Meridian 1

Spares planning

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June 1999

Standard, release 13.00. This document is reissued to include he NT5D03 Call Processor Card and minor edits. Changes to technical content are noted by revision bars in the margins.

Contents

List of tables

About this document

This document provides the information needed to calculate and plan for spare (replaceable) equipment. This guide also provides hardware failure rates.

References

See the Meridian 1 planning and engineering guide for:

— *Library navigator* (553-3001-000)

— *Meridian 1 system overview* (553-3001-100)

— *MPP600 Modular Power Plant: Description, installation, operation and maintenance manual* (167-9021-105)

— *Meridian 1 installation planning* (553-3001-120)

— *Meridian 1 system engineering* (553-3001-151)

— *Meridian 1 power engineering* (553-3001-152)

— *Meridian 1 equipment identification* (553-3001-154)

See the X11 software guide for an overview of software architecture, procedures for software installation and management, and a detailed description of all X11 features and services. This information is contained in two documents:

— *X11 software management* (553-3001-300)

— *X11 features and services*

See the *X11 input/output guide* for a description of all administration and maintenance programs, and see *X11 system messages guide* for information about system messages.

Spares planning

Definitions and assumptions

Failure rate—Failure rate equals the estimated number of failures for that item during one million (10^6) hours of operation. The only exception is to measurements for cabling or other items with low failure rates. Rates are also measured in Failures in Time (FIT) measurements. One FIT equals one billion (10^9) hours of operation.

Sparing interval—The sparing interval is the period of time that stocks of replaceable items should last without being replenished. This period is assumed to be one year following the installation of the system.

Stock confidence level—The stock confidence level is the allowed probability of not being out of stock when the sparing interval of one year is greater than 99.9 percent.

Card ambient temperature—The card ambient temperature is the average temperature of the air immediately surrounding the circuit card (usually higher than the ambient room temperature). Card failure rates in this document are based on a card ambient temperature of 40 degrees C (104 degrees F).

Turnaround time for repair—Equipment may be serviced at a repair house or at a centralized depot that serves subdepots. The turnaround time for the return-to-stock of a failed item is about ten working days (240 hours) from a repair house. The turnaround time for the return-to-stock of a failed item is about two working days from a centralized depot.

Actual turnaround periods vary in the field. As the number of systems served increases, the percentage of replaceable items required in stock is reduced.

Population range—Population range is the quantity of each type of system in the area served by the depot.

Spare stock size—The quantity of spares for a given stock item depends on the sparing interval, stock confidence level, failure rate, turnaround time for repair, and population range.

Calculating spares requirements

Use the following procedure to calculate the number of spares required to stock a depot for a one-year sparing interval:

1. Determine the number (N) of in-service specified circuit cards serviced by the depot.
2. Look up the card failure rate (F) for the specified circuit card in “Failure rates” on page 11.

   Card failure rates are expressed in terms of the number of failures per million hours (10^6).
3. Determine turnaround time (T) in hours.

   For repair house service, turnaround time is typically ten working days (240 hours). For centralized depot service, turnaround time is typically two working days (48 hours).
4. Calculate the NFT value by multiplying N x F x T.
5. Look up the number of spares required in “NFT values” on page 5.

Example: A centralized depot services 10,000 NT8D02 Digital Line Cards. The failure rate given for this card is 1.8 failures per 1 million hours. With a turnaround time of 48 hours:

$$NFT = 10{,}000 \times \frac{1.8}{1{,}000{,}000} \times 48 = 0.864$$

The number of spares required for an NFT value of 0.864 = 6.

NFT values

Table 1 translates NFT values to the number of spares required in stock. The following abbreviations are used:

N—Number in use

F—Failure rate

T—Turnaround time (in hours)

Table 1
Number of spares required (Part 1 of 6)

NFT values		Number of spares
From	To	
0	0.001	1
0.001	0.0452	2
0.0452	0.189	3
0.189	0.425	4
0.425	0.734	5
0.734	1.09	6
1.09	1.5	7
1.5	1.95	8
1.95	2.43	9
2.43	2.94	10
2.94	3.46	11
3.46	4.01	12
4.01	4.58	13
4.58	5.16	14

NFT values		Number of spares
From	To	
5.16	5.76	15
5.76	6.37	16
6.37	6.99	17
6.99	7.62	18
7.62	8.26	19
8.26	8.91	20
8.91	9.57	21
9.57	10.2	22
10.2	10.9	23
10.9	11.5	24
11.5	12.2	25
12.2	12.9	26
12.9	13.6	27
13.6	14.3	28

Table 1
Number of spares required (Part 2 of 6)

