MEAN TIME BETWEEN FAILURES
CALCULATION
(MTBF)

FOR

WESTINGHOUSE

ON

SINGLE POLE/SEVEN THROW SWITCH
PDS24433

AND

TRANSFER RF SWITCH NETWORK
PDS24422
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SYNOPSIS

SINGLE POLE/SEVEN THROW PIN DIODE SWITCH PDS 24433:

MTBF = 495.114 HOURS

TRANSFER RF SWITCH NETWORK PDS 24422:

MTBF = 84.373 HOURS
Mtbf calculations for SP7T switch
Westinghouse P/N: PDS24433

ENVIRONMENT: GROUND FIXED

AMBIENT TEMPERATURE: +40°C

P 5.1.2.1 MICROELECTRONICS:

\[ \lambda_p = \pi_Q (C_1 \pi_T + C_2 \pi_E) \pi_L \text{ FAILURE/10}^6 \text{ HOURS} \]

\[ \pi_Q = 0.25 \]
\[ \pi_L = 1 \]
\[ \pi_E = 2.5 \]
\[ \pi_T = 0.35 \text{ @ 50° C} \]
\[ \pi_V = 1.0 \]
\[ C_1 = 0.010 \text{ HERMETIC FLATPACKS} \]
\[ C_1 = 0.01 \]

\[ \lambda_p = 7.125 \times 10^3 \]
\[ N = 2 \]

TOTAL \( \lambda_p = 1.425 \times 10^{-2} \)

P 5.1.3 TRANSISTORS (DISCRETE SEMICONDUCTORS)

\[ \lambda_p = \lambda_b (\pi_B \pi_A \pi_Q \pi_R \pi_31 \pi_C) \text{ FAIL/10}^6 \text{ HRS} \]

GROUP I SILICON

\[ \lambda_b = 0.0025 \text{ (NPN; 70° C CASE TEMP; 0.5 POWER STRESS)} \]
\[ \lambda_b = 0.0040 \text{ (PNP; 70° C CASE TEMP; 0.5 POWER STRESS)} \]
\[ \pi_B = 5.8 \]
\[ \pi_A = 0.7 \]
\[ \pi_Q = 0.12 \]
\[ \pi_R = 1.5 \]
\[ \pi_3 = 0.65 \text{ (50% DERATED)} \]
\[ \pi_C = 1.0 \]

\[ \lambda_p \text{(NPN)} = 1.18755 \times 10^3 \]
\[ N = 7 \]

TOTAL \( \lambda_p = 8.31285 \times 10^3 \)

\[ \lambda_p \text{(PNP)} = 1.900 \times 10^3 \]
\[ N = 21 \]

TOTAL \( \lambda_p = 3.98982 \times 10^2 \)
P 5.1.3 DISCRETE SEMICONDUCTORS, PIN DIODES

\[ \lambda_p = \lambda_b \times \pi_B \times \pi_Q \times \pi_R \times \pi_A \text{ FAIL/10}^6 \text{ HRS} \]

GROUP VIII

\[ \lambda_b = 0.053 \text{ (50°C CASE TEMP; 0.5 POWER STRESS)} \]
\[ \pi_B = 3.9 \]
\[ \pi_Q = 1.0 \text{ (JNTX SCREENED)} \]
\[ \pi_R = 0.5 \text{ (P<10WATTS)} \]
\[ \pi_A = 1.0 \]

\[ \lambda_p = 0.10335 \]
\[ N = 14 \]
TOTAL \[ \lambda_p = 1.4469 \]

P 5.1.3 ZENER DIODE

\[ \lambda_p = \lambda_b (\pi_B \times \pi_A \times \pi_z) \]
\[ \pi_B = 3.9 \]
\[ \pi_A = 1.0 \]
\[ \pi_Q = 0.3 \text{ (JANTXV SCREENED)} \]
\[ \lambda_b = 0.0011 \text{ (50C AT .5 POWER STRESS)} \]

\[ \lambda_p = 1.287 \times 10^{-3} \]
\[ N = 1 \]
TOTAL \[ \lambda_p = 1.287 \times 10^{-3} \]

