



Millennium desk terminal

General specification

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Table of contents

Table of figuresTOC-xi

1	General overview	1-1
	Introduction	1-1
	Objectives	1-1
	Terminology and abbreviations	1-2
	Changes	1-2
	Prime requirements document	1-2
2	Performance requirements	2-1
	Transmission characteristics	2-1
	Transmit performance	2-1
	Transmit objective loudness rating	2-1
	Transmit frequency response	2-1
	Parallel set operation	2-2
	Distortion	2-2
	Off-hook noise	2-2
	Receive performance	2-3
	Receive objective loudness rating	2-3
	Receive frequency response	2-3
	Acoustic shock (maximum acoustic output)	2-4
	Receive noise	2-4
	On-hook receive sensitivity	2-4
	Receive requirements for hard of hearing	2-5
	Sidetone characteristics	2-5
	Sidetone objective loudness rating	2-5
	Sidetone distortion	2-5
	Tone signaling	2-5
	Tone frequencies and tolerance	2-5
	Tone output levels	2-6
	Tone duration	2-7
	Rise time and fall time	2-7
	Interdigital interval	2-7
	Tone leak	2-7
	Non-linear distortion	2-8
	Tone signal transients (tone level excursions)	2-8
	Transmitter muting	2-8
	Muting interval	2-8

TOC-viii Table of contents

Signaling sidetone	2-8
Pause	2-9
Modem signaling	2-9
Alerting acoustical output	2-9
Special tone generation	2-10
Features and functions	2-10
Card reader	2-10
Vacuum fluorescent display (VFD)	2-10
Voice synthesis	2-11
Quick access keys	2-11
Datajack data call	2-11
Smart card alert	2-12
Millennium Manager (NCC) changes	2-13
CO answer supervision	2-13
Inferred Answer Supervision	2-13
3 Electrical requirements	3-1
Power requirements	3-1
Power interruption	3-1
Current and voltage characteristics	3-1
On-hook metallic resistance	3-1
Longitudinal on-hook resistance	3-2
Metallic on-hook impedance	3-2
Metallic off-hook resistance	3-2
Longitudinal off-hook resistance	3-3
Metallic off-hook impedance (return loss)	3-3
Longitudinal balance	3-3
Load number/Ringer Equivalence	3-3
Voltage and current stresses	3-4
Surge voltages	3-4
Dielectric strength	3-4
Over currents	3-4
Electrostatic discharge (ESD)	3-4
Electrical fast transient immunity	3-5
Electromagnetic environment	3-5
Radiated electromagnetic compatibility	3-5
Conducted electromagnetic interference	3-5
Immunity to narrowband electromagnetic fields	3-5
Radiated immunity	3-5
Conducted immunity	3-5
Test methods	3-6
Magnetic field susceptibility	3-6
Requirements	3-6
60 Hz suppression	3-6
4 User operating environment	4-1
Temperature range	4-1
Humidity	4-1
Shipping and storage conditions	4-1

5	Environmental requirements	5-1
	Low temperatures	5-1
	High temperatures	5-1
	Thermal shock	5-2
	Humidity	5-2
	Humidity Cycle	5-2
	Atmospheric Pressure	5-3
	Fungus growth	5-3
	Air purity	5-3
	Vibration	5-3
	Transportation simulation (bounce)	5-3
	Transportation methods	5-4
	Mechanical shock (unpackaged)	5-4
	Mechanical shock	5-4
	User inflicted stress and vandalism	5-4
	Surface finishes	5-4
	Handset cord	5-4
	Pry points	5-4
	Flame resistance	5-5
	Dents	5-5
6	Regulatory and safety requirements	6-1
	Regulatory requirements	6-1
	Safety requirements	6-1
	Fire hazard	6-1
	Acoustic shock	6-1
	Terminal weight	6-1
7	Reliability	7-1
	Service life	7-1
	Mean time between failures (MTBF)	7-1
	Switch-hook	7-1
	Dial (keypad)	7-1
	Card reader	7-1
	VFD display	7-2
	Display impact resistance	7-2
	Mean time to repair (MTTR)	7-2
8	Maintenance and administration	8-1
	Maintainability	8-1
	Equipment handling	8-1
	Adjustments, alignments, and calibrations	8-1
	Ready condition	8-1
	Packaging	8-1
	Adjustments	8-2
	Reversibility restrictions	8-2
	Preventive maintenance	8-2
	Accessibility	8-2
	Diagnostic capabilities and alarms	8-2
	Test points	8-2

9 Documentation	9-1
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GlossaryG-1	
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1 General overview

This section will present an overview of the Millennium desk terminal.

Introduction

This document outlines the performance specification of the Millennium desk terminal with respect to: performance, product safety, reliability, and maintenance and repair. For details concerning operation and features, refer to the *Millennium deskset terminal installation, operation, and maintenance guide*. The terminal is available from the factory with two card reader options. The customer will identify the configuration which they will provide as their standard configuration.

Objectives

The Millennium desk terminal is an intelligent terminal that connects to an analog CO line and a supplementary power source to provide enhanced service. The terminal requires answer supervision signals from the central office, or may come equipped with an inferred answer supervision module for lines where answer supervision is not possible. Networking of terminals is provided over the Packet Switched Network (PSN) to the Millennium Manager (NCC).

This terminal also offers an external data jack for connecting with laptop and Power-book computers with internal modems to send data over the phone line.

The terminal meets the Canadian and U.S. regulatory requirements, these being:

- CS-03 Issue #7 (D.O.C. Certification Standard — Canada)
- FCC Part 68 and 15 (Certification Standard — U.S.A.)

It meets safety standards CSA C22.2 No 0.7 (Canada)

It will also meet most performance requirements as contained in:

- CSA-T-510
- EIA spec RS-470
- BELLCORE TA-TSY-000456 Iss1

Terminology and abbreviations

See the glossary for definitions of terms used in this document.

Changes

This is the second issue of this document.

Prime requirements document

In case of any discrepancy between a specific requirement in the document and that outlined in some other document, the requirements of this document shall take precedence, except in the case of regulatory requirements.

2 Performance requirements

This section describes the performance characteristics that will be maintained over the expected life of the product and over the full range of environmental conditions, as described in Environmental requirements, Chapter 5.

Transmission characteristics

The transmission characteristics of the product comply with the requirements described in the following sections.

Transmit performance

The performance requirements during transmission are described in the following sections.

Transmit objective loudness rating

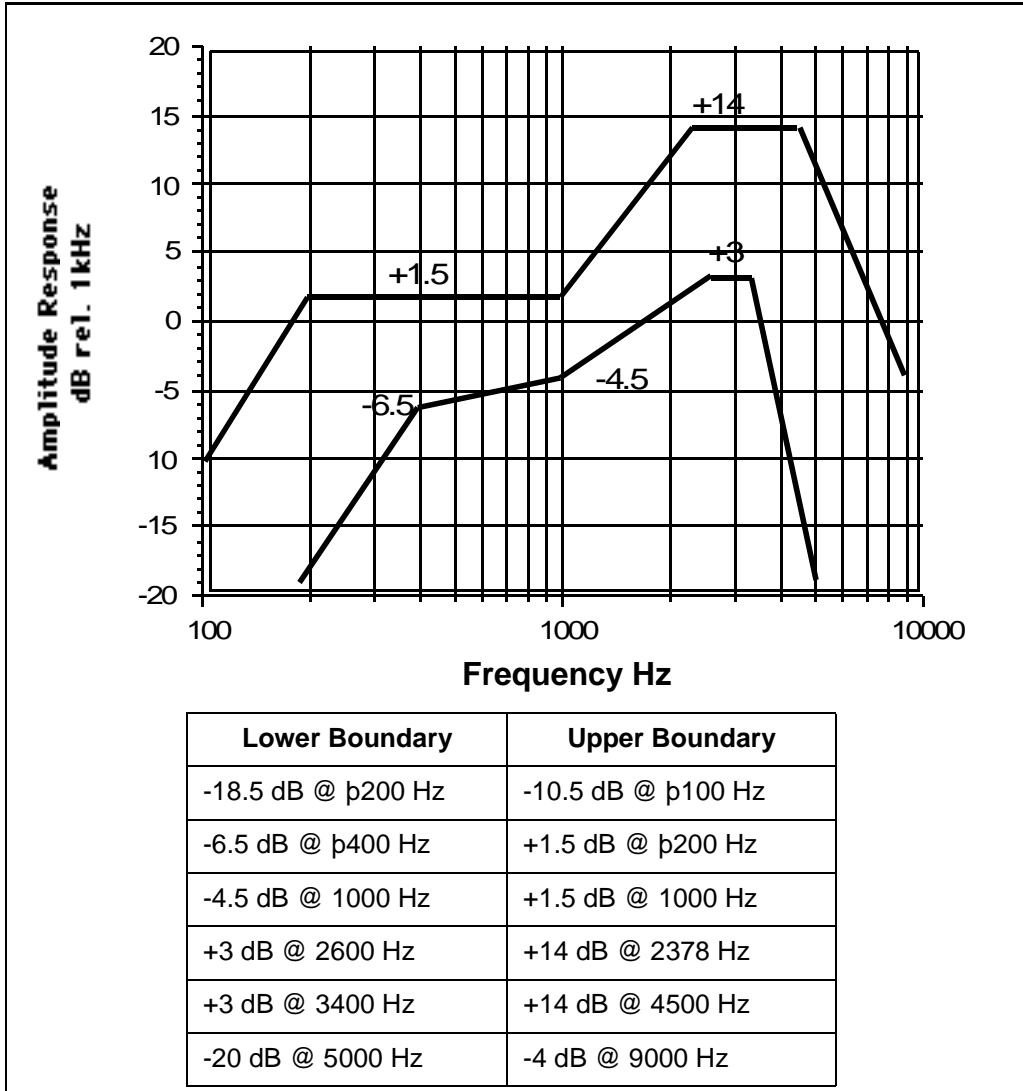
Transmit measurements are made as specified in IEEE Standard 661-1979 and Standard 269-1983 using an external feeding bridge of $2 \times 200 \frac{3}{4}$, $2 \times 2 \mu\text{F}$, at 48 Vdc using 26 gauge (0.4 mm) artificial line. The TOLR shall be:

- At 0 km (0 kft): -46 ± 4.5 dB
- At 4.575 km (15 kft): -42 ± 4.5 dB
- For points between 0 and 4.575 km, the TOLR is proportional to loop current.

Transmit frequency response

The transmit frequency response falls inside the limits shown in Figure 2-1 for a loop length of 0 km (0 kft).

Figure 2-1: Transmit frequency response



Parallel set operation

The terminal does not support parallel set operation due to the fraud and abuse potential.

Distortion

The total harmonic distortion at 1000Hz does not exceed 5% when tested per IEEE standard 269-1983, except that the input sound pressure level is fixed at +6dBPa and the line current is 25 mA.

Off-hook noise

Off-hook noise is less than 15 dBnc.

Receive performance

The performance requirements during reception are described in the following sections.

Receive objective loudness rating

Receive measurements are made as specified in IEEE Standard 661-1979 and Standard 269-1983. To make the measurements, an external feeding bridge of $2 \times 200 \frac{3}{4}$, $2 \times 2 \mu\text{F}$, at 48 Vdc using 26 gauge (0.4 mm) artificial line is used. The ROLR is as follows:

- At 0 km (0 kft): $49 \pm 5 \text{ dB}$
- At 4.575 km (15 kft): $53 \pm 5 \text{ dB}$

At intermediate points between 0 and 4.575 km, the ROLR is proportional to loop current.

Receive frequency response

The receive frequency response falls inside the limits shown in Figure 2-2 for a loop length of 0 km (0 kft).

Figure 2-2: Receive frequency response

Frequency Hz	
Lower Boundary	Upper Boundary
-7 dB @ p425 Hz	-17 dB @ p100 Hz
-5 dB @ p500 Hz	+3 dB @ p400 Hz
-5 dB @ 3000Hz	+6 dB @ 3300Hz
-7 dB @ 3300Hz	-2 dB @ 5200Hz

Acoustic shock (maximum acoustic output)

The acoustic shock/peak acoustic pressure from the receiver does not exceed +36 dBP_a when a simulated 10x1000 μ s lightning voltage surge of 800 V is applied to the tip and ring of the terminal.

Receive noise

The receive noise of the telephone handset when set to the nominal receive level shall not exceed a sound level of 37 dB(A) on a quiet line termination.

On-hook receive sensitivity

With a 1 kHz, 1 V, signal applied to the tip and ring leads in the on-hook condition, the output from the receiver unit is less than -70 dBP_a.

Receive requirements for hard of hearing

- **Magnetic flux coupling:** The terminal provides magnetic coupling with hearing aids. The magnetic field generated by the receiver meets the requirements of CSA Standard CAN3-T515-M85, Section 4.
- **Amplified receive:** The terminal provides three levels of amplification (approx. 6.7, 13.3, and 20 dB) above the normal level (0dB). The maximum level of amplification meets CSA Standard CAN3-T515-M85, Section 5.

Sidetone characteristics

The terminal was tested for two sidetone characteristics: loudness and distortion.

Sidetone objective loudness rating

Sidetone measurements are made as specified in IEEE7 Standard 661-1979 and Standard 269-1983 using an external feeding bridge of $2 \times 200 \frac{3}{4}$, $2 \times 2 \mu\text{F}$, at 48 Vdc using 26 gauge (0.4 mm) artificial line. The SOLR falls between 6 and +23 dB for loops up to 15 kft.

Sidetone distortion

The distortion does not exceed 7% when tested as per IEEE Standard 269-1983. The calibration distance for the test shall be .76 centimeters.

Tone signaling

The tone signaling characteristics of the product comply with the requirements described in the following sections.

Tone frequencies and tolerance

The depression of each button on the dial pad (individually) generates two tones, as defined in Figure 2-3. No output tone is generated if two or more buttons are pushed simultaneously. If a second key is depressed before the first is released, the second key is ignored.

Each frequency is within +/- 1.0% of nominal when tested at 20 °C. Over the range of 0 °C to +50 °C, each frequency should be within 1.5% of nominal.

The above constraints apply for any set current from 20 mA to 100 mA.

Figure 2-3: Tone frequencies generated

	1209	1336	1477	Frequency grid (frequencies in Hz)
697	1	2	3	
770	4	5	6	
852	7	8	9	
941	*	0	#	

Tone output levels

Below are the limits for tone output levels when tested in the circuit shown in Figure 2-1 with the loop current adjusted:

At 20 mA:

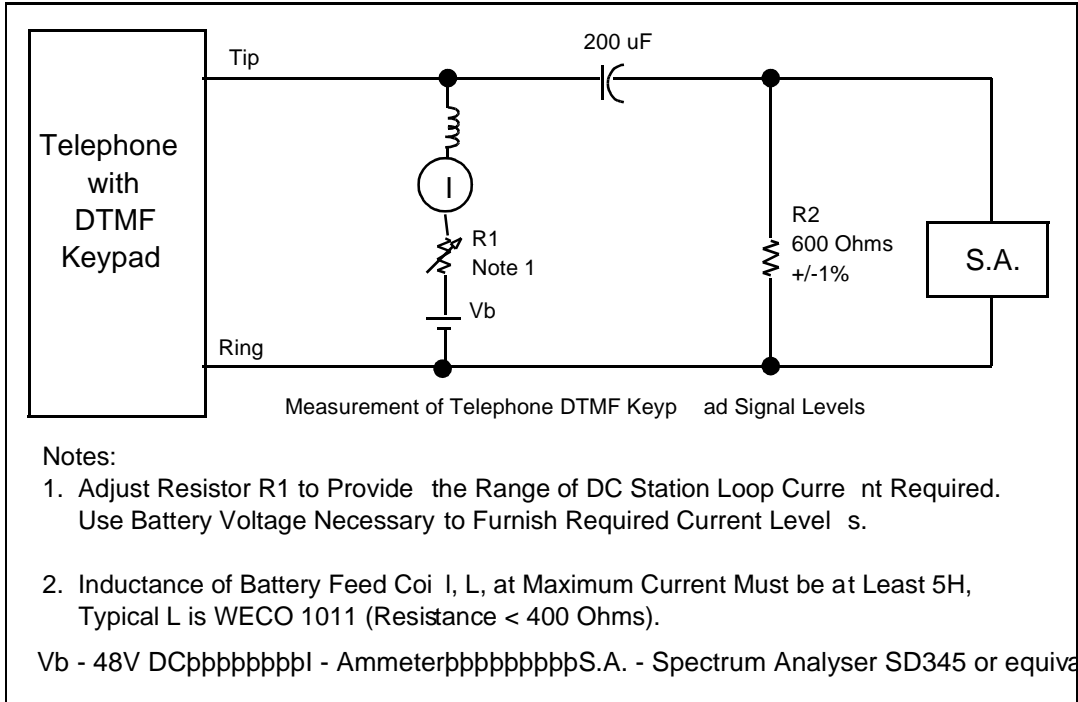
- Low frequency components: Minimum-7.5 dBm
- Maximum-1.0 dBm
- High frequency components: Minimum-5.5 dBm
- Maximum-0.0 dBm

At 100 mA:

- Low frequency components: Minimum-14.0 dBm
- Maximum-5.0 dBm
- High frequency components: Minimum-12.0 dBm
- Maximum-4.5 dBm

In addition, levels of high frequency components are 2 dB \pm 1.5 dB higher than low frequency components.