NFT values		Number of spares
From	To	
14.3	15	29
15	15.8	30
15.8	16.5	31
16.5	17.2	32
17.2	17.9	33
17.9	18.7	34
18.7	19.4	35
19.4	20.1	36
20.1	20.9	37
20.9	21.6	38
21.6	22.4	39
22.4	23.1	40
23.1	23.9	41
23.9	24.6	42
24.6	25.4	43
25.4	26.2	44
26.2	26.9	45
26.9	27.7	46
27.7	28.5	47
28.5	29.2	48
29.2	30	49
30	30.8	50
30.8	31.6	51
31.6	32.4	52
32.4	33.2	53
33.2	33.9	54
33.9	34.7	55

NFT values		Number of spares
From	To	
34.7	35.5	56
35.5	36.3	57
36.3	37.1	58
37.1	37.9	59
37.9	38.7	60
38.7	39.5	61
39.5	40.3	62
40.3	41.1	63
41.1	41.9	64
41.9	42.7	65
42.7	43.5	66
43.5	44.3	67
44.3	45.2	68
45.2	46	69
46	46.8	70
46.8	47.6	71
47.6	48.4	72
48.4	49.2	73
49.2	50	74
50	50.9	75
50.9	51.7	76
51.7	52.5	77
52.5	53.3	78
53.3	54.2	79
54.2	55	80
55	55.8	81
55.8	56.6	82

Table 1
Number of spares required (Part 3 of 6)

NFT values		Number of spares
From	To	
56.6	57.5	83
57.5	58.3	84
58.3	59.1	85
59.1	60	86
60	60.8	87
60.8	61.6	88
61.6	62.5	89
62.5	63.3	90
63.3	64.1	91
64.1	65	92
65	65.8	93
65.8	66.6	94
66.6	67.5	95
67.5	68.3	96
68.3	69.2	97
69.2	70	98
70	70.9	99
70.9	71.7	100
71.7	72.5	101
72.5	73.4	102
73.4	74.2	103
74.2	75.1	104
75.1	75.9	105
75.9	76.8	106
76.8	77.6	107
77.6	78.5	108
78.5	79.3	109

NFT values		Number of spares
From	To	
79.3	80.2	110
80.2	81	111
81	81.9	112
81.9	82.7	113
82.7	83.6	114
83.6	84.4	115
84.4	85.3	116
85.3	86.2	117
86.2	87	118
87	87.9	119
87.9	88.7	120
88.7	89.6	121
89.6	90.4	122
90.4	91.3	123
91.3	92.2	124
92.2	93	125
93	93.9	126
93.9	94.7	127
94.7	95.6	128
95.6	96.5	129
96.5	97.3	130
97.3	98.2	131
98.2	99.1	132
99.1	99.9	133
99.9	100.8	134
100.8	101.7	135
101.7	102.5	136

Table 1
Number of spares required (Part 4 of 6)

NFT values		Number of spares
From	To	
102.5	103.4	137
103.4	104.3	138
104.3	105.1	139
105.1	106	140
106	106.9	141
106.9	107.7	142
107.7	108.6	143
108.6	109.5	144
109.5	110.3	145
110.3	111.2	146
111.2	112.1	147
112.1	113	148
113	113.8	149
113.8	114.7	150
114.7	115.6	151
115.6	116.4	152
116.4	117.3	153
117.3	118.2	154
118.2	119.1	155
119.1	119.9	156
119.9	120.8	157
120.8	121.7	158
121.7	122.6	159
122.6	123.5	160
123.5	124.3	161
124.3	125.2	162
125.2	126.1	163

NFT values		Number of spares
From	To	
126.1	127	164
127	127.8	165
127.8	128.7	166
128.7	129.6	167
129.6	130.5	168
130.5	131.4	169
131.4	132.2	170
132.2	133.1	171
133.1	134	172
134	134.9	173
134.9	135.8	174
135.8	136.6	175
136.6	137.5	176
137.5	138.4	177
138.4	139.3	178
139.3	140.2	179
140.2	141.1	180
141.1	141.9	181
141.9	142.8	182
142.8	143.7	183
143.7	144.6	184
144.6	145.5	185
145.5	146.4	186
146.4	147.3	187
147.3	148.1	188
148.1	149	189
149	149.9	190

Table 1
Number of spares required (Part 5 of 6)

NFT values		Number of spares
From	To	
149.9	150.8	191
150.8	151.7	192
151.7	152.6	193
152.6	153.5	194
153.5	154.4	195
154.4	155.2	196
155.2	156.1	197
156.1	157	198
157	157.9	199
157.9	158.8	200
158.8	159.7	201
159.7	160.6	202
160.6	161.5	203
161.5	162.4	204
162.4	163.3	205
163.3	164.1	206
164.1	165	207
165	165.9	208
165.9	166.8	209
166.8	167.7	210
167.7	168.6	211
168.6	169.5	212
169.5	170.4	213
170.4	171.3	214
171.3	172.2	215
172.2	173.1	216
173.1	174	217

