Model AM7

Central Office Simulator

A Programmable Simulator of Central Office or PABX Switches for Testing of CPE and Network Equipment

Ameritec

Ameritec Corporation is an ISO 9001:2000 Certified Company

Introduction

The Ameritec Model AM7 CO Simulator is capable of simulating many of the functions of Central Office switches, PABX switches or the Public Switched Telephone Network (PSTN). The AM7 is user programmable, allowing realistic testing when an actual switch is not available.

The AM7 mainframe is a miniature, high performance, non-blocking digital switch. It is capable of switching up to 48,000 calls per hour, and has 10 option card slots for installation of plug-in interfaces. Interface options include Analog Loop/Ground Start, 2- or 4-wire E&M, 1.544Mbps T1 and 1.544Mbps SLC®96 linecards. Line card types can be mixed in the same unit to simulate multiple switch interfaces.

The AM7 can detect pulse, DTMF or MF R1 signaling, and can establish a switched connection to any other line in the unit. All call progress tones and cadences are programmable, to produce dialtone, ring, ringback, busy tones, winks, etc.

The AM7 can simulate Special Information Tones, circuit congestion conditions, such as line or trunk busy, and can introduce programable switched connection loss.

The AM7 includes a powerful dialing analyzer for analyzing received digits. Optional Tone Receiver cards are available for decoding MF and DTMF digits for use with T1 or SLC®96 interfaces.

The AM7 is a self-contained, compact, lightweight unit which is easily hand carried, or can be rack mounted for laboratory use.

AM7 Central Office Simulator with option boards

Applications

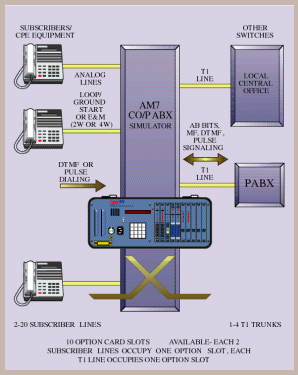
The AM7 is easily configured to simulate a variety of CO or PABX switches. This allows testing to be performed in development or manufacturing environments where a real switch is not available, or it is too costly, risky or limiting to use lines connected to a live switch.

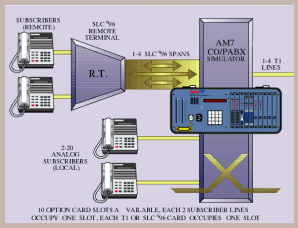
The Analog line interface options for the AM7 make it perfect for testing of Customer Premises Equipment (CPE), particularly in development, manufacturing and repair areas.

The T1 line interface option allows testing of CPE or switching equipment with T1 interfaces, and when used in combination with Analog linecards, allows the AM7 to simulate the subscriber and trunk functions of a switch.

The SLC®96 option allows the AM7 to fully simulate a COT, making the AM7 perfect for installation testing of SLC®96 Remote Terminals (RTs).

The portability of the AM7 allows use in the field to test or install CPE or other equipment. The ability to remote control the AM7 via a built in RS232 port makes it suitable for automated test applications in the laboratory.

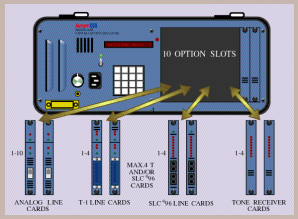




Interface Options

The AM7 has 10 card slots for installation of options. Various mixes of options are possible, up to the 10 slot maximum:

- 1-10 Dual Line Analog Loop/Ground Start linecards
- 1-10 Dual Line Analog E&M linecards
- 1-4 Single Line T1 PCM linecards and/or Single Line SLC®96 linecards
- 1-7 Tone Receiver Cards



Flexible Numbering Plan

The AM7 can be programmed with a numbering plan in the same way as a Central Office or PABX switch. The numbering plan defines what received digits the switch should match, and the action the switch should take when a match is made.

The numbering plan is implemented with "Dialing Codes" which define the response of the AM7 to received dialed digits. Four different Dialing Code Groups can be programmed into the unit.

For each Dialing Code Group up to 8 Expected Digit fields can be programmed. Each Expected Digit field can hold up to 12 digits. The Expected Digit Field can be programmed to match DTMF or MF digits, "any" digit, hook flashes, or perform an Automatic Sequence ("Auto Code").

User programmed Dial Code Groups can be saved in up to four storage memories which retain the complete AM7 configuration, even with power removed.

