

# TAS Gemini™ Warp Dual Terminal Emulator

**The TAS Gemini Warp High Speed Dual Terminal Emulator is a unique new tool for evaluating the performance of data communications equipment.**

The patented\* Gemini architecture gives you two complete data analyzers in one compact package, so it is ideal for end-to-end testing of modems, multiplexers, DSU/CSUs, ISDN terminal adapters, T1/E1 transceivers, and a host of other data communications devices. Gemini is an ideal tool for R&D, engineering, quality assurance, manufacturing, and product evaluation applications.

Gemini drastically reduces the cost, time, and equipment complexity required to achieve an effective, thorough test setup. Gemini provides built-in call setup capabilities, so it eliminates the

need for separate terminals or PCs. Gemini features several built-in, automatic performance tests, including:

- High Speed Bit Error and Throughput Test
- High Speed File Transfer/Data Compression Performance Test
- Call Connect Reliability Test
- Multipoint Polling Test
- Character Echo/Block Acknowledgment Test
- Message Error Rate (Polling) Test

Gemini operates at up to 2.048 Mbps, so you can use Gemini to test a wide range of DCE equipment. In addition to easy-to-use front panel menus, Gemini can be controlled via standard RS-232 or GPIB control ports. Remote control commands are simple, high-level, and easy to read, so designing Gemini into automatic test systems is a snap. Gemini Warp gives you the easiest, most cost-effective solution for testing a wide range of data communications equipment.



*Gemini Warp contains two complete data analyzers for comprehensive, end-to-end testing of data communications equipment at rates up to 2.048 Mbps.*

## Major Features:

- Two complete data analyzers with coordinated control
- Operation to 2.048 Mbps
- Bit Error Rate and Throughput tests
- Async File Transfer/Data Compression tests
- Sync (HDLC) File Transfer/Data Compression tests
- Call Connect Reliability tests
- Point-to-Point and Multi-Point Polling tests
- Character Echo and Block Acknowledgment tests
- High-speed EIA 530-A interfaces
- High-speed RS-232 interfaces
- Interface signal event timing measurements
- Built-in call setup capability
- Easy-to-use front panel menus
- Interchangeable test interfaces
- RS-232 and GPIB remote control
- Built-in RS-232 to GPIB bus translator
- Pre-defined and user-definable test configurations for modems, CSU/DSUs, and terminal adapters
- Small, lightweight, and portable

## Applications:

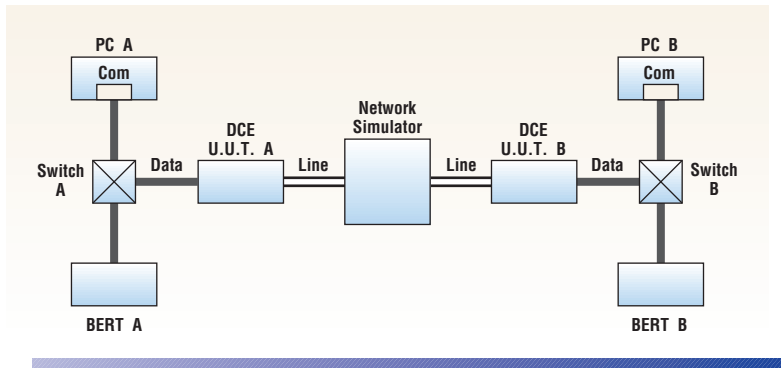
- R&D Test
- Manufacturing Test
- Engineering Test
- Product Evaluation
- Field Lab Test/Evaluation
- Quality Assurance Test

# TAS Gemini™ WARP Dual Terminal Emulator

**Gemini Eliminates The Need For a Whole Test Bench Full of Equipment**

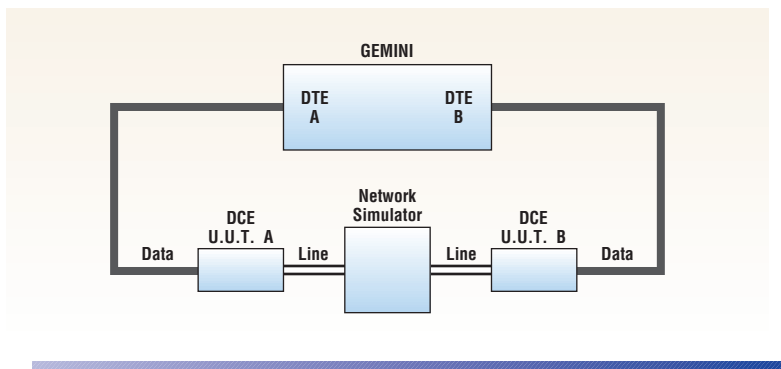
**Gemini contains two complete data analyzers in one compact package. With Gemini, you can perform comprehensive end-to-end tests on a wide variety of data communications equipment.**

## The Old Way —



Gemini eliminates the usual clutter of two separate BERTs, protocol analyzers, terminals, PCs, and data switches common to so many DCE test setups.

