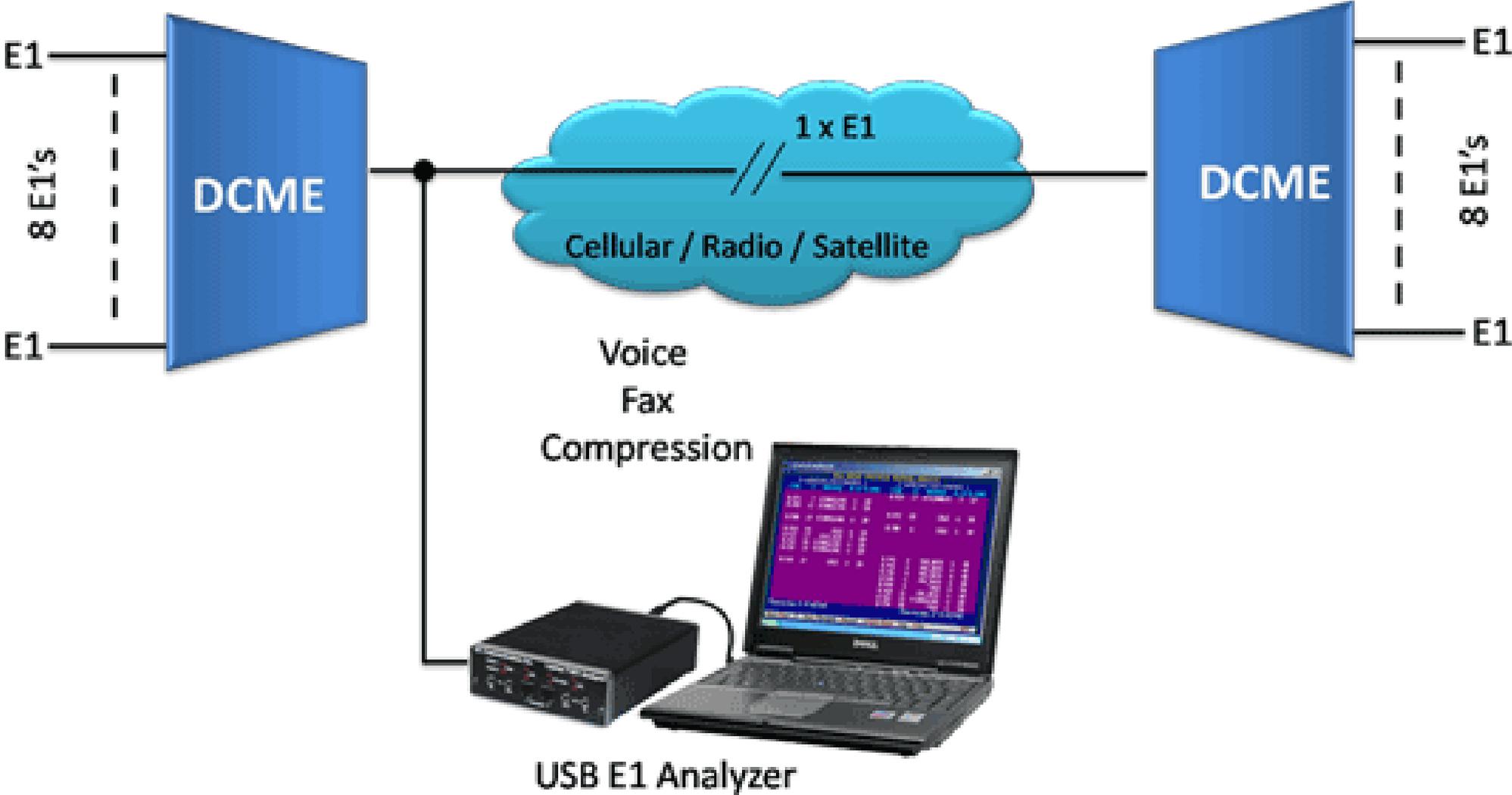

DCME Analyzer - E1 Only (Digital Circuit Multiplication Equipment)



