS

1630/31A/D/G-12. All Serials. New ROM release and update on ROM replacement policy. Supersedes 1630G-5, 1630G-5A, 1630A/D-6, 1630A/D/G-11, 1631A/D-1, 1631A/D-1A, 1631A/D-2, 1631A/D-3, 1631A-4, 1631A/D-11.

1630/31A/D/G-13, 54200A/D-7, 54201A/D-7. Serial prefixes 2645A and below. Modification to CRT PA lead to prevent intermittent power supply shutdown.

HP 1630G LOGIC ANALYZER

1630/31A/D/G-12. All serials. New ROM release and update on ROM replacement policy. Supersedes 1630G-5, 1630G-5A, 1630A/D-6, 1630A/D/G-11, 1631A/D-1, 1631A/D-1A, 1631A/D-2, 1631A/D-3, 1631A-4, 1631A/D-11.

1630/31A/D/G-13, 54200A/D-7, 54201A/D-7. Serial prefixes 2645A and below. Modification to CRT PA lead to prevent intermittent power supply shutdown.

HP 1631A/D LOGIC ANALYZERS

1630/31A/D/G-12. All serials. New ROM release and update on ROM replacement policy. Supersedes 1630G-5, 1630G-5A, 1630A/D-6, 1630A/D/G-11, 1631A/D-1, 1631A/D-1A, 1631A/D-2, 1631A/D-3, 1631A-4, 1631A/D-11.

1630/31A/D/G-13, 54200A/D-7, 54201A/D-7. Serial prefixes 2645A and below. Modification to CRT PA lead to prevent intermittent power supply shutdown.

HP 3061A BOARD TEST SYSTEM

3061A/3062A-18. All serials. Modifications to the HP 3253A ASRU calibration program to improve performance.

HP 3062A BOARD TEST SYSTEM

3061A/3062A-18. All serials. Modifications to the HP 3253 ASRU calibration program to improve performance.

HP 3235A/E SWITCH/TEST UNIT

3235A/E-2. Serials: 34520A DMM-s/n 2628A00223 and below. 34520B DMM-s/n 2628A00228 and below. Modification to prevent random power-on failures of 34520 DMM modules.

3235A/E-3. Serials: 34520A DMM-s/n 2628A00223 and below. 34520B DMM-s/n 2628A00228 and below. Modification to prevent backplane relays closing after short power loss.

3235A/E-4. All serials. Part number change of test/calibration software from 03235-10002 to 03235-10100.

HP 3400A RMS VOLTMETER

3400A-13B. All serials. Replacement of photochopper amplifier assembly to improve performance.

3400A-16. Serials below 2415A33728. Preferred replacement of input attenuator assembly to improve performance.

HP 3466A DIGITAL MULTIMETER

3466A-17. Serials 2549A26100 to 2549A26637. List of failures related to the switch assembly.

HP 3488A SWITCH/CONTROL UNIT

3488A-11. Serials 2719A10500 to 2719A10580. Incorrect line fuse installed.

HP 3552A TRANSMISSION TEST SET

3552A-14. All serials. Preferred replacement for resistor A3R113.

3552A-15-S. Serials 2615U06154 to 2615U06443. Possible incorrect fuse ratings. Elimination of potential safety hazard.

HP 3577A NETWORK ANALYZER

3577A-13. All serials. Mixers on all receivers in instrument must be of same type to meet the ratio phase specification.

HP 3582A SPECTRUM ANALYZER

3582A-6A. Serials 1809A04380 and below. Updating the ROM assembly.

HP 3709A CONSTELLATION DISPLAY

3709A-4-S. Serials 2722U00260 and below. On/off switch may cause potential safety hazard.

HP 3746A SELECTIVE LEVEL MEASURING SET

3746A-23. All serials. Modification to correct false readings when used in the SCAN mode with AVE 0 selected.