P 5.1.6 RESISTORS (CHIP) THICK FILM CHIP RESISTOR, MIL-R-55342

FAILURE RATE "R", 100mW

\[ \lambda_p = \lambda_b (\pi_B \times \pi_R \times \pi_Q) \]
\[ \lambda_b = 0.0014 \text{ (50C AMBIENT, 0.5 DERATED)} \]
\[ \pi_B = 2.4 \]
\[ \pi_R = 1.0 \text{ (RESISTANCE UPTO 100K)} \]
\[ \pi_Q = 0.1 \text{ ('R' FAILURE RATED)} \]

\[ \lambda_p = 3.36 \times 10^{-4} \]
\[ N = 72 \text{ (RF AND DC)} \]
TOTAL \[ \lambda_p = 2.42 \times 10^{-2} \]
5.1.7 Capacitors

DC: Ceramic Chip, MIL-C-55681, 20% Tolerance, Failure Rate 'R', 100 Volt Breakdown.

\[ \lambda_p = \lambda_b (\pi_b \times \pi_q \times \pi_{cv}) \]

\( \lambda_b = 0.0038 \) (50C Ambient Temp, 0.5 Derated)
\( \pi_b = 1.9 \)
\( \pi_q = 0.1 \) (R Failure)
\( \pi_{cv} = 0.75 \) (240 pF Capacitors)
\( \pi_{cv} = 1.13 \) (0.01 \( \mu \)F Capacitors)

240 pF and Lower
\[ \lambda_p = 5.415 \times 10^{-4} \]
\( N = 21 \)
Total \( \lambda_p = 1.137 \times 10^{-2} \)

0.01 \( \mu \)F and Lower
\[ \lambda_p = 8.1586 \times 10^{-4} \]
\( N = 2 \)
Total \( \lambda_p = 1.631 \times 10^{-3} \)

RF:

\[ \lambda_p = \lambda_b (\pi_b \times \pi_q \times \pi_{cv}) \]

\( \lambda_b = 0.0038 \) (50C Ambient Temp, 0.5 Derated)
\( \pi_b = 2.4 \)
\( \pi_q = 3.0 \) (Non-Established Reliability)
\( \pi_{cv} = 0.75 \) (C<240 pF Capacitors)

\[ \lambda_p = 1.6245 \times 10^{-2} \]
\( N = 15 \)
Total \( \lambda_p = 0.243675 \)

5.1.12.2 Printed Circuit Board Multi-Pin Connector

\[ \lambda_p = \lambda_b (\pi_b \times \pi_f \times \pi_k) \]

\( \lambda_b = 0.00047 \) (50C)
\( \pi_b = 3.4 \)
\( \pi_f = 3.28 \) (15 Pin Multi Pin)
\( \pi_k = 1.0 \)

Total \( \lambda_p = 5.24144 \times 10^{-3} \)
P 5.1.2.9.3 INTERCONNECTIONS IN DC

\[ \lambda_t = 0.000650 \]
\[ N_t = 91 \]
\[ \lambda_f = N_t \times \lambda_t \]

\[ \lambda_p = 5.915 \times 10^{-2} \]
\[ N = 1 \]

P 5.1.12 COAXIAL RF CONNECTORS

\[ \lambda_p = \lambda_b (\pi_b \times \pi_f \times \pi_k) \]

\[ \lambda_b = 0.0059 \quad \text{(OPERATING TEMP 50 C)} \]
\[ \pi_b = 3.4 \]
\[ \pi_f = 1.0 \]
\[ \pi_k = 1.0 \]

\[ \lambda_f = 2.006 \times 10^{-2} \]
\[ N = 8 \]
\[ \text{TOTAL } \lambda_f = 0.1605 \]

-----------------------------------------------

SUMMARY

\[ \lambda_{\text{TOTAL}} = \sum_{\text{TOTAL}} \lambda_p = 2.02 \text{ FAILURES/MILLION HOURS} \]

\[ \text{MTBF} = \lambda_{\text{TOTAL}} / 1 \times 10^6 = 2.02 / 1 \times 10^6 \]

495,114 HOURS BETWEEN FAILURES

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MTBF CALCULATION FOR
TRANSFER RF SWITCH NETWORK
WESTINGHOUSE P/N: PDS24422

ENVIRONMENT: GROUND FIXED

AMBIENT TEMPERATURE: +40°C

SW-2181-2AT PIN DIODE SWITCH

P 5.2.1.9 RF HYBRID

RF HYBRID \( \lambda_p = \left\{ \sum N_C \lambda_C \pi_G + [N_R \lambda_R + \sum N_T \lambda_T + \lambda_D] \pi_P \pi_L \right\} \pi_Q \pi_D \)

P 5.1.2.9.1 \( \sum N_C \lambda_C \pi_G \) ACTIVE COMPONENTS AND CAPACITORS

\( N_C = \) NUMBER OF EACH PARTICULAR PART
\( \lambda_C = \) FAILURE CONTRIBUTION OF EACH PART
\( \pi_G = \) DIE AND CAPACITOR CORRECTION FACTORS