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <http://www.gl.com>

Typical Application

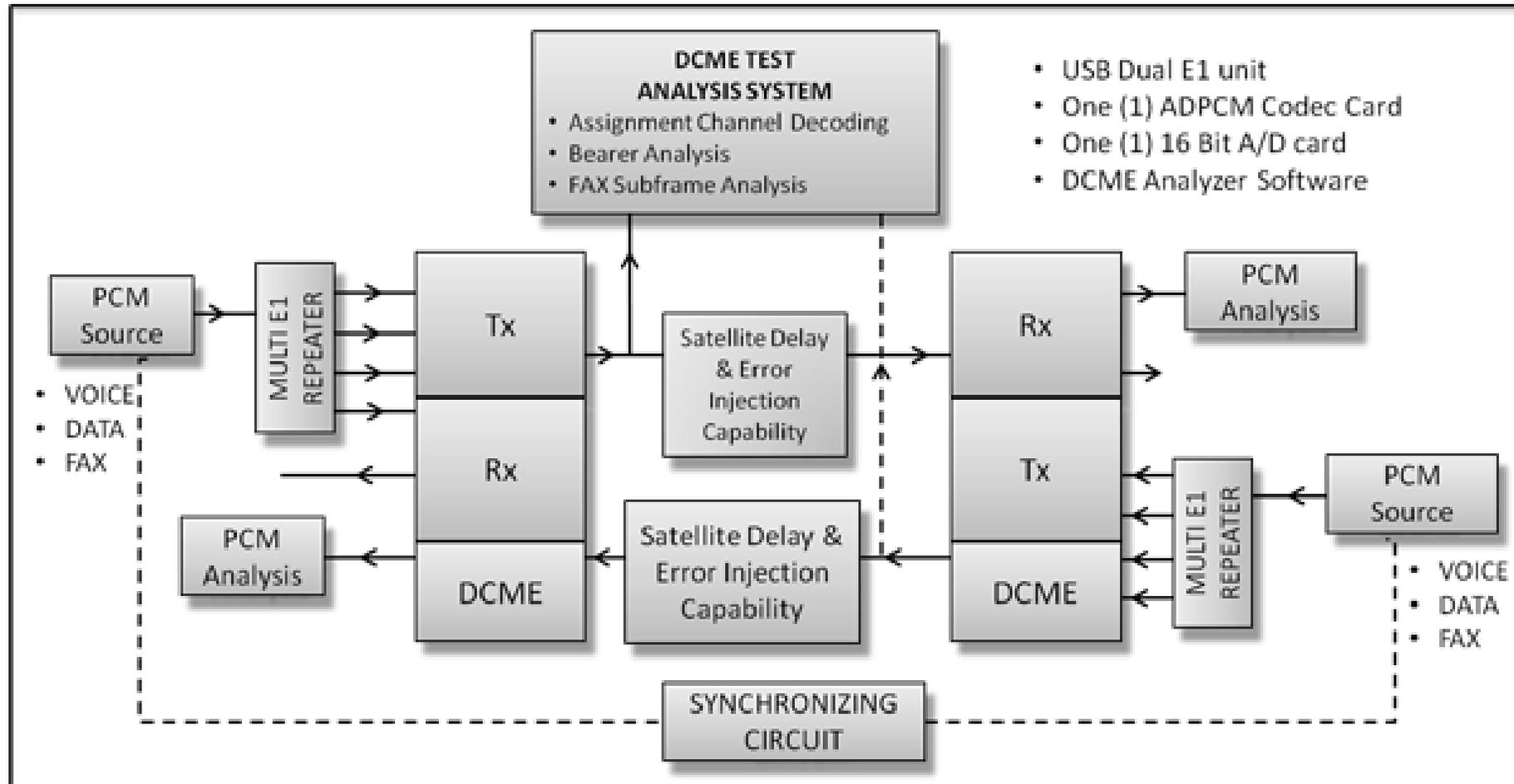


Features

- DCME analyzer uses GL' s Dual port USB E1 unit to provide the capability to test and analyze DCME signals
- Supports IESS-501 Rev 3 Specifications and equipment such as DTX 360 of ECTel
- Connects non-intrusively to the bearer side of DCME equipment
- Captures the entire DCME bearer signal to the PC' s hard disk
- Real-time and post processing of the DCME bearer signal
- Verification of channel mapping and implementation timing of the DCME protocol Golay and BCH error correction
- Bit level analysis and verification of facsimile data sub-multiplexing on DCME bearer

DCME Test and Analysis Tool Kit

- The figure shows a simplified block diagram of the use of this hardware and software as a Test Bed for end-to-end testing of DCMEs.



