TÜV Rheinland

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THE ATTACHED

TEST REPORT NO.

NET2/091301/99

Registered under: L004F001

for *Linear Technology,* **LTC 1544 / LTC 1546 Chipset**

consists of

Cover Sheet	1 page
NET Test Report (NTR)	60 pages
Annex A Diagram	4 pages
Total	65 pages

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NET TEST REPORT

for

equipment tested against the requirements
specified in
EUROPEAN TELECOMMUNICATION STANDARDS
NET 1 (Layer 1), NET 2 (Layer 1)

NTR Number:
NET2/091301/99

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1 IDENTIFICATION SUMMARY

1.1 NET TEST REPORT (NTR)

NTR Number : **NET2/091301/99**
NTR Date : **September 13, 1999**

Laboratory Manager:

September 27, 1999	**NET2**	**David A. Freemore**	
Date	Section	Name	Signature

1.2 Test Laboratory

TUV Telecom Services, Inc,
1775 Old Highway 8 NW, Suite 107
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1.3 Limits and Reservations

This test report satisfies European Standard EN 45001. The test results in this test report apply only to the particular System Under Test (SUT) and component Items Under Test (IUTs) declared in this test report.

1.4 Client Information

Name : **Linear Technology Corporation**
Street : **1630 McCarthy Blvd.**
City : **Milpitas, CA 95035**
Country : **USA**
Phone : **+1 (408) 954-8400**
Fax : **+1 (408) 434-0507**

Contact Person : **Dan Eddleman**
Phone : **+1 (408) 954-8400 ext. 3891**
Fax : **+1 (408) 434-0507**

1.5 Dates

Date of receipt of SUT : **August 31, 1999**
Date of Test : **September 13, 1999**

1.6 Description of System under Test (SUT)

Name of Supplier : **Linear Technology Corporation**
Street : **1630 McCarthy Blvd.**
City : **Milpitas, CA 95035**
Country : **USA**
Phone : **+1 (408) 954-8400**
Fax : **+1 (408) 434-0507**

Description of SUT:

The LTC 1544/ LTC 1546 Chipset will support X.21, V.35, V.24, and V.36 interfaces.

1.6.1 IUT (Item Under Test) Identification

Name	**LTC 1544 / LTC 1546 Chipset**
Version/Model	--
Part No.	--
Serial No.	--
Hardware Configuration for testing (PC, Bus System, Clock etc.)	**Linear Technology LTC1544/LTC1546 mounted on Multiprotocol Transceiver Demo Circuit DC196A**
Operating System	--
Version No.	--
Communication Software	--
Version No.	--
Software handling layer 2 and 3	--
Version No.	--

1.7 Nature of Conformance Testing

The purpose of Conformance Testing is to increase the probability that different implementations can interwork. However, the complexity of OSI protocols makes exhaustive testing impractical on both technical and economic grounds. Furthermore, there is no guarantee that an IUT which has passed all the relevant tests conforms to a specification. Neither there is any guarantee that such an IUT will interwork with other real open systems. Rather, the passing of the tests gives confidence that the IUT has the stated capabilities and that its behaviour conforms consistently in representative instances of communication.

1.8 Implemented physical capabilities

1.8.1 CCITT Recommendation X.21/X.27 Interface

15-pin DTE/DCE interface ISO 4903

Implemented Yes (X) No ( )

Tested Yes (X) No ( )

Interface board	**LTC 1544 / LTC 1546**		
minimum speed (bit/s)	--		
maximum speed (bit/s)	**8 Mbit/s**		
V.11 Transmitter	**LTC 1544 / LTC 1546**		
V.11 Receivers	**LTC 1544 / LTC 1546**		
Connector type	--		
Cable, name or part No.	--		
Length	--	shielded	unshielded

supported
X.27 (V.11)

T(A) (X)
C(A) (X)
R(A) (X)
I(A) (X)
S(A) (X)
B(A) (X)
G (X)
T(B) (X)
C(B) (X)
R(B) (X)
I(B) (X)
S(B) (X)
B(B) (X)
Reserved for future international use

1.8.2 CCITT Recommendation V.24/V.28 (RS232) Interface

25-pin DTE/DCE interface ISO 2110

Implemented Yes (X) No ( )

Tested Yes (X) No ( )

Interface board	LTC 1544 / LTC 1546		
minimum speed (bit/s)	--		
maximum speed (bit/s)	19.2 kbit/s		
V.28 Transmitter	LTC 1544 / LTC 1546		
V.28 Receivers	LTC 1544 / LTC 1546		
Connector type	--		
Cable, name or part No.	--		
Length	--	shielded	unshielded

CCITT circuit No.	supported	
102	(X)	
103	(X)	
104	(X)	
105	(X)	
106	(X)	
107	(X)	
108	(X)	
109	(X)	
111	(X)	
112	(X)	
113	(X)	Circuit supported but not tested
114	(X)	
115	(X)	
125	(X)	
140	( )	
141	(X)	
142	( )	

1.8.3 CCITT Recommendation V.35 Interface

34-pin DTE/DCE interface ISO 2593

Implemented Yes (X) No ( )
Tested Yes (X) No ( )

Interface board	**LTC 1544 / LTC 1546**		
minimum speed (bit/s)	--		
maximum speed (bit/s)	**640 kbit/s**		
V.35 Transmitter	**LTC 1546**		
V.35 Receivers	**LTC 1546**		
V.11 Transmitter	--		
V.11 Receivers	--		
V.28 Transmitter	**LTC 1544**		
V.28 Receivers	**LTC 1544**		
Connector type	--		
Cable, name or part No.	--		
Length	--	shielded	unshielded

CCITT circuit No.	Electrical characteristics		supported	
102a			( )	
102			(X)	
103	V.35 (X)	V.11 ( )	(X)	
104	V.35 (X)	V.11 ( )	(X)	
105	V.28 (X)	V.10 ( )	(X)	
106	V.28 (X)	V.10 ( )	(X)	
107	V.28 (X)	V.10 ( )	(X)	
108	V.28 (X)	V.10 ( )	(X)	
109	V.28 (X)	V.10 ( )	(X)	
113	V.35 (X)	V.11 ( )	(X)	Circuit supported but not tested
114	V.35 (X)	V.11 ( )	(X)	
115	V.35 (X)	V.11 ( )	(X)	
125	V.28 (X)	V.10 ( )	(X)	
140	V.28 ( )	V.10 ( )	( )	
141	V.28 (X)	V.10 ( )	(X)	
142	V.28 ( )	V.10 ( )	( )	

1.8.4 CCITT Recommendation V.36 (RS449) Interface

37-pin DTE/DCE interface ISO 4902

Implemented Yes (X) No ( )
Tested Yes (X) No ( )

Interface board	LTC 1544 / LTC 1546		
minimum speed (bit/s)	--		
maximum speed (bit/s)	8 Mbit/s		
V.11 Transmitter	LTC 1544 / LTC 1546		
V.11 Receivers	LTC 1544 / LTC 1546		
V.10 Transmitter	LTC 1544		
V.10 Receivers	--		
Connector type	--		
Cable, name or part No.	--		
Length	--	shielded	unshielded

CCITT circuit No.	Electrical characteristics		supported	
102			( )	
102a			( )	
102b			( )	
103	V.11 (X)		(X)	
104	V.11 (X)		(X)	
105	V.11 (X)	V.10 ( )	(X)	
106	V.11 (X)	V.10 ( )	(X)	
107	V.11 (X)		(X)	
108	V.11 (X)	V.10 ( )	(X)	
109	V.11 (X)		(X)	
113	V.11 (X)		(X)	Circuit supported but not tested
114	V.11 (X)		(X)	
115	V.11 (X)		(X)	
125	V.10 (X)		(X)	
128	V.11 (X)		(X)	
133	V.10 (X)		(X)	
140	V.10 ( )		( )	
141	V.10 (X)		(X)	
142	V.10 ( )		( )	

2 Test Conditions

2.1 Environmental Conditions

Temperature	: In the range of 15° to 35°	(√) Yes	( )No
Relative humidity	: In the range of 25% to 75%	(√) Yes	( )No
Air pressure	: In the range of 86 to 106 kPa	(√) Yes	( )No

2.2 Power Supply Limitations

All tests were carried out within +/- 5% of the normal operating voltage

2.3 Abstract Test Suites (ATS)

NET 1, second edition 1994
NET 2, second edition 1994

2.4 Test Equipment

Equipment used for measurements of layer 1, NET 1 and NET 2

	Serial-No.	Last Calibration
- Schnittstellen-Messbox VX	V0009	June '99
- Digital Multimeter HP 34401A	3146A25410	Dec '98
- Digital Multimeter HP 34401A	3146A34621	Dec '98
- Power Supply HP6235A	2450A08776	
- Oscilloscope HP 54520A	3415A00472	Dec '98
- Frequence Generator HP 33120A	US34014718	Dec '98
- Capacitance/Resistance Decade RCS-500	A0010	May '99

The TUV Telecom Services, test equipment is in the tolerance of the requirements of NET 1, 5.4.3 and NET 2, 7.2.3. Compliance is regularly checked by TUV Telecom Services,.

3 System Conformance Test Report Summary

This IUT has not been shown by conformance assessment to be non-conforming to the specified standard.
Exclusion: the SUT/IUT did not provide means of connection, see note 1.
Note 1: The SUT was an evaluation board, the measurements were taken at the board test points.

The tables in this section indicate for each test both the test case selection that was performed by the test laboratory and the results of testing. The tables are set up as followed below. Notes on the information that the test laboratory shall complete in the columns are profited below, and referenced as *n)*.

ATS-Reference	Selected	Run	Verdict	Observation
a)	b)	c)	d)	e)

a) Reference to the abstract test case of the ATS standard.

b) Indicates whether or not the test was selected according to the PICS and PIXIT.

c) Indicates whether or not the test did run to completion.

d) Indicates the verdicts as assigned during the test campaign.

Possible verdicts:

-PASS : The test purpose according to the ATS is achieved, test did run as defined in ETS to completion.

-INCONCLUSIVE : The test purpose according to the ATS is not achieved, test did run not as defined in ETS to completion.

-FAIL : The test purpose according to the ATS is not achieved

e) Indicates a reference to any observations made in section 8 of this test report.

3.1 Parameterized Executable Test Suite (PETS), Layer 1

The selection of the tests is limited by the implemented capabilities.

3.1.1 Clause X.21/V.11

NET 1 Clause	Selected	Run	Verdict	Observation
8.1.1.2, CCITT V.11, 5.2	yes	yes	pass	
8.1.1.2, CCITT V.11, 5.3	yes	yes	pass	
8.1.1.2.2a	yes	yes	pass	
8.1.1.2.2b	yes	yes	pass	
8.1.1.2.2c	no			
8.1.2	no			Note 1
8.1.3	no			

3.1.2 Clause V.24/V.28

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.1.1	no			Note 1
8.2.1.2	no			
8.2.2.1, Annex A, Table A-1	no			Note 1
8.2.4.1, Annex B.1.1	yes	yes	pass	
8.2.4.1, Annex B.1.2	yes	yes	pass	
8.2.4.1, Annex B.1.3	yes	yes	pass	
8.2.4.1, Annex B.1.4	yes	yes	pass	
8.2.4.1, Annex B.1.5	yes	yes	pass	
8.2.4.1, Annex B.1.6	yes	yes	pass	
8.2.4.1, Annex B.2.1	yes	yes	pass	

8.2.4.1, Annex B.2.2	yes	yes	pass	
8.2.4.1, Annex B.2.3	yes	yes	pass	
8.2.4.1, Annex B.2.4	yes	yes	pass	
8.2.4.1, Annex B.3.1	yes	yes	pass	
8.2.4.1, Annex B.3.2	no			
8.2.4.1, Annex B.3.3	yes	yes	pass	
8.2.4.1, Annex B.3.4	yes	yes	pass	
8.2.4.1, Annex B.4	yes	yes	pass	
8.2.4.1, Annex B.5	yes	yes	pass	
8.2.4.1, Annex B.7	no			

3.1.3 Clause V.35

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.1.1	no			Note 1
8.2.1.2	no			
8.2.2.2, Annex A, Table A-2	no			Note 1
8.2.4.2, Annex C.1.1	yes	yes	pass	
8.2.4.2, Annex C.1.2	yes	yes	pass	
8.2.4.2, Annex C.1.3	yes	yes	pass	
8.2.4.2, Annex C.1.4	yes	yes	pass	
8.2.4.2, Annex C.2	no			Note 1
8.2.4.2, Annex C.3.1	yes	yes	pass	
8.2.4.2, Annex C.3.2	yes	yes	pass	
8.2.4.2, Annex C.4	yes	yes	pass	
8.2.4.1, Annex B.1.2	yes	yes	pass	
8.2.4.1, Annex B.1.3	yes	yes	pass	
8.2.4.1, Annex B.1.4	yes	yes	pass	
8.2.4.1, Annex B.1.5	yes	yes	pass	
8.2.4.1, Annex B.2.1	yes	yes	pass	
8.2.4.1, Annex B.2.2	yes	yes	pass	
8.2.4.1, Annex B.4	yes	yes	pass	
8.2.4.1, Annex B.5	yes	yes	pass	

3.1.4 Clause V.36/V.10

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.2.3, Annex A, Table A-3	no			Note 1
8.2.4.4, CCITT V.10, 5.2.1	yes	yes	pass	
8.2.4.4, CCITT V.10, 5.2.2	yes	yes	pass	
8.2.4.4, CCITT V.10, 5.2.3	yes	yes	pass	
NET 1 8.1.1.1.2	no			

3.1.5 Clause V.36/V.11

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.1.1	no			Note 1
8.2.1.2	no			
8.2.2.3, Annex A, Table A-3	no			Note 1
8.2.4.5, CCITT V.11, 5.2	yes	yes	pass	
8.2.4.5, CCITT V.11, 5.3	yes	yes	pass	
NET 1 8.1.1.2.2a	yes	yes	pass	
NET 1 8.1.1.2.2b	yes	yes	pass	
NET 1 8.1.1.2.2c	no			

4 Test Report Physical Layer

4.1 Test Report X.21/V.11

The following tests are performed based on the IUT operating as a DTE.