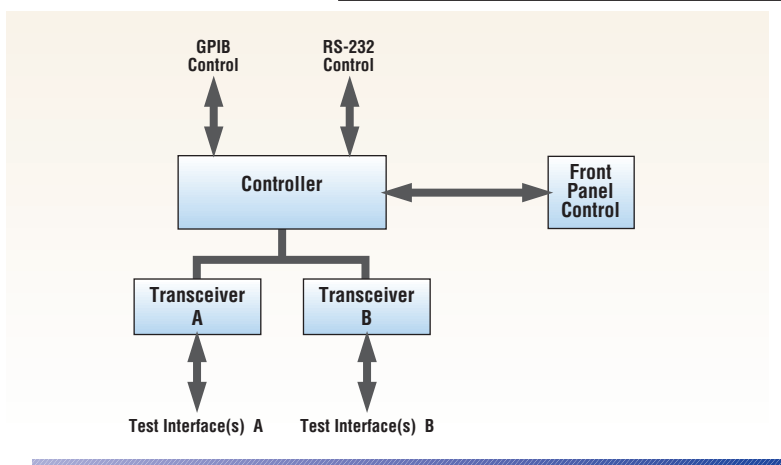
## The Gemini Way —



Simply connect each of the two data analyzers (DTE A and DTE B) to a DCE device, and connect the DCE devices through a real or simulated communications medium. That's it - you're ready to perform a whole host of state of the art advanced tests!

The patented Gemini architecture consists of a controller and two data transceivers. The data transceivers operate independently to insure test integrity. Each data transceiver can operate in a call setup/message transfer mode, or in one of several performance test modes. Gemini handles the switching between these modes internally, thereby resulting in an easy-to-use, compact, cost-effective test setup.

*Gemini eliminates the need for separate BERTs, protocol analyzers, PCs, and data switches often associated with DCE test setups.*



Gemini maintains separate parameters for call setup and test modes, so test parameters don't have to be reprogrammed when you change test modes. This makes it very easy, for example, to set up a call using an asynchronous data format and perform a test using synchronous format. Gemini accepts terminal clock from its internal synthesizer, an external source, or from the DCE device. Gemini-supplied clock can be adjusted in 0.1% increments to check the DCE device's ability to handle clock offset.

*The patented Gemini architecture delivers maximum testing capability in a compact, cost-effective package.*

## Easy-to-Use Front Panel Menus Perform Complex Test Operations at the Touch of a Button!

Once test parameters have been selected, Gemini executes the test completely automatically. Gemini can even be programmed to stop a test

automatically if preset error limits are reached. This makes front panel operation easy, and makes remote control programs far easier to implement.

```
tas CONFIGURATION: ta&b | ra&b
#BLOCKS: 100
BLOCK SIZE: 10E2
PATTERN: space
RESYNC ENABLE: yes
SYNC LOSS - ERROR BURST: yes
SYNC LOSS - NO DATA: 3 sec
EXECUTION MODE: manual
SYNC TIMEOUT: 10 sec
BIT ERROR LIMIT: A: 1000 B: 1000
CHAR ERROR LIMIT: A: 200 B: 200
BLOCK ERROR LIMIT: A: 50 B: 50
SYNC LOSS LIMIT: A: 2 B: 2
```

***Gemini can stop a test automatically if preset error limits are reached.***

## Sync Operation to 2.048 Mbps Lets you Test a Wide Range of DCE Equipment Without Shifting Gears!

Gemini operates at up to 2.048 Mbps in the sync data format, 256 kbps async. This allows you to use one compact instrument to meet all of your performance testing requirements.

- No** expensive separate BERTs for transmission testing
- No** super-fast PCs with special serial cards for file transfer tests
- No** special custom hardware and software for call connect reliability tests
- No** chorus of protocol analyzers for multi-point polling tests! Gemini does it all, and gives you more time to think about your testing job, instead of thinking about your test setup.