NFT values		Number of spares
From	To	
174	174.9	218
174.9	175.8	219
175.8	176.7	220
176.7	177.5	221
177.5	178.4	222
178.4	179.3	223
179.3	180.2	224
180.2	181.1	225
181.1	182	226
182	182.9	227
182.9	183.8	228
183.8	184.7	229
184.7	185.6	230
185.6	186.5	231
186.5	187.4	232
187.4	188.3	233
188.3	189.2	234
189.2	190.1	235
190.1	191	236
191	191.9	237
191.9	192.8	238
192.8	193.7	239
193.7	194.6	240
194.6	195.5	241
195.5	196.4	242
196.4	197.3	243
197.3	198.2	244

Table 1
Number of spares required (Part 6 of 6)

NFT values		Number of spares
From	**To**	
198.2	199.1	245
199.1	200	246
200	200.9	247
200.9	201.8	248
201.8	202.7	249
202.7	203.6	250
203.6	204.5	251
204.5	205.4	252
205.4	206.3	253
206.3	207.2	254
207.2	208.1	255
208.1	209	256

Failure rates

The following tables list replaceable equipment and provide failure rates for that equipment:

— Table 2 modules, shelves, and packaging

— Table 3 power and cooling equipment

— Table 4 circuit cards

— Table 5 mass storage (disk drive) equipment

— Table 6 station equipment

Note: "N/A" indicates the failure rate is not available at this time.

The failure rates are based on a circuit card ambient temperature of 40 degrees C (104 degrees F). This temperature is usually higher than the surrounding room temperature. Running the system at a lower temperature will increase the life expectancy of components and improve overall system reliability.

There are many cables available from Northern Telecom. The approximate failure rate for most cables, based on failures in time per billion hours (10^9), is 0.5. For a detailed listing of cables, see *Meridian 1 equipment identification* (553-3001-154).

Table 2
Failure rates of modules, shelves, and packaging (Part 1 of 3)

Order code	Description	Failure rate per 10^6 hrs
A0634488 A0634489	Fiber Remote Multi-IPE Single-mode (1-4 Superloops) (1-2 Superloops)	1.86
A0634490 A0634491	Fiber Remote Multi-IPE Multi-mode (1-4 Superloops) (1-2 Superloops)	1.86
A0634492 A0634493	Fiber Remote Multi-IPE Redundant Option, Single-mode Multi-mode	1.86
NT5D21AA NT5D21DA	Core/Network Module AC Core/Network Module DC	0.25
NT5K11	Enhanced Existing Peripheral Equipment (EEPE) Module	1.0
NT6D39AA NT6D39DC	CPU/Network Module AC CPU/Network Module DC	1.10
NT6D60CA NT6D60DA	Core Module AC Core Module DC	0.23
NT7D00AA NT7D00AC NT7D00BA	Top Cap (AC) Top Cap (option 21A) Top Cap (DC)	0.14
NT8D11AC NT8D11DC	Common Equipment/Peripheral Equipment (CE/PE) Module AC CE/PE Module DC	0.70
NT8D13AA NT8D13DC	Peripheral Equipment (PE) Module AC PE Module DC	0.50
NT8D34AA NT8D34DC	CPU Module AC CPU Module DC	0.60
NT8D35AA NT8D35DC	Network Module AC Network Module DC	0.90
NT8D36AA	InterGroup Module	1.70

Table 2
Failure rates of modules, shelves, and packaging (Part 2 of 3)

Order code	Description	Failure rate per 10^6 hrs
NT8D37AA NT8D37DC	Intelligent Peripheral Equipment (IPE) Module AC IPE Module DC	0.80
NT8D47AA NT8D47DC	Remote Peripheral Equipment (RPE) Module AC RPE Module DC	0.60
NT9D11AA NT9D11DC	Core/Network Module AC Core/Network Module DC	0.42
QSD6	Carrier Shelf 0 (RPE)	3.24
QSD11	Carrier Shelf 1 (RPE)	3.24
QSD17	XN CPU Shelf	4.85
QSD27	MCDS Shelf	1.00
QSD33	Tape Shelf	3.00
QSD36	Memory Shelf	6.60
QSD37	CPU/Memory Shelf	7.00
QSD39	Network Shelf (left)	0.50
QSD40	Network Shelf (right)	0.50
QSD54	Network Shelf (right)	1.00
QSD55	Network Shelf (left)	1.00
QSD60	Cantilever Mount CPU Shelf	0.43
QSD62	Cantilever Mount CPU Shelf	1.00
QSD65	PE Shelf	0.26
QSD66	PE Expansion Shelf	0.26

Table 2
Failure rates of modules, shelves, and packaging (Part 3 of 3)

Order code	Description	Failure rate per 10^6 hrs
QSD67	Mass Storage Unit Shelf — without hard disk option — with hard disk option	 53.59 13.52
QSP35	Peripheral Equipment (right)	1.00
QSP36	Peripheral Equipment (left)	1.00
QSP39	CE Shelf	6.30
QSP40	Memory Shelf	6.60
QSP41	CPU/Memory Shelf	6.60
QSP43	Power Control Shelf	12.80
QSP44	Power Control Shelf	14.20
QSP45	Tape Shelf	13.19