4.1.1 Basic Interconnection Test

NET 1 Clause	Selected	Run	Verdict	Observation
8.1.2	no			

4.1.2 Generator Characteristics

4.1.2.1 Open Circuit Measurement (V.11, 5.2.1)

A - B terminated with 3.9 kOhms

4.1.2.1.1 Circuit T

Description	Limits	Results	Verdict	Observation
A - B	Vo ≤ 6.0V	-4.87 V	pass	
A - C	Voa ≤ 6.0V	-4.93 V	pass	
B - C	Vob ≤ 6.0V	-0.06 V	pass	

4.1.2.1.2 Circuit C

Description	Limits	Results	Verdict	Observation
A - B	Vo ≤ 6.0V	-4.87 V	pass	
A - C	Voa ≤ 6.0V	-4.93 V	pass	
B - C	Vob ≤ 6.0V	-0.06 V	pass	

4.1.2.2 Test Termination Measurement (V.11, 5.2.2)

Generator terminated with 2 x 50 Ohms

4.1.2.2.1 Circuit C (pin 3 and 10)

A binary state 1

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	-2.93 V	pass	
	Vos ≤ 3.0V	1.32 V	pass	

4.1.2.2.2 Circuit T (pin 2 and 9)

A binary state 1

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	-2.75 V	pass	
	Vos ≤ 3.0V	1.29 V	pass	

B binary state 2

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	2.81 V	pass	
	Vt1-Vt2 ≤ 0.4V	0.06 V	pass	
	Vos ≤ 3.0V	1.22 V	pass	
	Vos1-Vos2 ≤ 0.4V	0.07 V	pass	

4.1.2.3 Short Circuit Measurement (V.11, 5.2.3)

4.1.2.3.1 Circuit T

Description	Limits	Results	Verdict	Observation
A - C	Isa ≤ 150 mA	93 mA	pass	
B - C	Isb ≤ 150 mA	-0.21 mA	pass	

4.1.2.3.2 Circuit C

Description	Limits	Results	Verdict	Observation
A - C	Isa ≤ 150 mA	99 mA	pass	
B - C	Isb ≤ 150 mA	-0.25 mA	pass	

4.1.2.4 Power-off Measurement (V.11, 5.2.4)

Power-off applied voltage ±0.25V

4.1.2.4.1 Circuit T

Description	Limits	Results	Verdict	Observation
+0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
+0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	

4.1.2.4.2 Circuit C

Description	Limits	Results	Verdict	Observation
+0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
+0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	

4.1.3 Receiver Characteristics (V.11, 6.1)

4.1.3.1 Circuit R

The receiver *is* terminated with an optional cable resistance.

Limits according to NET 1, Revision 1, Figure 1

Description	Limits	Results	Verdict	Observation
Via = 6V	I ≤ 60.75 mA	55 mA	pass	
Via = 3V	I ≤ 30.75 mA	27 mA	pass	
Via = 1V	-0.5 ≤ I ≤ 10.75 mA	9.9 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -6V	I ≤ 60.75 mA	-55 mA	pass	
Via = -3V	I ≤ 30.75 mA	-26 mA	pass	
Via = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.9 mA	pass	
Vib = 6V	I ≤ 60.75 mA	55mA	pass	
Vib = 3V	I ≤ 30.75 mA	27 mA	pass	
Vib = 1V	-0.5 ≤ I ≤ 10.75 mA	9.9 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0001 mA	pass	
Vib = -6V	I ≤ 60.75 mA	-55 mA	pass	
Vib = -3V	I ≤ 30.75 mA	-26 mA	pass	
Vib = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.9 mA	pass	

4.1.3.2 Circuit I

The receiver *is not* terminated with an optional cable resistance.

Limits according to CCITT Recommendation V.11, Figure 6

Description	Limits	Results	Verdict	Observation
Via = 10V	I ≤ 3.25 mA	0.17 mA	pass	
Via = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -10V	I ≤ 3.25 mA	-0.17 mA	pass	
Via = -3V	I ≤ 1.5 mA	-0.05 mA	pass	
Vib = 10V	I ≤ 3.25 mA	0.17 mA	pass	
Vib = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0002 mA	pass	
Vib = -10V	I ≤ 3.25 mA	-0.17 mA	pass	
Vib = -3V	I ≤ 1.5 mA	-0.05 mA	pass	

4.1.3.3 Circuit S

The receiver *is* terminated with an optional cable resistance.

Limits according to NET 1, Revision 1, Figure 1

Description	Limits	Results	Verdict	Observation
Via = 6V	I ≤ 60.75 mA	52 mA	pass	
Via = 3V	I ≤ 30.75 mA	26 mA	pass	
Via = 1V	-0.5 ≤ I ≤ 10.75 mA	9.2 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0002 mA	pass	
Via = -6V	I ≤ 60.75 mA	-52 mA	pass	
Via = -3V	I ≤ 30.75 mA	-26 mA	pass	
Via = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.2 mA	pass	
Vib = 6V	I ≤ 60.75 mA	52 mA	pass	
Vib = 3V	I ≤ 30.75 mA	26 mA	pass	
Vib = 1V	-0.5 ≤ I ≤ 10.75 mA	9.2 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0002 mA	pass	
Vib = -6V	I ≤ 60.75 mA	-52 mA	pass	
Vib = -3V	I ≤ 30.75 mA	-26 mA	pass	
Vib = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.2 mA	pass	

4.1.3.4 Circuit B

The receiver *is* terminated with an optional cable resistance.

Limits according to NET 1, Revision 1, Figure 1

Description	Limits	Results	Verdict	Observation
Via = 6V	I ≤ 60.75 mA	52 mA	pass	
Via = 3V	I ≤ 30.75 mA	26 mA	pass	
Via = 1V	-0.5 ≤ I ≤ 10.75 mA	9.2 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0002 mA	pass	
Via = -6V	I ≤ 60.75 mA	-52 mA	pass	
Via = -3V	I ≤ 30.75 mA	-26 mA	pass	
Via = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.2 mA	pass	
Vib = 6V	I ≤ 60.75 mA	52 mA	pass	
Vib = 3V	I ≤ 30.75 mA	26 mA	pass	
Vib = 1V	-0.5 ≤ I ≤ 10.75 mA	9.2 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0002 mA	pass	
Vib = -6V	I ≤ 60.75 mA	-52 mA	pass	
Vib = -3V	I ≤ 30.75 mA	-26 mA	pass	
Vib = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.2 mA	pass	

Figure 0-1

Circuit T (pin 2 and 9)

Test Termination Measurement (V.11, 5.2.2)

Vt shall be ≥ 2.0 V or ≥ 50% of Vo whichever is greater

Vt1 - Vt2 shall be ≤ 0.4 V

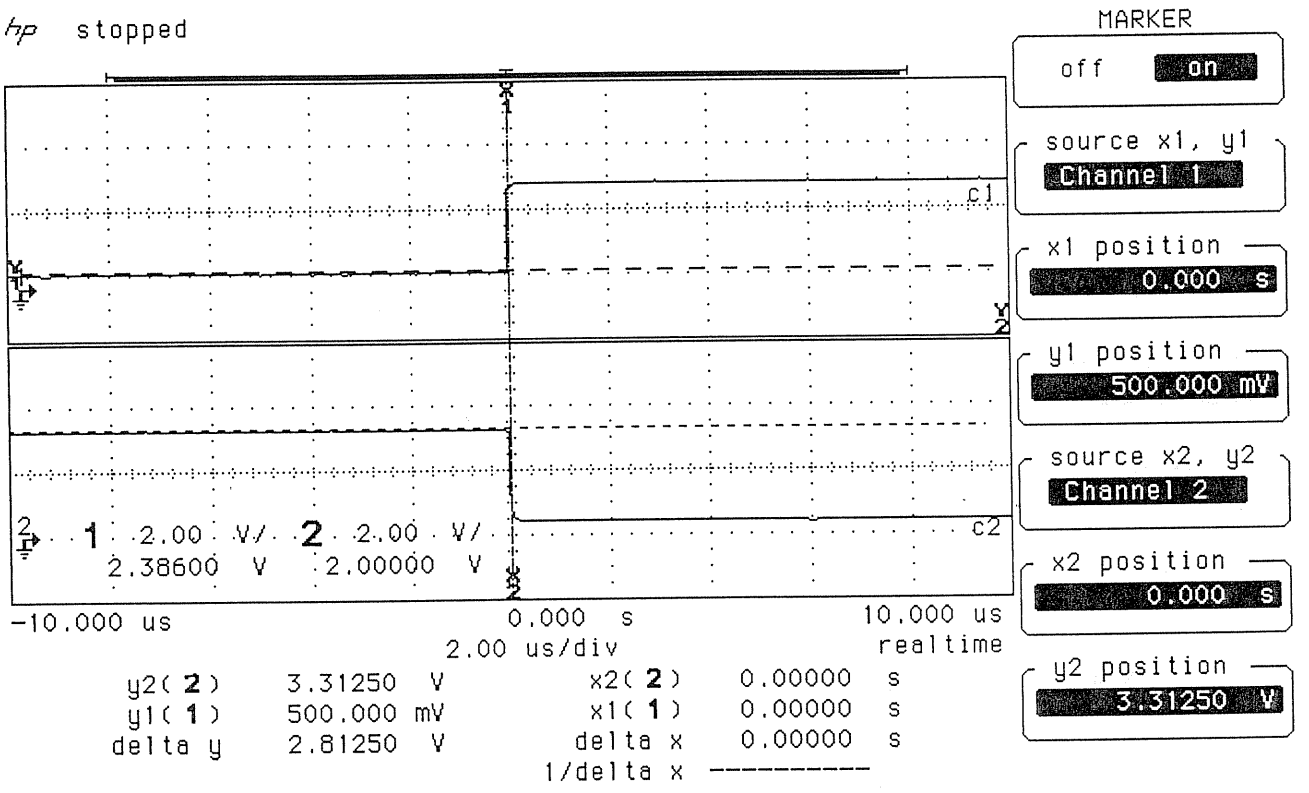

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Figure 0-2

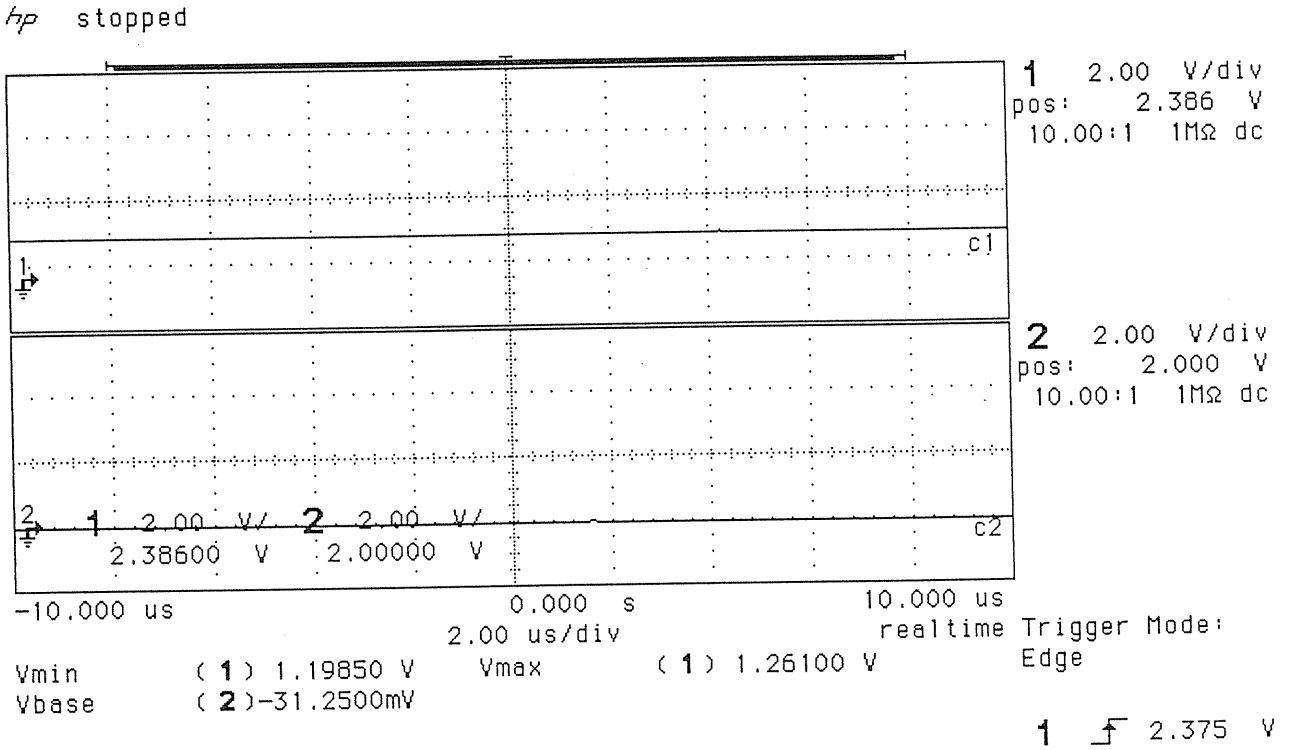
Circuit T (pin 2 and 9)

Test Termination Measurement (V.11, 5.2.2)