For currents between 20 and 100 mA the level is proportional to current.

Figure 2-1: DTMF signaling measurements

Tone duration

For Power Fail Mode manual dialing, the tone duration is for as long as the button remains depressed. In normal operation and when autodialing using the quick access keys in Power Fail Mode, the tone duration has a default value of 80 ± 15 msec.

Rise time and fall time

The rise and fall times of the DTMF signal are less than 5 ms.

Interdigit interval

The interdigit interval is defined as the time when either or both of the component frequencies are at a level of less than -55 dBm. During automatic dialing, such as with the quick access keys, the interdigit interval is between 45 and 100 ms.

Tone leak

The tone leak of DTMF component signals during the signal-off times is less than -55 dBm when measured into a 600 ohm resistive test termination at tip and ring.

Non-linear distortion

When tested in the circuit shown in Figure 2-1, with DC currents between 20 mA and 100 mA, the total power of all extraneous signals in the voice band above 500 Hz accompanying DTMF pulses is at least 20 dB below the level of the DTMF pulse.

Tone signal transients (tone level excursions)

Transient voltages within the first 5 ms of the on-time of the signal have a zero-to-peak level no greater than 12 dB above the zero-to-peak level of the steady state DTMF pulse.

Transmitter muting

During signaling, the transmit sensitivity of the speech circuit is reduced by a minimum of 45 dB.

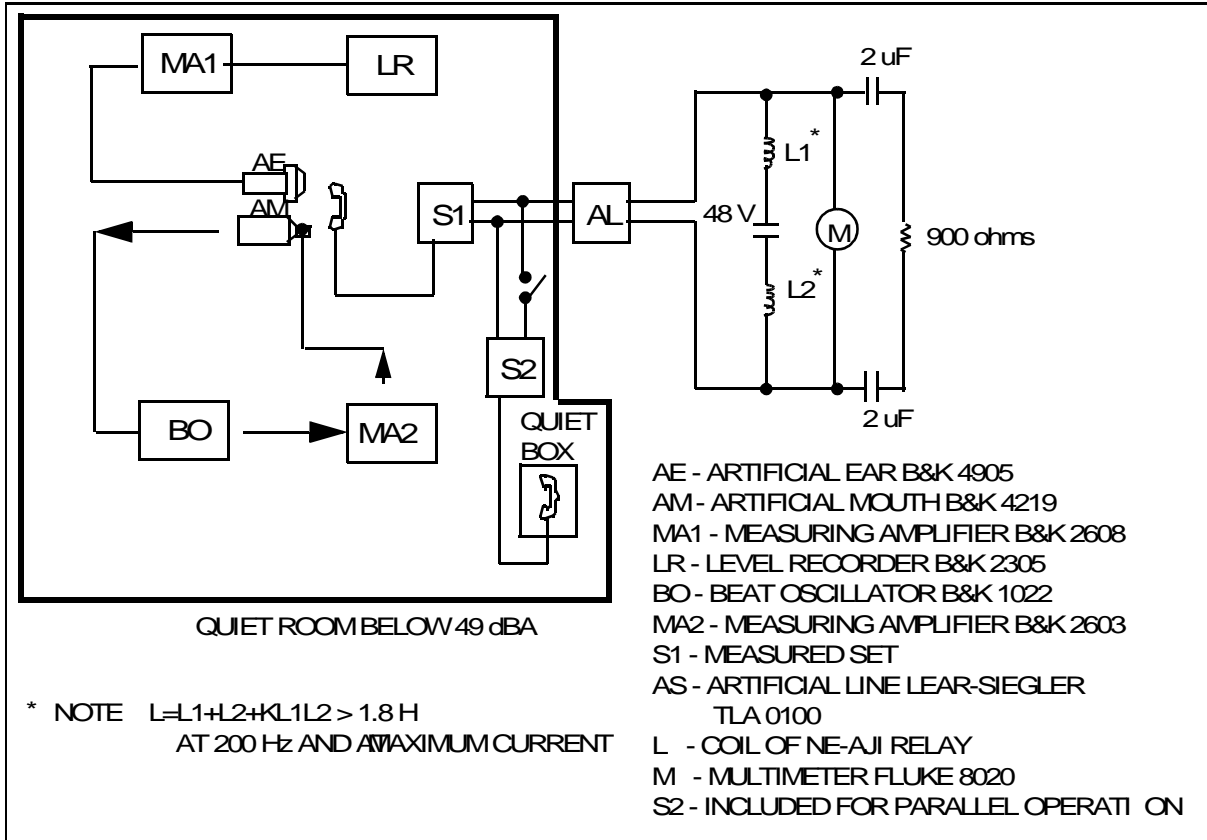
Muting interval

Muting starts before the level of any tone pair has risen above -35 dBm and ends no later than one second after the level of any tone pair has decreased below a level of -55 dBm.

Signaling sidetone

The circuit used to measure the receiver output level during signalling is shown in Figure 2-2. The telset receiver output is between -25 dBPa and +2 dBPa.

Figure 2-2: Measurement of signaling sidetone



Pause

The terminal is capable of generating a programmed Pause during the output of DTMF tones, such as during outdialing of quick access numbers. The nominal (default) value of this pause is two seconds.

Modem signaling

The modem signals using Bell 212A 1200 bps Differential Phase Shift Keying (DPSK) standard protocol.

Alerting acoustical output

The alerter in the on-hook terminal has a sound power level of at least 72 dBA, and it responds to a two-second ringing signal of 60 to 105 VRMS in the frequency range of 17 to 23 Hz with an acoustic output of 2 ± 0.25 seconds duration.

Special tone generation

The terminal provides synthesized precise dial tone to the user through the handset. In addition, it also provides bong tone and attention tone. The attention tone is similar to the ANSI SIT tone. The specification for the attention tone is as follows:

- | | | |
|---------------|---------------------|------------------|
| • First Tone | Frequency: 913.8 Hz | Duration: 150 ms |
| • Second Tone | 1370.6 Hz | 150 ms |
| • Third Tone | 1825.4 Hz | 250 ms |
| • Total | | 550 ms |

Features and functions

This section describes various features and functions of the desk terminal.

Card reader

Depending on the card reader type chosen, the desk terminal card reader will read magnetic stripe cards and/or pre-paid integrated circuit cards (PICC) cards, known as smart cards.

Magnetic stripe cards: Card readers read all data present on track 2 of all standard magnetic stripe cards. The reader reads on withdrawal, with card rates between 5 and 50 inches per second.

The one card exception is the Hello calling card, which will not be accepted as payment for a data call.

Smart cards: Cards compliant with ISO 7816, Parts 1, 2, and 3 can be read. The card remains in the card reader for the duration of the call.

Stripe/chip combination cards: If both the magnetic stripe and the chip are on the same side, the chip takes precedence.

Vacuum fluorescent display (VFD)

A two-line, 20-character dot matrix display is mounted on the upper front face of the terminal at an angle of 35 degrees with respect to the desk. It is highly readable from various angles. The VFD displays prompts to reinforce the audio prompts.

- There is provision for a continuous advertising line to display on the bottom row. This message has several configurations, which are set by the telco.
- The brightness of the display can be adjusted at the terminal by the craftsperson doing the installation or maintenance.
- The craft interface, which crafts people use to maintain the terminal, also has visual prompts.

The VFD connects to the main PCP with a single 26-conductor ribbon cable and connector.

Voice synthesis

The terminal generates high quality digital speech. The speech encoding method is ADPCM generated using an 8 kHz sample. This represents a bit rate of approximately 32 kbps.

There are two situations when voice prompts are muted: when the portable is dialing out, and when the call is established. The prompts are muted in order to avoid noise or interference on the line that might corrupt the data signals.

Quick access keys

These 10 keys are an optional feature, located to the right of the regular keypad. This side of the desk is covered with a blank bezel if this feature is not chosen.

Each key can be:

- configured to directly dial a number, such as a taxi company or a car rental agency.
- rated individually
- configured with an advertising or information visual prompt

Datajack data call

A data call is signalled by pressing the # key twice in succession. This signal is stripped out of the code and is not passed onto the NCC. A data call will not be signalled to the NCC (Millennium Manager) until the number has been dialed.

Keypad: When a data call is signaled, the keypad becomes disabled so that only the laptop attached to the datajack can dial out.

Visual prompts: There are four visual prompts that are unique to a data call. These prompts are displayed on the bottom line of the VFD.

