REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
B	ECO 1000204B replaces Rev. A with changes.	02/09/00	km/RCP
C	ECO 1000204C replaces Rev. B with changes.	05/15/00	km/RCP

THE REVISION STATUS OF ALL SHEETS OF
THIS DRAWING IS THE SAME AS SHEET 1

CAD-MAINTAINED CHANGES SHALL BE
INCORPORATED BY THE DESIGN ACTIVITY

1000210	1000100
NEXT ASSY	USED ON
APPLICATION	

VENDOR ITEM DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES

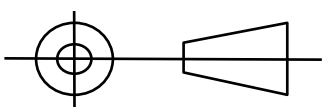
.XX DECIMAL ± NONE

.XXX DECIMAL ± NONE

ANGLES ± NONE

SURFACE QUALITY ± NONE

THIRD ANGLE PROJECTION



CONTRACT NO

DRAWN	M. Barg	DATE 12/09/99
APVD	R. C. Provencher	DATE 01/05/00
CHECKED	G. Flebotte	DATE 01/05/00
APVD	S. J. Graveline	DATE 01/05/00
APVD		DATE
APVD		DATE
APVD		DATE

TRANSCEPT
Manchester, NH 03103-3353

Bias Tee,
High Power, TDMA

SIZE		DWG NO
A		**1000204**

SCALE		SHEET
NONE		**1 of 11**

1. SCOPE

This specification covers the detailed requirements for PCS/DCS band, high power, TDMA protocol, bias tee assembly.

2. APPLICABLE DOCUMENTS

The following documents, of issue in effect on the date of invitation for bids, or request for proposal, unless otherwise specified, form a part of this specification to the extent specified herein.

2.1 STANDARDS

2.2 PUBLICATIONS

2.2.1 American National Standards Institute (ANSI)

- Y14.5M-1982 Dimensioning and Tolerancing

2.2.2 Bellcore

- GR-1089-CORE Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network Telecommunications Equipment
- GR-63-CORE Network Equipment Building System (NEBS) Capabilities: Physical Protection for Earthquake and Office Vibration.
- TR-332, Issue 6 Reliability Prediction Procedure for Electronic Equipment

2.2.3 Underwriters Laboratories (UL)

- UL1950, Third Edition Safety of Information Technology Equipment, Including Electrical Business Equipment

2.3 ORDER OF PRECEDENCE

In the event of conflict between this specification and the references herein, this specification shall take precedence.

3. REQUIREMENTS

3.1 GENERAL

Units furnished to this specification shall conform to the requirements as specified herein.

3.2 MATERIALS

a. Materials shall be used that ensure the unit meets the performance requirements specified herein.

b. Materials used to mount components shall have a minimum flammability rating of UL94V-0.

3.3 DESIGN AND CONSTRUCTION

The unit shall be designed and constructed in a manner that will ensure compliance with UL 1950, Bellcore GR-63-CORE, and the ESD requirements of Bellcore GR-1089-CORE.

3.3.1 Physical Outline

The unit shall comply with the physical outline as specified in Figure 1.

3.3.2 Connector Input/Output Pin Numbers and Functions

The connector input and output pin numbers and functions shall be as specified in Figure 1.

3.3.3 Electrostatic Discharge (ESD) Protection

a. The unit shall be designed to meet the ESD requirements of Bellcore GR-1089-CORE.

b. The unit shall have a grounded metallic case to protect against ESD during handling, installation, and repair.

3.3.4 Electromagnetic Interference (EMI) and Electromagnetic Coupling (EMC)

The unit shall have a shielded metallic case to limit EMI radiation. The unit shall meet the RF shielding requirements of Table I.

3.3.5 Finish

All surfaces of the unit shall have a corrosion inhibiting finish.

3.3.6 Weight

The unit shall weigh 6.0 ounces, maximum.

3.4 ELECTRICAL PERFORMANCE REQUIREMENTS

3.4.1 General

See Table I.