DCME Test Bed

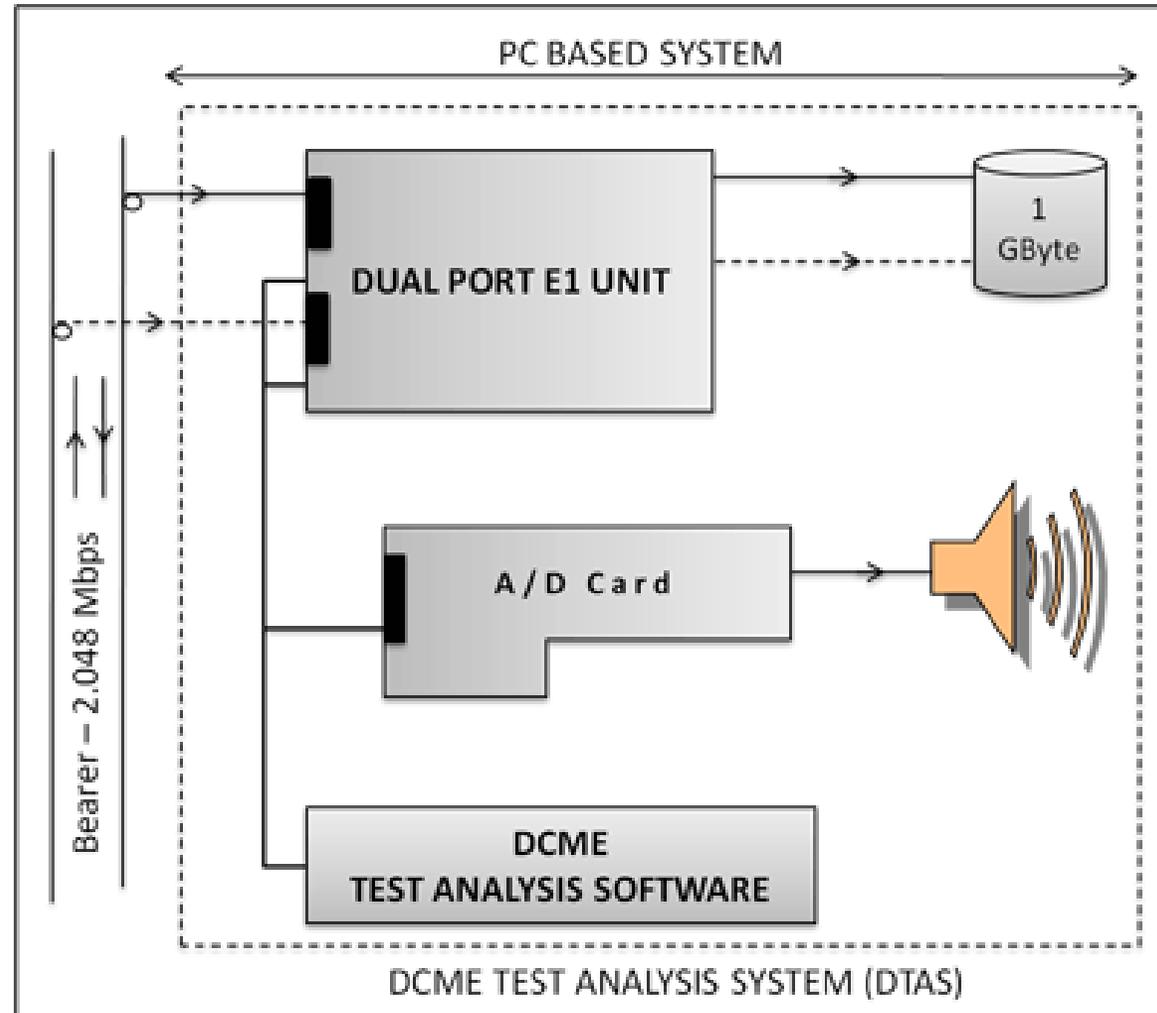
DCME Test and Analysis Tool Kit

Test Bed – Overview

- On the trunk sides, the DCMEs are loaded with PCM sources consisting of voice, data and fax signals.
- The loaded PCM signals are analyzed after having passed through DCME processing, together with, if required, injected satellite delay and error.
- The assignment channel, bearer frame and multiframe, connectivity and bit rotation are analyzed using the DCME Test and Analysis System (DTAS).

DCME Test Analysis System (DTAS)

- The DTAS connects non-intrusively to the bearer side of the DCME.
- Consists of - Dual port USB E1 unit, One 16 bit A/D Card w/ Speakers, and DCME Test Analysis Software.



E1 Analyzer Software

The screenshot displays the E1 USB - Analyzer software interface. The main window has a menu bar with 'File', 'Config', 'View', 'Monitor', 'IntrusiveTest', 'Special Applications', 'Window', and 'Help'. The 'Special Applications' menu is open, showing a list of options: Protocol Analysis, Protocol Emulation, Windows Client Server (WCS), Record / Playback File, Dial Digits, Call Capture & Analysis, Physical Layer Monitor, Echo Test Solutions, MCBERT, HDLC, TRAU, AudioBridge, StripChart, DCME Analyzer (highlighted), Voice Quality Assessment, and Multiplex/Demultiplex. A sub-menu for DCME Analyzer is also visible, listing various analysis options such as Bearer Frame-by-Frame Analysis, DCME Frame-by-Frame Analysis, DCME Multiframe-by-Multiframe Analysis, Fax Sub-Frame Analysis, ADPCM File Extraction and Conversion, Full Duplex Facsimile Protocol Analysis, Full Duplex Facsimile Protocol Analysis w/T30 Signaling, Error Correction Utilities, Single Bearer Capture & Analysis, Full Duplex Capture & Analysis, Full Duplex PCM Analysis, Full Duplex Assignment Channel Analysis, DCME Realtime Bearer Analysis, and DCME Fax Viewer.

The interface includes several monitoring panels. The 'MONITOR E1 (#1)' panel shows a list of error indicators with green status lights: LINE SYNC LOSS, HDB3 VIOLATION, CARRIER LOSS, FRAME ERROR, REMOTE, DISTANT MF, A I S, ES Overflow, and ES Underflow. Below this is a 'Legends' section with 'History' (yellow circle) and 'Not Active' (green circle), and 'Active' (red circle). The 'Signal Input' section shows 'Freq (Hz)' as 2048000 and 'Level (dBc)' as -0.637. The 'Error Counters' table is as follows:

BPV	Frame	CRC
0	9	0

There are also checkboxes for 'Beep ON' and 'Log Alarms', and buttons for 'Reset All' and 'Hide Panel'. The status bar at the bottom right indicates '#2 E1 In Sync'.

Bearer Frame-by-Frame Analysis

- Extraction and display of raw bearer data.

The diagram above the screenshot illustrates the structure of a Bearer Frame. It is divided into three main sections: Timeslot 0, Timeslot 1, and Timeslot 2. Within Timeslot 0, there are Control Channel Bits and Unique Word. Timeslot 1 contains Facsimile Control Channel Bits. Timeslot 2 contains the main data payload.