Table 3
Failure rates of power and cooling equipment (Part 1 of 3)

Order code	Description	Failure rate per 10^6 hrs
A0321130	Fan Unit (option 21A)	N/A
A0355200	Power Failure Transfer Unit	5.70
NT0R71	Rectifier –48V/25A	8.00
NT0R72	Rectifier –48V/25A	8.33
NT5C03	Rectifier –48V/50A	1.20
NT5K12	Enhanced Peripheral Equipment Power Supply	1.8
NT5C07	Rectifier –48V/50A	1.00
NT6D40	PE Power Supply DC	1.60
NT6D41	CE Power Supply DC	0.61
NT6D42	DC Ringing Generator	0.82
NT6D43	CE/PE Power Supply DC	1.50
NT6D52	Rectifier –48V/30A	1.20
NT6D53	Junction Box	N/A
NT7D03	Ringing Generator DC	1.81
NT7D10	Power Distribution Unit DC	N/A
NT7D12	Rectifier Rack	N/A
NT7D14	CE/PE Power Supply AC	2.34
NT7D15	System Monitor (option 21A)	N/A
NT7D67	Power Distribution Unit DC	N/A
NT8D06	PE Power Supply AC	2.10
NT8D21	Ringing Generator AC	2.02

Table 3
Failure rates of power and cooling equipment (Part 2 of 3)

Order code	Description	Failure rate per 10^6 hrs
NT8D22	System Monitor	1.00
NT8D29	CE Power Supply AC	1.27
NT8D52AB	Pedestal Blower Unit AC	2.00
NT8D52DD	Pedestal Blower Unit DC	N/A
NT8D53AB	Power Distribution Unit AC	N/A
NT8D53AD	Power Distribution Unit (option 21A)	N/A
NT8D56AA	CE Module Power Distribution Unit	N/A
NT8D56AC	CE/PE Module Power Distribution Unit	N/A
NT8D57AA	PE Module Power Distribution Unit	N/A
NT8D62AA	Thermal Sensor Harness for AC systems	N/A
NT8D62DC	Thermal Sensor Harness for DC systems	
NTAK04	AC/DC Power Converter for small Carrier Remote IPE	5.0
NTAK05	DC Power Supply for small Carrier Remote IPE	5.0
QAA47	Power Monitor Adaptor	0.00
QBL12	Battery Distribution Box	1.33
QBL14	Power Distribution Unit RPE	0.95
QBL15	Power Distribution Box	2.81
QBL21	Power Distribution Box	1.33
QCA13	Power Cabinet	N/A
QPC80	10 V Converter	0.60
QPC82	30 V Converter	0.60
QPC84	Power Monitor	1.80
QPC85	5/12 V Converter (RPE)	5.77

Table 3
Failure rates of power and cooling equipment (Part 3 of 3)

Order code	Description	Failure rate per 10^6 hrs
QPC163	48 V Regulator	0.16
QPC173	Power Monitor	1.14
QPC187	Ringing Generator	0.32
QPC188	Battery Monitor	0.54
QPC190	5/12 V Converter	8.15
QPC274	Fan Inverter (QRF8)	0.41
QPC509	Message Waiting Power Supply	2.52
QPC585	Power Converter	1.13
QRF8	48 V Rectifier	1.20
QRF9	48 V Rectifier	11.0
QRF12	48 V Rectifier	1.20
QSY22	Message Waiting Power Supply	3.59
QUA4	Power Failure Transfer Unit	1.44
QUAA3	Power Unit	1.94
QUD5	Cooling Unit	27.07
QUD15	Cooling Unit	24.07
QUD24	Cooling Unit	4.40
QUX19	Power Distribution Unit (QCA136)	3.00
QUX20	Power Distribution Unit (QCA136)	0.40
QUX21	Power Distribution Unit (QCA137)	0.40

Table 4
Failure rates of circuit cards (Part 1 of 14)

Order code	Description	Failure rate per 10^6 hrs
NT1P61	Fibre Superloop Network Card	1.05
NT1P62	Fibre Controller Card	1.03
NT1P63	Electro-optical Interface	1.14
NT1R20	Off-Premises Station Analog Line Card	5.00
NT5D03AA	Call Processor Card (48 Mbytes)	N/A
NT5D03BA	Call Processor Card (64 Mbytes)	N/A
NT5D03CA	Call Processor Card (80 Mbytes)	N/A
NT5D03EA	Call Processor Card (112 Mbytes)	N/A
NT5D03FA	Call Processor Card (128 Mbytes)	N/A
NT5D10AA	Call Processor Card (48 Mbytes)	N/A
NT5D10CA	Call Processor Card (64 Mbytes)	N/A
NT5D10EA	Call Processor Card (80 Mbytes)	N/A
NT5D10JA	Call Processor Card (112 Mbytes)	N/A
NT5D11 NT5D14	Line side T1 Line Card	N/A
NT5D12AA	Dual DTI/PRI Card (DDP)	1.76
NT5D20	Input/Output Processor/Core Multi Drive Unit	N/A
NT5K02	Flexible Analog Line Card	6.0
NT5K07	Universal Trunk Card for Hong Kong	4.3
NT5K09	Quad Density Receiver	1.5
NT5K10	Enhanced Dual Loop Buffer Card	1.0
NT5K17	Enhanced Dual Loop Buffer Card	1.9