Visual prompt	This prompt occurs when:
Connect equipment and start call	a data call has been signalled but there is nothing plugged into the data jack or no number has yet been dialed by the modem of the equipment attached to the data jack
Lost connection	a data jack call in progress is interrupted
Replace receiver	the receiver is lifted off hook while a data call is in progress
Datajack in service	a data call is established, and the handset is on-hook

The data jack prompts will not be displayed if the warning timers have expired for a smart card call.

Note: The data jack circuitry has been designed to provide compatibility with most types of data equipment (including laptops, notebooks, portable fax machines, etc.). However, due to the fact that the Millennium terminal must remain in control of a data jack call, current from the telephone loop is shared between it and the device plugged into the data jack. The variables of loop length and the line interface characteristics of the data equipment can potentially cause situations where a data jack call attempt may fail or data transmission difficulties might occur during the call.

Smart card alert

Smart Card Alert is sometimes called the Forgotten Card Alarm. It warns users who forget their cards in the card reader. It generates an audible alarm tone when the user leaves a valid smart card in the reader after placing the handset back on hook.

The SCA uses a relay to control the signal to the alerter transducer. The relay can switch the alerter transducer signal from either the telephony ringer circuit, bypassing the SCA, or to an SCA-generated tone.

The SCA generates its tone with an HC04 inverter, which also drives the alerter transducer differentially. The volume, at a distance 0.5 meters from the set and perpendicular to the front face, will be a minimum of 70 Phons. The tone will have a major frequency component near three Khz.

A signal from the PC5 pin of the 82C445A PIO chip passed through a 74HC14 inverter controls the alerter source selection relay. When it is high, the relay will not be energized, and the alerter transducer will be connected to the alerter circuit. Setting it low will turn on the relay, and connect the transducer to the SCA tone generator circuit on the power PCP. The inverter was included to make the logic the same for the SCA implementation on other Millennium terminals.

If an incoming call and the FCA tone coincide, the call will take precedence.

The alarm will be configured via timer fields in the Feature Configuration table and will support the following functions:

1. Variable start delay (Onhook balance)
2. Variable start delay (Following a call or hookswitch transition)
3. Variable duration for cadence time for ON period
4. Variable duration for cadence timer for OFF period
5. Duration timer.

When on hook, the alarm must be sensitive to keypad and display activity so that it will not sound if the user is using the payphone for card management functions. In this case, the alarm will sound after a period of inactivity.

If the card is not removed, the alarm will eventually stop (duration expired). the terminal will continue to monitor the card reader and if necessary, will send a card reader blocked alarm to the Millennium Manager (NCC).

Millennium Manager (NCC) changes

The NCC will support the addition of five new fields in the Feature Configuration table:

1. Onhook card present alarm delay (default = 5 seconds)
2. Postcall card present alarm delay (default = 2 seconds)
3. Card present alarm duration (default = 10seconds)
4. Cadence_timer_ON (default = 0.5 seconds)
5. Cadence_time_OFF (default = 0.5 seconds)

CO answer supervision

The terminal requires Wink or Hard Reversal, or inferred answer supervision to indicate that the called party has answered. Under normal conditions, line polarity is CO battery voltage (27 to 56 V) for Ring and ground for tip.

Wink is defined as a momentary reversal (typically 100 ms) of polarity.

A hard reversal is defined as a reversal in polarity from the time the called party answers the set until the call is terminated.

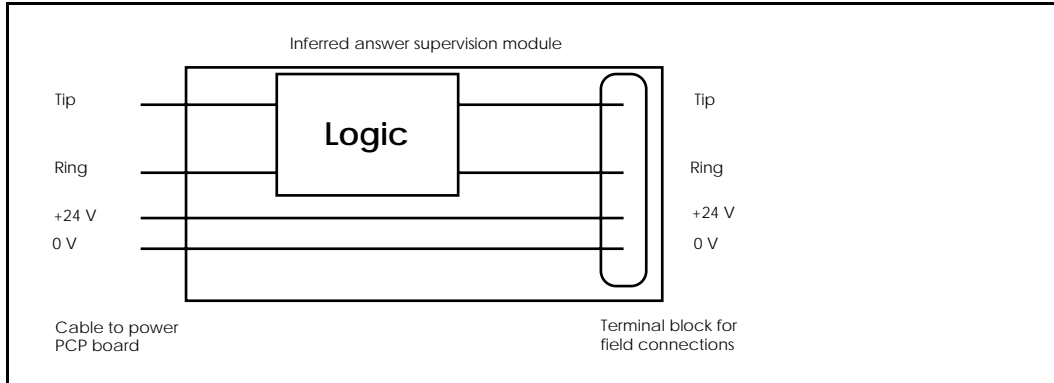
The terminal supports answer supervision provided it is in a format similar to a DMS switch with RMR and RMT enabled, such as with false supervision on operator-assisted calls and true supervision on toll or local calls.

Inferred Answer Supervision

Inferred answer supervision is used in cases where older CO equipment cannot support answer supervision. It works by monitoring the line for call progress tones and human speech. It reverses the polarity of tip and ring when a call is answered.

The IAS module resides in the terminal and is connected between the telephone line and the power PCP board. Supplementary power is routed through the module, but does not power it.

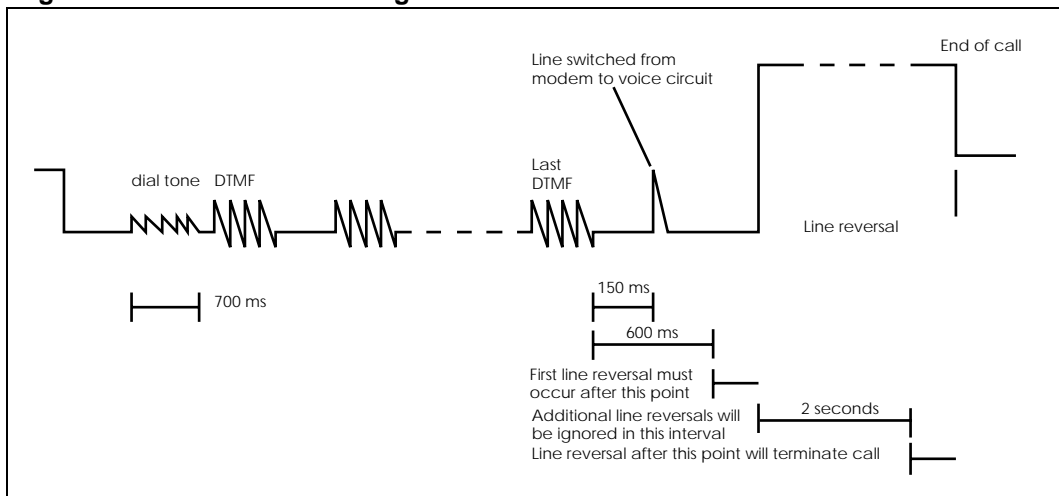
Figure 2-3: IAS module interface



Loop current from the telephone line powers the module. The module operates normally with DC loop currents from 20 mA to 120 mA. The maximum voltage drop across the module is seven VDC. Line breaks up to 600 milliseconds do not reset the module.

The line reversal indication from the IAS module conforms to the timing shown in Figure 2-4. The terminal waits 600 milliseconds after the last DTMF tone before it recognizes a valid line reversal. Then it ignores any more line reversals for the next two seconds. It interprets a line reversal that occurs more than two seconds after the first one as disconnect supervision, and ends the call.

Figure 2-4: Line reversal timing



3 Electrical requirements

This section refers to the power requirements of the Millennium desk terminal.

Power requirements

The terminal requires two types of connections for full operation.

- While the set is off-hook, the telephony portion of the terminal is supplied by the telephone line with 27 to 56 V, 20 to 100 mA.
- In addition, an external 24 V nominal DC supply must be provided to the terminal.

Power interruption

For momentary interruptions of power of less than one cycle of 60 Hz, terminal operation is not affected. For power interruptions exceeding this value, service shall be reduced to a Power Fail Mode.

When full power is restored, the terminal returns to a normal (full) level of service. If power is restored in one to two seconds, the real time clock is restored without Millennium Manager intervention, that is, no alarm is issued and no time synch request is generated).

If a data call is in progress when the power fails, it will terminate.

Current and voltage characteristics

The current and voltage characteristics of the product comply with the requirements described in the following sections.

On-hook metallic resistance

The resistance between tip and ring is greater than 5 M Ω when measured with a 100 V source.

3-2 Electrical requirements

The resistance between tip and ring is greater than 150 k Ω when measured with a source voltage of 200 V.

Longitudinal on-hook resistance

The resistance from tip-to-ground and ring-to-ground is greater than 10 M Ω when measured with a 100 V source.