3.5 ENVIRONMENTAL

3.5.1 Temperature Range

3.5.1.1 Transportation and Storage Temperature Range, Ambient

The unit ambient transportation and storage temperature range shall be -40 °C to +85 °C.

3.5.1.2 Operating Temperature Range, Ambient

The unit ambient operating temperature range shall be -40 °C to +85 °C.

3.5.2 Shock

3.5.2.1 Transportation, Storage and Handling Shock

a. The unit shall not sustain any physical damage or deteriorate in functional performance when subjected to shock levels expected during transportation, storage and handling.

b. The unit shall withstand transportation and storage shock in accordance with GR-63-CORE.

c. The unit shall withstand installation handling shock, unit unpackaged, and transportation handling shock, unit packaged, in accordance with GR-63-CORE, Section 4.3.2 and 4.3.1, as a minimum.

3.5.3 Vibration

3.5.3.1 Transportation and Storage Vibration

a. The unit shall not sustain any physical damage or deteriorate in functional performance when subjected to vibration levels expected during transportation and storage.

b. The unit shall withstand transportation and storage vibration in accordance with GR-63-CORE, Section 4.4.4, as a minimum.

3.5.3.2 Operational Vibration

The unit shall meet all of the performance requirements when exposed to operational vibration levels in accordance with GR-63-CORE, Section 4.4.3, as a minimum.

3.5.4 Humidity

3.5.4.1 Transportation and Storage Humidity

The unit shall withstand transportation and storage humidity in accordance with GR-63-CORE, Section 4.1.1.3, as a minimum.

3.5.4.2 Operational Humidity

3.5.5 Altitude

a. The unit shall operate when exposed to relative humidity levels from 0 to 95%, condensing.

b. The unit shall meet all of the performance requirements when exposed to operational humidity levels IAW GR-63-CORE, Section 4.1.2.

3.5.5.1 Transportation and Storage Altitude

The unit shall withstand all transportation and storage altitudes that occurs in commercial transportation by rail, truck, ship, and aircraft.

3.5.5.2 Operational Altitude

The unit shall operate at altitudes from sea level to 10,000 feet, maximum.

3.6 RELIABILITY

3.6.1 General

a. Individual component part stresses (power, voltage, current, and junction temperature) within the hardware design shall comply with the requirements of an approved derating guideline for ambient temperatures up to +85 ^{o}C.

b. Under no circumstance shall manufacturer ratings be exceeded.

c. The unit shall support a useful life of 10 years or 87,000 operating hours under any combination of service and storage conditions, with reasonable maintenance.

d. The module shall meet all requirements after 5 years of storage without maintenance, adjustment, or part replacement.

3.6.2 Mean Time Between Failure (MTBF)

3.6.2.1 Predicted MTBF

a. The supplier shall perform a reliability prediction to ensure the design of the unit is adequate.

b. The unit shall have a predicted Mean Time Between Failures (MTBF) of greater than or equal to 25,000,000 hours.

c. The reliability prediction shall be based on the following factors:

1) Unit ambient temperature of +40°C.

2) 50% rated electrical stress

3) Ground, Fixed, Uncontrolled environmental conditions.

d. The supplier shall fully explain and document the technical basis for the prediction.

e. The reliability prediction shall not represent the expected field observed reliability.

3.6.2.2 Demonstrated MTBF

During the first year of deployed operation, the demonstrated reliability shall be greater than or equal to 12,500,000 hours.

3.7 MARKING

a. Each unit shall be permanently and legibly marked with the Supplier's name, Supplier's part number, Transcept's name, Transcept specification number and specification revision level, and **serial number**, on UL-approved label stock that is compatible with the environmental specifications stated in paragraph 3.5 of this document.

b. The serial number shall consist of 15 digits, allocated as follows:

Digit:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	0	**0**	**X**	**X**	**0**	**0**	**0**	**2**	**5**	**1**	**0**	**0**	**0**	**0**	**1**
	YR		**MO**		**Fixed ***						**1 - 99999 ****				