Programmable Actions

For each Expected Digit Field, there are 8 user programmable Action Codes which define what the AM7 should do in response to the received digits. The actions are:

- Wait for 1-99 seconds
- Ringback tone for 1-99 seconds
- Reorder tone for 1-99 seconds
- Busy tone for 1-99 seconds
- Dial tone for 1-99 seconds
- Dial tone until digit received
- Confirming tone for 1-99 seconds
- Digital Milliwatt for 1-99 seconds
- Setup call to specific outgoing port
- Setup call to outgoing port in hunt group
- Generate a Wink
- Provide Answer Supervision
- Remove Answer Supervision
- Send 400Hz tone for 1-99 seconds
- Send 400Hz tone until digit received
- Send selected SIT tones
- Ignore Dialed Digits
- Accept Dialed Digits
- Release PCM Tone Receiver
- Release Tone Analyzer
- Release Dial Pulse Analyzer
- Attach PCM Tone Receiver

AM7 Central Office Simulator

Configurable System

Most operational parameters of the AM7 are user configurable to enable faithful emulation of almost any switch.

The AM7 System/Unit Parameters control the following for the entire system:

- Real Time Clock/Calendar Setting
- Automatic Hourly Printout Yes/No
- Ring Generator Characteristics
- Dial Tone Characteristics
- Ringback Tone Characteristics
- Line Busy Tone Characteristics
- Reorder Tone Characteristics
- Tone Dial Analyzer Operation
- Dial Pulse Analyzer Operation
- Report Unexpected Data Link Messages (SLC®96) Yes/No
- PCM Master Span Selection
- Receiver Card Signaling Type
- Connection Loss (0 to 14dB)
- Printer/RS232 Configuration
- Software Version Display

User Defined Call Progress Signals

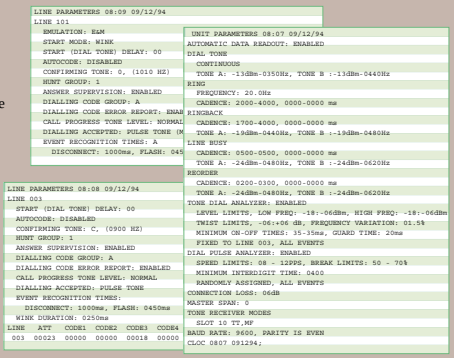
The AM7 allows the user to completely configure the call progress signals generated. Configuration of the following is provided:

- Continuous/Interrupted Dial Tone
- Dial Tone Cadence
- Dial Tone Level/Frequency
- Ring Cadence
- Ring Frequency
- Ringback Tone Cadence
- Ringback Level/Frequency
- Line Busy Tone Cadence
- Line Busy Level/Frequency
- Reorder Tone Cadence
- Reorder Level/Frequency

Individual Line Configuration

Each line of the AM7 system can be independently configured with the following parameters:

- SLC®96 Start Mode: Single Party/Loop Start or Universal Voice Grade/Ground Start (Mode I only)
- SLC®96 Trunk Assign Delay 0-99 sec.
- Dial Tone/Start Delay 0-99 seconds
- Auto Code (execute programmed sequence of actions)
- Confirming Tone Frequency (13)
- Hunt Group Assignment (1-8)
- Answer Supervision Yes/No
- Dial Code Group/Numbering Plan (4)
- Dial Code Report Yes/No
- Progress Tone Levels Normal/Low
- Decode Tone, Pulse or Both
- Minimum Flash Time (50-1250mS)
- Minimum Disconnect Time (50-1250mS)
- Wink Time (50-950mS)
- Display of Call Activity Registers (Call Attempts, Calls Matching Code, Calls Matching no Code)



Unit and Line Parameter Printouts

Dialing Analyzers

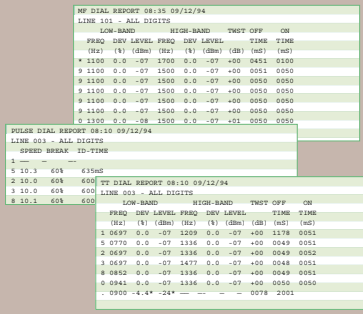
The AM7 features a comprehensive digit analyzer, which produces detailed statistics and errors related to tone and pulse dialing. The Dialing Analyzer Reports are output to the RS232 port for printing, display on a terminal, or capture by a computer. The user configurable parameters for the dialing analyzers are:

Tone Dialing Analyzer:

- Tone Dialing Report Yes/No
- Low Tone Min./Max. Level
- High Tone Min./Max. Level
- Twist, Maximum +, -
- Frequency Offset, Maximum
- Tone Minimum On/Off Time
- Tone Guard Time
- Random or Fixed Line Selection
- All Digits/Out of Range Digits