HP 3764A DIGITAL TRANSMISSION ANALYZER

3764A-19B. Serials between 2615U01162 and 2719U01637. Retrofit kit to upgrade the auxiliary analog input.

3764A-22. Serials 2712U01594 and below. Preferred replacement of A3 or A3 (option 001) assemblies.

HP 3789B DS3 TRANSMISSION TEST SET

3789B-2. All serials. Retrofit procedure for Opt. 003 — 2nd measurement.

HP 4936A TRANSMISSION IMPAIRMENT MEASURING SET

4936A-8. All serials. Preferred replacement capacitors on transmitter assembly.

HP 4948A IN-SERVICE TRANSMISSION IMPAIRMENT MEASURING SET

4948A-4. Serials 2615U00247 and below (excluding 159, 167, 190, 192, 193, 204, 206, 207, 218, 219, 227, 229-238, 243-245). Firmware upgrade to improve performance.

HP 4951C PROTOCOL ANALYZER

4951C-4. All serials. Instructions on replacing damaged rear panel studs.
4951C-5. Serials 2631A00851 and below, and 2631F50306 and below. Recommended line voltage rectifier diode replacement where the line voltage exceeds 210 volts.

HP 5335A UNIVERSAL FREQUENCY COUNTER

5335A-11A. Series prefixes below 2548A. Cycle power off then on if front panel exhibits lockup problem.
5335A-22. Serials 2510A07735 through 2510A07831, and 2510A07731 and below. Simple modification to increase the reliability of the power supplies.

HP 5384A/85A FREQUENCY COUNTER

5384A/85A-3. Series prefixes 2436A and below. Modification to prevent power supply fuses from prematurely blowing.

HP 6010A DC POWER SUPPLY

6010A-2. Serials 2707A00255 to 2707A00284. Modification to prevent output voltage being present after power off.
6010A-3. All serials. Modification to prevent transient response during auto-parallel operation.

HP 6011A AUTORANGING POWER SUPPLY

6011A-4. All serials. Modification to prevent transient response during auto-parallel operation.

HP 6012B AUTORANGING POWER SUPPLY

6012B-3. All serials. Modification to prevent transient response during auto-parallel operation.

HP 6030A SYSTEM DC POWER SUPPLY

6030A-5. Serials 2641A00465 to 2641A00494. Modification to prevent output voltage being present after power off.
6030A-6. All serials. Modification to prevent transient response during auto-parallel operation.

HP 6031A AUTORANGING POWER SUPPLY

6031A-8. All serials. Modification to prevent transient response during auto-parallel operation.

HP 6032A AUTORANGING POWER SUPPLY

6032A-7. All serials. Modification to prevent transient response during auto-parallel operation.

HP 8672A SYNTHESIZED SIGNAL GENERATOR

8672A-15A. All serials. Retrofit kit to modify 8672A for compatibility with 86720A. Supersedes 8672A-11, 8672A-13, 8672A-15.

HP 8673B SYNTHESIZED SIGNAL GENERATOR

8673B-2B. Serial prefixes 2629A and below. Firmware history and upgrade kit.
8673B-3. Serial prefixes 2629A and below. Millimetre-wave source modules compatibility kit.
8673B-5A. All serials. Procedure for troubleshooting the option switch.
8673B-8. Serial prefixes 2552A, 2634A and above. Recommended replacement for calibration EPROM A1A8U13.
8673B-9. Serial prefixes 2629A and below. Recommended insulators for transistors A3Q1 through A3Q4 mounted on the anodized heat sink A3MP54.

HP 8673C SYNTHESIZED SIGNAL GENERATOR

8673C-2B. Serial prefixes 2626A and below. Firmware history and upgrade kit.

8673C-5A. All serials. Procedure for troubleshooting the option switch.

8673C-7. Serial prefixes 2626A and below. Procedure for retrofitting the 8673C to form a millimetre-wave source system.

8673C-9. Serial prefixes 2552A, 2634A and above. Recommended replacement for calibration EPROM A1A8U13.

