

TRANSISTOR EQUIVALENTS

IBM TYPE	IBM P/N	COMMERCIAL EQUIVELENT
003		2N64
004		2N113
008		2N113
013	344892	2N1303, 2N1309
014	345763	2N1303, 2N1309
015	526797	2N380, 2N502A, 2N247, 2N384, 2N500
016	526880	2N380
017		2N380
018	347592	2N380
019	389000	2N380.
020		2N1303, 2N1309
021	526796	2N1303, 2N1309
022	526898	2N174, PG-5
023		2N1038
025	318322	2N1303, 2N309, 2N1381
026	535441	2N270, 2N324, 2N404, 2N526, R212XC
028	610371	2N1038, 2N1039, 2N1040, 2N1041, 2N1042, 2N1043
029	492451	2N527, R212XC
030	369099	2N224, R212
032	369100	2N705, 2N2894*, GL-77
033	318324	2N1303, 2N1309, 1-D, 2N274, 2N503, 2N368
034	535009	2N1303, 2N1309, 1-D
035	492452	2N1303, 2N1309, 1-D
036	207363	2N456, 2N1159, PG-14, 2N1383
037	208196	2N173, 2N441, 2N442, PG-5
038	208197	2N379, 2N1412, PG-5, 2N378
039		2N705, 2N2894*, 2N706
042	369108	2N242, 2N379, 2N669, PG-20, 2N243, 2N257, 2N268, 2N301, 2N392, 2N1168
043		2N705, 2N2894*
044	369119	2N43, 2N44, 2N464, 2N465, 2N467, 2N1008B, 2N1191, 2N1193, 2N241A
046	369109	2N1303, 2N217
047	369113	2N2904, 2N1132, T3517
049	209001	2N277, PG-5
050	369205	2N553, PG-14

063	344891	2N377, 2N1302
071	492450	2N377, 2N647, 2N1302
075	318323	2N377, 2N647, 2N1302
083	318325	2N388, 2N1302
084	369390	2N1893, T4200
085		2N1302
086	369087	2N214, 2N557 - <i>not 2N228, not 2N188, corrected by Bob Feretish</i>
	369654	2N1302, 2N1304
087	369123	2N228
088		2N228, 2N1304 .
089	369559	2N228
090		2N228
091	369561	2N214, 2N228, 2N557, 2N1302
092	369562	2N228
093	369560	2N228
094	369081	2N228
095	369205	2N228
096	369110	2N1302
097	369114	SL-100, T3111
098	369126	1341, 3013, 2N708
099	369213	2N1302
100	369134	T4200, SL-2, 2N1893, 2N1613
101	369177	2N705, 2N2894*, GL-77
102	369179	2N705, 2N2894*, GL-77
103	369180	2N705, 2N2894*, GL-77
104	369182	2N705, 2N2894*, GL-77
105	369183	2N705, 2N2894*, GL-77
106	369194.	2N705, 2N2894*, GL-77
107	369195	2N705, 2N2894*, GL-77
108	369214	2N155, 2N256, 2N307A, PG-5
112		2N705, 2N2894*
113	477282	PG-20
114	369608	2N1303, 2N1309
116		2N1309
117		2N1303
118	369204	2N527, 2N1038, 2N1039, 2N1040, 2N1041, 2N1042, 2N1043, 2N1044, 2N1045, 2N307
119	369616	PG-20, 2N155, 2N256, 2N307, 2N1309
120	369628	2N247, 2N380, 2N1515, 2N1517

121		2N1309
122	369641	2N2411, SL-35
123	369648	2N2552, 2N2553, 2N2554, 2N2555, 2N2556, 2N2557, 2N2558
124	369656	2N705, 2N2894*, GL-77
125	483012	1-D, 2N1303, 2N1309
127	369659	2N1303, 2N1309
128	369662	2N1142, 2N705, 2N2894*
129	369664	2N1309
130	369667	PG-20, 2N456, 2N1159
131	369682	3517, SL-33, 20904, 2N2696
132	2414801-1766936	PG-7
133	2414803	PG-20
134	2414806-2703799	2N1038, 2N1039, 2N1040, 2N1041, 2N1042, 2N1043, 2N1044, 2N1045
135	2414848	2N705, 2N2894*, GL-77
136	2414877	FT0019, 2N3251
138	2414918	2N2696, 3517, 2904
139	2414938	2N2411, SL-35
141	2414947	FT0019, 2N2411, 2N3251
142		2N2904
143	2414971	FT0019
150	2391139	2N2904
151	369215	2N955
152	369587	2N955
153	369588	2N955
154	369589	2N955
155		2N955
156		2N955
157		2N955
158		2N955
159		2N955
160	369669	2N955
161	369683	2N955
162		2N955
164		2N955
165		2N955
167	369597	2N388, 2N302
168	369602	42C6, 2N2193, 2N2863
169	369605	1341
170	369609	2N377, 2N647, 2N1302