The screenshot shows the following hex dump of raw bearer data:

```

SF 1 0 3 0 CFC D77FB FF2273462EBDD3F63D1CFA7561FED14261FDE3F53B2BES265F1A
1B 1 7 3 0 C377FDE9D1151C23FCEF6244F2B3B2E64E1C12561EBE4FE22E9E427291B2
DF 1 6 2 0 FC522ADDF77FFE4CE9645EDDC5F5F3213A2144221EC242DB8D5372FFC22
9B 0 1 3 2 544EDA F325F1CFEFBC4353F391D766FFFB11164D9CD251CCFE5471DF91F7
DF 1 5 3 2 67221B126F1A1CE9B5F64ECC3161F142C23F52EFEP5321E9D2162E1B1131
1B 0 5 1 2 344CD145FEDCD2BE6242FEA1E7F2D2F922573FDEE2171B9D5E53CFDFCS53
DF 1 1 3 3 6BCE3F41DE1C11C326311BF2641FC1F2525FDBC337FFCF3431E3DF342FE
1B 1 2 1 1 D5AD364FDAD2376353B2A1C73DFF2F22354FEDC2141EBEEE511FCEF7432D
DF 0 7 3 2 EC325FD9EE254F152CEC2F5232BEAE1371FEDE5553F123E64DDAF163CF92
1B 0 4 2 0 CF451CEDA2413E621D8337411ED1EE3722BFF3564EDC5331FE91F53F2D2E
SF 1 2 0 2 F54F1CDB1226CF1EEB1373DFA1A1745FFE1D1541DFED25DED91162128PCF
9B 0 0 2 2 43541AC3553CF1D9FD72E1F2C261731EBA2464EBB1274EBC217221C1CF6
5F 0 7 0 2 F74ED95243EDBD81E41119FC254F15DF5372E2BCF31DA91C61FFE1C575
9B 0 5 0 3 722CC2261C1BC3AF27F21EED2711F111F5432FDAF624FE9F24323CEEF71F
DF 0 2 1 1 33CC6171CECB52115211DE937F22D2ED3442DBBD326EF9DE741ECDB13FF1
9B 1 4 3 1 FFBDS41DF8C524114FFD1C2612FDFFD22365EFD C3263FD FE43D3EFPB5713FF
    
```

Below the hex dump, the application displays the following metadata:

```

Filename: C:\DCMETOOL\TEST\TEST3.E1      Filesize: 9920000
Unique Word      : EB21 (DCME Frame 1-63)
Control Channel  : 1F1B4AF10F54
Fax Control Channel : FBDDE207
Bearer Frame No  : 298219
File Position (Bytes): 9542976
    
```

Navigation controls at the bottom include: ↑↓ Inc/Dec 1 Frame, Page Up/Down 16 Frames, ⇔ 1024 Frames, Esc Prev Menu.

DCME Frame-by-Frame Analysis

- Synchronizes to the DCME Frame and Multi-frame
- Assembly of the control channel messages
- Decodes and verifies BC and IT identification words
- Displays frame by frame DCME map connectivity
- Performs Control Channel Error Correction Coding
- Utilities for search and analysis of anomalies

```

C:\DCMETool\dcme.exe
DCME FRAME-BY-FRAME ANALYSIS
Data For BC=1 Unknown
Frames 1 thru 16 M
XX XX XX XX XX XX XX X
E2 73 33 DC E5 73 5D EC 0
11 66 F1 DC 12 71 2E EE 0
D6 F3 5F AD 4D 73 3E B2 0
D4 53 5D C1 D7 F3 2D 1C 0

CC List
BC IT S A
XXX XXX XX XX
45 45 1 0
108 0 3 0
46 46 1 0
109 0 3 0

Pool <1 or 2> = 1
File Pointer = 1
File Size = 9920000 <Clean Capture>
Current Location = 320
File Name = C:\DCMETOOL\TEST\TEST3.E1

Assignable Bearers = 122
Preassigned Bearers = 0
2-Bit Mode: Enabled
Pool 2 Not Detected

TS0 Check = Sync
Unique Word = UW1-63 - 0 Errors
DCME Frame # = 15
Encoded CC = 2D276AD1027E
Decoded CC = 2D2D10 0 Errors
Decimal CC = 45 45 1 0
Sync = n <= -68dBm0
Async = Normal
BC Type = Voice

Search BC File Map ↑↓ DCME Frame PUp/PDn DCME MFrame Pool Dos ESC
TX144_1 .226 22671872 06-30-94 15:59
TX144_1 .ZIP 11264817 06-20-07 19:49
W1 679936 11-17-010 14:21
WEST 475136 03-28-06 12:36
X .ADP 20016 06-12-07 19:11
A: <DRIVE>
B: <DRIVE>
C: <DRIVE>
D: <DRIVE>
E: <DRIVE>
F: <DRIVE>
G: <DRIVE>
H: <DRIVE>
I: <DRIVE>
J: <DRIVE>
K: <DRIVE>
L: <DRIVE>
M: <DRIVE>
N: <DRIVE>
O: <DRIVE>
P: <DRIVE>
Q: <DRIVE>
↑↓ PUp/PDn HOME/END Type Uga/Text ESC