8673C-10. Serial prefixes 2629A and below. Recommended insulators for transistors A3Q1 through A3Q4 mounted on the anodized heat sink A3MP54.

HP 8673D SYNTHESIZED SIGNAL GENERATOR

8673D-2B. Serial prefixes 2626A and below. Firmware history and upgrade kit.

8673D-5A. All Serials. Procedure for troubleshooting the option switch.

8673D-7. Serial prefixes 2626A and below. Procedure for retrofitting the 8673D to form a millimetre-wave source system.

8673D-9. All Serials. Recommended YTM A1A10 replacement.

8673D-10. Serial prefixes 2552A, 2634A and above. Recommended replacement for calibration EPROM A1A8U13.

8673D-11. 2629A and below. Recommended insulators for transistor A3Q1 through A3Q4 mounted on the anodized heat sink A3MP54.

HP 8673E SYNTHESIZED SIGNAL GENERATOR

8673E-2. All serials. Firmware history and update kit.

HP 8770A ARBITRARY WAVEFORM SYNTHESIZER

8770A-6B. All serials. Firmware history and upgrade procedures.

8770A-12. Serial prefixes 2626A and below. Procedure for testing A10R8 current limiting resistor.

8770A-14. Serial prefixes 2710A and below. 16K RAM assembly replaced by 64K RAM assembly to expand memory.

8770A-15. Serial prefixes 2710A and below. Procedure for installing 512K memory retrofit kit, K51.

HP 8970B NOISE FIGURE METER

8970B-1. Serial prefix 2645A. Firmware update to improve performance.

HP 10312B/C 80286 PREPROCESSOR INTERFACE

10312B/C-2. All serials. New flexible cable assembly that offers improved electrical and mechanical characteristics.

HP 37212A MODEM

37212A-1A. All serials. Procedure to clear invalid initiation of remote digital loopback (RDL).

HP 51089A DISPLAY UNIT

51089A-4A. Serial prefixes 2510A and below. Recommended replacement of older jumper-wired boards.

HP 54111D DIGITIZING OSCILLOSCOPES

54111D-1. Serial prefix 2701A and below. New ADC control assembly to improve performance.

HP 54200A/D OSCILLOSCOPE

1630/31A/D/G-13, 54200A/D-7, 54201A/D-7. Serial prefixes 2645A and below. Modification to CRT PA lead to prevent intermittent power supply shutdown.

HP 54201A/D DIGITIZING OSCILLOSCOPES

54201A/D-3. Serial prefix 2602A. Firmware update to improve EOI compatibility with fast controller.
54201A/D-4. Serial prefixes 2625A and below. Recommended A4 analog board assembly.
54201A/D-5. Serial prefixes 2632A and below. Firmware update corrects erroneous Vmin clipped message.
54201A/D-6. Serial prefixes 2625A, 2632A and 2638A. Incorrectly calculated negative slope trigger level causes failure to meet trigger sensitivity specification in some instruments.

HP 54201A/D OSCILLOSCOPE

1630/31A/D/G-13, 54200A/D-7, 54201A/D-7. Serial prefixes 2645A and below. Modification to CRT PA lead to prevent intermittent power supply shutdown.

HP 61001A DC POWER SUPPLY UNIT

61001A-2A-S. Serials 2504A00101 through 2504A00900. Possible shock hazard due to miswired input power.

HP 64220C 80C86 EMULATOR POD

64220C-2. Pod repair number 2549A00225 and below. Recommended replacement for processor chip mask set #1598.

HP 64253A Z80 EMULATOR SUBSYSTEM

64253A-3. Z80 emulator pod, all serials. Modification to correct peripheral interrupt routine execution of RETI instruction. Supersedes 64253A-2.

HP 64286 F9450 EMULATOR

64286A-3. Serial prefix 2713A and below. Modification to improve bus cycle timing.

HP 64416A/B 68020 EMULATION SUBSYSTEM

64416A-2. Emulation pod suffix number 00211 and below. Recommended label on the emulation control board's CPU socket to aid in cable connection.