Generator offset voltage Vos

Vos binary state 1 and binary state 2 ≤ 3.0 V

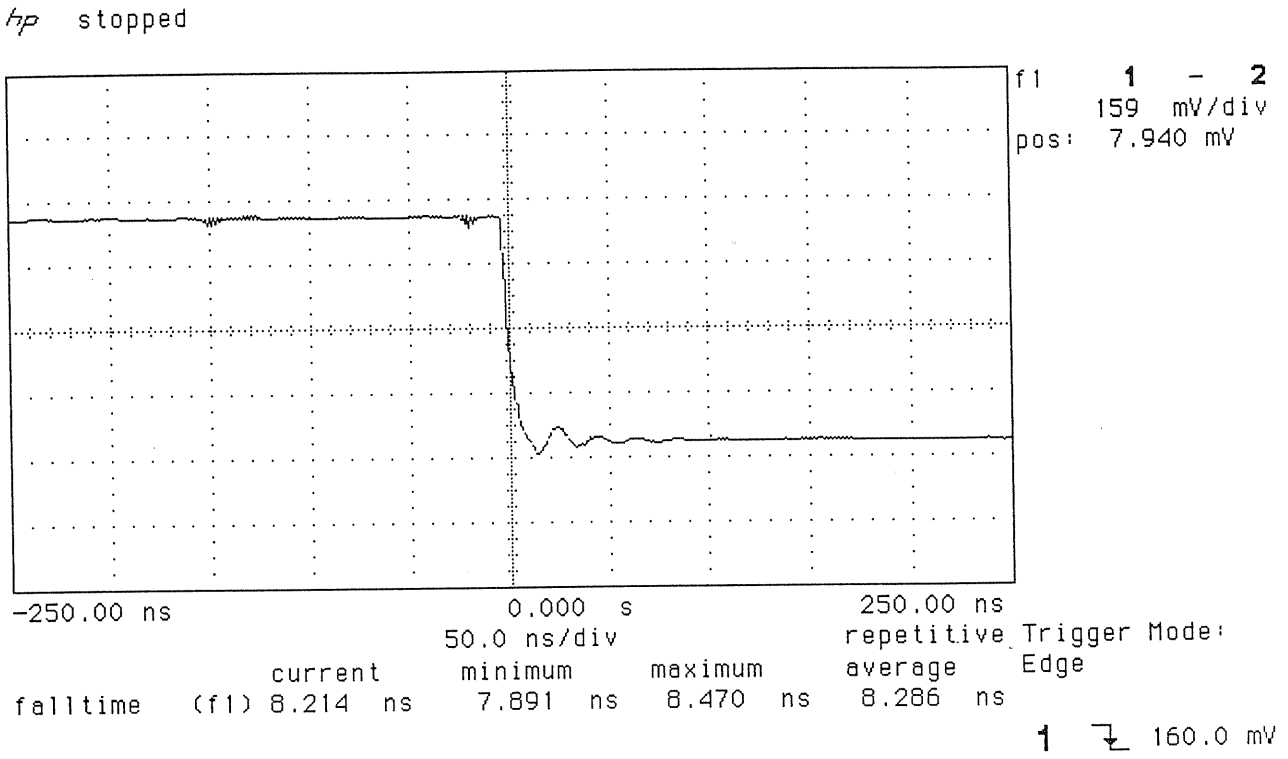
Vos1 - Vos2 shall be ≤ 0.4 V



4.1.4 Dynamic Rise Time Measurement (V.11, 5.3)

Figure O-3

Circuit T (pin 2 and 9)



20ns ≥ t or t ≤ 0.1tb

Verdict : Pass

4.2 Test Report V.24/V.28

The following tests are performed based on the IUT operating as a DTE.

4.2.1 Basic Interconnection Test

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.2.1	no			

4.2.2 Generator Characteristics

4.2.2.1 Protection against short circuit conditions (Annex B.1.1)

Circuit	Limits	Results	Verdict	Observation
103	no damage	no damage	pass	
105	no damage	no damage	pass	
108	no damage	no damage	pass	
141	no damage	no damage	pass	

4.2.2.2 Generator Output Current Limit (Annex B.1.2)

Circuit	Limits	Results	Verdict	Observation
103	I ≤ 0.5A	24 mA	pass	
105	I ≤ 0.5A	28 mA	pass	
108	I ≤ 0.5A	28 mA	pass	
141	I ≤ 0.5A	88 mA	pass	

4.2.2.3 Generator Output Voltage open circuit (Annex B.1.3)

Circuit	Limits	Results	Verdict	Observation
103	U ≤ 25V	9.35 V	pass	
105	U ≤ 25V	9.35 V	pass	
108	U ≤ 25V	9.35 V	pass	
141	U ≤ 25V	8.99 V	pass	

4.2.2.4 Generator Output Voltage limit under maximum load (Annex B.1.4)

Circuit	Limits	Results	Verdict	Observation
103 Binary 1	U ≥ 5V	8.46 V	pass	
105	U ≥ 5V	8.53 V	pass	
108	U ≥ 5V	8.53 V	pass	
141	U ≥ 5V	8.28 V	pass	
103 Binary 2	U ≥ 5V	-8.66 V	pass	TBR2 reqmt
105	U ≥ 5V	-8.89 V	pass	TBR2 reqmt
108	U ≥ 5V	-8.89 V	pass	TBR2 reqmt
141	U ≥ 5V	-8.75 V	pass	TBR2 reqmt

4.2.2.5 Generator Output Voltage limit under minimum load (Annex B.1.5)

Circuit	Limits	Results	Verdict	Observation
103	U ≤ 15V	8.94 V	pass	
105	U ≤ 15V	8.97 V	pass	
108	U ≤ 15V	8.97 V	pass	
141	U ≤ 15V	-8.83 V	pass	

4.2.2.6 Generator Output Power (Annex B.1.6)

(x) o.k. - see test Annex B.3.1 b

4.2.3 Load Characteristics

4.2.3.1 Load Resistance Conditions (Annex B.2.1)

Measurement with 3V applied

Circuit	Limits	Results	Verdict	Observation
104	3 kΩ ≤ R ≤ 7 kΩ	4070 Ω	pass	
106	3 kΩ ≤ R ≤ 7 kΩ	4893 Ω	pass	
107	3 kΩ ≤ R ≤ 7 kΩ	4918 Ω	pass	
109	3 kΩ ≤ R ≤ 7 kΩ	4950 Ω	pass	
114	3 kΩ ≤ R ≤ 7 kΩ	4893 Ω	pass	
115	3 kΩ ≤ R ≤ 7 kΩ	4037 Ω	pass	

Measurement with 15V applied

Circuit	Limits	Results	Verdict	Observation
104	3 kΩ ≤ R ≤ 7 kΩ	4065 Ω	pass	
106	3 kΩ ≤ R ≤ 7 kΩ	4885 Ω	pass	
107	3 kΩ ≤ R ≤ 7 kΩ	4901 Ω	pass	
109	3 kΩ ≤ R ≤ 7 kΩ	4531 Ω	pass	
114	3 kΩ ≤ R ≤ 7 kΩ	4213 Ω	pass	
115	3 kΩ ≤ R ≤ 7 kΩ	4032 Ω	pass	

4.2.3.2 Maximum Load open circuit voltage (Annex B.2.2)

Circuit	Limits	Results	Verdict	Observation
104	U ≤ 2V	0.029 V	pass	
106	U ≤ 2V	0.035 V	pass	
107	U ≤ 2V	0.017 V	pass	
109	U ≤ 2V	0.037 V	pass	
114	U ≤ 2V	0.029 V	pass	
115	U ≤ 2V	0.030 V	pass	

4.2.3.3 Maximum Load Shunt Capacitance (Annex B.2.3)

Circuit	Limits	Results	Verdict	Observation
104	C ≤ 2500pF	< 40 pF	pass	
114	C ≤ 2500pF	< 40 pF	pass	
115	C ≤ 2500pF	< 40 pF	pass	

4.2.3.4 Load Impedance (Annex B.2.4)

Circuit	Limits	Results	Verdict	Observation
104	capacitive	capacitive	pass	
114	capacitive	capacitive	pass	
115	capacitive	capacitive	pass	

4.2.4 Transition between significant signal states

4.2.4.1 Wave Form (Annex B.3.1)

Circuit	Limits	Results	Verdict	Observation
103 slope positive	monotone, no negative components	monotone, no negative components	pass	see figure O-4
103 slope negative	monotone, no negative components	monotone, no negative components	pass	see figure O-4

4.2.4.2 Maximum Transition Time on Control Interchange Circuits (Annex B.3.2)

Circuit	Limits	Results	Verdict	Observation
105		no test		
108		no test		

4.2.4.3 Maximum Transition Time on Data and Timing Interchange Circuits (Annex B.3.3)

Transmission speed: 19.2 kbit/s (3% Tb: 19.2 kbit/s = 1,56µs)

Test under consideration of NET 2, Annex B7

(X) B7 no : The generator was terminated with 3000 Ohms and 2500 pF

Circuit	Limits	Results	Verdict	Observation
103	t ≤ 3% Tb	851 ns	pass	see figure O-5, O-6

4.2.4.4 Maximum Instantaneous Rate of Voltage Change (Annex B.3.4)

Circuit	Limits	Results	Verdict	Observation
103	t ≥ 200ns	309 ns	pass	see figure O-7, O-8