PIN DIODES:

BEAM LEAD DIODES (SAMPLE CALCULATION):

P 5.1.3 DISCRETE SEMICONDUCTORS, PIN DIODES

\( \lambda_p = \lambda_B \times \pi_B \times \pi_Q \times \pi_R \times \pi_A \) FAIL/10^6 HRS

GROUP VIII

\( \lambda_B = 0.053 \) (50° C CASE TEMP; 0.5 POWER STRESS)
\( \pi_B = 3.9 \)
\( \pi_Q = 0.5 \) (JNTXV SCREENED)
\( \pi_R = 0.5 \) (P<10WATTS)
\( \pi_A = 1.0 \)

\( \lambda_p = 5.1675 \times 10^2 \)
CHIP DIODES (SAMPLE CALCULATION):

P 5.1.3 DISCRETE SEMICONDUCTORS, PIN DIODES

\[ \lambda_p = \lambda_B \times \pi_B \times \pi_Q \times \pi_R \times \pi_A \text{ FAIL}/10^6 \text{ HRS} \]

GROUP VIII

\[ \lambda_B = 0.053 \text{ (50°C CASE TEMP; 0.5 POWER STRESS)} \]
\[ \pi_B = 3.9 \]
\[ \pi_Q = 25 \text{ (UN-SCREENED)} \]
\[ \pi_R = 0.5 \text{ (P<10WATTS)} \]
\[ \pi_A = 1.0 \]

\[ \lambda_p = 2.58375 \]

PIN DIODES:

BEAM LEADS:

\[ \lambda_C = 5.1675 \times 10^{-2} \]
\[ N_C = 6 \]
\[ \pi_0 = 0.2 \]

CHIP DIODES:

\[ \lambda_C = 2.58375 \]
\[ N_C = 4 \]
\[ \pi_0 = 0.2 \]

RF CAPACITORS

\[ \lambda_C = 8.55 \times 10^3 \]
\[ N_C = 12 \]
\[ \pi_0 = 0.8 \]

\[ \sum N_C \lambda_C = 2.21109 \]

P 5.1.2.9.2 CHIP AND SUBSTRATE RESISTORS

\[ \lambda_R = 0.00015 \]
\[ N_R = 7 \]

P 5.1.2.9.3 INTERCONNECTIONS

\[ N_I = 48 \]
\[ \lambda_I = 0.000650 \]
P 5.1.2.9-7 PACKAGE FAILURE RATE

\[ S = 3.5'' \]
\[ \lambda_a = 0.0323 \text{ (50C, FROM TABLE 5.1.2.9-4)} \]

ENVIRONMENTAL \( \pi_s \)
\[ \pi_s = 0.78 \]

QUALITY \( \pi_q \)
\[ \pi_q = 1.0 \text{ (B-1 SCREENED MIL-STD-883 METHOD 5008)} \]

DENSITY FACTOR \( \pi_d \)
\[ \pi_d = 1.31 \]

RF HYBRID \( \lambda_p = 2.99425 \)

DC COMPONENTS

P 5.1.3-1 TRANSISTORS (DISCRETE SEMICONDUCTORS)

\[ \lambda_p = \lambda_b (\pi_b, \pi_a, \pi_q, \pi_r, \pi_m, \pi_c) \text{ FAIL} / 10^6 \text{ HRS} \]

GROUP I SILICON

\[ \lambda_b = 0.0025 \text{ (NPN; 70° C CASE TEMP; 0.5 POWER STRESS)} \]
\[ \lambda_b = 0.0040 \text{ (PNP; 70° C CASE TEMP; 0.5 POWER STRESS)} \]
\[ \pi_b = 5.8 \]
\[ \pi_a = 0.7 \]
\[ \pi_q = 0.12 \]
\[ \pi_r = 1.5 \]
\[ \pi_m = 0.65 \text{ (50 % DERATED)} \]
\[ \pi_c = 1.0 \]

\[ \lambda_p(\text{NPN}) = 1.18755 \times 10^{-3} \]
\[ N = 2 \]
\[ \text{TOTAL} \ \lambda_p = 2.3751 \times 10^{-3} \]

\[ \lambda_p(\text{PNP}) = 1.900 \times 10^{-3} \]
\[ N = 6 \]
\[ \text{TOTAL} \ \lambda_p = 1.14 \times 10^{-2} \]
5.1.3 ZENER DIODE

\[ \lambda_p = \lambda_b (\pi_e \times \pi_a \times \pi_t) \]
\[ \pi_b = 3.9 \]
\[ \pi_a = 1.0 \]
\[ \pi_t = 0.3 \text{ (JANTXV SCREENED)} \]
\[ \lambda_b = 0.0011 \text{ (50C AT .5 POWER STRESS)} \]
\[ \lambda_p = 1.287 \times 10^3 \]
\[ N = 1 \]