64416A-3. Emulation pod suffix number 00186 and below. Grabber probe assembly may be missing from shipments—order HP P/N 1400-1422.

64416AB-1. Emulation pod serial prefix number 2650A and below. Test procedure for emulation break, emulation memory write, and coordinated emulation start.

64416B-2. Emulation pod suffix number 00274 and below. Recommended label on the emulation control board's CPU socket to aid in cable connection.

64416B-3. Emulation pod suffix number 00234 and below. Grabber probe assembly may be missing from shipments—order HP P/N 1400-1422.

HP 64657A 80286 PREPROCESSOR INTERFACE

64657A-2. All serials. Upgrade to 64657B cable technology.

HP 70001A MODULAR MEASUREMENT SYSTEM MAINFRAME

70001A-7-S. Serials 2704A01437 and below. Modification to prevent possible shock hazard if safety earth ground is defeated and there is a short on the +5 volt supply.

HP 70205A GRAPHICS DISPLAY

70205A-3. Serial prefix 2629A and below. New dot generator board assembly update kit.

HP 70206A SYSTEM GRAPHICS DISPLAY

70206A-6. Serial prefix 2629A and below. New dot generator board assembly update kit.

HP 70591A MODULE DEVELOPMENT KIT

70591A-1. All serials. Assembly instructions for 1/8 module kit.

HP 70592A MODULE DEVELOPMENT KIT

70592A-1. All serials. Assembly instructions for 2/8 module kit.

HP 70593A MODULE DEVELOPMENT KIT

70593A-1. All serials. Assembly instructions for 3/8 module kit.

HP 70900A LOCAL OSCILLATOR

70900A-14A. All serials. New firmware for increased system compatibility.

HP 71000 SPECTRUM ANALYZER SYSTEMS

71000A-3. All serials. Recommended system re-configuration cable kit.

Service Note Order Form

If you want service notes, please check the appropriate boxes below and return this form separately to one of the following addresses.

Hewlett-Packard
1820 Embarcadero Road
Palo Alto, California 94303

For European customers (ONLY)

Hewlett-Packard
Nederland BV
Central Mailing Dept.
P.O.Box 529
1180 AM Amstelveen
The Netherlands

Name _____
Firm _____
Address _____
City _____
State _____ Zip _____

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Safety Service Note 61001A-2A-S. The test will take approximately 15 minutes to perform.

If you choose to have Hewlett-Packard inspect the unit, return it to a Customer Service Center and reference the Product Safety Service Note.

HP 70001A Modular Measurement System Mainframe

Mainframes with serial number 2704A001437 and below may not have enough space between a circuit trace and a solder pad. In these instances, if the safety earth ground is defeated and there is a short on the +5V power supply, a possible shock hazard may exist.

The modification procedure is detailed in Product Safety Service Note 790001A-7-S. A kit (70001-60076) is available that supplies all the necessary material to make the modification. No adjustment is needed after the modification.