Figure O-4

Reference V.28 Wave Form

Ch1 = Circuit 103

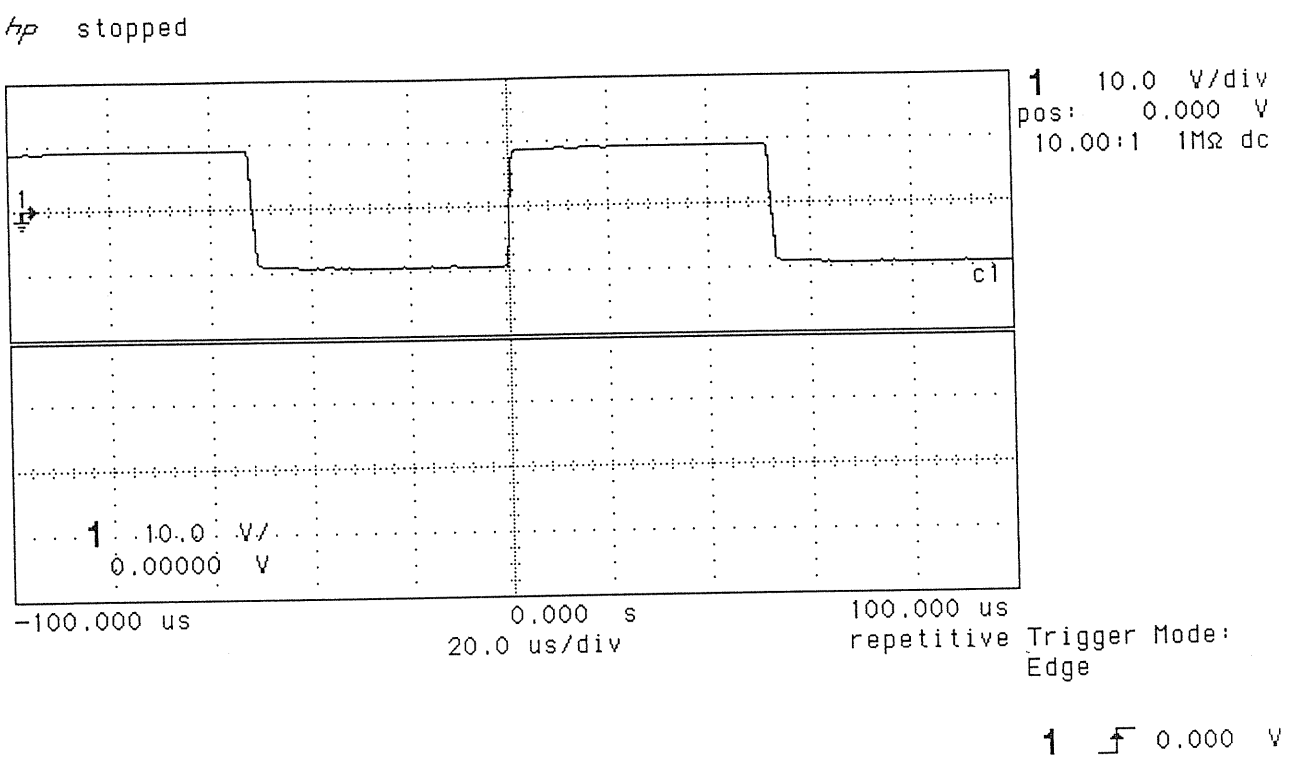


Figure O-5

Transition between significant signal states

Circuit = CCITT 103, Send Data
Load = see paragraph 4.4.3.3

SLOPE POSITIVE

Transition time shall be ≤ 3% of the nominal period

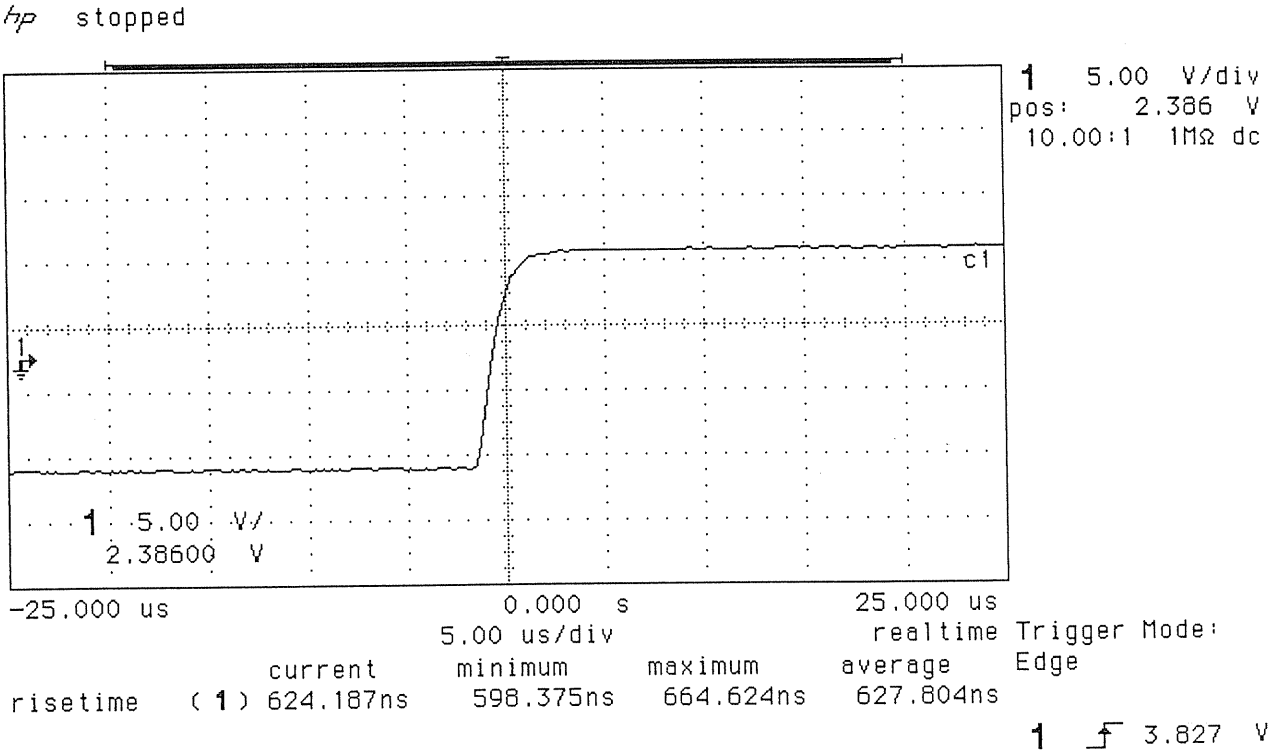


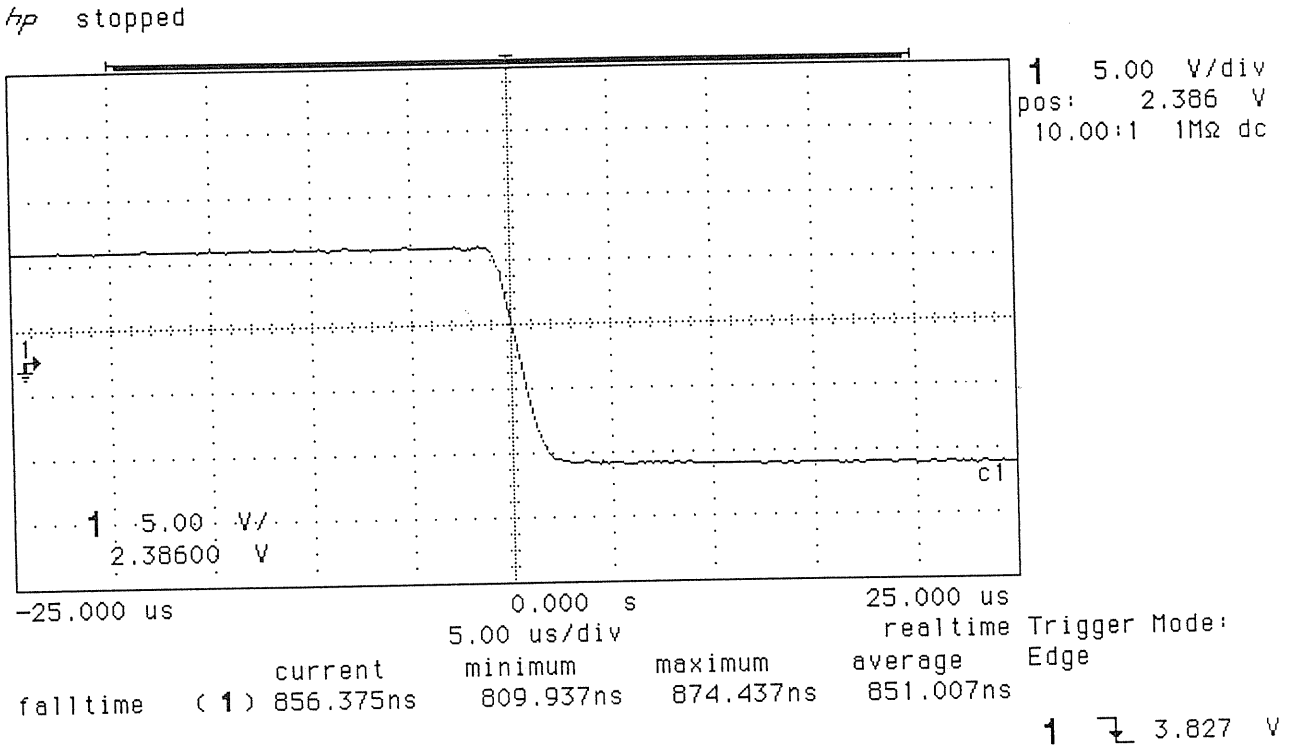
Figure O-6

Transition between significant signal states

Circuit = CCITT 103, Send Data
Load = see paragraph 4.4.3.3

SLOPE NEGATIVE

Transition time shall be ≤ 3% of the nominal period



TÜV Rheinland

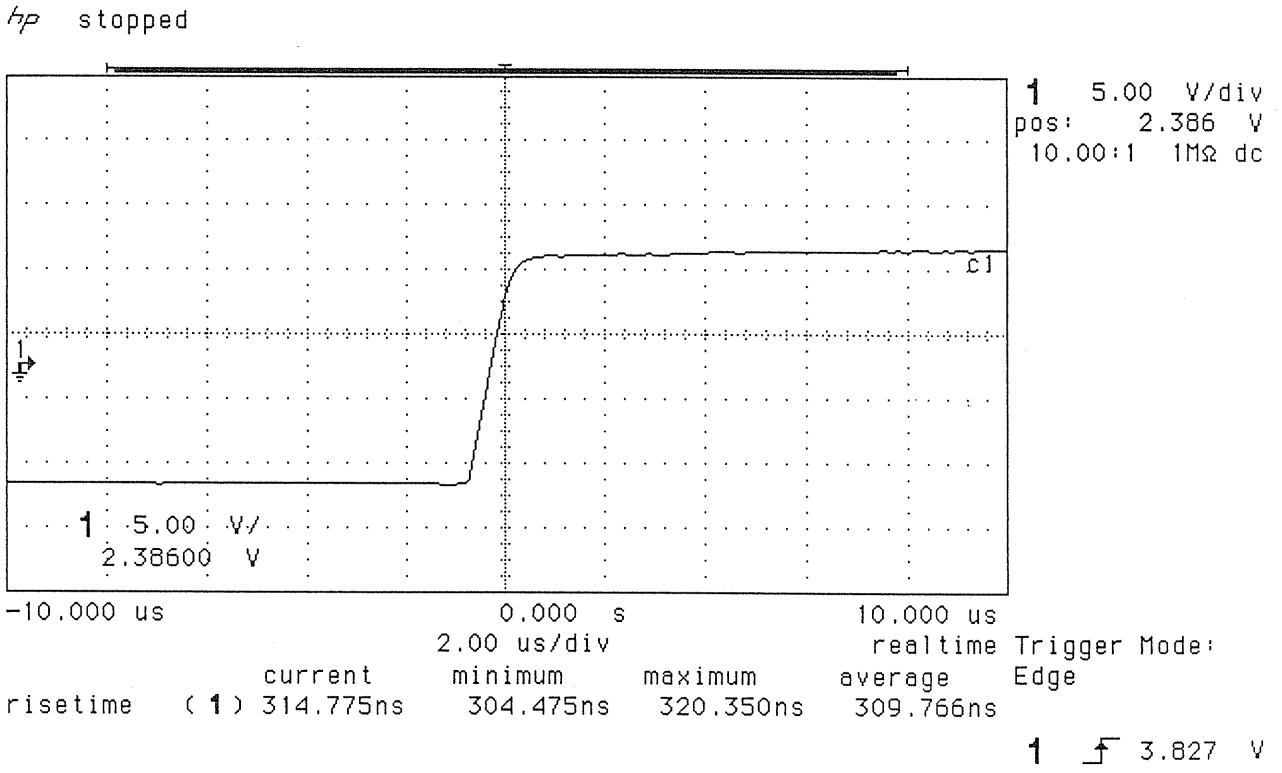
Figure O-7

Maximum Instantaneous Rate of Voltage Change

Circuit = CCITT 103, Send Data
Load = 7000 Ohms (purely resistive)

SLOPE POSITIVE

Rate of Voltage Change shall be ≥ 200ns (30V per µs = 6V per 200ns)



TÜV Rheinland

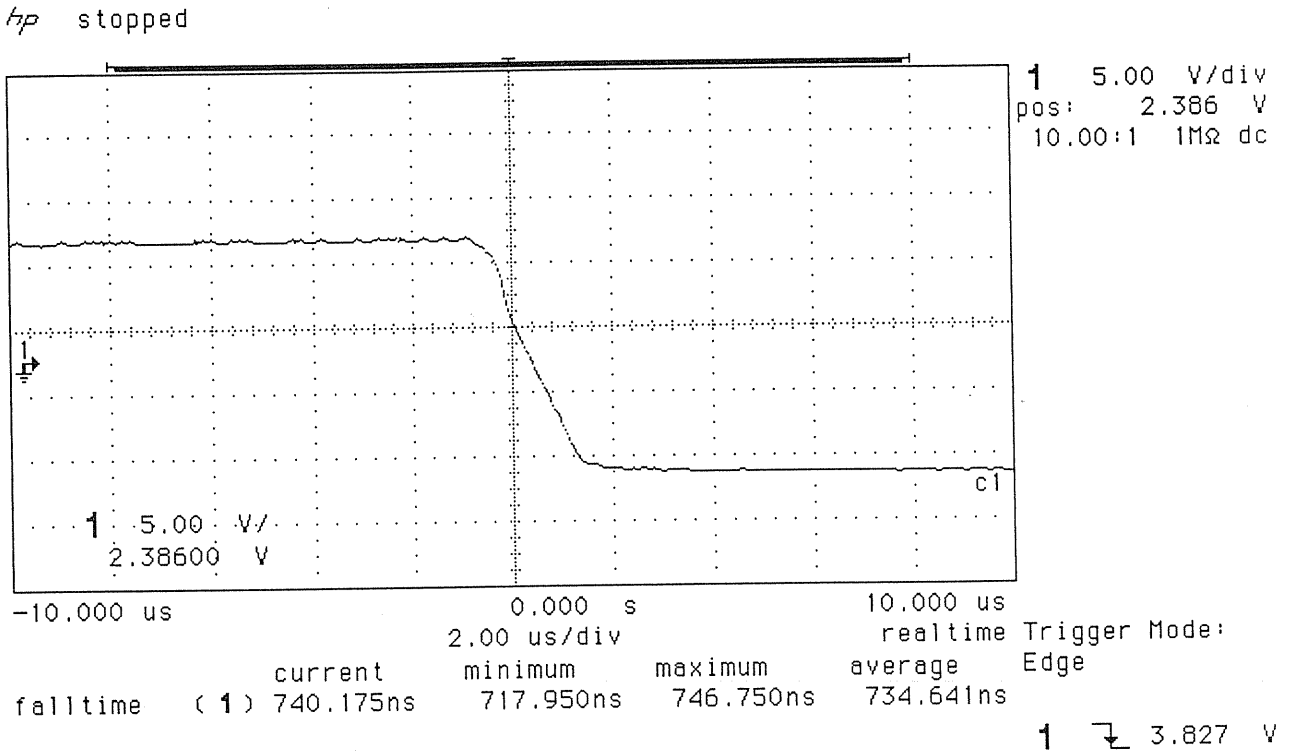
Figure O-8

Maximum Instantaneous Rate of Voltage Change

Circuit = CCITT 103, Send Data
Load = 7000 Ohms (purely resistive)

SLOPE NEGATIVE

Rate of Voltage Change shall be ≥ 200ns (30V per µs = 6V per 200ns)



4.2.5 Power off Measurement (Annex B.4)

Circuit	Limits	Results	Verdict	Observation
105	R ≥ 300Ω	∞ Ω	pass	
107	R ≥ 300Ω	∞ Ω	pass	
108	R ≥ 300Ω	∞ Ω	pass	

4.2.6 Short Circuit Test (Annex B.5)

A binary state 0

Connected to common return

Circuit	Limits	Results	Verdict	Observation
103	no damage	no damage	pass	
105	no damage	no damage	pass	
108	no damage	no damage	pass	

Connected to a load of 3000 Ohms where the open circuit voltage is -2V

Circuit	Limits	Results	Verdict	Observation
103	no damage	no damage	pass	
105	no damage	no damage	pass	
108	no damage	no damage	pass	

B binary state 1

Connected to common return

Circuit	Limits	Results	Verdict	Observation
103	no damage	no damage	pass	
105	no damage	no damage	pass	
108	no damage	no damage	pass	

Connected to a load of 3000 Ohms where the open circuit voltage is +2V

Circuit	Limits	Results	Verdict	Observation
103	no damage	no damage	pass	
105	no damage	no damage	pass	
108	no damage	no damage	pass	

4.2.7 Allowance for Capacitance of Connections Leads (Annex B.7)

Circuit	Limits	Results	Verdict	Observation
All Leads	C ≤ 2500pF	< 40 pF	pass	

4.3 Test Report V.35

The following tests are performed based on the IUT operating as a DTE.

4.3.1 Basic Interconnection Test

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.2.2	no			

4.3.2 Generator Characteristics

4.3.2.1 Source Impedance (Annex C.1.1)

Circuit	Limits	Results	Verdict	Observation
103	100 ± 50 Ω	92 Ω	pass	

4.3.2.2 Resistance A&B-C (Annex C.1.2)

Circuit	Limits	Results	Verdict	Observation
103 2V applied	150 ± 15 Ω	161 Ω	pass	
103 -2V applied	150 ± 15 Ω	158 Ω	pass	

Generator Open Circuit Output Voltage (TBR2 7, 6.1.1) A - B 3.9 Kohm

Circuit	Limits	Results	Verdict	Observation
103 A-B Binary 1	Vo ≤ 1.2 V	0.98 V	pass	TBR2 reqmt
103 A-C	Voa ≤ 1.2 V	0.54 V	pass	TBR2 reqmt
103 B-C	Vob ≤ 1.2 V	-0.44 V	pass	TBR2 reqmt
103 A-B Binary 2	Vo ≤ 1.2 V	-0.98 V	pass	TBR2 reqmt
103 A-C	Voa ≤ 1.2 V	-0.51 V	pass	TBR2 reqmt
103 B-C	Vob ≤ 1.2 V	0.47 V	pass	TBR2 reqmt

4.3.2.3 Test Termination Measurement (Annex C.1.3)

Circuit	Limits	Results	Verdict	Observation
103 P/S A to B Binary 1	0.55 ± 0.11V	0.52 V	pass	
103 P/S MP to gnd	Vos ≤ 0.6 V	0.008 V	pass	TBR2 reqmt
103 P/S A to B Binary 2	0.55 ± 0.11V	-0.52 V	pass	TBR2 reqmt
103 P/S MP to gnd	Vos ≤ 0.6 V	-0.002 V	pass	TBR2 reqmt