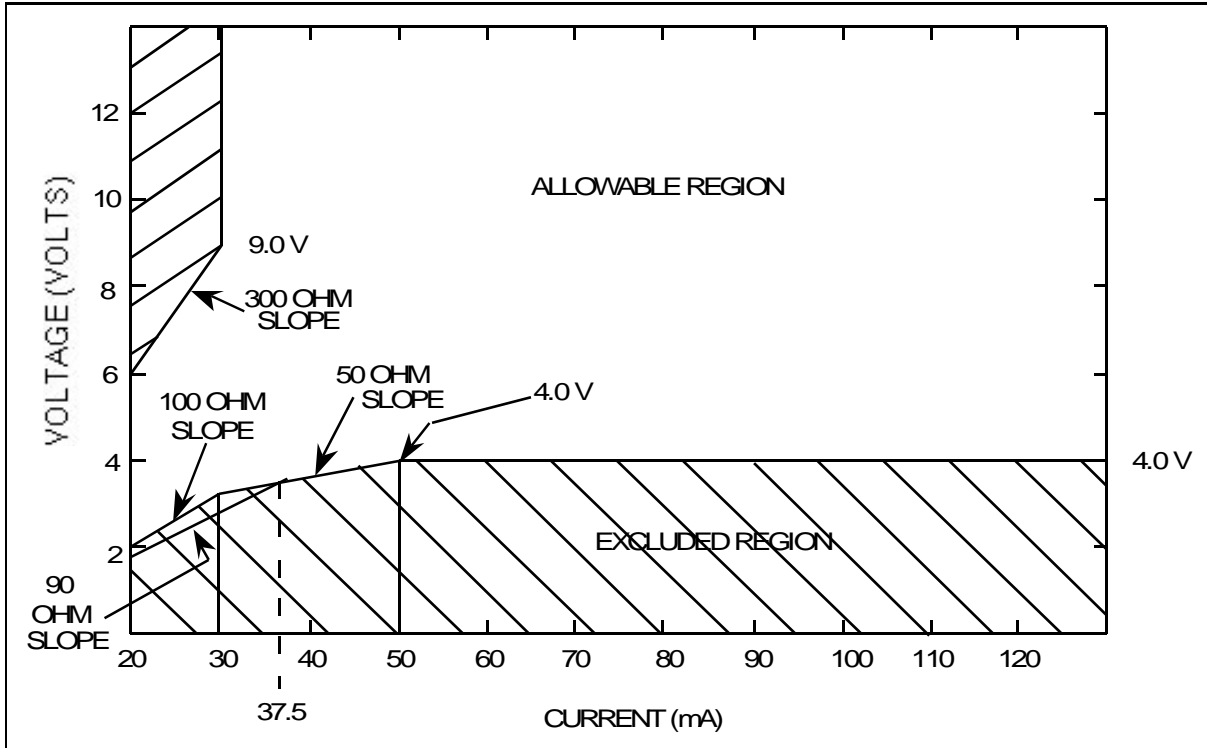
The resistance from tip-to-ground and ring-to-ground is greater than 150 k Ω when measured with a 200 V source.

Metallic on-hook impedance

The terminal meets the metallic on-hook impedance specified in CS-03, Issue #7.

Metallic off-hook resistance

The Off-hook DC resistance between tip and ring, excluding the line cord, falls inside the limits of Figure 3-4.

Figure 3-4: Off-hook DC resistance limits

Longitudinal off-hook resistance

The resistance from tip or ring to ground, and all accessible conductive parts, is greater than 250 k Ω when measured with a 100 V source.

Metallic off-hook impedance (return loss)

The terminal meets the metallic off-hook impedance specified in CS-03, Issue #7.

Longitudinal balance

The terminal exceeds the longitudinal balance requirement of CS-03, Issue #7.

Load number/Ringer Equivalence

As measured per CS-03, Issue #7, the load number of the terminal is 40.

The FCC Part 68 Ringer Equivalence (REN) is 2.0B

Voltage and current stresses

The requirements of the Surge Voltages section and the Dielectric Strength section apply after the telephone set has been subjected to the Humidity test.

Surge voltages

Metallic surge voltage — The telephone set shall withstand three surges of each polarity applied between tip and ring, of 1000 V peak, 10 x 1000 μ s. The surge generator shall have a current capacity of greater than 200 A. This requirement applies to both the on-hook and off-hook states.

Longitudinal surge voltage — The telephone set shall withstand three surges of each polarity applied between tip-to-ground and ring-to-ground, of 1500 V peak, 10 x 1000 μ s. The surge generator shall have a current capacity of greater than 400 A. This requirement applies to both the on-hook and off-hook states.

Dielectric strength

With the telephone set wrapped in grounded metal foil, with a voltage of 1000 V 60 Hz applied between tip and ring, with tip and ring shorted together, and ground, there shall be no breakdown. The voltage is raised from 0 V at a rate of approximately 200 V/sec and held steady at 1000 V for 60 seconds. Breakdown is indicated by currents greater than 0.5 mA during the steady state voltage condition. This test shall be performed in both the on-hook and off-hook states.

Over currents

The telephone set survives, undamaged, the application of 150 mA for a period of one hour.

The telephone set survives, undamaged, in the off-hook state, the application of 130 V RMS 20 Hz through a 200 ohm source resistance for five cycles of 2 seconds on and 4 seconds off.

Electrostatic discharge (ESD)

Direct ESD: Because of its non-metallic plastic housing, this product cannot be tested using the preferred contact discharge method. The unit shall meet IEC 1000-4-2 (formerly IEC 801-2) air discharge severity level 4. This specifies a test voltage of 15 kV using a 330 Ω / 150 pF probe. Dropped calls or display resets below the +/- 15kV damage threshold are acceptable provided functionality of the terminal is restored without unusual user activity.

Indirect ESD: The unit shall meet IEC 1000-4-2 (formerly IEC 801-2) contact discharge severity level 4. This specifies a test voltage of 8kV using a 330 $\frac{3}{4}$ / 150 pF probe. Dropped calls or display resets are acceptable provided the functionality of the terminal is restored without unusual user activity.

Electrical fast transient immunity

The unit shall meet IEC 10004-4, severity level 3. Each of the two tests will be applied for a duration of one minute. Severity level 3 is intended for a product in an industrial environment such as the relay room of open-air high voltage substations. For future product, meeting severity level 2 (protected environment) is sufficient.

Electromagnetic environment

The electromagnetic environment takes into consideration two conditions: radiated compatibility and conducted interference.

Radiated electromagnetic compatibility

The narrow band radiated electric field from the unit shall meet the limits of CISPR 22 Class A, using ANSI 63.4 test methods.

Conducted electromagnetic interference

The conducted EMI measured at the power lines of the unit shall meet the limits of CISPR 22 Class A, using ANSI 63.4 test methods.

Immunity to narrowband electromagnetic fields

Two types of immunity are tested for in regard to narrowband electromagnetic fields. These are described below:

Radiated immunity

The unit shall continue to operate to specification when subjected to a radiated RF signal with a field strength of 3V/m over the frequency range of 0.1 KHz to 200 MHz. Sound pressure level measured at the handset shall not exceed 55 dBSPL for compliance to this specification.

Conducted immunity

The unit shall continue to operate to specification when subjected to a conducted RF signal with a common mode voltage of 2volts applied to the line over the frequency range of 0.1 kHz to 30MHz.

Note: Narrow peaks of susceptibility below the requirements outlined in the section on Electromagnetic environment, are acceptable in portions of the RF spectrum not subject to high fields, such as outside AM TV and FM broadcast, CB or amateur frequency bands.

Test methods

In both the radiated and the conducted test methods, the detected audio is measured at the handset using a sound level meter set to A-weighting. The threshold for detection is set to 55 dB(A). Ambient noise should be 10 dB below this level. The interfering signal frequency is stepped across the range required for the measurement. The radiated or conducted interfering signal level is increased at each test frequency until the audio threshold of 55 dB(A) is reached. At this point, the level of the interfering RF signal is measured and plotted, producing an immunity profile.

Magnetic field susceptibility

The susceptibility to a magnetic field was measured for malfunction and degradation of performance.