5.1.6 RESISTORS (CHIP) THICK FILM CHIP RESISTOR, MIL-R-55342.

FAILURE RATE "R", 100mW

\[ \lambda_p = \lambda_b (\pi_e \times \pi_r \times \pi_q) \]
\[ \lambda_b = 0.0014 \text{ (50C AMBIENT, 0.5 DERATED)} \]
\[ \pi_b = 2.4 \]
\[ \pi_r = 1.0 \text{ (RESISTANCE UPTO 100K)} \]
\[ \pi_q = 0.1 \text{ ('R' FAILURE RATED)} \]
\[ \lambda_p = 3.36 \times 10^{-4} \]
\[ N = 58 \]
TOTAL \[ \lambda_p = 1.948 \times 10^{-2} \]

5.1.7 CAPACITORS

DC: CERAMIC CHIP, MIL-C-55681, 20% TOLERANCE, FAILURE RATE 'R',
100 VOLT BREAKDOWN.

\[ \lambda_p = \lambda_b (\pi_e \times \pi_q \times \pi_{cv}) \]
\[ \lambda_b = 0.0038 \text{ (50C AMBIENT TEMP, 0.5 DERATED)} \]
\[ \pi_b = 1.9 \]
\[ \pi_q = 0.1 \text{ (R FAILURE)} \]
\[ \pi_{cv} = 0.75 \text{ (240 pF CAPACITORS)} \]
\[ \pi_{cv} = 1.13 \text{ (.01 \mu F CAPACITORS)} \]
\[ \lambda_p = 5.415 \times 10^{-4} \]
\[ N = 6 \]
TOTAL \[ \lambda_p = 1.14 \times 10^{-2} \]

\[ \lambda_p = 8.1586 \times 10^{-4} \]
\[ N = 2 \]
TOTAL \[ \lambda_p = 1.631 \times 10^{-3} \]
P 5.1.2.9.3 INTERCONNECTIONS IN DC

\[ \lambda_i = 0.000650 \]
\[ N_i = 27 \]
\[ \lambda_p = N_i \times \lambda_i \]
\[ \lambda_p = 1.755 \times 10^{-2} \]

P 5.1.12 COAXIAL RF CONNECTORS

\[ \lambda_p = \lambda_b \left( \pi_e \times \pi_f \times \pi_k \right) \]
\[ \lambda_b = 0.0059 \text{ (OPERATING TEMP 50 C)} \]
\[ \pi_e = 3.4 \]
\[ \pi_f = 1.0 \]
\[ \pi_k = 1.0 \]
\[ \lambda_p = 2.006 \times 10^{-2} \]
\[ N = 3 \]
\[ \text{TOTAL } \lambda_p = 6.018 \times 10^{-2} \]

\[ \lambda_{\text{TOTAL}} = \sum \lambda_p = 2.34 \text{ FAILURES/MILLION HOURS} \]
\[ \text{MTBF} = \lambda_{\text{TOTAL}} / 1 \times 10^6 = 2.34 / 1 \times 10^6 \]
\[ 428,027 \text{ HOURS BETWEEN FAILURES} \]
MTBF CALCULATION FOR
TRANSFER RF SWITCH NETWORK
WESTINGHOUSE P/N: PDS24422

SW-2181-TRA PIN DIODE SWITCH (MONOLITHIC CHIP)

P 5.1.2.2 MOS LINEAR, MONOLITHIC DEVICE

\[ \lambda_p = \pi_q (C_1 \times \pi_T \times \pi_V + C_2 \times \pi_B) \pi_L \]

\[ \pi_q = 2.0 \quad (MIL-883-(B-1) SCREENED) \]
\[ \pi_L = 10.0 \quad (NEW TECHNOLOGY) \]
\[ \pi_B = 2.5 \]
\[ \pi_T = 0.76 \]
\[ \pi_V = 1.0 \]
\[ C_2 = 0.0026 \]
\[ C_1 = 0.06 \]

TOTAL \( \lambda_p = 1.042 \)