## Built-In Call Setup Capability Eliminates Separate Terminals, PCs, and Switches from Your Setup.

Gemini can perform call setup for autodial modems, ISDN terminal adapters, and other switched-network data communications equipment. Call setup data format can be async, monosync, bisync, or HDLC. Gemini is also compatible with CCITT V.25 bis call setup procedures. No longer do you have to switch in a terminal, PC, or protocol analyzer for call setup, then switch back to your BERT for a performance test.

```
tas STRAP A: ATZ^M
STRAP B: ATZ^M
ORIG A: ATDT2^M
ORIG B: ATST1^M
ANSW A: ATSO=1^M
ANSW B: ATSO=1^M
DROP A: \P2 +++\P2 ATH^M
DROP B: \P2 +++\P2 ATH^M
```

***Gemini's built-in call setup capability eliminates the need for separate protocol analyzers, PCs, or terminals.***

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## Automatic Bit Error Rate and Throughput Tests Analyze the Transmission Performance of DCE Devices



Gemini's Basic and High Speed Bit Error Rate/Throughput (BERT) tests automatically measure data transmission performance. The Gemini BERT tests measure errors and throughput on industry-standard or user-defined patterns, at both test interfaces. The Gemini BERT tests report the following test results:

- bit errors, character errors, and block errors
- bit error rate, block error rate (High Speed BERT only)
- bits/sec., characters/sec., and block/sec.

- transmit clock frequency and receive clock frequency
- number of pattern sync loses
- in-sync duration

Gemini can calculate results based on modulo 2 or modulo 10 block sizes.

Gemini can also automatically terminate a test based upon preset limits for bit errors, character errors, and block errors. This saves valuable test time, and makes it easier to implement automatic test procedures.

## Automatic File Transfer/Data Compression Efficiency Test Shows Your Modem's True Speed Using Real File Transfers!

Gemini provides built-in means to measure file transfer efficiency. This is an important capability for evaluating modems and other devices that incorporate error correction and data compression schemes such as CCITT V.42 bis. Both the Basic and High Speed File Transfer tests give you a **standard** means of measuring device throughput that eliminates the inaccuracies and headaches of PCs, COM port cards, and file transfer software.

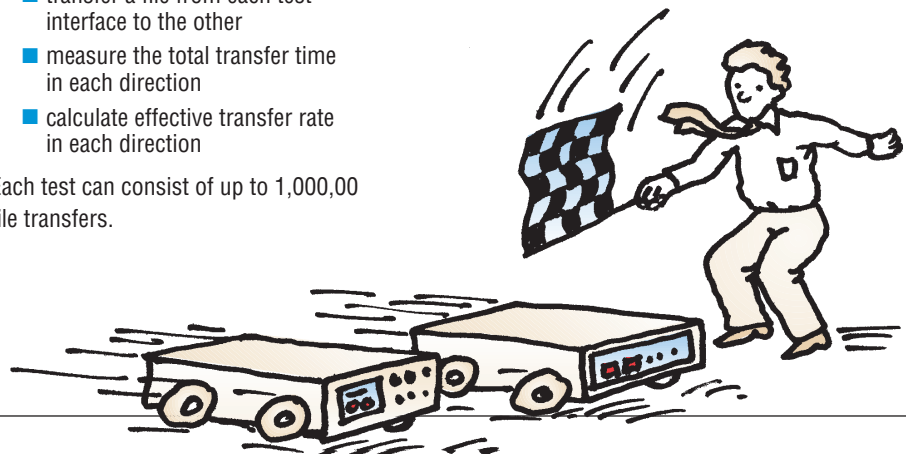
The Gemini Warp File Transfer tests measure the performance of **both** async and new sync (HDLC) data compression equipment. At each step in a File Transfer test, Gemini performs the following operations:

- transfer a file from each test interface to the other
- measure the total transfer time in each direction
- calculate effective transfer rate in each direction

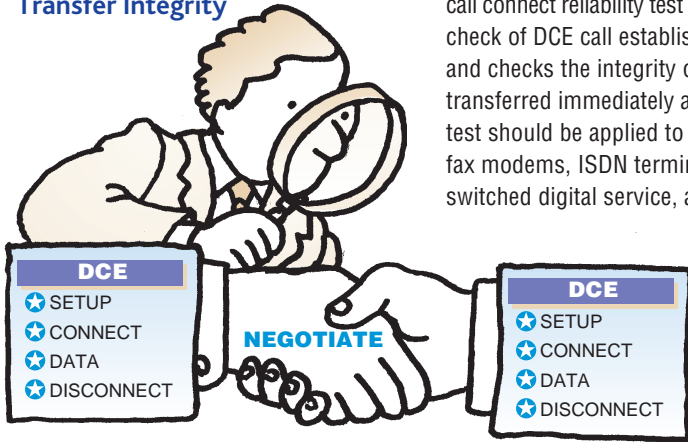
Each test can consist of up to 1,000,00 file transfers.