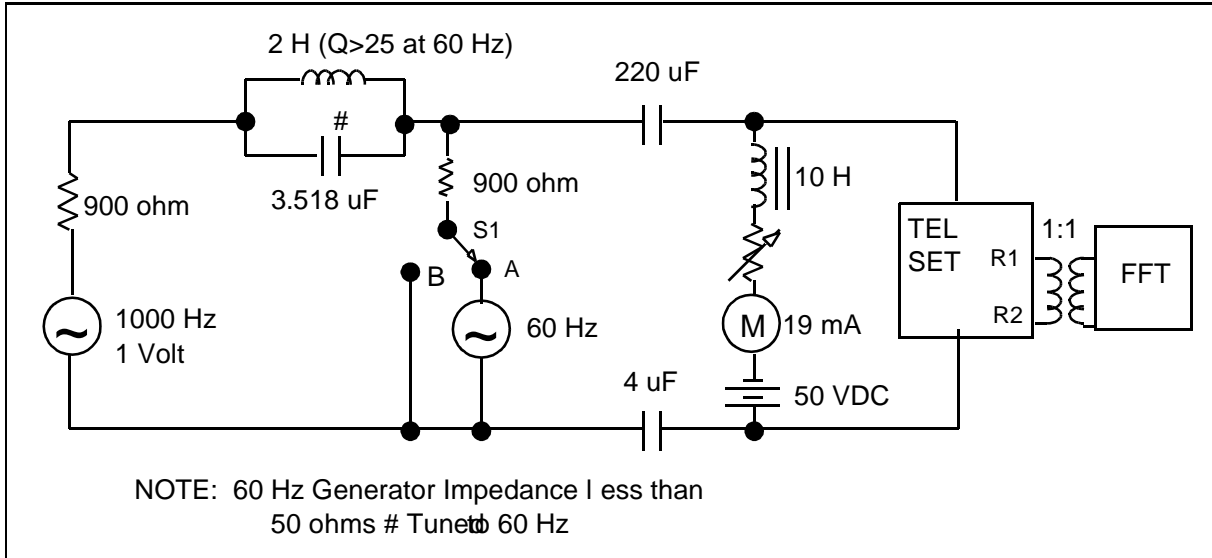
Requirements

When subjected to magnetic fields, as indicated below, the terminal exhibits no malfunction or degradation of performance beyond the tolerance given in this specification.

Frequency	Magnetic Field
• 60 Hz	130 dBuA/m
• 60 Hz- 250 kHz	-10 dBuA/m decade, slope

60 Hz suppression

The telephone set shall be put in the test circuit shown in Figure 3-5. The frequency analyzer (FFT) is connected across the receiver terminals through an isolating transformer, and S1 is put in position A. The 60 Hz injection level is increased until the level of the sideband frequencies, 940 and 1060 Hz, are 30 dB below the level of the fundamental frequency, 1000 Hz. At this point, S1 is put in position B and the open circuit voltage of the 60 Hz generator is measured. This level shall be a minimum +9 dBV.

Figure 3-5: 60 Hz suppression test circuit

4 User operating environment

The Millennium desk terminal is intended for use indoors, or in temperature-controlled environments.

Temperature range

The terminal is designed for an operating temperature of 0 °C to +50 °C.

Humidity

The terminal is designed for an operating humidity environment of up to 90% relative humidity at 40 °C.

Shipping and storage conditions

Storage temperature range tolerance is -50 °C to +70 °C.

The storage relative humidity tolerance is up to 90% relative humidity at 40 °C.

The telephone set is designed for a shipping vibration environment of:

- 5 to 60 Hz, 0.35 mm displacement
- 60 to 500 Hz, 5g (maximum)

The telephone set is designed for a shipping temperature shock of -40 °C to +60 °C over five minutes.

5 Environmental requirements

The Millennium desk terminal meets all the requirements described in this document when subjected to the following environmental conditions. These conditions represent the extremes of ambient environment encountered in an indoor environment.

Note: Different units may be used for each test.

Low temperatures

The terminal is tested in accordance with IEC Publication 68-2-1, Test Ab, which specifies a minimum of 16 hours at -50 °C while the terminal is not operating. Then the terminal is operated at the lowest specified operating temperature, in this case 0 °C. The following details apply:

1. Measurement at 0 °C will meet all requirements embodied in this specification.
2. Recovery time:4 hours.
3. The end point measurement will meet all functional requirements embodied in this specification.

High temperatures

The terminal is tested in accordance with IEC Publication 68-2-2, Test Bb, which specifies a minimum of 16 hours at +70 °C while the terminal is not operating, and at an absolute humidity not greater than 20 g of water vapor per cubic metre of air. Then the terminal is operated at the highest specified operating temperature, in this case +50 °C. The following details apply:

1. Measurement at +50 °C will meet all requirements embodied in this specification.
2. Recovery time:4 hours.
3. The end point measurement will meet all functional requirements embodied in this specification.

Thermal shock

The terminal is tested in accordance with IEC Publication 68-2-14, Test Na, and 68-2-33 to which the following details will apply:

1. Low temperature:-40 \pm 3 °C
2. High temperature:+60 \pm 3 °C
3. Number of cycles:5
4. Exposure time:30 minutes
5. Changeover time:5 minutes
6. Initial measurements prior to conditioning will meet all requirements embodied in this specification.
7. Recovery time:4 hours
8. The end point measurement satisfies all functional requirements embodied in this specification.

Humidity

The terminal is tested in accordance with IEC Publication 68-2-3, Test Ca, and 68-2-28 which specifies exposure to 95% Relative Humidity at 40 °C. The following details will apply:

1. Test duration: 21 days
2. Recovery time: greater than 2 hours but less than 4 hours
3. The end point measurement will meet all functional requirements embodied in this specification.

Humidity Cycle

The unit shall withstand three cycles of the following test:

State	Duration of Exposure	Temperature (°C \pm 3 °C)	Relative Humidity %
a	30 min	2350 \pm 20	
b	30 min	6615 or less	
c	30 min	3290 or greater	
d	30 min	-40any convenient value	

A recovery and stabilization period of 4 hours at 23 \pm 3 °C and 50% \pm 20% relative humidity shall be allowed following the application of these stresses.

Atmospheric Pressure

The terminal is tested in accordance with IEC Publication 68-2-13, Test M, to which the following details apply:

1. Non-operating 8-hour “soak” under 85 mbar air pressure at -50 °C
2. Recovery time: not less than 1 hour but less than 2 hours
3. Operation: 650 mbar at -40 °C
4. The end point measurement will meet all functional requirements embodied in this specification.

Fungus growth

The terminal is subjected to tests in accordance with IEC Publication 68-2-10 Test J. At the end of testing, there will be no evidence of mold growth, corrosion, discoloration, or loss of insulation and/or embrittlement.

Air purity

The terminal is able to operate in environments of up to 100,000 particles of 0.5 microns or larger per cubic foot.

Vibration

The terminal is tested in accordance with IEC Publication 68-2-6, Test Fc, to which the following details apply:

1. Test procedure: A
2. Axis of Vibration: 3 mutually perpendicular axes
3. Frequency Range: 5 to 500 Hz
4. Vibration Amplitude: 5 - 60 Hz 60 - 500 Hz
5. Displacement: 0.35 mm 5 g (max)
6. Endurance duration: 1 hour in each plane

There will be no visible signs of damage. The end point measurement will meet all functional requirements embodied in this specification.

Transportation simulation (bounce)

In accordance with IEC Publication 68-2-55, the packaged set shall withstand testing that simulates the effect of bouncing which could occur when products are transported as loose cargo over rough road conditions on the loading platform of vehicles.

Transportation methods

No special constraints shall be applied to standard methods of shipment (e.g. air freight, truck, rail, etc.)

Mechanical shock (unpackaged)

In accordance with IEC Publication 68-2-27, Test EA, severity A, the terminal will withstand infrequent, non-repetitive shocks such that would be encountered by equipment and components during transportation.

Mechanical shock

When **packaged** as it would normally be shipped, the terminal will meet the following drops onto a concrete surface:

- a 75 cm face drop on each face (six drops)
- a 75 cm corner drop on each corner (eight drops)

When **unpackaged**, the terminal will meet the following drop onto a concrete surface covered with 3mm asphalt tile or similar surface:

- six random drops from a height of 7 cm

User inflicted stress and vandalism

The terminal housing is composed of ABS polymers; the display of acrylic and polycarbonate. Because of its indoor design, it is recommended that the terminal be installed in supervised or patrolled areas.

The terminal is resistant to user-inflicted stress and vandalism as described below:

Surface finishes

The surfaces are resistant to handset blows, pencils, ballpoint pens, chalk, lipstick, nail enamel, etc.

Handset cord

The handset cord is a standard curled cord that terminates inside the housing. It will withstand any of the stresses experienced by normal, indoor telephone use.

Pry points

The housing is securely fastened together with screws located under the base housing to reduce accessibility. Further, the set can be fastened to wall or desk for added stability.

Flame resistance

Exposed housing parts have a flame resistance of UL94 HB, which means the terminal is resistant to flames and hot objects, such as cigarette lighters, matches, cigarettes, and cigars over a short term exposure.