----------------------------------------

SUMMARY

\[ \lambda_{TOTAL} = \sum_{TOTAL} \lambda_p = 1.042 \quad FAILURES/MILLION HOURS \]

\[ MTBF = 1x10^6/\lambda_{TOTAL} = 1x10^6/1.042 \]

959,693 HOURS BETWEEN FAILURES
MTBF CALCULATION FOR
TRANSFER RF SWITCH NETWORK
WESTINGHOUSE P/N: PDS24422

SP6T PIN DIODE SWITCH

P.5.1.2.1 MICROELECTRONICS:

\[ \lambda_p = \pi_Q (C_1 \pi_T \pi_V + C_2 \pi_B) \pi_L \text{ FAILURE/10}^6 \text{ HOURS} \]

\[ \begin{align*}
\pi_Q &= 0.25 \\
\pi_L &= 1 \\
\pi_B &= 2.5 \\
\pi_T &= 0.35 @ 50^\circ \text{ C} \\
\pi_V &= 1.0 \\
C_2 &= 0.010 \text{ HERMETIC FLATPACKS} \\
C_1 &= 0.01 \\
\end{align*} \]

\[ \lambda_p = 7.125 \times 10^{-3} \]

\[ N = 2 \]

TOTAL \[ \lambda_p = 1.425 \times 10^{-2} \]

P.5.1.3-1 TRANSISTORS (DISCRETE SEMICONDUCTORS)

\[ \lambda_p = \lambda_b (\pi_{B1} \pi_{A1} \pi_{Q1} \pi_{R1} \pi_{S1} \pi_{C}) \text{ FAIL/10}^6 \text{ HRS} \]

GROUP I SILICON

\[ \lambda_b = 0.0025 \text{ (NPN; 70° C CASE TEMP; 0.5 POWER STRESS)} \]

\[ \begin{align*}
\pi_{B1} &= 5.8 \\
\pi_{A1} &= 0.7 \\
\pi_{Q1} &= 0.12 \\
\pi_{R1} &= 1.5 \\
\pi_{S1} &= 0.65 \text{ (50 % DERATED)} \\
\pi_{C1} &= 1.0 \\
\end{align*} \]

\[ \lambda_p(NPN) = 1.18755 \times 10^{-3} \]

\[ N = 12 \]

TOTAL \[ \lambda_p = 1.425 \times 10^{-2} \]
P 5.1.3 DISCRETE SEMICONDUCTORS, PIN DIODES
\[ \lambda_p = \lambda_B \times \pi_B \times \pi_Q \times \pi_R \times \pi_A \text{ FAIL/10}^6 \text{ HRS} \]

GROUP VIII

\( \lambda_B = 0.053 \) (50°C CASE TEMP; 0.5 POWER STRESS)
\( \pi_B = 3.9 \)
\( \pi_Q = 1.0 \) (JNTX SCREENED)
\( \pi_R = 0.5 \) (P<10WATTS)
\( \pi_A = 1.0 \)

\[ \lambda_p = 0.10335 \]
\[ N = 12 \]
TOTAL \( \lambda_p = 1.2402 \)

P 5.1.6 RESISTORS (CHIP) THICK FILM CHIP RESISTOR, MIL-R-55342,
FAILURE RATE "R", 100mW

\[ \lambda_p = \lambda_B (\pi_B \times \pi_R \times \pi_Q) \]

\( \lambda_B = 0.0014 \) (50C AMBIENT, 0.5 DERATED)
\( \pi_B = 2.4 \)
\( \pi_R = 1.0 \) (RESISTANCE UPTO 100K)
\( \pi_Q = 0.1 \) ('R' FAILURE RATED)

\[ \lambda_p = 3.36 \times 10^{-4} \]
\[ N = 20 \] (RF AND DC)
TOTAL \( \lambda_p = 6.72 \times 10^{-3} \)
P 5.1.7 CAPACITORS

DC: CERAMIC CHIP, MIL-C-55681, 20% TOLERANCE, FAILURE RATE 'R', 100 VOLT BREAKDOWN.

\[ \lambda_p = \lambda_B \times \pi_Q \times \pi_{CV} \]

\[ \lambda_B = 0.0038 \quad (50^\circ \text{C AMBIENT TEMP, 0.5 DERATED}) \]
\[ \pi_B = 1.9 \]
\[ \pi_Q = 0.1 \quad (R \text{ FAILURE}) \]
\[ \pi_{CV} = 0.75 \quad (240 \text{ PF CAPACITORS}) \]
\[ \pi_{CV} = 1.13 \quad (.01 \mu \text{F CAPACITORS}) \]