Gemini provides built-in industry standard files, and allows download of custom files from a PC. Standard files include patterns defined by EIA and CCITT. Gemini can perform half-duplex or duplex transfers, and reports the following results:

- transfer time
- min, max, and average transfer rate
- rate for most recent transfer
- number of failed transfers
- number of character errors (async) or frame errors (sync)



### Automatic Call Connect Reliability Test Provides a Thorough Test of Handshake and Initial Data Transfer Integrity



Call connect reliability testing is essential to the thorough evaluation of switched network data communications equipment. The Gemini call connect reliability test provides a thorough check of DCE call establishment procedures, and checks the integrity of the data that is transferred immediately after call setup. This test should be applied to dial modems and fax modems, ISDN terminal adapters, switched digital service, and many other network devices.

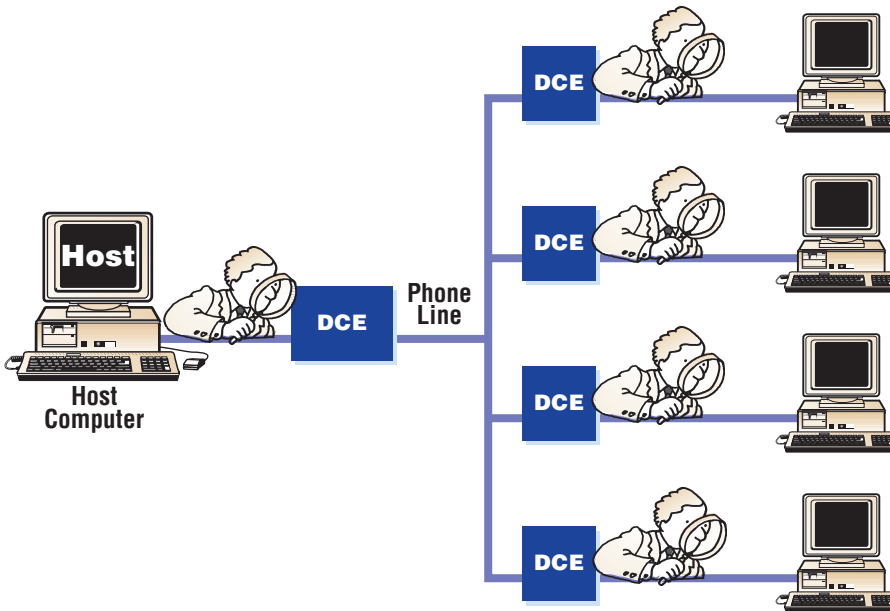
For each call attempt in a connect reliability test, Gemini performs the following operations:

- set up the call
- wait for call connect indication from DCE
- transfer data
- check data from remote DCE
- disconnect the call

Gemini can perform up to one million call attempts per test. Gemini logs and maintains the following test results:

- number of call attempts
- number of call failures
- failure statistics for each DTE (failure by cause)

### Multipoint Polling Test Evaluates Transmission Performance of Multipoint DCE Devices and Fax Modems



The Gemini Multipoint test evaluates the performance of devices that are designed to operate on multipoint or point-to-point poll/response networks. This includes multipoint modems, Digital Data System (DDS) CSU/DSUs, and ISDN terminal adapters. The Gemini Multipoint test also provides a thorough test of line turnaround performance for fax modems.

For multipoint testing each Gemini emulates a master and a slave DTE, or two slave DTEs. Using multiple Gemini units, you can construct a network that consists of one master and twenty one slave DTEs. The master DTE polls each slave and monitors each response. Each slave DTE looks for its address and responds to a valid poll message. Master and slave timing parameters, as well as poll and response messages, are completely programmable. Gemini Multipoint test results include the following:

#### At Master DTE

##### Aggregate Results

- number of polls sent
- current, min., max., and average RTS-CTS delay times

##### Results by Slave

- number of polls sent
- number of responses received
- number of response timeouts
- number of errored responses
- number of errors in address field of response
- number of errors in message field of response
- current, min., max., and average poll response times

#### At Each Slave DTE

- number of polls received
- number of errors in message field of poll

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## Character Echo and Block Acknowledgment Test Measures the Processing Delay of Communications Devices

Gemini's Character Error and Block Acknowledgment tests automatically measure device latency in processing individual characters and embedded protocol data transmissions. This is important for DCEs which are used in applications where any noticeable delay is perceived as poor device performance. The Character Echo test emulates an application in which each keystroke is either echoed back to the originator or acted upon immediately. This is a half-duplex test and provides the following results:

- One-way Character Latency
- Round Trip Delay

The Block Acknowledgment test emulates DTE-to-DTE protocols which alternately transmit and receive. In this test a block of data is transmitted in one direction and an acknowledgment is returned. Delays introduced by both devices are measured and the following results are provided:

- One-way Character Latency
- One-way Block Latency
- Round Trip Delay

These tests can be programmed to transmit either a fixed or random pattern.