Table 4
Failure rates of circuit cards (Part 2 of 14)

Order code	Description	Failure rate per 10^6 hrs
NT5K18	Extended PPM CO Trunk Card	3.5
NT5K19	E&M/2280 Hz Trunk Card	2.2
NT5K20	Extended Tone Detector	2.2
NT5K21	XMFC/MFE Sender Receiver card	2.7
NT5K36	Direct Inward Dial/Direct Outward Dial Trunk Card for Germany	19.0
NT5K70	Central Office Trunk Card for Germany (8 units)	4.6
NT5K71	Central Office Trunk Card for Germany (4 units)	4.6
NT5K72	E&M Trunk Card for Germany	19.0
NT5K82	Central Office Trunk Card	4.6
NT5K83	E&M Trunk Card for Switzerland	19.0
NT5K83AA	E&M Trunk Card for Denmark	2.5
NT5K83CA	E&M Trunk Card for Norway	2.5
NT5K83DA	E&M Trunk Card for Holland	19.0
NT5K83EA	E&M Trunk Card for Australia	2.5
NT5K84AA	Direct Inward Dial Trunk Card for Switzerland	2.5
NT5K84BA	Direct Inward Dial Trunk Card for Australia	4.6
NT5K93	Central Office Trunk Card for Norway	4.6
NT5K99	Central Office Trunk Card for Spain	4.6

Table 4
Failure rates of circuit cards (Part 3 of 14)

Order code	Description	Failure rate per 10^6 hrs
NT5K96	Flexible Analog Line Card without Message Waiting	6.0
NT6D6003	Core Bus Terminator Card	0.23
NT6D63	I/O Processor Card	4.60
NT6D64	Core Multi Drive Unit	N/A
NT6D65	Core to Network Interface Card	3.00
NT6D66AA	Call Processor Card (24 Mbytes)	13.30
NT6D66AB	Call Processor Card (24 Mbytes)	13.14
NT6D66DA	Call Processor Card (48 Mbytes)	13.50
NT6D66DB	Call Processor Card (48 Mbytes)	13.34
NT6D80AA	Multi-purpose Serial Data Link Card	4.47
NT7D16	Data Access Card	4.07
NT7R51	Local Carrier Interface Card	2.40
NT7R52	Remote Carrier Interface Card	1.80
NT8D01AC NT8D01BC NT8D01AD NT8D01BA	Controller-4 Card Controller-4 Card SMT Controller-2 Card Controller-2 Card	7.00 1.86 6.50 1.86
NT8D02	Digital Line Card	1.80
NT8D03	Analog Line Card	5.10
NT8D04BA	Superloop Network Card	2.32
NT8D09	Analog Message Waiting Line Card	5.80
NT8D14	Universal Trunk Card	3.40

Table 4
Failure rates of circuit cards (Part 4 of 14)

Order code	Description	Failure rate per 10^6 hrs
NT8D15	E&M Trunk Card	3.70
NT8D16	Digitone Receiver Card	2.70
NT8D17	Conference/TDS Card	5.10
NT8D18	Network/DTR Card	7.30
NT8D19	Memory/Peripheral Signaling Card	4.20
NT8D41AA	Dual Port SDI Paddle Board	2.20
NT8D41BA	Quad Serial Data Interface Paddle Board	164.0
NT9D34	Enhanced Mass Storage Interface Card	2.26
NT8D41	Dual Port SDI Paddle Board	2.20
NT8D72AB	2048 kbps Primary Rate Interface	5.62
NT9D19AA	Call Processor Card (48 MB)	11.95
NT9D19CA	Call Processor Card (64 MB)	12.10
NT9D19HA	Call Processor Card (96 MB)	12.25
NT9D34	Enhanced Mass Storage Interface Card	2.26
NTAG03	Central Office Trunk Card for Holland	19.0
NTAG04	Central Office/Direct Inward Dial Trunk Card for Holland	19.0
NTAG26	Extended Multi-frequency Receiver	TBD
NTBK51	Downloadable D-Channel Daughterboard	1.24
NTCK16	Generic Central Office Trunk Card	4.6
NTND01	Integrated CPU/Memory Card (6 MB)	5.80
NTND01	Integrated CPU/Memory Card (12 MB)	5.90

Table 4
Failure rates of circuit cards (Part 5 of 14)