***** Digits 5 through 10 are fixed at 000251 which indicates a Bias Tee assembly.

*** *** Vendor shall contact Transcept buyer for serial number assignment.

c. The **vendor part number, Transcept part number** and **serial number** will be bar coded to the following standard industry ***Mode 39*** criteria:

- Check Digit = 0
- Interpretation = None
- Bar Code Height = .25 inches
- Bar Code Ratio = 3:1
- Bar Code Width Multiplier = 2
- Human-readable text above the barcode

d. Appropriate safety labels shall be affixed to the unit in accordance with UL-1950.

e. All label locations shall be as indicated in Figure 1.

3.8 WORKMANSHIP

Units shall be manufactured and processed in a careful and workmanlike manner and shall be free from defects of material and construction that may affect performance, life and serviceability.

3.9 INTERCHANGEABILITY

Interchangeability shall exist between all bias tee assemblies and any replaceable assemblies, subassemblies, and parts.

4. QUALITY ASSURANCE PROVISIONS

4.1 RESPONSIBILITY FOR INSPECTIONS

a. Unless otherwise specified in the subcontract or purchase order, the supplier is responsible for the performance of all inspections as specified herein.

b. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the contracting agency.

c. Transcept reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 QUALITY CONFORMANCE INSPECTIONS

Each unit shall be subjected to the inspections and tests as specified herein.

4.2.1 Visual Inspections

The supplier shall certify that each unit submitted for acceptance is in full conformity with the supplier's specification and has been adequately inspected for freedom from material or manufacturing defects.

4.2.2 Electrical Tests

a. Each unit shall meet the electrical performance requirements over the ambient operating temperature range in accordance with Table I herein, and in accordance with an approved ATP.

b. Test data shall be provided when specified in the purchase order or subcontract.

c. Warranty and first article test requirements shall be specified in the purchase order or subcontract.

d. All requirements in Table I shall be met with a $\pi/4$ DQPSK modulated input signal representative of a TDMA signal source having all time slots modulated with pseudo-random data field bits, unless specified otherwise.

e. Compliance shall be demonstrated via measured data.

4.3 FIELD RELIABILITY VERIFICATION TEST

4.3.1 Purpose

The purpose of this field reliability verification test is allow Transcept to work with the supplier at the earliest opportunity to correct reliability-related problems with the supplier's product, and to establish an acceptance criterion for demonstrated MTBF.

4.3.2 Ground Rules

a. Unit operating hours shall be calculated by the following method:

   1) When a unit is put into service following a successful system check, the time when service is begun is recorded in the Transcept database.

   2) When a failure is detected in the field, a field technician removes the suspected unit, records date and time and sends the unit and time stamp back to Transcept.

   3) This calculation assumes that the unit operates 24 hours per day.

b. The suspected unit is analyzed by Transcept.

c. The unit is counted as a charged failure to the supplier when it has been determined that the unit failed due to design, manufacturing, component or workmanship problems.

d. The unit is not counted as a charged failure if the failure is attributable to maintenance procedures, handling, or having been induced by the failure of other equipment.

e. Transcept returns the failed unit to the supplier with a failure report.

f. The supplier shall perform a detailed failure analysis to determine the cause of the failure.

g. If a compliance verification rejection boundary is crossed (see Figure 2), the supplier shall develop and implement a corrective action plan designed to provide Transcept with compliant product.

h. The corrective action plan must be acceptable to Transcept and may include additional sample testing of product.

i. Product delivered following implementation of the approved corrective action plan will be subject to a field reliability verification test.

4.3.3 Reliability Verification

Compliance with the MTBF requirement shall be determined by assessing the cumulative operating time and failures that accrue during the first year of equipment deployment. The MTBF will be sampled on an item-by-item basis by tracking total unit operating hours versus failures using the test plan shown in Figure 2. The producer and consumer risks associated with this test are 22.3% and 22.5 %, respectively, when the true MTBF is twice the MTBF min. The accept-reject criteria for this test are listed in Table II. This test will last no more than 9.74 times the MTBF requirement.