## IEEE-488 (GPIB) and RS-232 Remote Control Interfaces Make it Easy to Include Gemini in Automatic Test Systems

Gemini is an ideal solution for automatic DCE test systems, because it performs all low-level test operations, and frees the test controller to perform high-level tasks such as user interface and report generation. Gemini provides a high-level programming language that yields easy-to-write, easy-to-maintain test programs. For example, the command to start a test is as follows:

```
/TEST:RUN/
```

The following command sets the BERT pattern, blocks/test, and block size:

```
/BERT:PATT=511  
NBLCKS=1000, BSIZ=10^3/
```

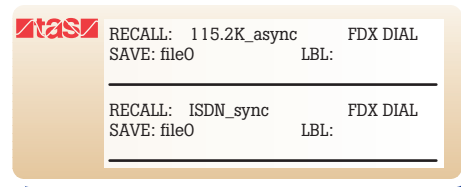
The command to get BERT results from DTE port A is as follows:

```
/BERT:RPTa/
```

Gemini commands are the same regardless of control protocol (RS-232 CRLF, RS-232 ACK/NAK, GPIB). Gemini presents two options for controlling an automatic DCE test system. One option is to use a GPIB controller, and simply "daisy-chain" Gemini and other devices in the test system on the GPIB bus. The second option is to use Gemini's built-in RS-232/GPIB bus translator to control the other instruments in the test system. This allows you to control a whole rack of instruments from one RS-232 port.

## Pre-Defined Test Configurations for Modems, DSU/CSUs, and Terminal Adapters Get You Up and Running Immediately

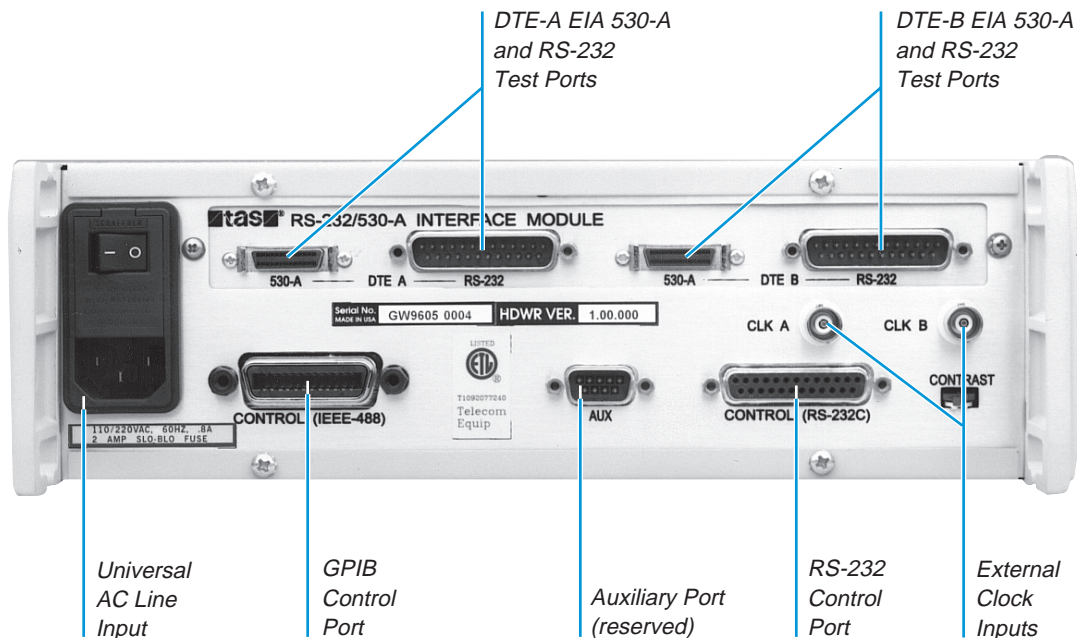
Gemini provides a host of pre-defined test setups for modems, terminal adapters, DDS sets, and other DCE devices. Gemini also provides non-volatile storage for user defined test setups. You can use pre-defined test setups as is, or modify them and save them as user-defined setups.