Order code	Description	Failure rate per 10^6 hrs
NTND02	Misc/SDI/Peripheral Signaling Card	1.10
NTND08	ROM Card	0.30
NTND09	6 Mbyte Memory Card	1.30
NTND10	Changeover and Memory Arbitrator Card	1.70
NTND31	ROM Card	1.20
QPA57	Function Card	16.50
QPA58	Interface Card	8.50
QPA59	Miscellaneous Card	9.50
QPC33	Tape Unit Interface Card	9.30
QPC39	CDR Timing Card	7.81
QPC40	Arithmetic Logic Unit (CDR)	11.65
QPC41	CPU Miscellaneous Register Card — vintage N and later (CDR)	10.15 2.36
QPC42	Sequencer (CDR) Card	8.39
QPC43	Peripheral Signaling Card	1.73
QPC50	Network Card	13.09
QPC52	Network Extender Card	1.11
QPC53	Conference Card	13.51
QPC60	500/2500 Line Card — vintage E — vintage L	 8.70 5.28
QPC61	SL-1 Line Card — vintage C — vintage H	 6.18 3.73

Table 4
Failure rates of circuit cards (Part 6 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC62	1.5 Mbaud Converter Card	9.60
QPC63	Local Carrier Buffer Card	7.04
QPC64	Peripheral Buffer Card	9.50
QPC65	Remote Peripheral Switch Card	13.38
QPC66	2 Mbaud Converter Card	11.00
QPC67	Carrier Maintenance Card	9.20
QPC70	CO/FX/WATS Trunk Card	6.16
QPC71	E&M/DX/Paging Trunk Card	3.10
QPC72	Loop Signaling Trunk Card	6.56
QPC73	Recorded Telephone Dictation Applique Card	3.50
QPC74	Recorded Announcement Trunk Card	2.50
QPC79	Digitone Receiver Card	7.40
QPC99	Carrier Interface Card	12.51
QPC130	CDR Tape Control Card	10.30
QPC139	Dual Serial Data Interface Card	1.67
QPC156	Multigroup Control Card	8.38
QPC158	Multigroup Extender Card	5.83
QPC162	AIOD C25 Data Trunk Card	7.30
QPC164	Bus Terminating Unit	0.45
QPC189	MF Sender Card	14.60
QPC192	OPX Line Card	12.97

Table 4
Failure rates of circuit cards (Part 7 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC197	Tone and Digit Switch Card — vintage D and later	12.52 2.46
QPC213	Changeover and Memory Arbitrator Card	9.29
QPC215	Segmented Bus Extender Card — vintage A — vintage B	 5.41 2.20
QPC216	Three-Port Extender Card	7.18
QPC217	CO, FX, WATS Trunk Card	7.83
QPC218	CO, FX, WATS Trunk Card	10.49
QPC219	CO, FX, WATS Trunk Card (Message Register)	11.60
QPC220	Bus Terminating Unit	0.42
QPC234	CDR ROM1 Card	9.03
QPC235	CDR ROM2 Card	8.34
QPC237	4-Wire E&M Trunk Card	1.50
QPC239	Recorded Telephone Dictation Trunk Card	5.07
QPC250	Release Link Trunk Card	7.73
QPC251	Tone and Digit Switch Card	2.33
QPC252	Tone and Digit Switch Card	14.66
QPC253	Tone and Digit Switch Card (μ-Law)	14.66
QPC254	Tone and Digit Switch Card (A-Law)	14.66
QPC266	ACD Interface Card	0.37
QPC267	500/2500 Line Card (Message Waiting)	11.33

Table 4
Failure rates of circuit cards (Part 8 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC268	Control, Interface, and Memory Card	10.37
QPC271	Control and Timing Card	24.02
QPC272	CO and FX Trunk Card	10.90
QPC280	Conference Card (A-Law)	13.95
QPC284	500 Line Card (A-Law)	8.53
QPC285	SL-1 Line Card (A-Law)	5.45
QPC286	500 Line Message Waiting Card (A-Law)	8.61
QPC287	E&M, DX, Paging Trunk Card (A-Law)	6.97
QPC288	Loop Signaling Trunk Card (A-Law)	7.09
QPC289	Recorded Telephone Dictation Trunk Card (A-Law)	8.19
QPC290	Recorded Announcement Trunk Card (A-Law)	5.61
QPC291	Digitone Receiver Card (A-Law)	6.68
QPC292	OPX 500 Line Card (A-Law)	12.75
QPC293	CO, FX Trunk Card (A-Law)	6.44
QPC294	Recorded Telephone Dictation Trunk Card (A-Law)	7.22
QPC295	CO, FX, MR DET Trunk Card (A-Law)	10.46
QPC296	4-Wire E&M Trunk Card (A-Law)	8.38
QPC297	Attendant Console Monitor Card	7.85
QPC301	CDR ROM Card (Multi-Port)	10.05
QPC302	Ground Button Recall Line Card	10.10