Dents

The housing is not easily dented or chipped by small tools or objects that may be used to strike the terminal. In particular, the handset should not be capable of functionally damaging the housing.

6 Regulatory and safety requirements

The Millennium desk terminal meets the regulatory and safety requirements of the CSA in Canada and the FCC and UL in the U.S.

Regulatory requirements

The terminal meets regulatory specifications CSA C108.8 in Canada and FCC Parts 68 and 15 in the U.S. and is certified or listed in conformance with these standards.

Safety requirements

The unit shall meet all applicable requirements of Canadian Standards Association's CSA-NRTL, which covers both Canada and the United States.

Testing to the harmonized North American standard UL2950/CSA C22.2 No. 950 which is IEC-950 based may be conducted to assist the introduction of the product into non-North American/CALA countries.

Fire hazard

Polymeric materials used in the terminal are self extinguishing so as to not create a fire hazard.

Acoustic shock

The telephone inherently minimizes acoustic shock and annoying clicks.

Terminal weight

The terminal weighs approximately 1500 grams, facilitating ease of installation and replacement.

7 Reliability

Millennium desk terminals meet all of the failure rate parameters specified in the following sections.

Service life

The telephone is designed for a service life of 10 years.

Mean time between failures (MTBF)

MTBF for electronic components only is less than 5% per year, or 20 years. MTBF for individual modules, such as the card reader and display, is specified separately. Electro-mechanical component failures are specified in terms of life cycles, as specified in the sections below:

Switch-hook

The mechanical life of the switch-hook is rated at 500,000 cycles.

Dial (keypad)

The mechanical life of the dial is rated at 1,000,000 cycles.

Card reader

The life of the card reader is rated at 100,000 card reads. In a normal environment, cleaning the reading mechanism should be necessary no more than once per 5,000 cards read or once per year, whichever comes first.

VFD display

The service life of the display module is expected to be 14 years. During that time, it will have been powered-up and operating for about 100,00 hours without electronic failure. The individual pixels of the display shall maintain a minimum of 50 per cent brightness after illumination for 50,000 hours.

Display impact resistance

The terminal will resist display breakage up to 25 inch-pounds. This is test as per CSA C22.2 No. 950 section 4.2.4 (steel ball test) with a modified steel sphere 1.5 inches in diameter (38.1mm) having a mass of 221 g and dropped 1,250 mm on to the sample. For this test, the terminal is support so that the display is within five degrees of the perpendicular.

Mean time to repair (MTTR)

For single hardware faults, the MTTR in a field environment should not exceed one hour. Ninety-five percent of all repairs should be effected in less than 15 minutes. This is assumed to include:

1. time to isolate a failure at the site of the terminal.
2. time to effect repairs or replace defective modules
3. time to reinstall modules or repairs.
4. time to perform final verification testing and place the system back into full operation.

The downtime attributed to preventive maintenance, travel time to the trouble spot, as well as other logistic and administrative delay times are not included in the above MTTR figures. In a field environment, replaceable modules should include:

- card reader
- data jack board
- handset cord
- line and spiral cord assembly
- quick keys (rep dialer) cover plate

8 Maintenance and administration

This section describes the maintainability of the Millennium desk terminal from a physical point of view.

Maintainability

The desk terminal has a few replaceable field parts, as described in Chapter 7, but if the terminal fails to function properly, the whole unit should be replaced.

Equipment handling

The unit is designed so that field level maintenance can be performed, over the range of environmental conditions specified in Chapter 5. Required maintenance such as testing, removal, replacement, and hook-up should be possible over this range with only external cleaning or wiping allowed. The unit is designed so that special handling or protective equipment is not needed for transport between the local supply facility and the field.

Adjustments, alignments, and calibrations

Field level maintenance adjustments, alignments or calibrations should not be required for the unit.

Ready condition

The unit, when released to the field for use, should perform in accordance with the requirements specified herein after a period of at least seven days during which no maintenance, checkout, or testing has occurred.

Packaging

Elements within the unit are packaged to group functionally-related elements within modules so as to minimize interconnections between modules, and to simplify fault isolation.

Adjustments

Modules are designed such that all replacement modules, when installed in the terminal, should be immediately operable at design accuracy without requirement for continuity testing, functional adjustment, or calibration of the replacement module.

Reversibility restrictions

The unit design and construction incorporates features such that it is difficult to install equipment or modules incorrectly, and to attach cables, electrical plugs, and any other such items in an improper manner.

Preventive maintenance

There is no scheduled maintenance (including maintenance inspections and parts replacement) required for the unit except periodic cleaning of the card reader (read head).

Accessibility

The terminal craft interface is accessed with a key card. The printed circuit pack in the stand is connected to the main printed circuit pack by a 10 conductor cable equipped with a ribbon connector that can be disconnected. All field replaceable modules can be removed and replaced without removing or disconnecting any other module.

Diagnostic capabilities and alarms

Refer to the applicable section of the *Millennium deskset terminal installation, operation and maintenance guide*, which explains the alarms, error codes, and the use of the craft interface to diagnose operational problems and to return the terminal to service after maintenance activities.

Test points

Some test points are provided on the PCP boards where required for use during shop testing and repair.

9 Documentation

The primary terminal document is the *Millennium deskset terminal installation, operation, and maintenance guide*, which is in accordance with existing Administrative Procedures and Operating Standards. The following elements will be among the sections addressed:

- product description
- installation and testing
- operating procedures
- maintenance and repair procedures

Besides the installation guide, documentation relating to the Millennium desk terminal operation includes the following Millennium books:

- *Database Design Report*
- *Terminal Management Reference Guide*
- *System Management Reference Guide*
- *Card Management Reference Guide*
- *System Manager's Handbook*
- *System Configuration Guide*
- *Millennium Maximizer telco user guide*

Glossary

The following terms and abbreviations may appear in this document or other documents referenced in this one:

AABS

See Automated Alternate Billing Service

ac

See alternating current

ACCS

See Automated Calling Card Service.

ADPCM

Adaptive Differential Pulse Code Modulation

alarms

Messages generated by terminals to alert the Network Control Center of terminal failure conditions.

alternating current

A flow of electricity that changes its direction on a regular basis.

ANSI

American National Standards Institute

answer detection

See supervision.

AO

See Automated Operator.

AOS

Alternate Operator Services.

API

See Application Programmatic Interface.

Application Programmatic Interface

A set of procedure calls that gives a workstation program a standard interface to communicate with a host computer system, such as Tandem.

ASTM

American Society for Testing and Materials

AT&T

American Telephone and Telegraph

Automated Alternate Billing Service (AABS)

A feature that allows automated calling card, collect, and third-number billed calls and uses voice and visual prompts to communicate with the calling and billed parties.

Automated Calling Card Service (ACCS)

A feature that allows the customer to dial a 0+ call and bill it to a calling card number provided by the telco or a commercial credit card company.

Automated Operator

See Automated Alternate Billing Service (AABS).

BOC

Bell Operating companies

button

A button on the computer screen is a grayed-in rectangular box with a centered label on it that initiates an action when it is clicked on using the mouse. It is also sometimes used to describe the keys on the face of the payphone.

call-detail record (CDR)

A record of data on calls processed by the Network Control Center. These records are stored on the recording device, and are used for billing data and to compile studies on traffic and equipment service, division of revenue, engineering, and fraud.

carrier

The name of the company providing the telephone service.

CBA

Canadian Bankers Associations (Canada)

CCC

Commercial credit card

CCITT

International Telegraph and Telephone Consultative Committee

CDR

See call detail record

central office (CO)

Part of the telecommunications network which provides telecommunication services to subscribers within a given area. It consists of switching equipment and trunks for establishing connections to other central offices.

CFS

Card fully seated

checksum

A data integrity test that is typically used to ensure that memory and transmitted messages have not been corrupted.

Chip card

See pre-paid integrated circuit card (PICC)

client-server architecture

A method of connecting a PC with a mainframe in order to take advantage of the abilities of both.

CO

See central office (CO)

configuration

The definition or modification of the characteristics of an object.

CP

Card present

craft interface

Part of the maintenance level of the Millennium terminals. Used by the craftspersons to maintain, install, and operate the Millennium terminals.

CRTC

The Canadian Radio and Telecommunications Commission, the federal regulator of the telecommunication industry in Canada.

CSA

Canadian Standards Association

Datapac

Telecom Canada's Data Packet Switching Network. Also a synonym for X.25.

dc

See direct current.