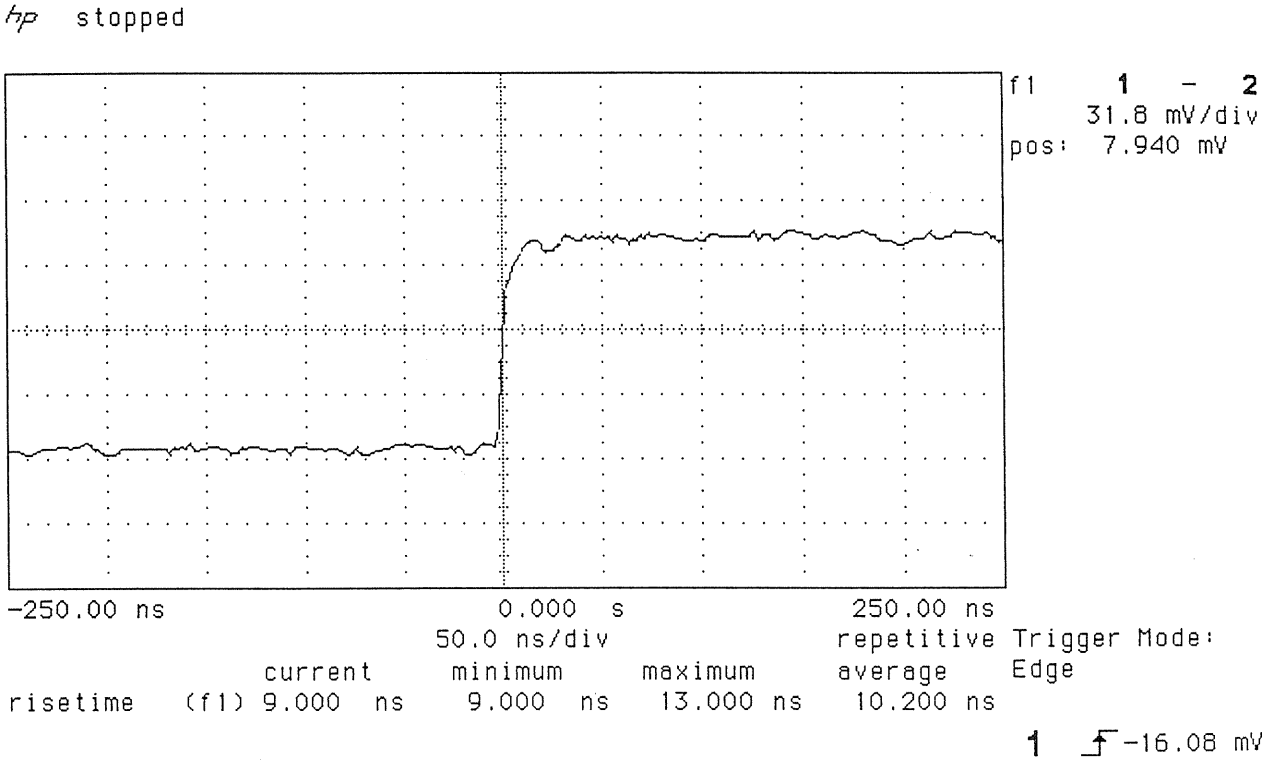
4.3.2.4 Measurement Rise/Fall Time (Annex C.1.4)

Circuit	Limits	Results	Verdict	Observation
103	0.01 tb	10.2 ns	pass	see figure O-9

Figure O-9

Dynamic Rise Time Measurement (V.35, II.3, d)

Speed = 64000 bit/s 1%tb = 156ns



Verdict : Pass

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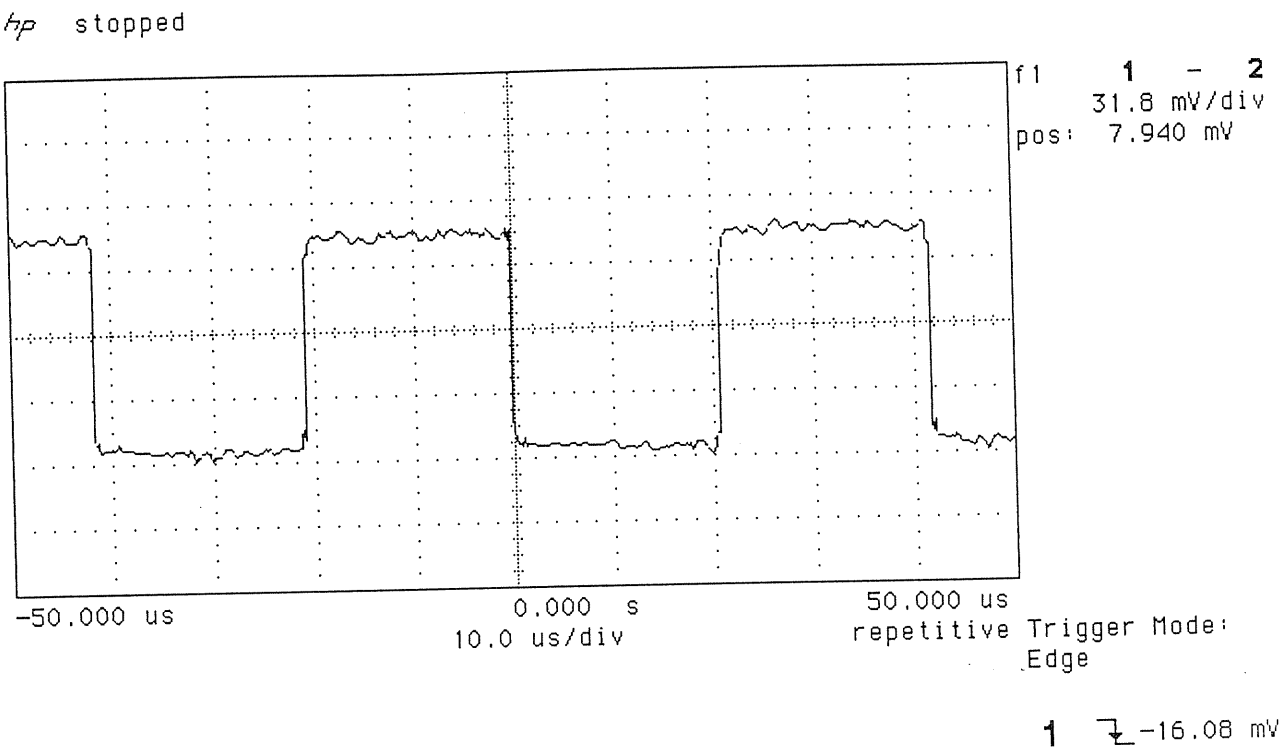
Figure O-10

Reference V.35 Wave Form



4.3.3 Impedance of Interconnecting Cable (Annex C.2)

Circuit	Limits	Results	Verdict	Observation
P/S	100 ± 20 Ω	Tested by Inspection	N/A	Note 1

4.3.4 Load Characteristics (Annex C.3)

4.3.4.1 Impedance (Annex C.3.1)

Circuit	Limits	Results	Verdict	Observation
104	100 ± 10 Ω	104.0 Ω	pass	
114	100 ± 10 Ω	100.0 Ω	pass	
115	100 ± 10 Ω	103.0 Ω	pass	

4.3.4.2 Resistance A&B-C (Annex C.3.2)

Circuit		Limits	Results	Verdict	Observation
104	+2V applied	150 ± 15 Ω	160.0 Ω	pass	
104	-2V applied	150 ± 15 Ω	160.0 Ω	pass	
114	+2V applied	150 ± 15 Ω	160.0 Ω	pass	
114	-2V applied	150 ± 15 Ω	160.0 Ω	pass	
115	+2V applied	150 ± 15 Ω	160.0 Ω	pass	
115	-2V applied	150 ± 15 Ω	160.0 Ω	pass	

4.3.5 Generator/Load Protection (Annex C.4)

Circuit	Limits	Results	Verdict	Observation
103	no damage	no damage	pass	
104	no damage	no damage	pass	
114	no damage	no damage	pass	
115	no damage	no damage	pass	

4.3.6 Unbalanced Circuits

4.3.6.1 Generators

Circuit	Description	Limits	Results	Verdict	Observation
C	Max. Voltage	Uo ≤ 25V	8.6 V	pass	TBR2 7.5.1.1
H	Max. Voltage	Uo ≤ 25V	8.6 V	pass	
L	Max. Voltage	Uo ≤ 25V	-7.4 V	pass	
C	Max. load 3 kohm	U1≥ 5V	7.8 V	pass	TBR2 7.5.1.2 Binary 1
H	Max. load	U1≥ 5V	7.8 V	pass	TBR2 7.5.1.2 Binary 1
L	Max. load	U1≥ 5V	-7.1 V	pass	TBR2 7.5.1.2 Binary 1
C	Max. load 3 kohm	U1≥ 5V	-7.3 V	pass	TBR2 7.5.1.2 Binary 2
H	Max. load	U1≥ 5V	-7.3 V	pass	TBR2 7.5.1.2 Binary 2
L	Max. load	U1≥ 5V	7.5 V	pass	TBR2 7.5.1.2 Binary 2
C	Min. Load 7 kohm	Ul ≤ 15V	8.2 V	pass	
H	Min. Load	Ul ≤ 15V	8.2 V	pass	
L	Min. Load	Ul ≤ 15V	-7.2 V	pass	
C	Short Circuit	Ik ≤ 500mA	24 mA	pass	
H	Short Circuit	Ik ≤ 500mA	24 mA	pass	
L	Short Circuit	Ik ≤ 500mA	-71 mA	pass	
H 2volt	Resistance power off	R ≥ 300Ω	1333 Ω	pass	

4.3.6.2 Receivers

Circuit	Description	Limits	Results	Verdict	Observation
D	Voltage without Terminator	EL ≤ 2V	0.035 V	pass	
E	Voltage without Terminator	EL ≤ 2V	0.017 V	pass	
F	Voltage without Terminator	EL ≤ 2V	0.038 V	pass	
D	Rmin, 3V applied	7kΩ ≥ R ≥ 3kΩ	4934 Ω	pass	
E	Rmin, 3V applied	7kΩ ≥ R ≥ 3kΩ	4950 Ω	pass	
F	Rmin, 3V applied	7kΩ ≥ R ≥ 3kΩ	4991 Ω	pass	
D	Rmax, 15V applied	7kΩ ≥ R ≥ 3kΩ	4918 Ω	pass	
E	Rmax, 15V applied	7kΩ ≥ R ≥ 3kΩ	4934 Ω	pass	
F	Rmax, 15V applied	7kΩ ≥ R ≥ 3kΩ	4731 Ω	pass	

4.4 Test Report V.36

The following tests are performed based on the IUT operating as a DTE.

4.4.1 Basic Interconnection Test

NET 2 Clause	Selected	Run	Verdict	Observation
8.2.2.3	no			Note 1

4.4.2 Generator Characteristics

4.4.2.1 Open Circuit Measurement (V.11, 5.2.1)

A - B terminated with 3.9 kOhms

4.4.2.1.1 Circuit 103

Description	Limits	Results	Verdict	Observation
A - B	Vo ≤ 6.0V	-4.82 V	pass	
A - C	Voa ≤ 6.0V	-4.93 V	pass	
B - C	Vob ≤ 6.0V	-- V	pass	

4.4.2.1.2 Circuit 105

Description	Limits	Results	Verdict	Observation
A - B	Vo ≤ 6.0V	-4.87 V	pass	
A - C	Voa ≤ 6.0V	-4.93 V	pass	
B - C	Vob ≤ 6.0V	-0.06 V	pass	

4.4.2.1.3 Circuit 108

Description	Limits	Results	Verdict	Observation
A - B	Vo ≤ 6.0V	-4.87 V	pass	
A - C	Voa ≤ 6.0V	-4.93 V	pass	
B - C	Vob ≤ 6.0V	-0.06 V	pass	

4.4.2.2 Test Termination Measurement (V.11, 5.2.2)

Generator terminated with 2 x 50 Ohms

4.4.2.2.1 Circuit 103

A binary state 1

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	-2.81 V	pass	
	Vos ≤ 3.0V	1.32 V	pass	

B binary state 2

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	2.81 V	pass	
	Vt1-Vt2 ≤ 0.4V	0.0 V	pass	
	Vos ≤ 3.0V	0.97 V	pass	
	Vos1-Vos2 ≤ 0.4V	0.35 V	pass	

4.4.2.2.2 Circuit 105

A binary state 1

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	-3.0 V	pass	
MP - Gnd	Vos ≤ 3.0V	1.38 V	pass	

4.4.2.2.3 Circuit 108

A binary state 1

Description	Limits	Results	Verdict	Observation
A - B	2V≤Vt≥0.5Vo	-3.0 V	pass	
MP - Gnd	Vos ≤ 3.0V	1.35 V	pass	

4.4.2.3 Short Circuit Measurement (V.11, 5.2.3)

4.4.2.3.1 Circuit 103

Description	Limits	Results	Verdict	Observation
A - C	Isa ≤ 150 mA	93 mA	pass	
B - C	Isb ≤ 150 mA	-0.19 mA	pass	

4.4.2.3.2 Circuit 105

Description	Limits	Results	Verdict	Observation
A - C	Isa ≤ 150 mA	99 mA	pass	
B - C	Isb ≤ 150 mA	-0.24 mA	pass	

4.4.2.3.3 Circuit 108

Description	Limits	Results	Verdict	Observation
A - C	Isa ≤ 150 mA	-0.22 mA	pass	
B - C	Isb ≤ 150 mA	96 mA	pass	

4.4.2.4 Power-off Measurement (V.11, 5.2.4)

Power-off applied voltage ±0.25V

4.4.2.4.1 Circuit 103

Description	Limits	Results	Verdict	Observation
+0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
+0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	

4.4.2.4.2 Circuit 105

Description	Limits	Results	Verdict	Observation
+0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
+0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	

4.4.2.4.3 Circuit 108

Description	Limits	Results	Verdict	Observation
+0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
+0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixa ≤ 100 µA	< 1.0 µA	pass	
-0.25V applied	Ixb ≤ 100 µA	< 1.0 µA	pass	

4.4.3 Receiver Characteristics (V.11, 6.1)

4.4.3.1 Circuit 104

The receiver *is* terminated with an optional cable resistance.

Limits according to NET 1, Revision 1, Figure 1

Description	Limits	Results	Verdict	Observation
Via = 6V	I ≤ 60.75 mA	54 mA	pass	
Via = 3V	I ≤ 30.75 mA	27 mA	pass	
Via = 1V	-0.5 ≤ I ≤ 10.75 mA	9.9 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -6V	I ≤ 60.75 mA	-54 mA	pass	
Via = -3V	I ≤ 30.75 mA	-27 mA	pass	
Via = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.9 mA	pass	
Vib = 6V	I ≤ 60.75 mA	54 mA	pass	
Vib = 3V	I ≤ 30.75 mA	27 mA	pass	
Vib = 1V	-0.5 ≤ I ≤ 10.75 mA	9.9 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0001 mA	pass	
Vib = -6V	I ≤ 60.75 mA	-54 mA	pass	
Vib = -3V	I ≤ 30.75 mA	-27 mA	pass	
Vib = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.9 mA	pass	

4.4.3.2 Circuit 106

The receiver *is not* terminated with an optional cable resistance.