```

BC / IT Connectivity

- Analysis on the following types of BC' s 64 kbps, 40 kbps, Bit Banks, Fax Banks, 4/3 bit overload , 3/2 bit overload, and pre-assigned
- Verification of connectivity and implementation delay
- For each selected IT (overload or normal), extraction of the ADPCM words (whether 2, 3 or 4 bit) and decoding to PCM for comparison with the original PCM input

c:\dcmetool\dcm.exe

8575808

CURRENT BC/IT			CONNECTIVITY			8575808		
BC	IT	T	BC	IT	T	BC	IT	T
1	12	U	21	21	U	42	42	U
2	13	U	22	22	U	43	43	U
3	14	U	23	23	U	44	44	U
4	15	U	24	24	U	45	45	U
5	1	U	25	25	U	46	46	U
6	2	U	26	26	U	47	47	U
7	3	U	27	27	U	48	48	U
8	4	U	28	28	U	49	49	U
9	5	U	29	29	U	50	50	U
10	6	U	30	30	U	51	51	U
11	7	U	31	31	U	52	52	U
12	8	U	32	32	U	53	53	U
13	9	U	33	33	U	54	54	U
14	10	U	34	34	U	55	55	U
15	11	U	35	35	U	56	56	U
16	16	U	36	36	U	57	57	U
17	17	U	37	37	U	58	58	U
18	18	U	38	38	U	59	59	U
19	19	U	39	39	U	60	60	U
20	20	U	40	40	U	61	61	U
			41	41	U			

LEGEND For Column 'T'

T = Transparent Channel
D = Data Channel
U = Voice Channel
F = Fax Channel
B = Bit Bank
U = Unconnected
4 = Voice Channel in 4-Bit Mode
3 = Voice Channel in 3-Bit Mode
2 = Voice Channel in 2-Bit Mode

Change ↓ DCME Frame PDn DCME MFrame Legend Data ESC

DCME Multiframe-by-Multiframe Analysis

- Analyze the bearer output of a DCME for async words.
- Async words contains information about IT circuit alarms, bearer backward alarms, DLC support messages, and other maintenance information.

```
c:\dcmefool\dcmemf.exe
DCME MULTIFRAME-BY-MULTIFRAME ANALYSIS

ASYNC WORDS
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

Pool <1 or 2> = 1
File Size = 9920000
Current Location = 25408
File Name = C:\DCMETOOL\TEST\TEST3.E1
File Pointer = 1
Pool 2 Not Detected

RESULTS

IT Circuit Alarms: Normal
DCME Bearer Backward Alarm: Normal
DLC Support Message:
Rx Bearer Channel Check:
BC: Decoder
Channel Check Alarm
Transmit Channel Check: Normal

File  ↑↓ Next/Previous DCME MFrame Pool  ESC
```


Full Duplex Facsimile Protocol Analysis

- Decodes and displays FCC messages from 2 DCME's (Tx and Rx) on a frame basis.
- Filtering of FCC messages on active or specific IT's.
- Decodes T.30 HDLC frames.

c:\dcmetool\dualfax.exe

FULL DUPLEX FACSIMILE PROTOCOL ANALYSIS

C:\DCMETOOL\TEST\FAXWEST.1 C:\DCMETOOL\TEST\FAXEAST.1

TIME	IT	MESSAGE	M.ID	M.CONT	TIME	IT	MESSAGE	M.ID	M.CONT
0.876	7	SIGNALLING	6	20	0.828	17	DISCONNECT	7	5F
0.888	13	SIGNALLING	6	20					
0.900	19	SIGNALLING	6	20	0.892	20	IDLE	6	30
0.910	24	IDLE	6	30	0.908	6	IDLE	6	30
0.912	17	DISC_ACK	7	60					
0.916	26	SIGNALLING	6	20					
0.926	12	SIGNALLING	6	20					
0.944	19	IDLE	6	30	0.942	2	FAX_DATA	6	40
					0.944	3	FAX_DATA	6	40
					0.946	4	FAX_DATA	6	40
					0.948	5	FAX_DATA	6	40
					0.950	6	IDLE	6	30
					0.960	11	FAX_DATA	6	40
					0.968	15	SIGNALLING	6	20
					0.978	20	IDLE	6	30