240 PF CAPACITORS

\[ \lambda_p = 5.415 \times 10^{-4} \]
\[ N = 13 \quad (RF \text{ AND DC}) \]
TOTAL \[ \lambda_p = 7.0395 \times 10^{-3} \]

.01 UF CAPACITORS

\[ \lambda_p = 8.1586 \times 10^{-4} \]
\[ N = 2 \]
TOTAL \[ \lambda_p = 1.631 \times 10^{-3} \]

P 5.1.2.9.3 INTERCONNECTIONS

\[ \lambda_p = N_t \times \lambda_t \]
\[ \lambda_t = 0.000650 \]
\[ N_t = 73 \]

TOTAL \[ \lambda_p = 4.745 \times 10^{-2} \]

P 5.1.12 COAXIAL RF CONNECTORS

\[ \lambda_p = \lambda_B \times \pi_B \times \pi_F \times \pi_K \]

\[ \lambda_B = 0.0059 \quad (\text{OPERATING TEMP 50 C}) \]
\[ \pi_B = 3.4 \]
\[ \pi_F = 1.0 \]
\[ \pi_K = 1.0 \]

\[ \lambda_p = 2.006 \times 10^{-2} \]
\[ N = 7 \]
TOTAL \[ \lambda_p = 0.14042 \]
\[ \lambda_{TOTAL} = \sum_{TOTAL} \lambda_f = 1.472 \text{ Failures/Million Hours} \]

\[ \text{MTBF} = 1 \times 10^6 / \lambda_{TOTAL} = 1 \times 10^6 / 1.472 \]

\[ 79.366 \text{ Hours Between Failures} \]
MTBF CALCULATION FOR
TRANSFER RF SWITCH NETWORK
WESTINGHOUSE P/N: PDS24422

PD-1000-2

P 5.1.12 COAXIAL RF CONNECTORS

\[ \lambda_p = \lambda_b (\pi_z \times \pi_f \times \pi_r) \]

\[ \lambda_b = 0.0059 \text{ (OPERATING TEMP 50 C)} \]

\[ \pi_z = 3.4 \]

\[ \pi_f = 1.0 \]

\[ \pi_r = 1.0 \]

\[ \lambda_p = 2.006 \times 10^{-2} \]

\[ N = 3 \]

TOTAL \( \lambda_p = 6.018 \times 10^{-2} \)

P 5.1.8.1 INDUCTIVE DEVICES, TRANSFORMERS

\[ \lambda_p = \lambda_b (\pi_b \times \pi_q) \]

\[ \pi_q = 12.0 \text{ (RF TRANSFORMERS, MIL SPEC)} \]

\[ \pi_b = 5.7 \] (FROM 5.1.8.3.2 WHERE \( T_a = 40^\circ C; \Delta T = 30^\circ C \))

\[ T_{hs} = 73^\circ \text{ (MAXIMUM OPERATING TEMP = 85\circ C;)} \]

\[ \lambda_b = 0.0108 \]

\[ \lambda_p = 0.739 \]

\[ N = 2 \]

TOTAL \( \lambda_p = 1.477 \)

-----------------------------

SUMMARY

\[ \lambda_{TOTAL} = \sum \text{TOTAL } \lambda_p = 1.53718 \text{ FAILURES/MILLION HOURS} \]

\[ \text{MTBF} = 1 \times 10^6 / \lambda_{TOTAL} = 1 \times 10^6 / 1.53718 \]

\[ 690.541 \text{ HOURS BETWEEN FAILURES} \]

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MTBF CALCULATION FOR
TRANSFER RF SWITCH NETWORK
WESTINGHOUSE P/N: FDS24422

SYSTEM SUMMARY

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<th>$\lambda_{TOTAL}$ OF COMPONENT</th>
<th>MTBF</th>
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<td>XFER SWITCH</td>
<td>4</td>
<td>1.04</td>
<td>959,693</td>
</tr>
<tr>
<td>SP6T SWITCH</td>
<td>1</td>
<td>1.472</td>
<td>679,366</td>
</tr>
<tr>
<td>PD-1000-2</td>
<td>1</td>
<td>1.54</td>
<td>650,541</td>
</tr>
<tr>
<td>POWER DIVIDER</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OVERALL $\lambda_{TOTAL} = 11.852$**

**MTBF = \(1 \times 10^6 / 11.852\)**

**84,373 HOURS**