***Gemini gives you ready-to-run test setups for modems, DDS sets, ISDN terminal adapters, and other data communications equipment.***



**Gemini is a  
World-Class Performer**



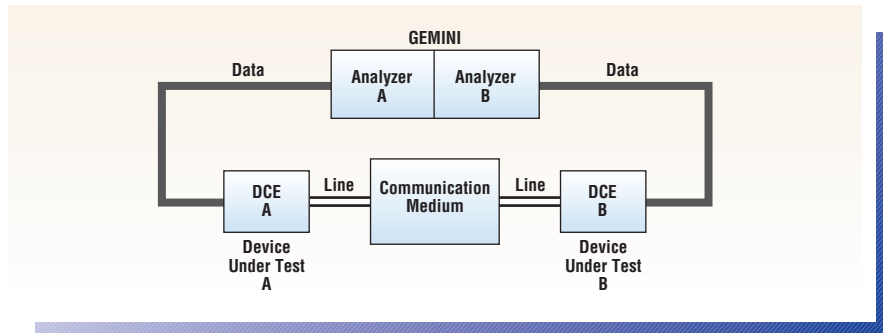
**Gemini meets or exceeds worldwide standards for compatibility and electrical safety. Gemini gives you the following key interface features:**

- High-speed RS-232/V.24 test interfaces with V.10 compatible signal levels
- High-speed EIA 530-A test interfaces
- RS-232 and GPIB control interfaces
- BNC connectors for external clock input
- Interchangeable interface module
- Universal AC line interface accepts worldwide AC line formats

# TAS Gemini™ WARP Dual Terminal Emulator

## Gemini Warp Applications

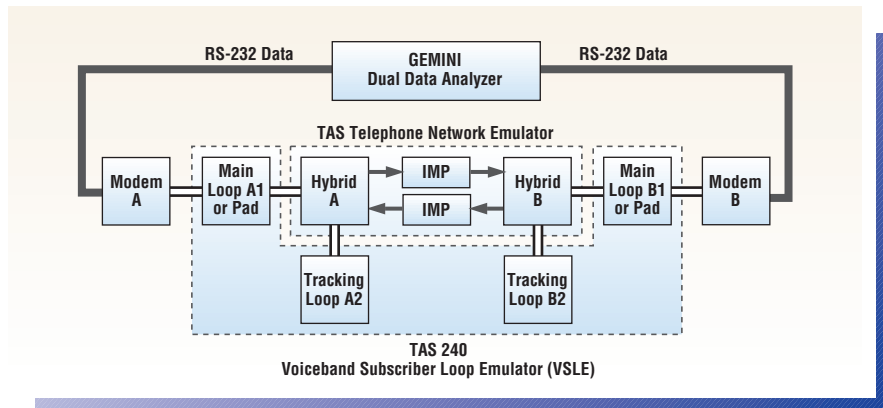
Gemini emulates the terminals at either end of a data communications link. Gemini connects to the DCE device at each end of the link. Typically, an actual or simulated communication medium might be an analog PSTN connection or a subscriber loop. Gemini can perform effective performance tests on virtually any DCE device at rates up to 2.048 Mbps.



*Gemini can test a wide range of DCE devices that operate at rates up to 2.048 Mbps.*

## Modem Performance Evaluation

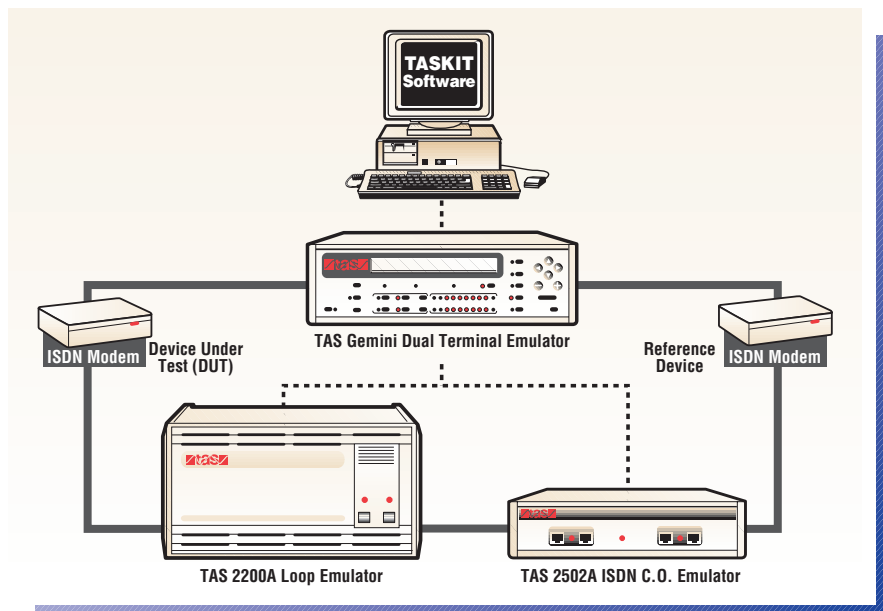
Combine Gemini with a TAS Telephone Network Emulator, control PC, and TASKIT® software for a complete automatic modem test system. The Telephone Network Emulator provides realistic, controllable network conditions. Gemini measures modem performance. The TASKIT software automates the test procedure and logs results. TAS provides several automatic modem test systems to fit a wide range of applications. With these systems, you can automatically evaluate modems with procedures from EIA, CCITT, and ETSI.