Processing IT # ACTIVE Processing IT # ACTIVE

West/East IT Fast Forward Rewind ↓/PgDn/Home Log File ESC

Full Duplex Facsimile Protocol Analysis with T30 Signaling

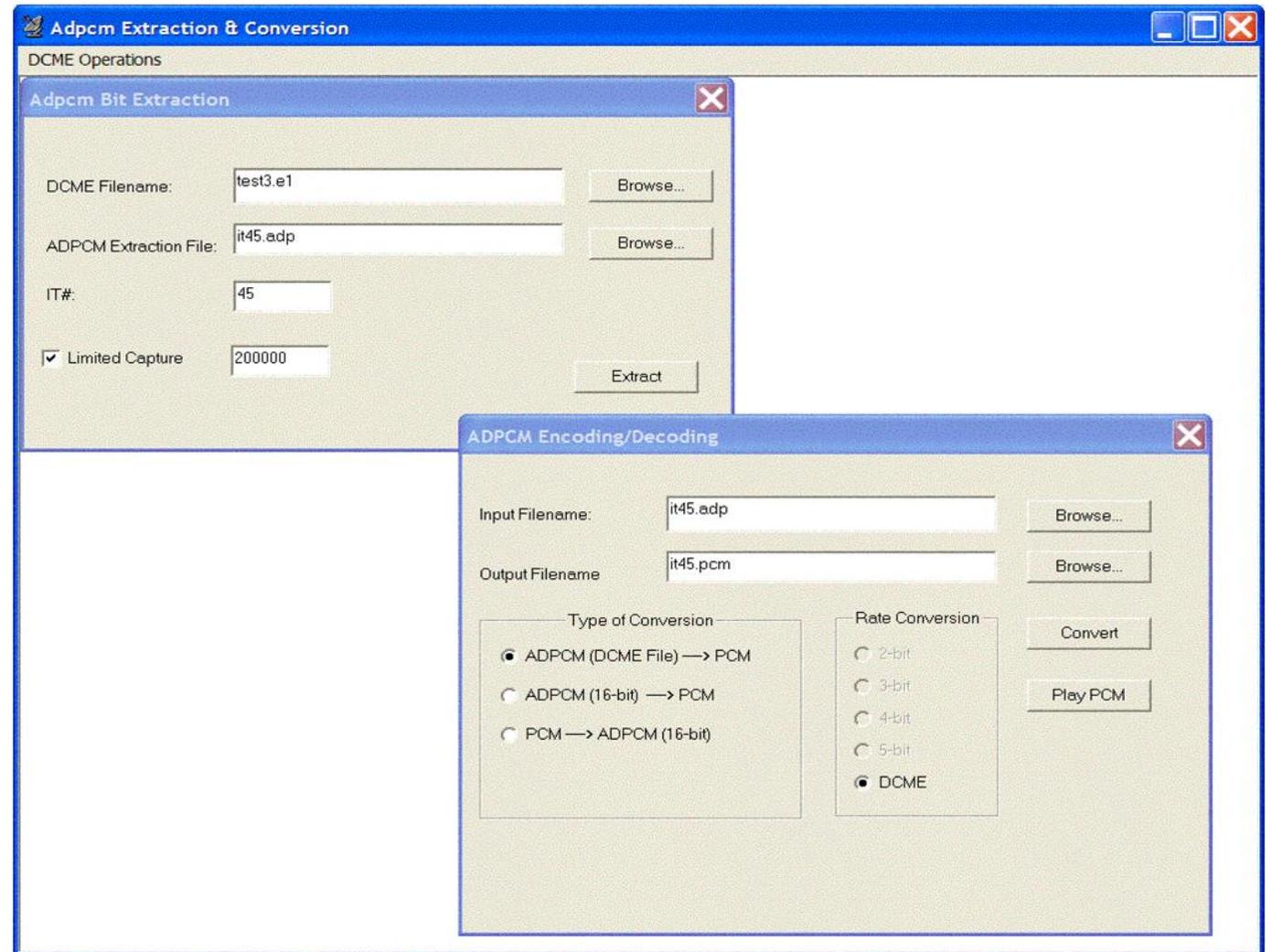
- Displays T30 signaling messages exchanged between two DCMEs
- Gather Facsimile data for later viewing

```

c:\dcmetool\dualt30.exe
FULL DUPLEX FACSIMILE PROTOCOL ANALYSIS w/T30 SIGNALLING
C:\DCMETOOL\TEST\FAXEAST.1          C:\DCMETOOL\TEST\FAXWEST.1
TIME  IT  MESSAGE  M.ID M.CONT  TIME  IT  MESSAGE  M.ID M.CONT
0.058  2  FAX_DATA  6    40
0.060  3  FAX_DATA  6    40
0.062  4  FAX_DATA  6    40
0.064  5  FAX_DATA  6    40
0.066  6  SIGNALLING 6    20
0.076  11 FAX_DATA  6    40
0.078  12 SIGNALLING 6    20
0.088  17 SIGNALLING 6    20
0.094  20 SIGNALLING 6    20
0.096  21 FAX_DATA  6    40
0.098  22 FAX_DATA  6    40
0.100  23 FAX_DATA  6    40
0.104  25 FAX_DATA  6    40
0.106  26 IDLE     6    30
0.006  7  SIGNALLING 6    20
0.018  13 SIGNALLING 6    20
0.030  19 SIGNALLING 6    20
0.040  24 SIGNALLING 6    20
Processing IT # ACTIVE
West/East IT Fast Forward Rewind ↓/PgDn/Home Log File ESC
  