Table 4
Failure rates of circuit cards (Part 9 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC311	Data Line Card (SL-1) — vintage F and later	13.91 8.26
QPC319	RPE Processor Card (2 Mb/s RPE)	12.31
QPC320	Carrier Interface Circuit Card (2 Mb/s RPE)	7.93
QPC321	Phase Locked Loop Card	4.65
QPC322	Path Switch Card	2.78
QPC326	Daughter Board for Data Line Card	1.54
QPC327	MFC Sender/Receiver Card	20.07
QPC330	Buffered Message Register Trunk Card	9.78
QPC331	Buffered Message Register Trunk Card (A-Law)	16.64
QPC342	Attendant Console Monitor Card (A-Law)	10.50
QPC343	Ground Button Recall Line Card (A-Law)	12.50
QPC353	Modem Pool Line Card (μ-Law)	8.23
QPC354	Modem Pool Line Card (A-Law)	6.26
QPC357	Italian DID Trunk Card	12.64
QPC362	Combined Conference and Network Card	2.71
QPC371	Codec Switched Card	0.45
QPC376	Dual Network Card — vintage B and later	9.80 8.01
QPC397	MCDS Asynchronous Card	12.68
QPC411	System Clock Generator Card	2.00

Table 4
Failure rates of circuit cards (Part 10 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC412	InterGroup Switch Card	2.14
QPC414	Network Card	3.00
QPC417	Junctor Board	1.70
QPC422	Tone Detector Card	17.40
QPC423	192 K Memory Card	43.50
QPC424	Central Processing Unit Card	8.10
QPC425	CPU Card — vintage C and later	10.50 5.02
QPC426	192 K Memory Card	43.50
QPC430	Asynchronous Interface Line Card	22.82
QPC432	4-Port Data Line Card	8.15
QPC441	Three-Port Extender Card	2.00
QPC443	Control and Timing Card	9.62
QPC444	Conference Card	3.20
QPC446	µ-Law Conference Card (Warning Tone)	11.20
QPC449	Loop Signaling Trunk Card	2.27
QPC450	CO/FX/WATS Trunk Card	3.34
QPC451	SL-1 Line Card	5.15
QPC452	500/2500 Line Card — vintage C and later	8.70 5.20
QPC464	Peripheral Buffer Card	9.00
QPC471	Clock Controller Card — vintage H and later	2.44 1.00

Table 4
Failure rates of circuit cards (Part 11 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC472	Digital Trunk Interface Card	6.00
QPC473	DTI Carrier Interface Card	6.60
QPC475	Digitone Receiver Card	3.10
QPC477	Bus Terminating Unit (XT CPU)	0.33
QPC477Ax	Bus Termination Unit	0.26
QPC477A20	Bus Termination Unit	0.64
QPC477A21	Bus Termination Unit	0.64
QPC478	128 K Memory Card	31.70
QPC479	128 K Memory Card	25.60
QPC484	ROM Card	2.80
QPC485	ROM Card	2.80
QPC486	ROM Card	2.80
QPC487	ROM Card	2.80
QPC488	ROM Card	2.80
QPC494	500/2500 Message Waiting Card	8.00
QPC496	Bus Extender Card	0.69
QPC500	PE Backplane	3.24
QPC501	PE Backplane	3.24
QPC503	CE Backplane	3.24
QPC513	Enhanced Serial Data Interface Card	6.00
QPC526	PPM CO Trunk Card (A-law)	16.82
QPC527	CO/FX/WATS Trunk Card (A-law)	12.37

Table 4
Failure rates of circuit cards (Part 12 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC528	CO/FX/WATS Trunk Card (EIA)	14.23
QPC532	Ground Button Line Card	13.93
QPC536	Digital Trunk Interface Card	12.36
QPC540	Tone Detector Card	6.49
QPC552	Control and Timing Card	9.82
QPC553	Function Card	10.90
QPC554	Interface Card	5.00
QPC555	Miscellaneous Card	5.85
QPC556	Changeover and Memory Arbitrator Card	6.37
QPC574	Digitone Receiver Card	0.83
QPC578	Integrated Services Digital Line Card	2.72
QPC579	CPU Function Card	2.60
QPC580	CPU Interface Card	3.36
QPC581	Changeover and Memory Arbitrator Card	2.80
QPC583	768 K Memory Card	2.93
QPC584	Mass Storage Interface Card — vintage L and later	2.26 1.40
QPC591	Double Density Line Card	6.22
QPC594	500/2500 Line Card	3.70
QPC595	Dual DT Receiver Card (A-law)	6.28
QPC602	ROM Card	3.20
QPC609	Tone and Digit Switch Card	2.33