5. PREPARATION FOR DELIVERY

5.1 PRESERVATION, PACKAGING AND PACKING

The unit shall be preserved, packaged and packed for delivery to meet the transportation and storage requirements as specified in paragraph 3.5.

6. NOTES

Table I. Electrical Performance Requirements

Parameter	Units	Specification	Notes
Passband Frequency Range RF Connector to RF/DC Connector	 MHz	 1700 to 2300	(see Note 1)
Total Passband Path Loss RF Connector to RF/DC Connector	 dB	 0.2 max.	(see Note 6)
Isolation: RF Connector to BIAS • 150 to 499 MHz • 500 to 2300 MHz	 dB dB	 20.0 50.0	
Isolation: RF/DC Connector to BIAS • 150 to 499 MHz • 500 to 2300 MHz	 dB dB	 20.0 50.0	
Duty Cycle		Continuous	
Modulation Protocol		TDMA	$\pi/4$ DQPSK modulation.
Carrier Frequency Separation Range • Minimum • Maximum	 kHz MHz	 30 15.0	
RF Input Power (operational) • RF connector (average) • RF connector (peak) • RF connector, multi-carrier (average) • RF connector, multi-carrier (peak)	 watts watts # @ watts # @ watts	 100 1000 4 @ 25 4 @ 63	 Maximum. (See Note 4).
Maximum “No Damage” RF Input Power • RF connector (average) • RF connector (peak)	 watts watts	 150 1500	Unit shall survive with no damage with any input level up to the specified maximum per input.
RF Input/Output Impedance	ohms	50	Nominal
RF Input / Output VSWR (passband)		1.25:1 max.	
RF Input Load VSWR (operational)		2.0:1 max.	
RF Output Load VSWR (operational)		2.0:1 max.	
Maximum RF Input / Output Load VSWR (survive without damage)		∞:1	Unit shall operate with any load VSWR at any phase angle (see Note 5).
DC Block • RF Connector • RF/DC Connector • BIAS Connector	 	 Yes No No	
Bias Interface • Voltage • Current • Resistance	 VDC amperes ohms	 10 to 50 2.0 max. 0.25 max.	
Passive Intermodulation Distortion • Wideband • Transmit Band (1930 to 1990 MHz) • PCS Receive Band (1850 to 1910 MHz)	 dBc dBc dBc	 -123..0 max. -123.0 max. -143.0 max.	(see Note 2)

Table I. Electrical Performance Requirements

Parameter	Units	Specification	Notes
RF Shielding	dBc	-80 min.	(see Note 3)
Connector Interface • RF • RF/DC • BIAS		 Type N (m) Type N (f) BNC (f)	Mark connector as speciifed in Figure 1.
Connector Plating		Low PIM	All connector surfaces shall be plated with a low-PIM corrosion-inhibiting finish.
Input Surge Voltage Pulse • Voltage • Rise Time • Fall Time	 V ns ns	 2000 100 10	The unit shall withstand the specified input surge voltage pulse, at the RF/DC connector, due to a lightning strike.
Residual Throughput Voltage Pulse • Voltage • Rise Time • Fall Time	 V ns ns	 TBD TBD TBD	The unit shall attenuate the input surge voltage pulse so that the residual throughput energy, output at the RF connector, is below the speciifed levels.
Power Dissipation (thermal load)	watts	7.0 max.	Measured with the maximum RF input power level present at all four (4) input ports simultaneously

NOTES for Table I:

1. It is desirable that a single unit operate over the passband frequency range of 1700 to 2300 MHz . The passband frequency range may be narrowed to 1850 to 1990 MHz to optimize performance or significantly reduce cost.
2. Passive intermodulation distortion shall be measured utilizing a mutually acceptable industry standard (two test tones at +43 dBm). Carrier frequency separation shall be set the minimum. The intermodulation products shall be measured at the RF/DC connector. The intermodulation products shall be measured relative to the individual test tone carrier power levels at the RF/DC connector.
3. RF shielding shall be measured with a quarter-wave stub positioned 1.0 cm from the unit at any location. RF shielding shall be measured over the operational frequency range. The level of RF shielding shall be relative the RF input power present at the RF connector. RF shielding shall be measured with the maximum RF input power level present at the RF connector.
4. Power handling shall be tested at maximum output load VSWR, maximum temperature, and maximum altitude. Crest factor of TDMA-modulated carrier shall be 4 dB. Unit shall be able to handle the instantaneous peak power levels created by 4 TDMA carriers applied simultaneously, at 25W/carrier average power, into the RF connector.
5. The unit shall be designed for no-load operation. The unit shall incur no damage nor oscillation with any load presented at either input or output or both, including opens or shorts. The unit shall be unconditionally stable.
6. Total passband path loss shall include the effects of frequency sensitivity (flatness), temperature sensitivity and nominal insertion loss deviation. Total passband path loss shall be measured over the specified temperature and frequency limits.