Pulse Dialing Analyzer:

- Dial Pulse Report Yes/No
- Pulse Min./Max. Speed
- Pulse Min./Max. Percent Break
- Pulse Minimum Interdigit Time
- Random or Fixed Line Selection
- All Digits/Out of Range Digits



```
MF DIAL REPORT 08:35 09/12/94
LINE 101 - ALL DIGITS
      LOW-BAND              HIGH-BAND      TWST OFF    ON
   FREQ  DEV LEVEL FREQ  DEV LEVEL          TIME  TIME
    (Hz)  (%) (dBm) (Hz)  (%) (dBm) (dB)  (mS)  (mS)
* 1100  0.0  -07  1700  0.0  -07  +00  0451  0100
  1100  0.0  -07  1500  0.0  -07  +00  0051  0050
  1100  0.0  -07  1500  0.0  -07  +00  0050  0050
  1100  0.0  -07  1500  0.0  -07  +00  0050  0050
  1100  0.0  -07  1500  0.0  -07  +00  0050  0050
  1100  0.0  -08  1500  0.0  -07  +01  0050  0050
```

```
PULSE DIAL REPORT 08:10 09/12/94
LINE 003 - ALL DIGITS
  SPEED BREAK  ID-TIME
1 ---  --  ---  635mS
5 10.3   60%     635mS
2 10.0   60%     600
3 10.0   60%     600
8 10.1   60%     600
```

```
TT DIAL REPORT 08:10 09/12/94
LINE 003 - ALL DIGITS
      LOW-BAND              HIGH-BAND      TWST OFF    ON
   FREQ  DEV LEVEL FREQ  DEV LEVEL          TIME  TIME
    (Hz)  (%) (dBm) (Hz)  (%) (dBm) (dB)  (mS)  (mS)
1 0697  0.0  -07  1209  0.0  -07  +00  1178  0051
5 0770  0.0  -07  1336  0.0  -07  +00  0049  0051
2 0697  0.0  -07  1336  0.0  -07  +00  0049  0052
3 0697  0.0  -07  1477  0.0  -07  +00  0048  0051
8 0852  0.0  -07  1336  0.0  -07  +00  0049  0051
0 0941  0.0  -07  1336  0.0  -07  +00  0050  0050
. 0900 -4.4* -24* ---  --   --   --   0078  2001
```

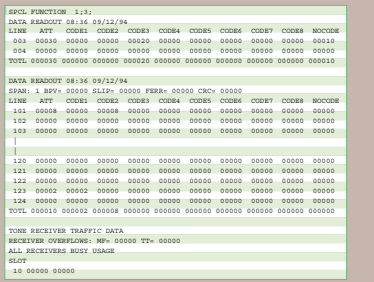
Reports

The AM7 produces a variety of reports which are presented via the RS232 port. Unit Data Registers can be output automatically on the hour:

- Unit Power On/Off Report
- Data Readout Report (per-line Call Activity Registers):
  - Call Attempts
  - MFR1 Decoder Overflows
  - DTMF Decoder Overflows
  - For Each SLC®/T1 Line:
    - Bipolar Violations
    - Frame Slips
    - Frame Errors
    - CRC Errors/SLC® Alarms
- Dialing Code Error Report
- Tone Dialing Analyzer Report
- Dial Pulse Analyzer Report
- Power Recovery after Failure

In addition to automatic reports, there are five reports which can be requested by the user:

- Report Selected Setup Parameters
- Report All Setup Parameters
- Report All Data Registers for each line
- Report Dialing codes for all lines
- Report Data for Selected lines



```
SPCL FUNCTION  1;3;
DATA READOUT 08:36 09/12/94
LINE   ATT   CODE1  CODE2  CODE3  CODE4  CODE5  CODE6  CODE7  CODE8  NOCODE
 003  00030  00000  00000  00020  00000  00000  00000  00000  00000  00010
 004  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
TOTL 00030 00000 00000 00020 00000 00000 00000 00000 00000 00010

DATA READOUT 08:36 09/12/94
SPAN: 1 BPV= 00000 SLIP= 00000 FERR= 00000 CRC= 00000
LINE   ATT   CODE1  CODE2  CODE3  CODE4  CODE5  CODE6  CODE7  CODE8  NOCODE
 101  00008  00000  00008  00000  00000  00000  00000  00000  00000  00000
 102  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
 103  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
 |
 |
 120  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
 121  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
 122  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
 123  00002  00002  00000  00000  00000  00000  00000  00000  00000  00000
 124  00000  00000  00000  00000  00000  00000  00000  00000  00000  00000
TOTL 00010 00002 00008 00000 00000 00000 00000 00000 00000 00000

TONE RECEIVER TRAFFIC DATA
RECEIVER OVERFLOWS: MF= 00000 TT= 00000
ALL RECEIVERS BUSY USAGE
SLOT
 10 00000 00000
```