Table 4
Failure rates of circuit cards (Part 13 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC611	Tone and Digit Switch Card with Centralized Attendant Service	10.67
QPC628	CO Loop Start Supervisory Trunk Card	7.41
QPC659	Dual Loop Peripheral Buffer Card	2.75
QPC673	512 K RAM Memory Card	5.04
QPC674	256 K Memory Card	5.80
QPC687	CPU Card	2.80
QPC695	500/2500 Line Daughter Board	6.09
QPC705	Power Converter Message Waiting Line Card, 1st tier	0.73
QPC706	Half PE Expansion Power Converter, 1st tier	1.14
QPC709	Miscellaneous/Peripheral Signaling Card	2.90
QPC710	µ-Law Digitone Receiver Card	0.82
QPC717	CPU ROM D/B Card	0.40
QPC720	Primary Rate Interface Card	6.00
QPC723	RS-232 4-Port Interface Line Card	11.41
QPC742	Floppy Disk Interface Card — vintage F and later	3.20 1.50
QPC757	D-Channel Handler Interface Card	3.06
QPC775	Clock Controller Card	2.44
QPC789	16-Port Message Waiting Line Card	5.53

Table 4
Failure rates of circuit cards (Part 14 of 14)

Order code	Description	Failure rate per 10^6 hrs
QPC814	768 K Memory Card	5.00
QPC841	Four-Port Serial Data Interface Card	2.30
QPC918	High-Speed Data Card	12.68
QPC939	ROM Card	0.30
QPC940	ROM Card	0.30

Table 5
Failure rates of mass storage equipment

Order code	Description	Failure rate per 10^6 hrs
NT5D20	IO Processor/Core Multi Drive Unit Combination pack (IODU)	43.00
NT6D64	Core Multi Drive Unit	40.00
NT8D68	Floppy Disk Unit	66.66
NT8D69	Multi Disk Unit	122.20
NT9D33	Small System Multi Drive Unit	122.20
NTND15	Floppy Disk Unit	66.70
NTND16	Multi Disk Unit	73.40
QMM38	Mass Storage Unit — MSU only — MSU with hard disk option	 53.59 13.52
QMM43	Mass Storage Unit	53.59
QMM45	Mass Storage Unit	45.70
QMT102	Disk Drive Controller	3.23
QMT103	Hard Disk Drive	16.31
QMT104	Floppy Disk Drive	22.83
QPC584	Mass Storage Interface Card	2.26
QPC742	Floppy Disk Interface Card	3.23
QUW1	Magnetic Tape Unit	48.00
QUW9	Magnetic Tape Unit	20.58

Table 6
Failure rates of station equipment (Part 1 of 3)

Order code	Description	Failure rate per 10^6 hrs
NE-500/2500	500/2500 Telephone	N/A
NE-DGQC-35	Line Cord	3.50
NE-G3AR-35	Handset	0.50
NE-G3DRN-3	Console Handset	0.50
NE-T1	Transmitter	0.50
NE-U1	Receiver	0.50
NTZK06	M2006 Telephone	3.08
NTZK08	M2008 Telephone	3.10
NTZK16	M2616 Telephone	3.88
NTZK20	M2016S Telephone	5.87
NTZK22	M2216ACD-1 Telephone	4.68
NTZK23	M2216ACD-2 Telephone	5.37
NT1F05	M2009 Telephone	12.22
NT1F06	M2112 Telephone	14.04
NT1F07	M2018 Telephone	13.36
NT1F11	M3000 Touchphone	21.01
NT2G00	M1250 Console	15.12
NT6G00	M2250 TCM Console	N/A
P0547117	Dial Pad	2.50
P0547118	Hookswitch	0.50
P0547125	LED Strip	0.50
QCB6	Connector Cable	0.50

Table 6
Failure rates of station equipment (Part 2 of 3)

Order code	Description	Failure rate per 10^6 hrs
QCW1	Attendant Console	19.50
QCW2	Attendant Console	27.87
QCW3	Attendant Console	24.69
QCW4	Attendant Console (Alphanumerical Display)	21.37
QKK1	Handsfree Interface/Remote Powering Kit	0.33
QKK3	Automatic Handsfree Interface Kit	0.82
QKN1	Headset Interface Kit	0.25
QMT1	10-Button Key Lamp Expansion Module	2.89
QMT2	20-Button Key Lamp Expansion Module	4.73
QMT3	Lamp Field Array Module	13.99
QMT4	Handset Module	0.50
QMT11	Asynchronous/Synchronous Interface Module	6.34
QMT12	Add-On Data Module	9.92
QMT15	Amplified Handset Module	N/A
QMT21	High-Speed Data Module	N/A
QPC710	µ-Law Digitone Receiver	5.20
QPF23	Terminating Plug	0.16
QSAM3	Group Listening Switch Kit	0.50
QSR2	Venture 1 Headset	N/A

Table 6
Failure rates of station equipment (Part 3 of 3)

Order code	Description	Failure rate per 10^6 hrs
QSU1E	SL-1 Telephone (Phase I)	14.64
QSU1F	SL-1 Telephone (Phase II)	13.09
QSU1G	SL-1 Telephone (Phase III)	11.48
QSU3	SL-1 Telephone (16-Digit Display)	19.16
QSU6	ACD Telephone	13.57
QSU7	ACD 16-Digit Display Telephone	14.37
QSU60	SL-1 Telephone (Fully Modular)	13.18

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