```

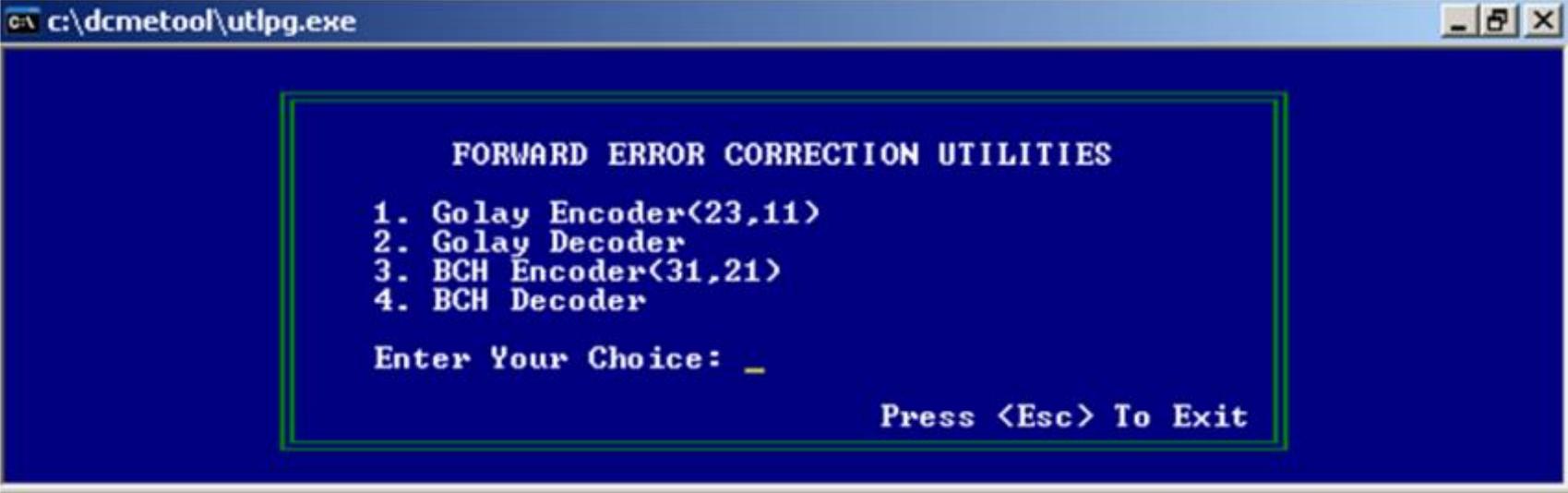
ADPCM Extraction & Conversion

- Supports voice file extraction from captured data for later playback
- ADPCM encoded speech vary in word length (2-bit, 3-bit, and 4-bit mode)
- Audio playback of PCM for analysis