Limits according to CCITT Recommendation V.11, Figure 6

Description	Limits	Results	Verdict	Observation
Via = 10V	I ≤ 3.25 mA	0.18 mA	pass	
Via = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -10V	I ≤ 3.25 mA	-0.18 mA	pass	
Via = -3V	I ≤ 1.5 mA	-0.05 mA	pass	
Vib = 10V	I ≤ 3.25 mA	0.18 mA	pass	
Vib = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0002 mA	pass	
Vib = -10V	I ≤ 3.25 mA	-0.18 mA	pass	
Vib = -3V	I ≤ 1.5 mA	-0.05 mA	pass	

4.4.3.3 Circuit 109

The receiver *is not* terminated with an optional cable resistance.

Limits according to CCITT Recommendation V.11, Figure 6

Description	Limits	Results	Verdict	Observation
Via = 10V	I ≤ 3.25 mA	0.17 mA	pass	
Via = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -10V	I ≤ 3.25 mA	-0.17 mA	pass	
Via = -3V	I ≤ 1.5 mA	-0.05 mA	pass	
Vib = 10V	I ≤ 3.25 mA	0.17 mA	pass	
Vib = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0002 mA	pass	
Vib = -10V	I ≤ 3.25 mA	-0.17 mA	pass	
Vib = -3V	I ≤ 1.5 mA	-0.05 mA	pass	

4.4.3.4 Circuit 114

The receiver *is* terminated with an optional cable resistance.

Limits according to NET 1, Revision 1, Figure 1

Description	Limits	Results	Verdict	Observation
Via = 6V	I ≤ 60.75 mA	53 mA	pass	
Via = 3V	I ≤ 30.75 mA	26 mA	pass	
Via = 1V	-0.5 ≤ I ≤ 10.75 mA	8.9 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -6V	I ≤ 60.75 mA	-53 mA	pass	
Via = -3V	I ≤ 30.75 mA	-26 mA	pass	
Via = -1V	-0.5 ≤ I ≤ 10.75 mA	-8.9 mA	pass	
Vib = 6V	I ≤ 60.75 mA	53 mA	pass	
Vib = 3V	I ≤ 30.75 mA	26 mA	pass	
Vib = 1V	-0.5 ≤ I ≤ 10.75 mA	8.9 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0003 mA	pass	
Vib = -6V	I ≤ 60.75 mA	-53 mA	pass	
Vib = -3V	I ≤ 30.75 mA	-26 mA	pass	
Vib = -1V	-0.5 ≤ I ≤ 10.75 mA	-8.9 mA	pass	

4.4.3.5 Circuit 115

The receiver *is* terminated with an optional cable resistance.

Limits according to NET 1, Revision 1, Figure 1

Description	Limits	Results	Verdict	Observation
Via = 6V	I ≤ 60.75 mA	54 mA	pass	
Via = 3V	I ≤ 30.75 mA	27 mA	pass	
Via = 1V	-0.5 ≤ I ≤ 10.75 mA	9.7 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -6V	I ≤ 60.75 mA	-54 mA	pass	
Via = -3V	I ≤ 30.75 mA	-27 mA	pass	
Via = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.7 mA	pass	
Vib = 6V	I ≤ 60.75 mA	54 mA	pass	
Vib = 3V	I ≤ 30.75 mA	27 mA	pass	
Vib = 1V	-0.5 ≤ I ≤ 10.75 mA	9.7 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0001 mA	pass	
Vib = -6V	I ≤ 60.75 mA	-54 mA	pass	
Vib = -3V	I ≤ 30.75 mA	-27 mA	pass	
Vib = -1V	-0.5 ≤ I ≤ 10.75 mA	-9.7 mA	pass	

4.4.3.6 Circuit 107

The receiver *is not* terminated with an optional cable resistance.

Limits according to CCITT Recommendation V.11, Figure 6

Description	Limits	Results	Verdict	Observation
Via = 10V	I ≤ 3.25 mA	0.18 mA	pass	
Via = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Via = 0V	-0.75 ≤ I ≤ 0.75 mA	-0.0001 mA	pass	
Via = -10V	I ≤ 3.25 mA	-0.18 mA	pass	
Via = -3V	I ≤ 1.5 mA	-0.05 mA	pass	
Vib = 10V	I ≤ 3.25 mA	0.18 mA	pass	
Vib = 3V	I ≤ 1.5 mA	0.05 mA	pass	
Vib = 0V	-0.75 ≤ I ≤ 0.75 mA	0.0002 mA	pass	
Vib = -10V	I ≤ 3.25 mA	-0.18 mA	pass	
Vib = -3V	I ≤ 1.5 mA	-0.05 mA	pass	

4.4.4 V.10 Measurements on circuit CCITT 141 (optional)

Reference	Description	Limits	Results	Verdict	Observation
V.10 5.2.1	A - C, terminated with 3.9 kOhms Binary 1	4V ≤ Vo ≤ 6V	-5.56 V	pass	
V.10 5.2.1	A - C, terminated with 3.9 kOhms Binary 2	4V ≤ Vo ≤ 6V	4.87 V	pass	TBR2 reqmt
V.10 5.2.2	A - C, terminated with 450 Ohms Binary 1	Vt ≥ 0.9 * Vo	-5.18 V	pass	
V.10 5.2.2	A - C, terminated with 450 Ohms Binary 2	Vt ≥ 0.9 * Vo	4.50 V	pass	TBR2 reqmt
V.10 5.2.3	Short Circuit	Is ≤ 150mA	-80.3 mA	pass	
V.10 5.2.4	Power off 0.25 V applied	Ix ≤ 100µA	< 1.0 µA	pass	
V.10 5.2.4	Power off -0.25 V applied	Ix ≤ 100µA	< 1.0 µA	pass	

Figure 0-11

Circuit 103 (pin 4 and 22)

Test Termination Measurement (V.11, 5.2.2)

Vt shall be ≥ 2.0 V or ≥ 50% of Vo whichever is greater

Vt1 - Vt2 shall be ≤ 0.4 V

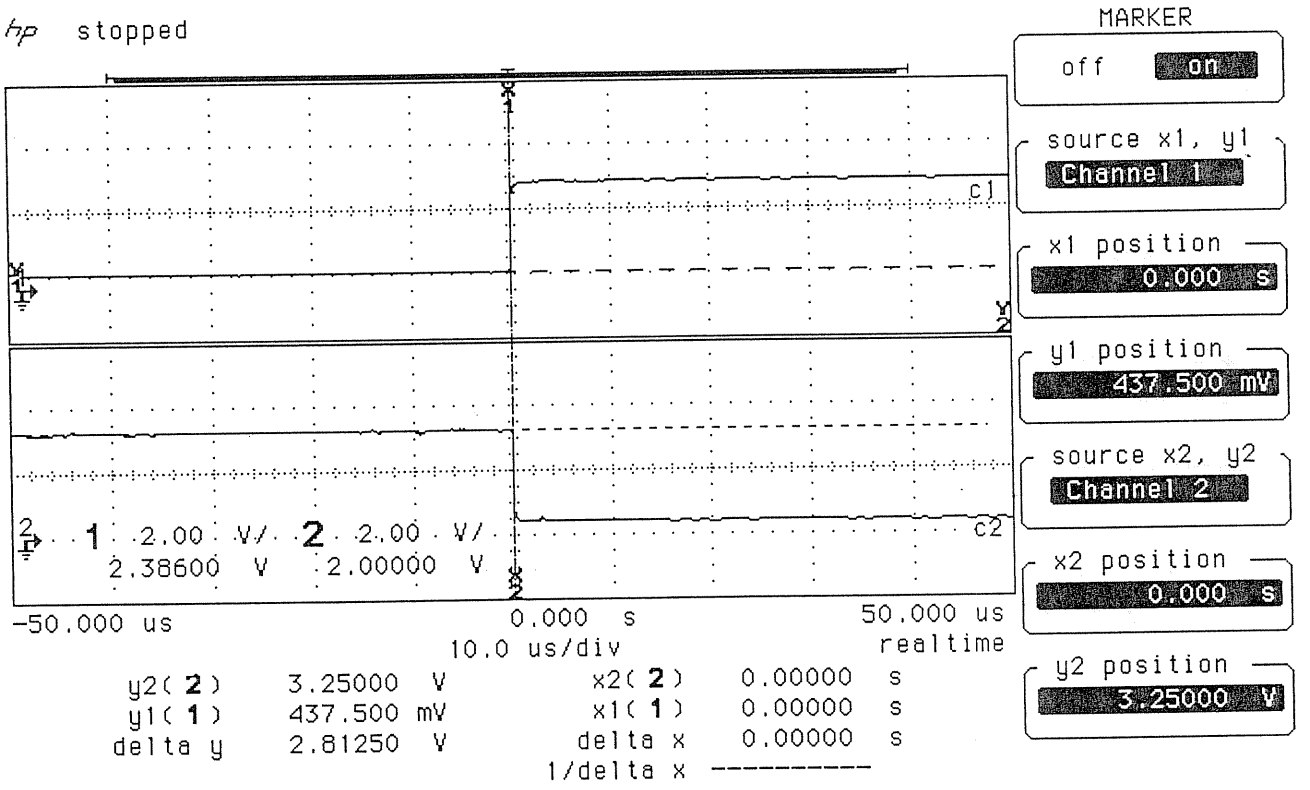


Figure 0-12

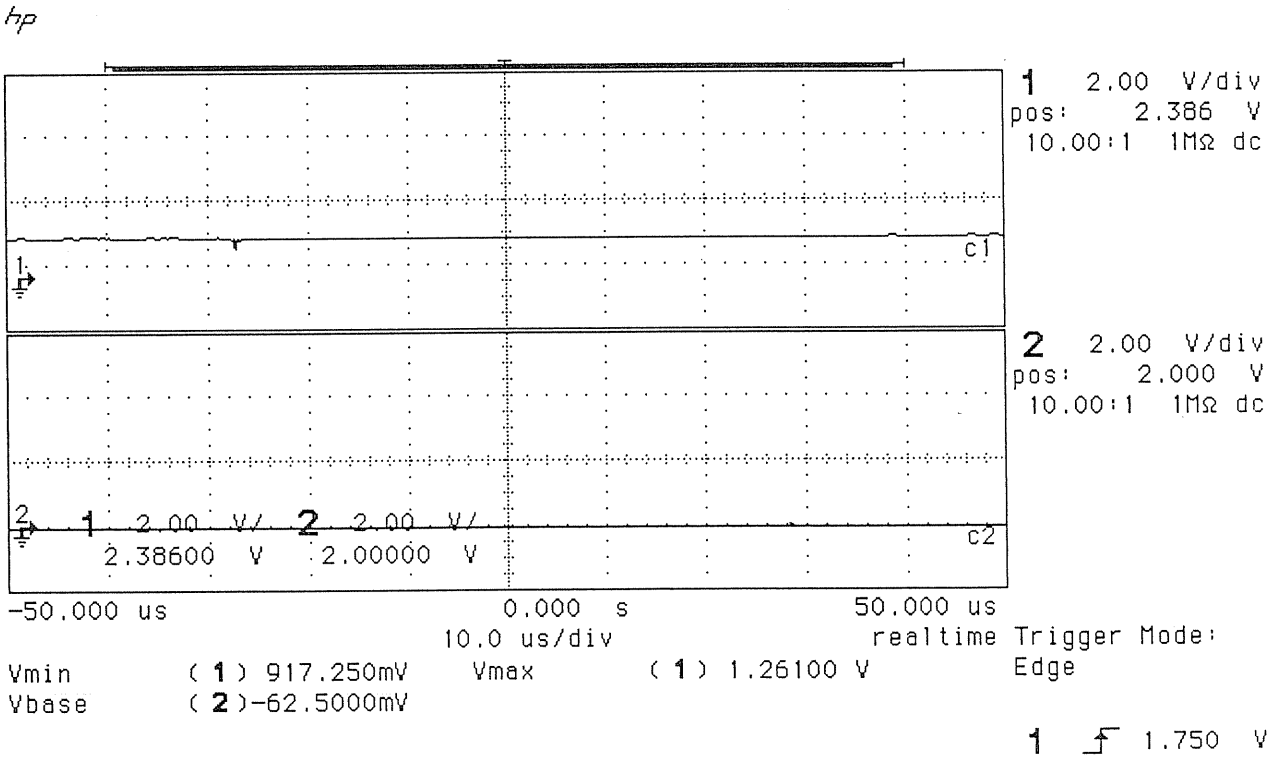
Circuit 103 (pin 4 and 22)

Test Termination Measurement (V.11, 5.2.2)

Generator offset voltage Vos

Vos binary state 1 and binary state 2 ≤ 3.0 V

Vos1 - Vos2 shall be ≤ 0.4 V



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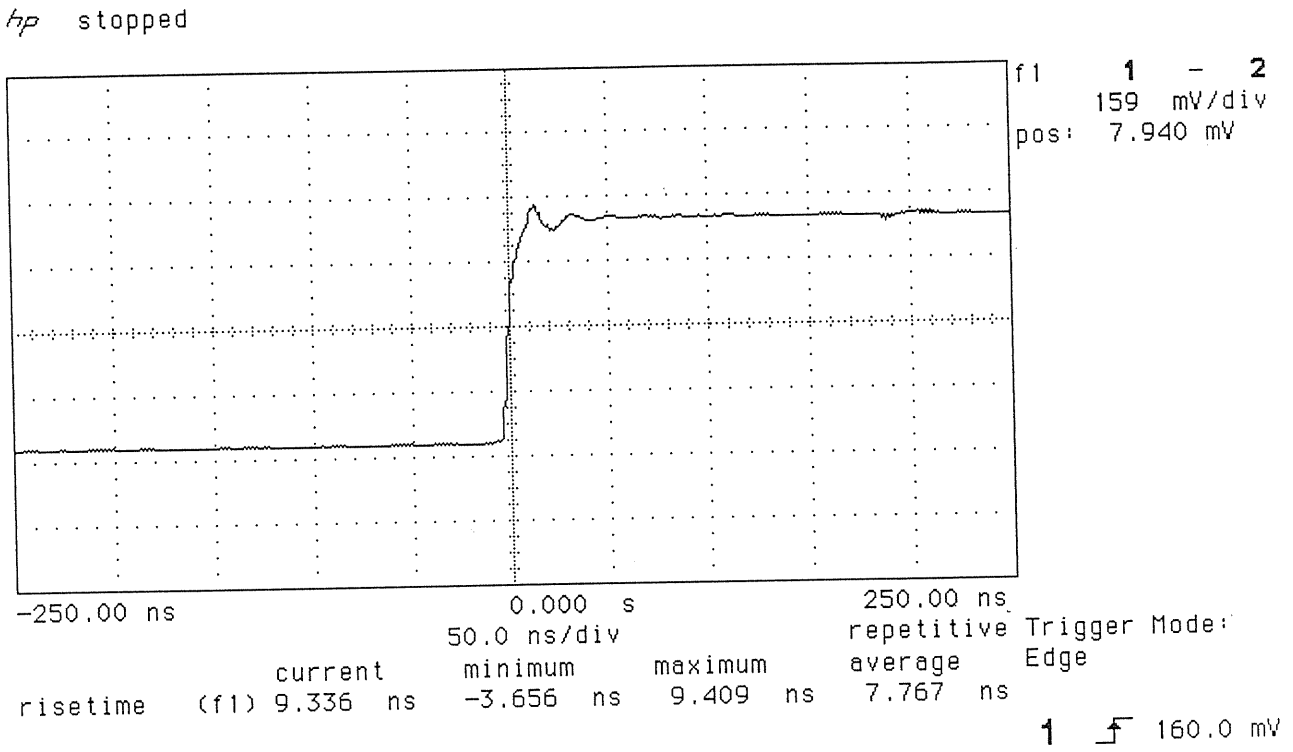
4.4.5 Dynamic Rise Time Measurement (V.11, 5.3)