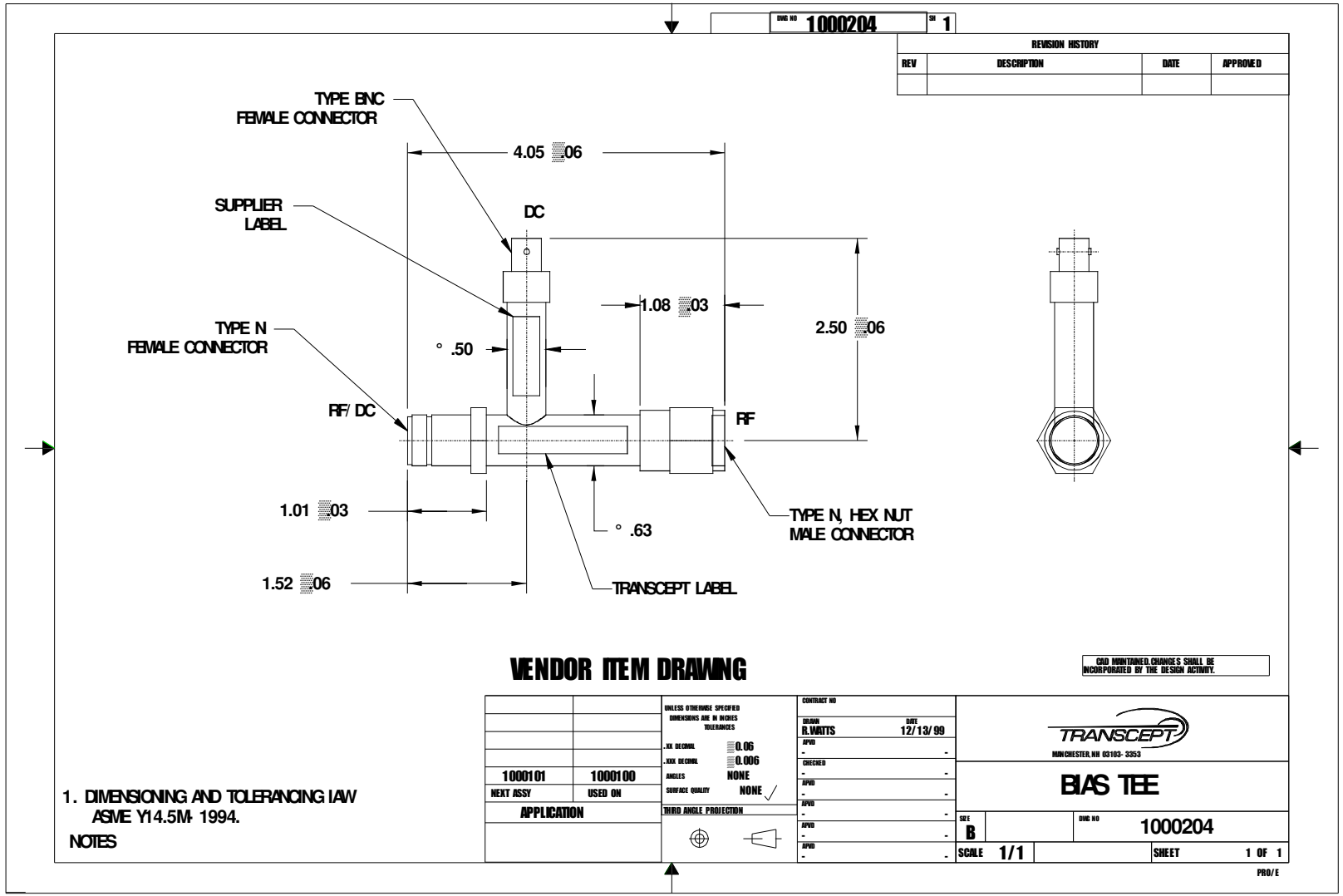


Figure 1. Physical Outline Drawing

SIZE	DWG NO	REV
A	1000204	C
SCALE NONE		
	SHEET 10 of 11	

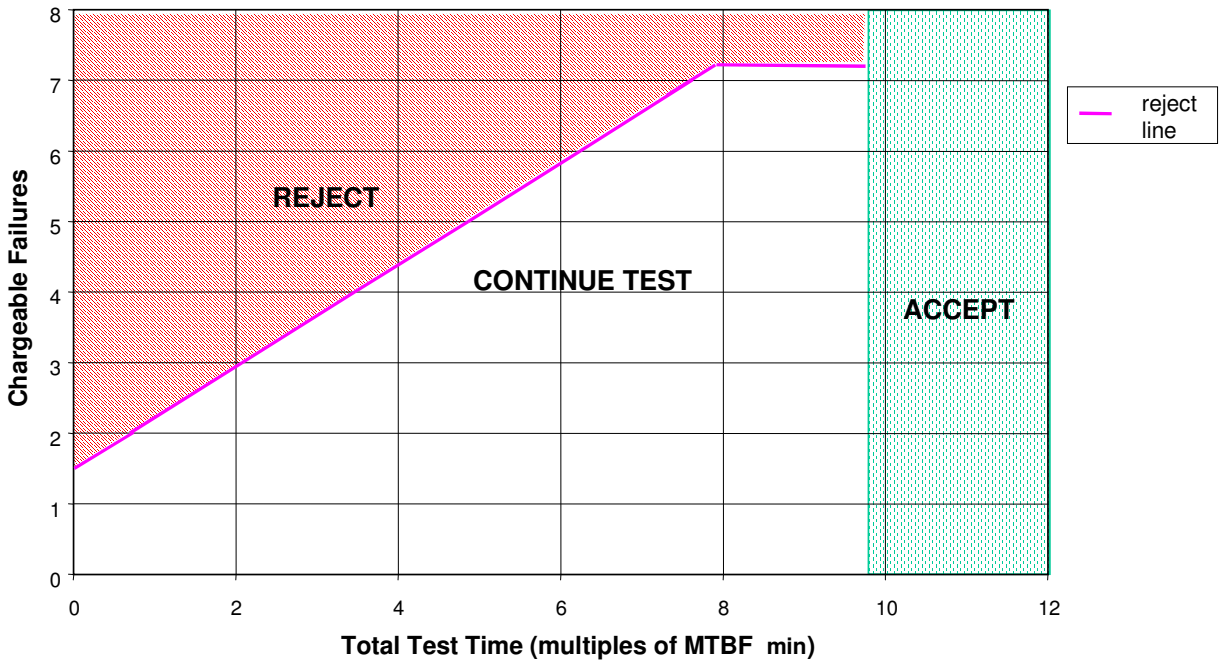


Figure 2. Field Reliability MTBF Test

Table II. Accept-Reject Criteria for Field Reliability

Chargeable Failures	Decide at t ≥
0	n/a
1	n/a
2	0.7
3	2.08
4	3.46
5	4.86
6	6.24
7	7.62
8	9.74