Dialing Analyzer Reports

Data Register Report

Viewable Data Registers

Several data registers can be viewed on the built-in display while the AM7 is running:

- Real Time Clock
- Software Version
- Digit Decoder Overflows
- SLC®/T1 Line Error Counters
- Per Line Set-Up Parameters
- Per-line Data Registers: Same as Report registers described above

Unit error registers can also be viewed:

- Per T1 or SLC® Line:

  BPV, Slip, Frame Error and CRC Error/SLC® Alarm Counters

Portable

The AM7 is a compact, self-contained, light weight and easily transported unit. It can optionally be rack mounted for laboratory or factory floor use.

AM7 Accessories

Remote Control/Chaining

The AM7 has an industry standard RS232 interface which can be used to remotely control the unit and/or for output of reports.

The AM7 can be controlled by a terminal or computer. All functions that are available from the front-panel user interface are available from the remote control port. Also included is an on-line Help facility for quick reference. Fifteen AM7 units can be chained together and controlled from a single RS232 device.

Accessories and Options

Line Modules: Field installable line interface modules (maximum of 10 per AM7 unit):

Order No.	Description
28-0055	2 Loop/Ground Start Analog lines
28-0059TT	2 2W/4W E&M DTMF/Pulse Trunks
28-0059MF	2 2W/4W E&M MFR1/Pulse Trunks
28-0069-1	1 1.544Mbps T-1 Line
28-0069-DLC	1 1.544Mbps SLC®96 Line
28-0070	DTMF/MF Tone Receiver Card

5-Ringer Equivalent Option: Option for 28-0055 module to allow operation with up to 5REN loads (standard is 2REN). P/N 25-0042.

Transit Case: A transit case is available for secure commercial transportation of one or two units, complete with cables and instruction manuals. P/N 87-0002.

Rack Mounting Kit: The AM7 can be rack mounted in standard 19” racks with an optional rack mount kit. P/N 85-0046.

Spare Card Carrying Case: Used to store up to 20 line card modules. P/N 85-0112.

AM7 CO Simulator Specifications

SYSTEM

Capacity: 10 option card slots. Each slot can accommodate any of the following:

Line Cards:
- Analog: 2 loop/ground start lines
- Analog: 2 E&M lines types I,II,III,IV,V
- T1: One span (max. 4 x SLC® 96 or T1)
- SLC®96: One span

Tone Decoders (max. of 7 per unit):
- DTMF: 6 TT decoders
- MFR1: 8 MFR1 decoders

Simultaneous Calls: Non-Blocking switching for any combination of connections.

Busy Hour Call Volume: Up to 48,000 calls/hour

Chaining: Up to 15 AM1/AM7 units may be chained and controlled via RS232 interface or print to a serial printer.

Signaling Systems:
Analog: Loop Start or Ground Start.
T1:E&M, Wink Start, Delay Dial, Dial Tone Start, Immediate Start, Loop Start, Ground Start, ESF.
SLC®96: Universal Voice Grade (Mode I) and Single Party (Modes I and II). Complies with Bellcore TR-TSY-000008
Dialing: Dial pulse, DTMF, or MFR1.
Dialing Codes: 4 groups of 8 for each line

DETECTORS

Analog Loop/Ground Start: Loop current, Ring trip, Ring ground, per line DTMF decoder
Analog E&M: E Lead, per line DTMF/MFR1 decoder
T1/SLC®: A/B signaling bits, per channel dial pulse decoder, optional shared DTMF/MFR1 digit decoders

DIGIT DECODERS

DTMF

On/Off Time: 40mS min.
Twist: +/- 9dB
Frequency Variation: +/- 1.5% accept, +/- 3.5% reject
Level: 0dBm to -24dBm per tone (40mS On/Off, 0dB Twist, 0Hz Frequency Variation), 0dBm to -6dBm per tone (40mS On/Off, +/- 9bB Twist, +/- 1.5% Frequency Variation)

MF(R1)

KP Digit On/Off Time: 55/20mS accept, 30/10mS reject
All Other Digits: 30/20mS accept, 10/10mS reject
Twist: +/- 6dB max.
Frequency Variation: +/- 1.5%
Level: 0dBm to -25dBm per tone