Figure O-13

Circuit 103



$20ns \geq t$ or $t \leq 0.1tb$

Rise time: 7.9 ns

Verdict : Pass

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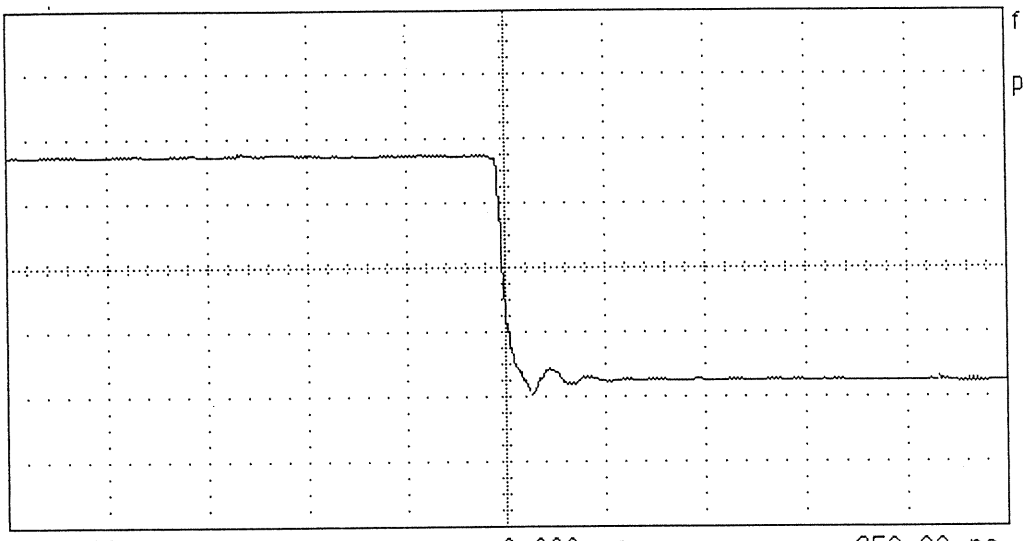
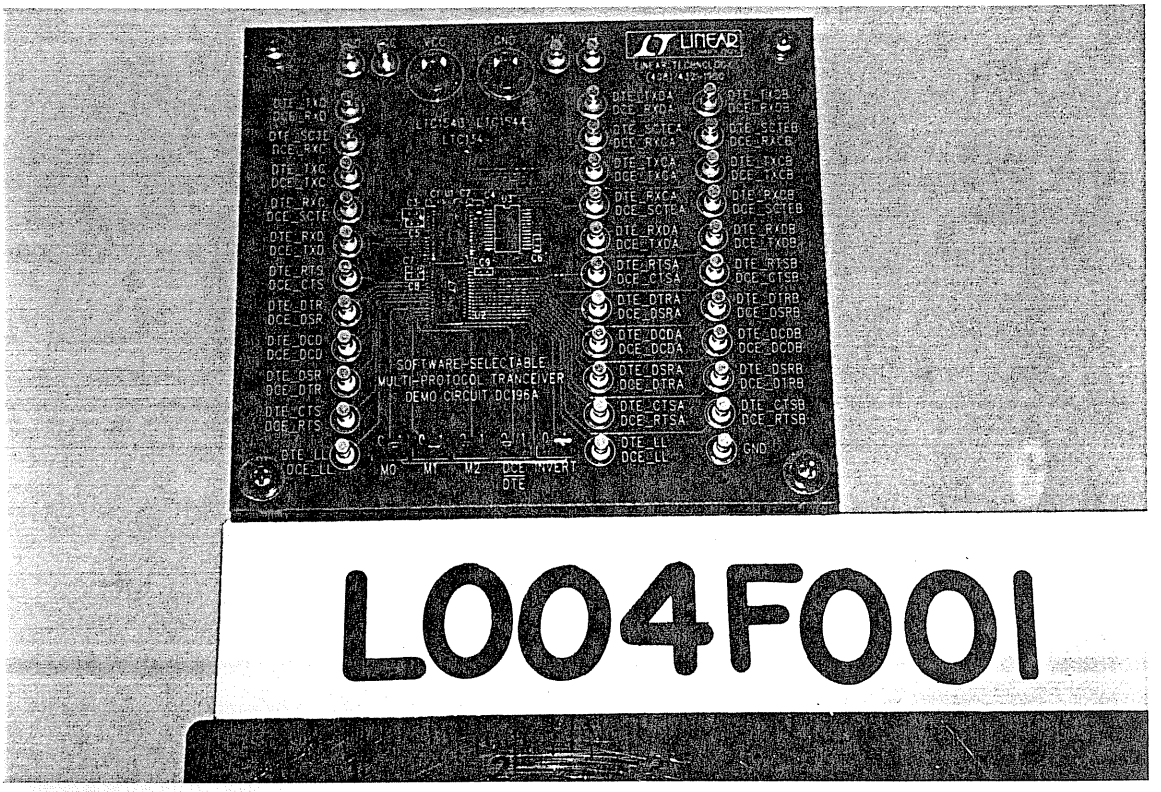
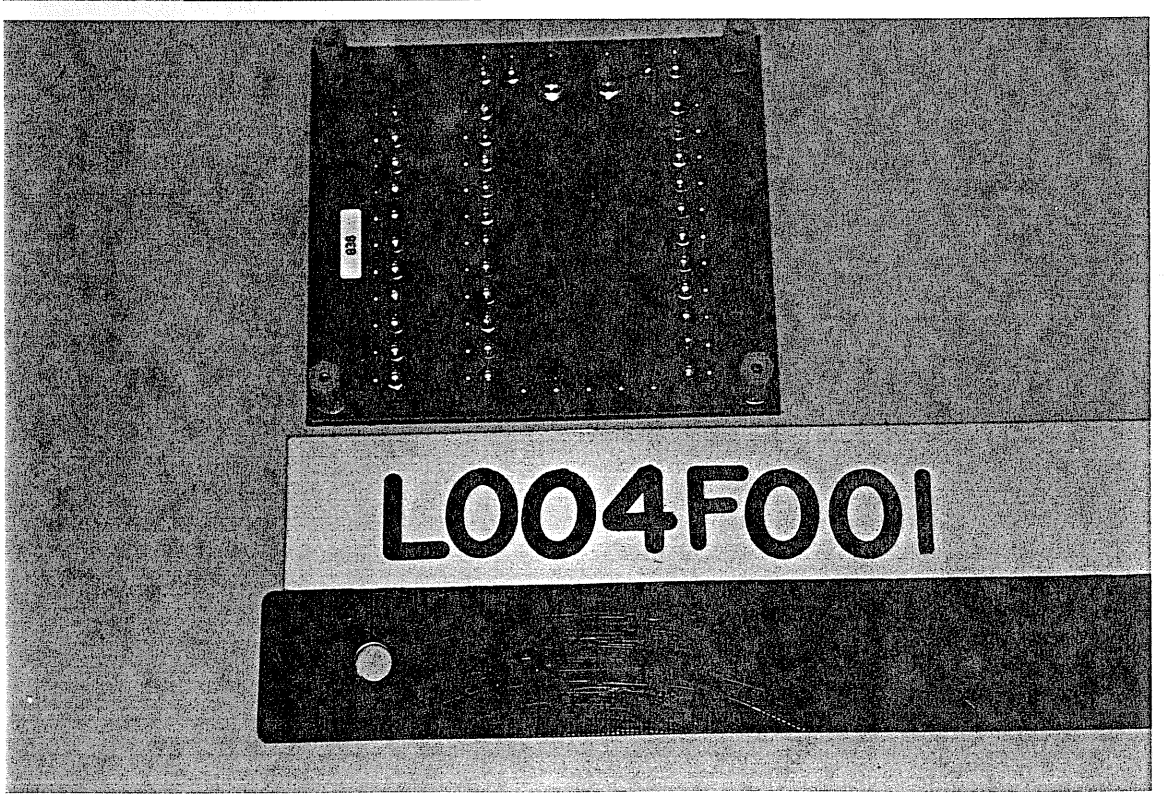
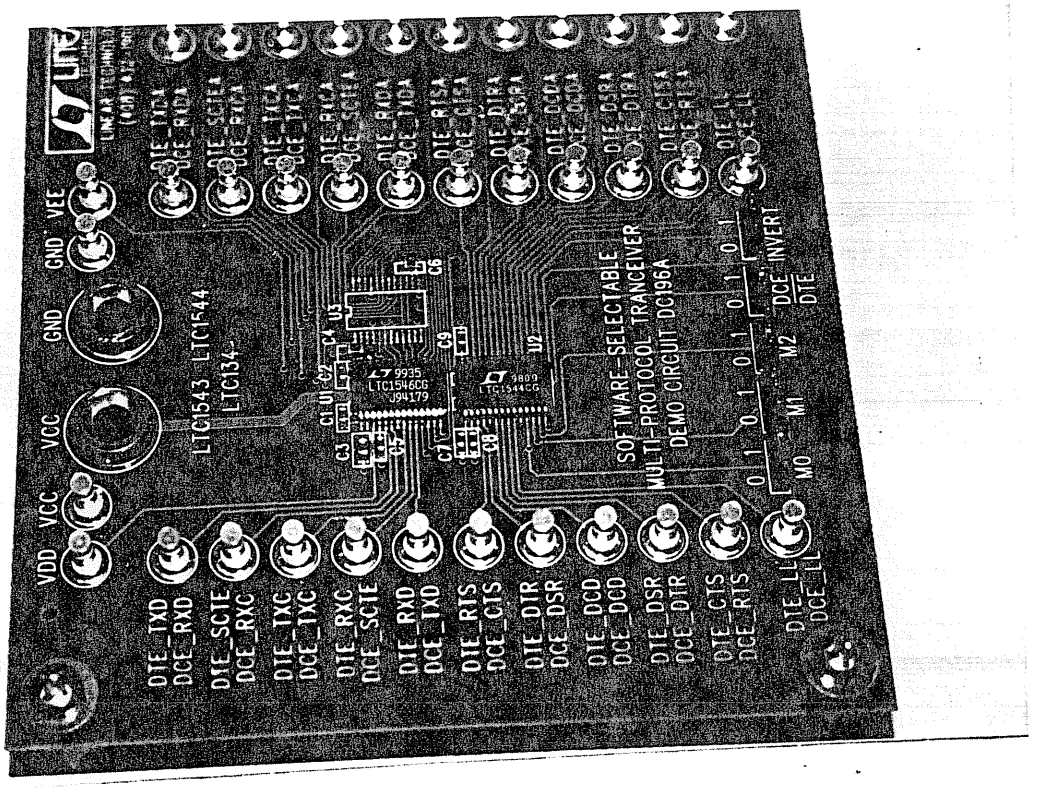
hp stopped



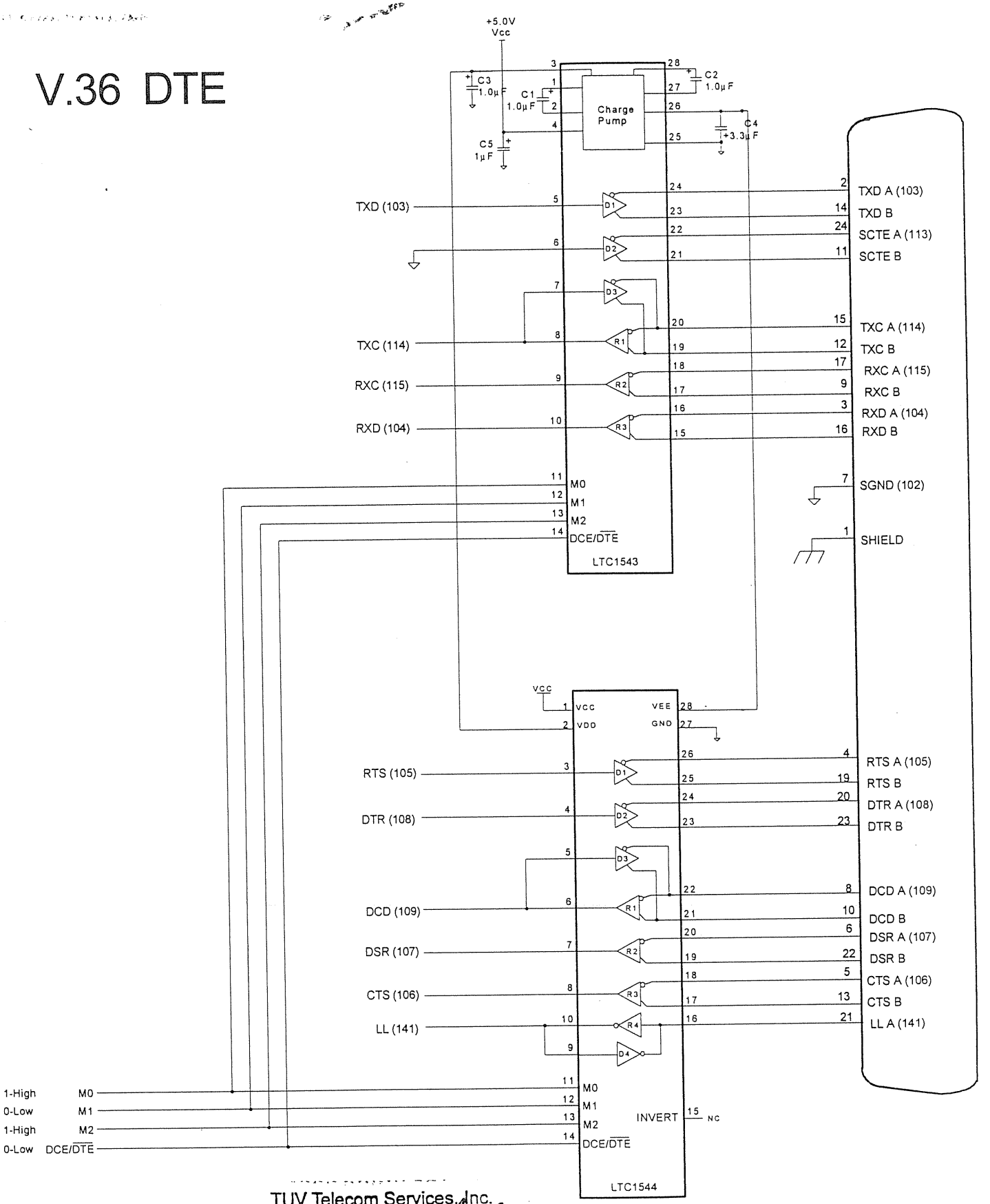
7 Photos


LINEAR
LTC1480 LTC1544
LTC1434
SOFTWARE-SELECTABLE
MULTI-PROTOCOL TRANCEIVER
DEMO CIRCUIT DC196A
M0 M1 M2 DCE/DTE INVERT
GND
L004F001