- | | | | | |
|---|--------------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|
| <input type="checkbox"/> 1349A/D-04 | <input type="checkbox"/> 4936A-08 | <input type="checkbox"/> 8673B-09 | <input type="checkbox"/> 51089A-04A | <input type="checkbox"/> 70592A-01 |
| <input type="checkbox"/> 1630/31A/D/G-12 | <input type="checkbox"/> 4948A-04 | <input type="checkbox"/> 8673C-02B | <input type="checkbox"/> 54111D-01 | <input type="checkbox"/> 70593A-01 |
| <input type="checkbox"/> 1630/31A/D/G-13, | <input type="checkbox"/> 4951C-04 | <input type="checkbox"/> 8673C-05A | <input type="checkbox"/> 54201A/D-03 | <input type="checkbox"/> 70900A-14A |
| <input type="checkbox"/> 54200A/D-7, | <input type="checkbox"/> 4951C-05 | <input type="checkbox"/> 8673C-07 | <input type="checkbox"/> 54201A/D-04 | <input type="checkbox"/> 71000A-03 |
| <input type="checkbox"/> 54201A/D-7 | <input type="checkbox"/> 5335A-11A | <input type="checkbox"/> 8673C-09 | <input type="checkbox"/> 54201A/D-05 | |
| <input type="checkbox"/> 3061A/3062A-18 | | | | |
| <input type="checkbox"/> 3235A/E-02 | <input type="checkbox"/> 5335A-22 | <input type="checkbox"/> 8673C-10 | <input type="checkbox"/> 54201A/D-06 | |
| | <input type="checkbox"/> 5384A/85A-3 | <input type="checkbox"/> 8673D-02B | <input type="checkbox"/> 61001A-02A-S | |
| <input type="checkbox"/> 3235A/E-03 | <input type="checkbox"/> 6010A-02 | <input type="checkbox"/> 8673D-05A | <input type="checkbox"/> 64220C-02 | |
| <input type="checkbox"/> 3235A/E-04 | <input type="checkbox"/> 6010A-03 | <input type="checkbox"/> 8673D-07 | <input type="checkbox"/> 64253A-03 | |
| <input type="checkbox"/> 3400A-13B | <input type="checkbox"/> 6011A-04 | <input type="checkbox"/> 8673D-09 | <input type="checkbox"/> 64286A-03 | |
| <input type="checkbox"/> 3400A-16 | | | | |
| <input type="checkbox"/> 3466A-17 | <input type="checkbox"/> 6012B-03 | <input type="checkbox"/> 8673D-10 | <input type="checkbox"/> 64416A-02 | |
| | <input type="checkbox"/> 6030A-05 | <input type="checkbox"/> 8673D-11 | <input type="checkbox"/> 64416A-03 | |
| <input type="checkbox"/> 3488A-11 | <input type="checkbox"/> 6030A-06 | <input type="checkbox"/> 8673E-02 | <input type="checkbox"/> 64416AB-01 | |
| <input type="checkbox"/> 3552A-14 | <input type="checkbox"/> 6031A-08 | <input type="checkbox"/> 8770A-06B | <input type="checkbox"/> 64416B-02 | |
| <input type="checkbox"/> 3552A-15-S | <input type="checkbox"/> 6032A-07 | <input type="checkbox"/> 8770A-12 | <input type="checkbox"/> 64416B-03 | |
| <input type="checkbox"/> 3577A-13 | | | | |
| <input type="checkbox"/> 3582A-06A | <input type="checkbox"/> 8672A-15A | <input type="checkbox"/> 8770A-14 | <input type="checkbox"/> 64657A-02 | |
| | <input type="checkbox"/> 8673B-02B | <input type="checkbox"/> 8770A-15 | <input type="checkbox"/> 70001A-07-S | |
| <input type="checkbox"/> 3709A-04-S | <input type="checkbox"/> 8673B-03 | <input type="checkbox"/> 8970B-01 | <input type="checkbox"/> 70205A-03 | |
| <input type="checkbox"/> 3746A-23 | <input type="checkbox"/> 8673B-05A | <input type="checkbox"/> 10312B/C-02 | <input type="checkbox"/> 70206A-06 | |
| <input type="checkbox"/> 3764A-19B | <input type="checkbox"/> 8673B-08 | <input type="checkbox"/> 37212A-01A | <input type="checkbox"/> 70591A-01 | |
| <input type="checkbox"/> 3764A-22 | | | | |
| <input type="checkbox"/> 3789B-02 | | | | |

Please photocopy this order form if you do not want to cut off the page.

Hewlett-Packard (Canada) Ltd.
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BENCH BRIEFS
3RD QUARTER 1987
Volume 27 Number 3

Service information from
Hewlett-Packard Company

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Please send them to the
Bench Briefs Editor.

Editor: Jim Bechtold
Hewlett-Packard