Dial Pulse

Max. Speed: 13.3pps @ 80% break; 26.6pps @ 40% break; 33.3pps @ 50% break
Min. Speed: 5.2pps @ 80% break; 3.9pps @ 40% break; 3.3pps @ 50% break
Break: 13-75% @ 5pps; 16-84% @ 10pps; 40-60% @ 25pps
Min. Interdigit Timing: 100mS @ 5pps, 60% break; 140mS @10pps, 60% break; 164mS @ 25pps, 60% break

DIGIT ANALYZER

Tone Dialing: TMS320 DSP measures level, frequency, on/off timing, Twist and Skew of DTMF or MF(R1) digits

Pulse Dialing: Speed, % break, interdigit timing

TONE GENERATORS

Call Progress Tones

Dial Tone Cadence: On/Off times from 0-9900mS
Dial Tone Level: -3dBm to -39dBm in 1dBm steps, for each tone, including Quiet
Dial Tone Frequency: 200Hz to 3500Hz in 10Hz steps, programmable for each tone
Ring Frequency: 15.0-35.0Hz in 0.1Hz steps
Ring Cadence: 2 ringing sequences (Ring 1 and Ring 2). Ring 1 programmable from 100-9900mS in 100mS steps. Ring 2 programmable from 0-9900mS in 100mS steps
Ringback Tone Cadence: 2 ringback sequences (Ringback 1 and Ringback 2). Ringback 1 programmable from 100-9900mS in 100mS steps. Ringback 2 programmable from 0-9900mS in 100mS steps
Ringback Level: -3dBm to -39dBm in 1dB steps, for each tone, including Quiet
Ringback Frequency: 200Hz to 3500Hz in 10Hz steps, programmable for each tone
Line Busy Tone Cadence: 2 line busy sequences (Line Busy 1 and Line Busy 2). Line Busy 1 programmable from 100-9900mS in 100mS steps. Line Busy 2 programmable from 0-9900mS in 100mS steps
Line Busy Level: -3dBm to -39dBm in 1dB steps, programmable for each tone, including Quiet
Line Busy Frequency: 200Hz to 3500Hz in 10Hz steps, for each tone, including Quiet
Reorder Tone Cadence: 2 reorder sequences (Reorder 1 and Reorder 2). Reorder 1 programmable from 0-9900mS in 100mS steps. Reorder 2 programmable from 0-9900mS in 100mS steps
Reorder Tone Level: -3dBm to -39dBm in 1dB steps, for each tone, including Quiet
Reorder Frequency: 200Hz to 3500Hz in 10Hz steps, programmable for each tone

Confirming Tones

Any line can generate one of the following single tones at -6dBm as part of a Step Sequence: 900Hz, 1010Hz, 1150Hz, 1280Hz, 1400Hz, 1530Hz, 1650Hz, 1780Hz, 1900Hz, 2030Hz, 2150Hz, 2280Hz, 2400Hz

SIT Tones

Any line can generate one of the following 6 SIT tones at -6dBm as part of an Action Sequence: Vacant Code (980/1370/1780Hz), No Circuit-BOC (980/1430/1780Hz), Intercept (910/1370/1780Hz), Reorder-BOC (910/1430/1780Hz), Reorder-Carrier (980/1370/1780), No Circuit-Carrier (910/1370/1780Hz)

SIGNAL/POWER SOURCES

Loop Voltage (2W Analog): -48V DC +5% open circuit
Ring Generator: Sine wave, variable 15.0-35.0Hz. 60Vrms open circuit, 40Vrms with 2REN load

MISCELLANEOUS

Frequency Response: Less than 0.7dB attenuation distortion from 300Hz to 3300Hz
Connection Loss: Programmable from 0dB to 14dB in 1dB steps
T1/SLC® Interfaces: Bantam connectors for each span. 8kHz Clock Source: internal 8kHz reference or span 1-4
User Interface: 16 button keypad, 16 digit alphanumeric LED display
RS232C/V.24 Port: Serial, asynchronous, ASCII code at 300-1200-2400-4800-9600 baud, Odd or Even parity, 7 Data Bits, 2 Stop Bits, full duplex on 3 wires (DB25P)
Audio Monitor: Built in monitor and loudspeaker
Non-Volatile Memory: 4 non-volatile memory sets for numbers and parameters. Active parameters are saved with power removed for up to 30 days.

POWER

108-125VAC, 50/60Hz, or
210-230VAC, 50/60Hz., 50W max.

DIMENSIONS

Compact and Portable

Dimensions: 16.8"L x 7.2"W x 11.5"H
Weight: 18 lb.

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Test Complete

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