L004F001

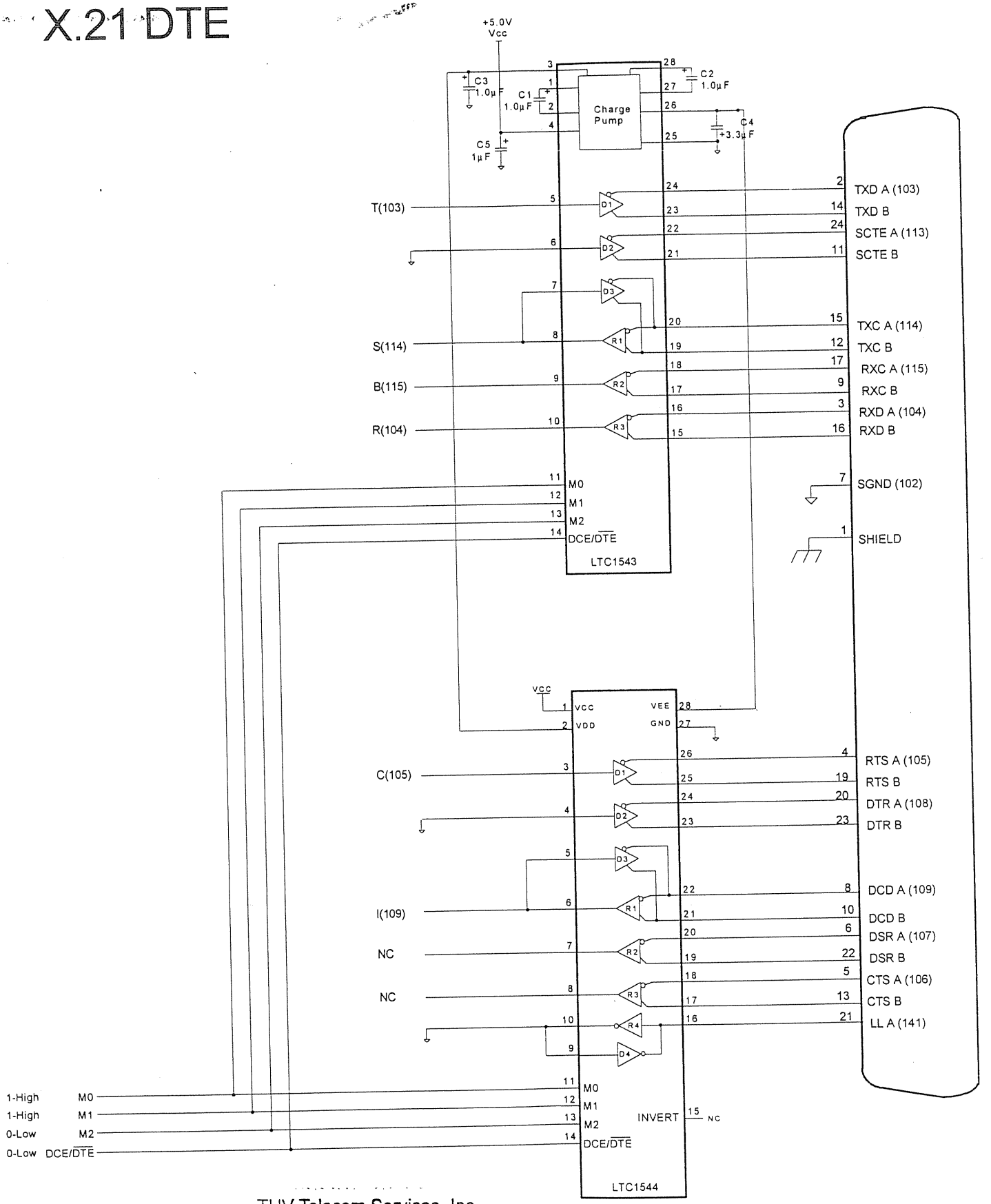

VEE
GND
GND
VCC
VCC
VDD
LTC1543 LTC1544
LTC134-
SOFTWARE SELECTABLE
MULTI-PROTOCOL TRANCEIVER
DEMO CIRCUIT DC196A
INVERT
DCE
DTE
M0
M1
M2
DTE_TXD
DCE_RXD
DTE_SCTE
DCE_RXC
DTE_TXC
DCE_TXC
DTE_RXC
DCE_SCTE
DTE_RXD
DCE_TXD
DTE_RTS
DCE_CTS
DTE_DTR
DCE_DSR
DTE_DCD
DCE_DCD
DTE_DSR
DCE_DTR
DTE_CTS
DCE_RTS
DTE_LL
DCE_LL

V.36 DTE



TUV Telecom Services, Inc.
ENDORSEMENT
Signature
Date 9-30-99

X.21 DTE



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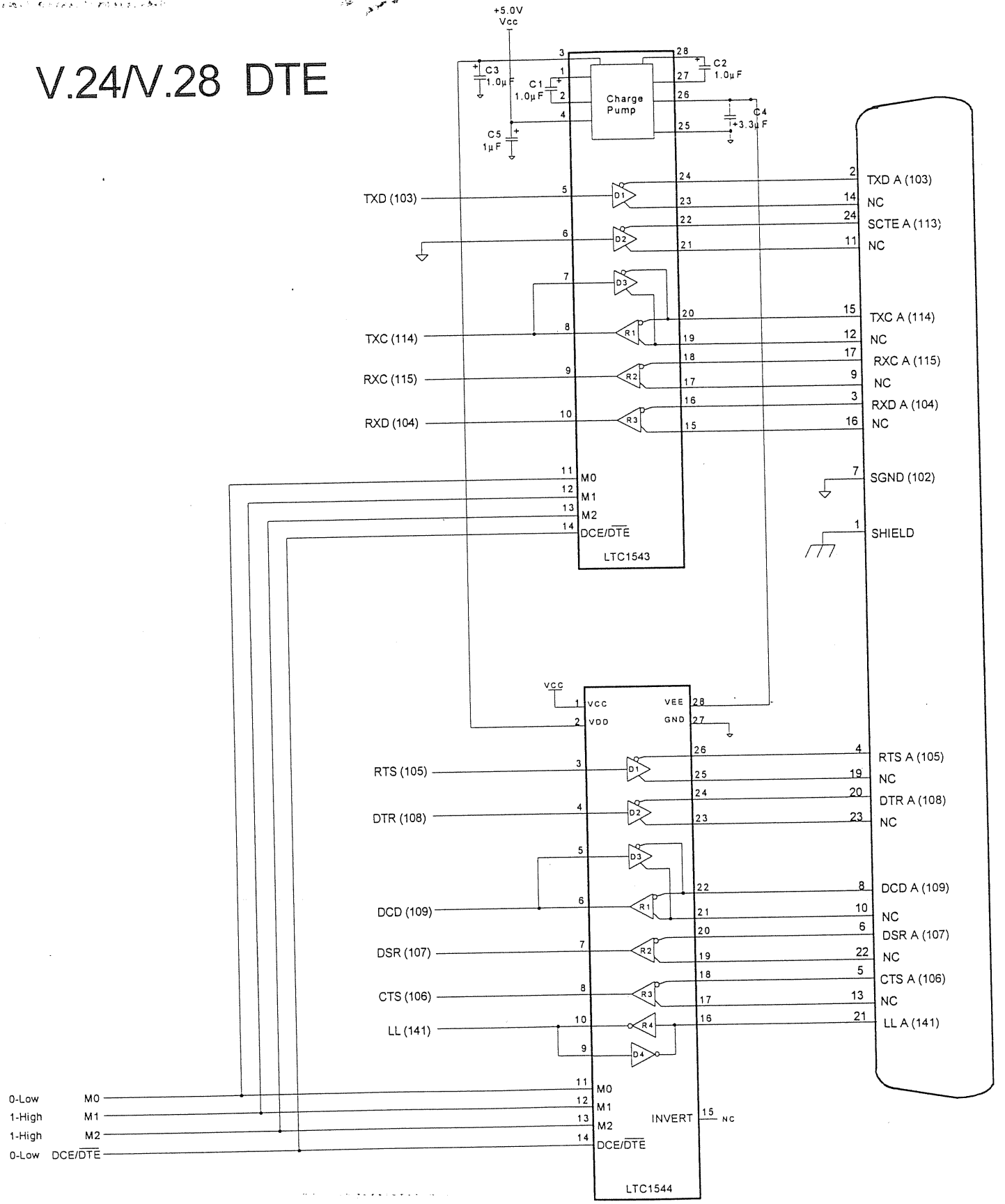
V.24/V.28 DTE



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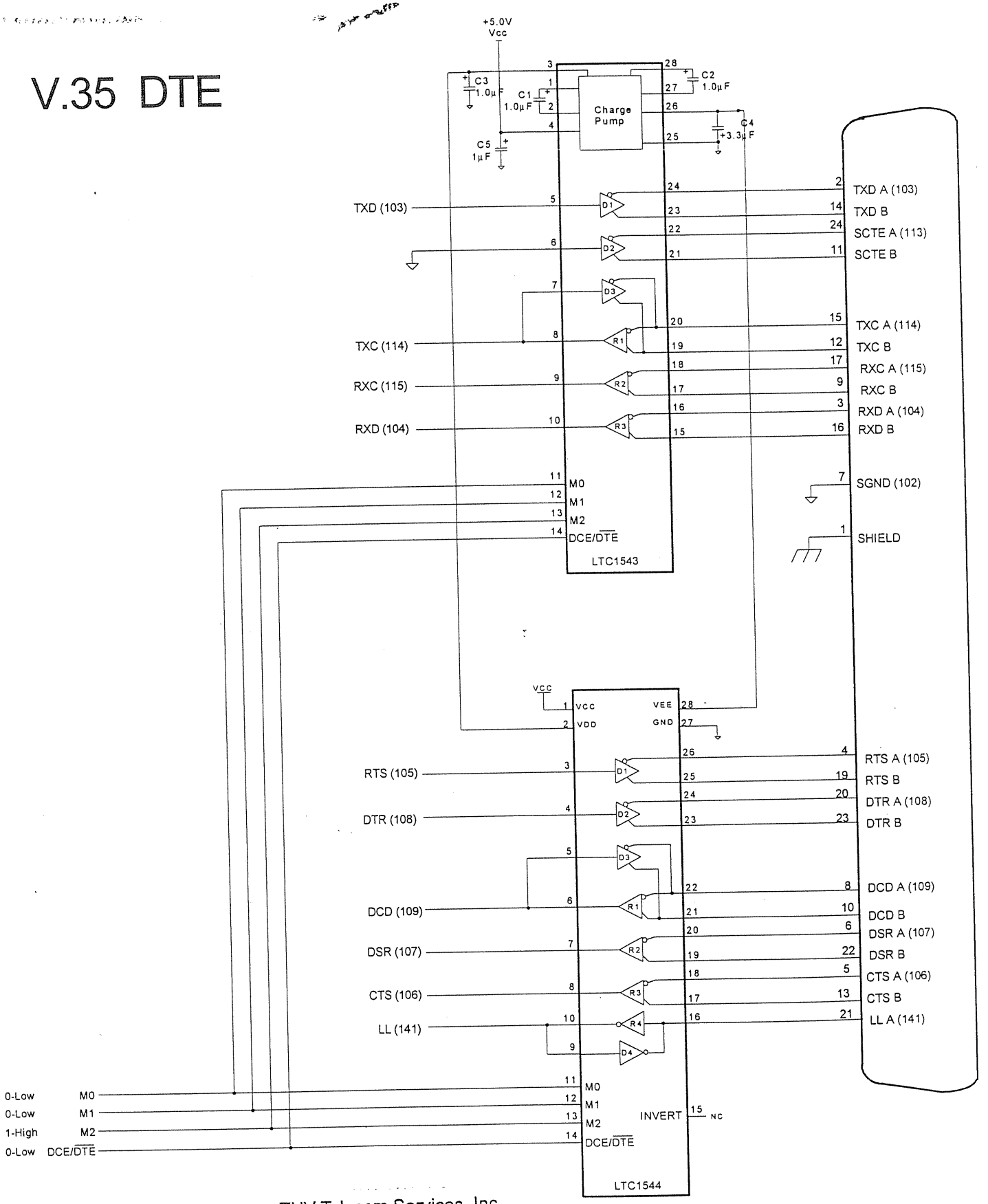
Date 9-30-99

V.35 DTE



TUV Telecom Services, Inc.
ENDORSEMENT
Signature
Date 9-30-99