Error Correction Utilities

- Convenient tool for encoding and decoding Golay and BCH forward error correction (FEC) codes used between two DCMEs.



```
c:\dcmetool\utlpg.exe

FORWARD ERROR CORRECTION UTILITIES

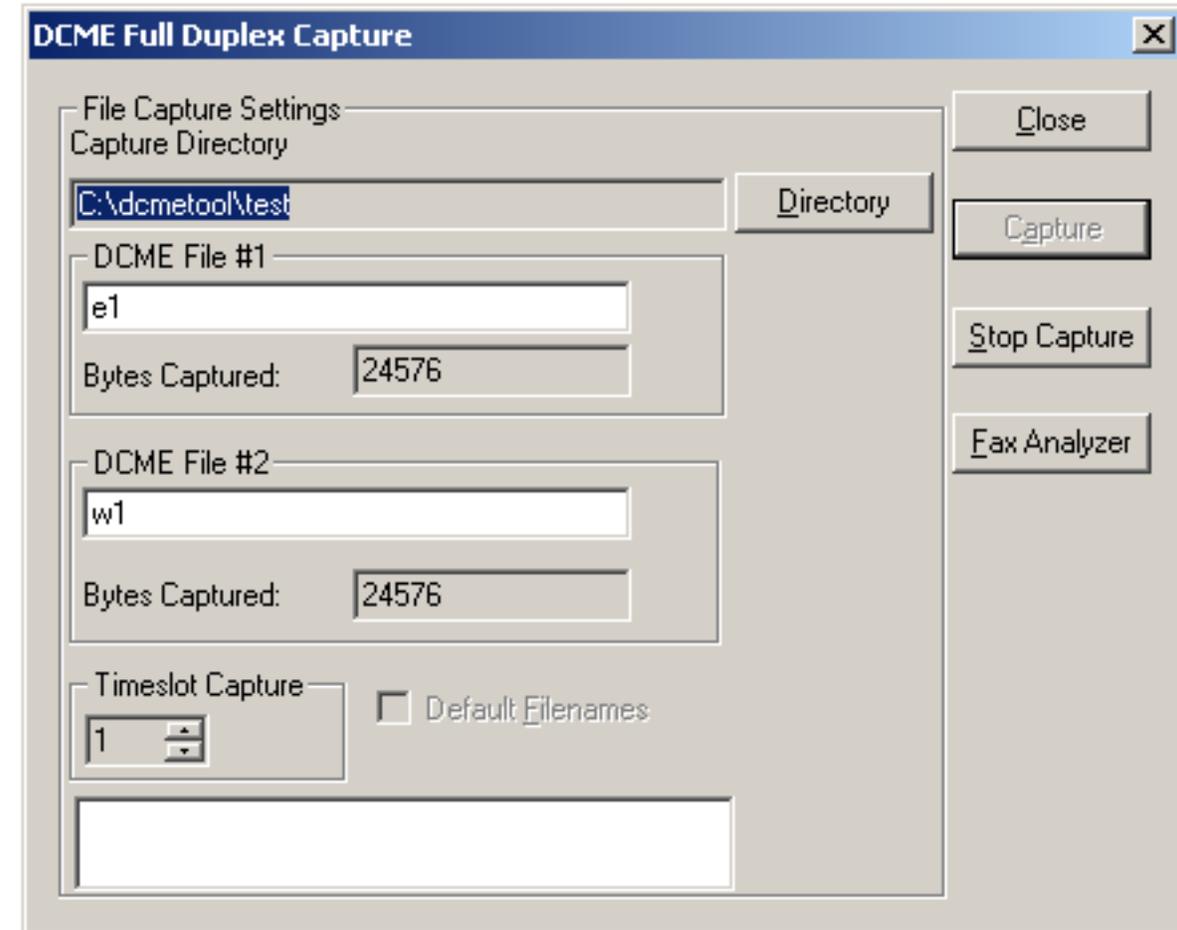
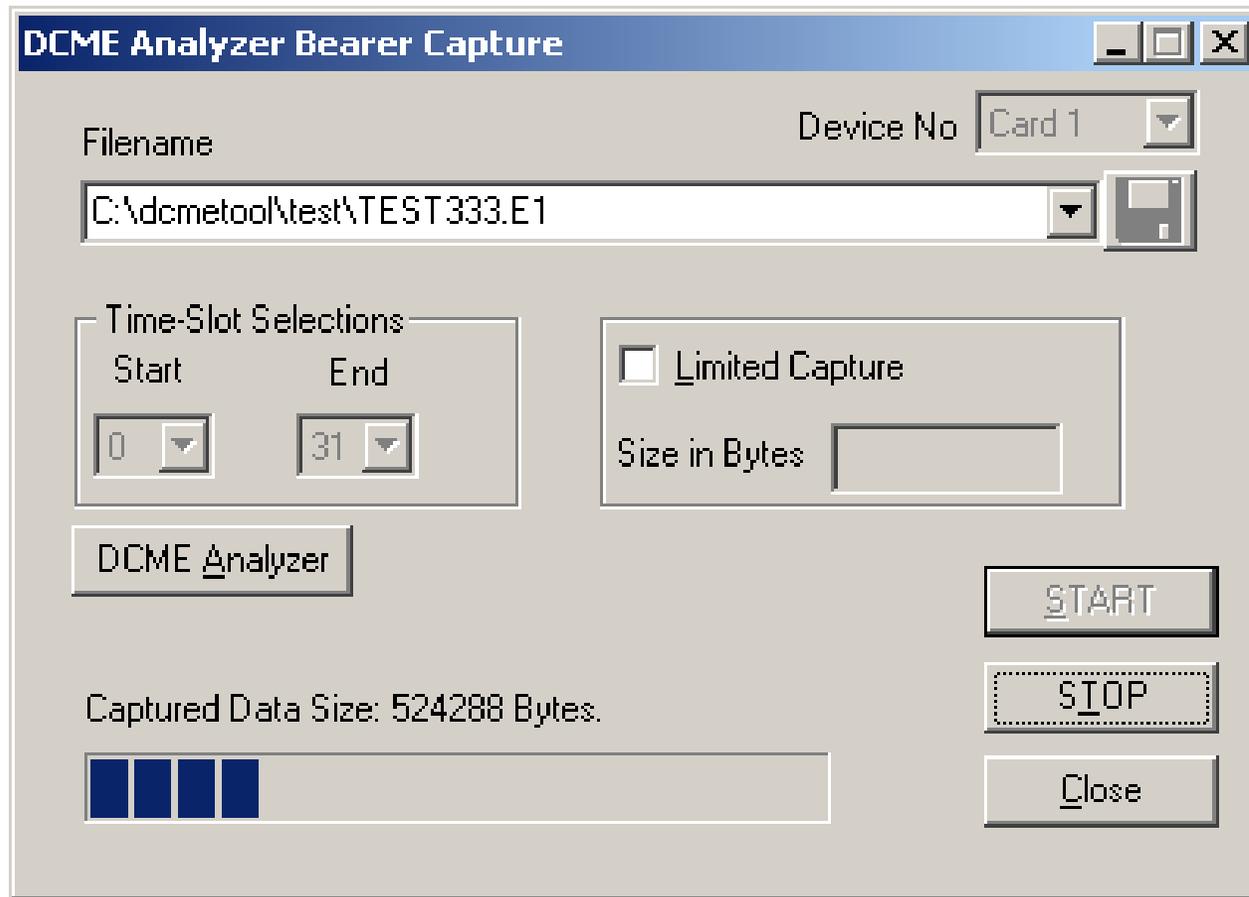
1. Golay Encoder(23,11)
2. Golay Decoder
3. BCH Encoder(31,21)
4. BCH Decoder

Enter Your Choice: _

Press <Esc> To Exit
```

DCME Bearer & Full Duplex Capture

- Capture the output of the DCME for analysis using other programs.



Real-time Bearer Analysis

- Indicates synchronizing and bearer format
- Gathers real-time statistics (every 1 second)
- BC / IT connectivity maps
- Real-time IT filtering of FCC messages

Realtime Bearer Analysis

Realtime Bearer Analysis | IT Filtering | BC->IT Connectivity

	WEST	EAST
Bearer Status:	InSync; NoErr	InSync; NoErr
Control Channel:	DCMESYNC	DCMESYNC
DCME Sync/UW Errors:	VALID	VALID
Golay Errors:	0	0
Pre-Assigned Bearers:	1	1
Available Bearers:	120	120
Active Bearers:	4	6
# of Voice Channels:	0	0
# of Data Channels:	1	0
Two-Bit Mode:	ENABLED	ENABLED
# of Bit Banks:	1	0
Transparent Channels:	0	0
# of Fax Banks:	2	6
Facsimile Control Channel:	VALID	VALID
BCH Errors:	0	3
Active Fax Channels:	2	12

Missing Data Count: 0

Dcme Status Logging

Enable

Status Logging Location:

Latest Update:

Thank You