DES

Data Encryption Standard

desktop

The screen background for Windows programs on which windows, icons, and dialog boxes appear.

dialpad

See keypad.

dial tone

A continuous audible tone sent to a subscriber to signify readiness to start dialing.

digital

Signals in the form of discrete on/off pulses, represented by the digits 0 and 1, where "1" signifies on and "0" signifies off.

direct current (dc)

An almost nonpulsating unidirectional current in which the changes in value are either zero or so small that they can be ignored.

DOC

Department of Communications (Canada)

DOS

Disk Operating System. One of the operating systems of a PC computer.

download

A term applied to the transfer of data from a primary source device, such as a main-frame computer, to a subsidiary destination device, such as a terminal.

DPSK

Differential phase shift keying

DTMF

See dual tone multifrequency (DTMF).

dual tone multifrequency (DTMF)

A signaling method that uses set combinations of two voice band frequencies. One frequency is selected from a set of low frequencies, and the other from a set of relatively high frequencies. This produces the various tones heard when the user pushes the buttons on the keypad.

EEPROM

See electrically erasable programmable read-only memory.

EIA

Electrical Industries Association

electrically erasable programmable read-only memory (EEPROM)

A type of memory in which initial data can be erased and changed electronically. It does not require power to maintain data. Data stored in the EEPROM of a control PCP in a terminal includes the NCC and terminal telephone numbers.

electrostatic discharge (ESD)

A transfer of electrostatic charge either caused by direct contact between two bodies that have a different electrostatic potential, or induced by an electrostatic field. It is important to protect against ESD as sensitive components in the terminal can be damaged.

EPROM

See Erasable Programmable Read Only Memory

erasable programmable read-only memory (EPROM)

A type of read-only memory in which data is initially programmable as in programmable read-only memory (_PROM). Unlike PROM, in which the program is fixed (cannot be changed) after initialization, EPROM data can be erased and changed after the initial program has been installed.

ESD

See electrostatic discharge.

EFT

Electrical Fast Transient

FCC

Federal Communications Commission. The U.S. government body that regulates the American telecommunications industry.

Fail to POTS Mode

A telephone that has lost its supplementary power reverts to Plain Ordinary Telephone Service (POTS) and is no longer able to provide credit, calling, and pre-paid integrated circuit card services.

FFT

Fast Fourier Transform

frequency shift keying (FSK)

A form of frequency modulation in which the modulating signal shifts the output frequency between predetermined values, and the output signal has no phase discontinuity. \

FSK

See frequency shift keying

Global Technical Services (GTS)

Provides technical assistance to the installation, operation, maintenance, and administration.

graphical user interface

This is a type of screen that usually has icons, pull-down menus, dialog boxes and on-line help and is accessed using a mouse or keyboard commands.

Guardian

The name of the operating system of the Tandem mainframe.

GUI

See Graphical user interface.

hotlist

A data table containing invalid credit, calling and pre-paid integrated circuit card numbers.

IEC

International Electrotechnical Commission

IEEE

Institute of Electrical and Electronic Engineers

integrated services digital network (ISDN)

A set of standards proposed by the CCITT to establish compatibility between the telephone network and various data terminals and devices. ISDN is a fully digital network, in general evolving from a telephone integrated digital network. It provides end-to-end connectivity to support a wide range of services, including circuit-switched voice, circuit-switched data, and packet-switched data over the same local facility.

interface

The device, method, or condition of communicating with separate entities, such as software and hardware components.

ISDN

See integrated services digital network

ISO

The International Standards Organization.

ISPCS

Integrated System for Public Communication Services

ISW

The Inside Service Wire, which provides power to the components of the terminal.

keypad

An alphanumeric keypad on the terminal used to enter alphanumeric information.

line

A transmission medium for connecting the equipment of a customer to a central office or other switch.

LRC

Longitudinal Redundancy Check

luhn

A card validation check. *See* luhn check digit

luhn check digit

A number added to a group of digits (forming a code) that identifies entities in the system used for verification.

Millennium Manager

See Network Control Center.

Millennium Maximizer

A Windows-based application that works with a PC and a Tandem mainframe in client-server architecture. It provides a graphical user interface into the Network Control Center (Millennium Manager)

MIS

Millennium Inmate System.

modem

A hardware device which converts data to voice frequency tones, and vice versa, to transmit data (MODulator DEModulator).

MSR

Millennium System Release. These releases are upgrades of the system.

MTBF

Mean time between failures

MTTR

Mean time to repair

NCC

See Network Control Centre. Also known as Millennium Manager.

network

Two or more interconnected computer systems, including the hardware and software used to connect them, with exchange information.

network control center

The control centre of the Millennium system. Also called Millennium Manager.

NNX

Represents Central Office Code Number where N=any number 2 to 9; X = any number 0 to 9.

NPA

Numbering Plan Area (Area Code)

NTP

A Northern Telecom publication or practice.

OC

Operating company

off-hook

Relates to the telephone set being terminated (i.e. drawing normal line current) when originating or answering a call.

OLTP

On-Line Transaction Processing. The OLTP subsystem handles the real-time processing requirements of the payphones, such as authorizing cards, directing external rating and card authorization requests, collecting data from the payphones, and sending tables to the terminals.

on-hook

The opposite of off-hook.

opcode

An abbreviation for operation code. See operation codes.

operation codes

These are messages craftspeople send to the Network Control Centre (NCC) from the terminal to inform the telephone company of the status of the terminal and the activities they have done. Each code is up to three digits long. The operating company specifies the meanings of most operation codes.

out of service

A state in which equipment is removed from service, either automatically by the system or manually by personnel.

packet-switched network (PSN)

A specialized communication system designed to carry digital data. Streams of data are divided into packets or units of standard size and sent along the network. Each packet has an address and system for checking the accuracy of the original data.

PAN

Personal Account Number

PC

IBM-compatible Personal Computer.

PCP

See printed-circuit pack.

PIC

Primary Inter-exchange Carrier.

PIN

Personal Identification Number.

POTS

Plain Ordinary Telephone Service or Plain Old Telephone Service, which is basic residential telephone service.

PICC

See pre-paid integrated circuit card.

pre-paid integrated circuit card (PICC)

Also known as a smart card, telecard or chip card. Users buy the cards and use them to pay for telephone calls by inserting them into the card reader. They contain an Electrically Erasable Programmable Read-Only Memory chip that records the value of the card. This value decreases as the card is used.

printed-circuit pack (PCP)

There are two printed-circuit packs (PCPs) in the credit card and universal terminals. The control PCP contains the integrated circuits that control all the functions of the terminal except those available in the power-fail mode. The telephony PCP contains the circuits that interface with the telephone line.

PSN

See packet-switched network.

radio frequency (RF)

The frequency in the portion of the electromagnetic spectrum that is between the audio frequency portion and the infrared portion.

RAM

See random access memory

random access memory (RAM)

Random Access Memory is memory used for temporary storage of information. In Millennium terminals this memory is backed up for at a minimum of 48 hours when there is a power failure.

read-only memory

A solid state storage chip that is programmed at the time of its manufacture and that cannot be reprogrammed by the computer user.

record

A record is a collection of related fields that is stored as one piece. A record can be searched for, added, updated, or deleted.

Region

In Millennium Maximizer, the region is geographical area in which the payphone is located.

Remote Server Call

The Remote Server Call is a Tandem software tool responsible for low-level communication between the client and the server.

REN

Ringer Equivalence Number

RF

See radio frequency.

RFI

Radio frequency interference

RH

Relative humidity

RMS

Root mean square

ROLR

Receive objective loudness rating

ROM

See read-only memory.

RSC

See Remote Server Call.

SCA

smart card alert

SIT

special information tone

SOLR

side-tone objective loudness rating

Smart card

See Prepaid integrated circuit card (PICC)

switch

A device which connects two or more parties or terminals together, and routes information along the network to the right destination.

Tandem

The name of the mainframe upon which Millennium Manager runs.

templates

Templates are collections of fields stored under one name. This allows the user to use an existing template when installing a payphone rather than entering in every detail each time a new payphone is installed. Each template is given a unique name.

terminal (payphone)

A telephone or other electronic device used at the location of a subscriber to send and receive messages over a communication channel.

TOLR

transmit objective loudness rating

TOPS

See Traffic Operator Position System

Traffic Operator Position System (TOPS)

A call processing system made up of a number of operator positions. Each operator position consists of a video display unit (VDU0, a controller, a keyboard, and a headset.

UL

Underwriters Laboratories Inc.

Vacuum Fluorescent Display (VFD)

A two-line 5X7 dot matrix display which provides all visual prompts.

VFD

See vacuum fluorescent display.

X.25

A CCITT-defined network layer protocol that is used in packet switching to establish, maintain, and clear virtual circuit connections between an ISDN terminal and a destination in the packet switching network.

Millennium desk terminal
General specification

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