*Combine Gemini with other TAS Modem Test System components for thorough, accurate, and completely automatic modem testing.*

## ISDN Terminal Adaptor Test

Gemini is ideal for performing a variety of performance and functional tests on ISDN terminal adapters. You can use Gemini to perform call setup, data transmission, and call connect reliability tests. For complete, automated, end-to-end testing of ISDN basic rate terminal adapters, combine Gemini with the TAS 2200A ISDN Loop Emulator and TAS 2502 ISDN Network Emulator. This system allows performance testing in accordance with Bellcore and ANSI procedures.



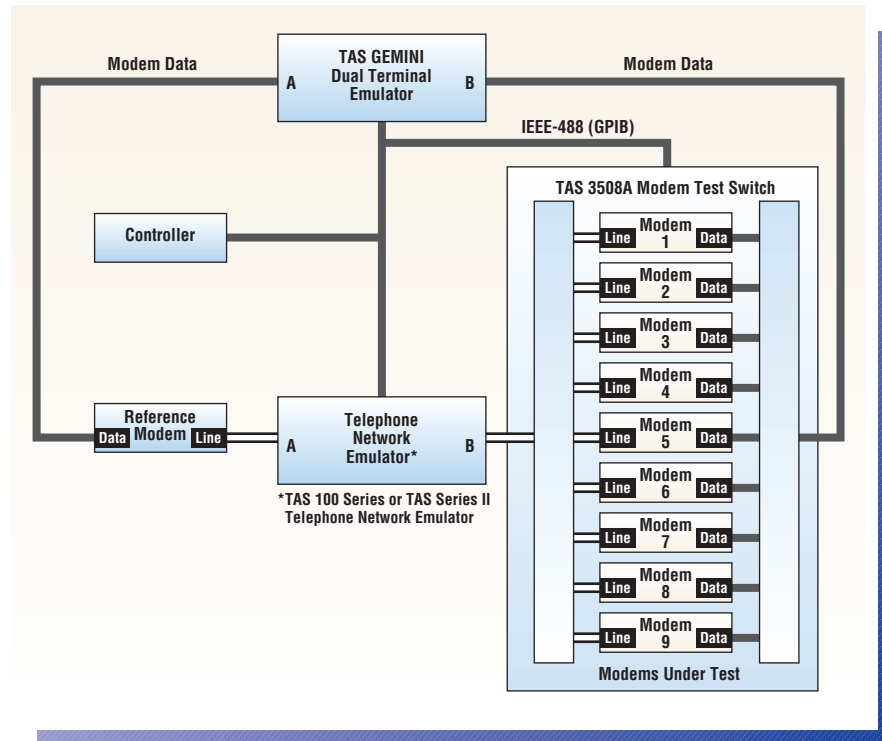
*Combine Gemini with the TAS 2200A Loop Emulator and TAS 2502A ISDN Central Office Emulator for complete, end-to-end testing of ISDN terminal adapters.*



### Modem Manufacturing Test

Gemini can also be applied to functional testing of modems in a manufacturing setting. Gemini makes it easy to check call setup and data transmission functions. With Gemini, you can:

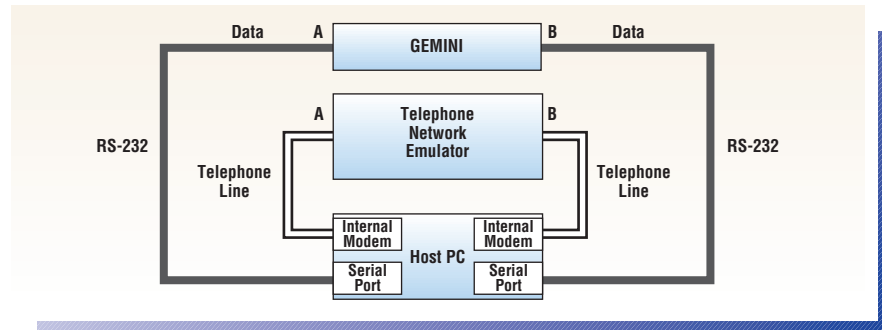
- perform call setup without other instruments
- check interface lead status
- measure clock frequencies
- put frequency offset on transmit clock



*Gemini gives you a compact, cost-effective, and fast solution for modem manufacturing test.*