171	369618	4205, SL-14, 2N1613
173	369624	4200, SL-14, 2N1893, 2N1613
174	369625	1343, SL-23
175	369632	5B, 2N989, 2N2418, 2N2419, 2N999
178	369686	T4206, SL-98, 2N3252, 2N2863
179	369687	74206, PC-80, SL-08, 2N2863, 2N3252
180	369688	SL-98, 2N3252, 2N2863
181	369689	SL-5, 2N3252, 2N2863
182	369690	0110, SL-14, 2N3252, 2N2863
183	369691	T4206, SL-14, 2N3252, 2N2863
184	369692	SL98, 3252, 2N2863
185	369693	2N2863, 2N862
186	369694	SL-2, 2N2537
187	369695	SL-5, 2N2537
188	369696	0018, SL-14, 2N3252, 2N2863
189	2414972	H84
190	369697	SL-14, 2N3252, 2N2863
192	2414804	2N1302
193	2414811	2N3011
194	2414818	SL-1, FT1312, 2N774
201	2391132	3517
203	2391160	1303
204	2391201	PG-5
205	2391208.	T3517, 2N2904
206	2391237	T1713, 2N2894
207	2391240	T1713, 2N3829.
208	2391243	2N3304
209	2391246	GL-77, 2N964
216	2391328	GL-77, 2N705, 2N2894*
219	2391733	PG-7
251	2414849	2N2484
252	2414863	SM3298
253		2N774
254	2414878	2N1893, 2N1613
255	2414879	SL-23, 2N706
256	2414880	2N2639
257	2414892	PL-28, H-85
258	2414900	3N74
259	2414921	SL-5, 2537, 2N2848

260	2414922	SL-4, T4206, 2N2863
261	2414923	4205
263	2414944	PL-14
265	2414950-	2N744
266	2414952	H-84
267	2390102	SL-97, 2N3252, 2N2537
268	2390103	SL-97, 0125, 2N3252
269	2390101	SL-97, 2N3252, 2N2537
270	2390104	SL-97, 2N2537, 2N3252
272	2414974	2N2484
273	2414977	0018, SL-2, 2N2863
274	2391015	SL-26
275	2391019	PL-28
278	2391057	1302
279	2391059	PL-14, H-84
283	2391114	H-86, 2N3418
284	2391117	T4206, PC-80, SL-98, 2N3252
285	2391118	T0018
286	2391131	FT0018
288	2301145	2N930
289	2391155	2N3011
290	2391156	T0062, 2N3013
291	2391170	SL-98, PC-80
292	2391171	H-84, PL-82, 2N3418
293	2391184	2N3252, 0125, SL-97
294	2391207	2N3252
295	2391224	2N2639, 10-H
296	2391236	T0059, 2N3303
297	2391238	T0016, 2N3011
298	2391241	T0062, 2N3013
299	2391242	T1211, 2N918
300	2391245	1211, 2N918
351	2391272	2N918
353	2391313	2N2243
354	2391319	2N3252, 4206
355	231329	SL-1, FT1312
357	2391345	PL-64, 2N3771
358	2391346	PL-64, H-98, 2N3771
359	2391347	SL-87

361	2391367	PL-14
363	2391666	0125, 2N3252
364	2391667	PL-64, 2N3772
365	2391723	SL-87
366	2391766	FT0047, SL-97, 2N3252
367	2391806	SL-87

DIODES

F1	2391164	U112
F2	2391312	U112
F3	2208532	2N3608
F4	2186859	FN3668
F5	2262489	2N4340
D1	30 AMP 150V	127324
	10 AMP 100V	598353
	10 AMP 200V	216197
	25 AMP 400V	5261455
	12 AMP 400V	5312673

THYRATRON TRANSISTORS FOR INDICATORS ON 2540 - P/N 813228

for some faster PNP types

CraneTransistorSubE-Mail April 2006 e-mail - from Ron Crane

Subject: Re: 1401 TAU debug status & 2N2894
Date: Wed, 12 Apr 2006 ...
From: Ron Crane rccrane at pacbell dot net
To: [those involved]

The IBM 102 and IBM 117 transistors are fast PNP germanium switching transistors in a TO-18 package. The cross reference for them on the SMS cross reference sheet is a 2N705 with a Vceo of 15 V.

Because the 2N705 was not available, we tried the 2N1303, which worked, but is much slower, 800 nS (2N1303) vs. 100 nS for the IBM 102 and 2N2894 in the logic gate circuit. In the flip-flop circuit it works for set and reset, but fails completely on clock input because the delay is much longer than the RC time constant of the AC coupled clock input circuit. The 2N1303 got used because it passed the "try it and see if it works" test done by me, not because any of the characterization or measurement described in this message was done at that time.

In the flip-flops, the emitter is tied to ground and the collector tied to - 12 V through a 1.5K resistor and clamped to -6 V with a diode giving a maximum measured collector-emitter voltage of about 6.7 V. If the diode gives out, or the -6V supply goes open circuit (inserting a card with power on), there is a maximum of 12 V through a 1.5K resistor to collector.

In the gate circuit, the collector is tied to -6V through a 560 ohm resistor.

In all cases, the 12 V rating on the 2N2894 transistor is adequate. The actual breakdown on the 2N2894 units purchased is higher. The lowest was 14.5V with most of them above 18 V.

I believe we should remove the remaining 9 or 10 2N1303's from the 102 positions and

replace them with 2N2894's. This will avoid problems in the future if the cards get swapped to a location where the original design speed is needed.

- Ron

e-mail from Van Snyder to Ed Thelen - Dec 20, 2009

[the above chart] lists transistor substitutions and some diode substitutions.

It doesn't list a substitution for IBM diode type AN. What is it?

Van

e-mail from Jim Hunt to group

I have replaced a few AN diodes with what we have on hand, and I have noticed that the forward resistance of an old AN diode is about 35-40 ohm, while the new ones are 5-10 ohm, but the good news is that it still works, those resistances are so small compared to the bias resistors that it doesn't matter.

I do wish we had some proper AN substitutes though.