### Testing PC Internal Modems

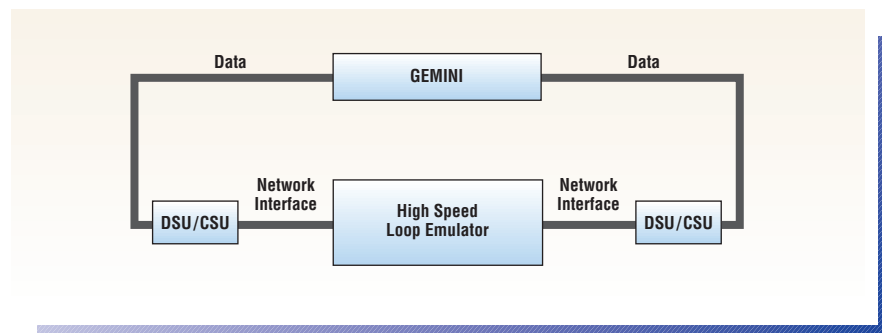
Combine Gemini with the TAS PC-POD™ for Windows Software Accessory to test PC internal communications devices such as modems, fax modems, and ISDN terminal adapters. PC-POD presents the internal modem card's signals on a PC COM port to allow access by Gemini.



*PC-POD allows you to use Gemini to test PC internal modems.*

### High Speed Terminal Test

Gemini's High Speed BERT and File Transfer Tests allow T1/E1 rate devices to be tested in half or full-duplex mode with a single unit. Technologies such as HDSL and ADSL can be run through uni- or bi-directional synchronous error rate tests with user selectable bit patterns. Similarly, the ability of high speed terminals to transfer file-based patterns, such as graphics and ascii files, can be tested via the synchronous, HDLC-formatted File Transfer test. BERT and File Transfer tests can be performed at rates up to 2.048 Mbps.

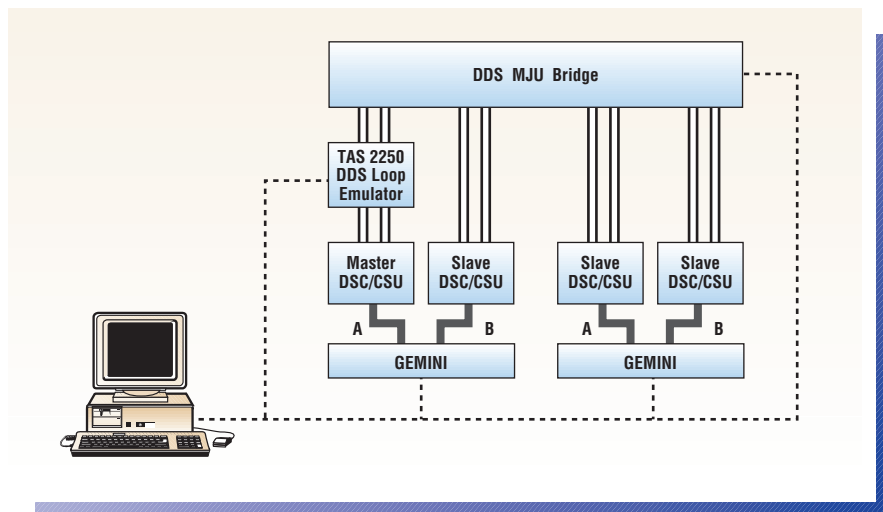


*Gemini allows T1/E1 rate devices to be tested with a single unit.*

# TAS Gemini™ WARP Dual Terminal Emulator

## Multidrop Network Test

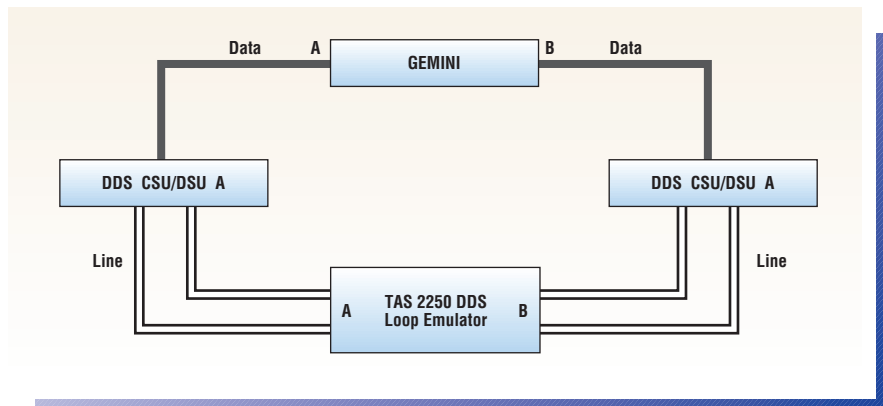
Gemini easily performs testing of multidrop modem, DDS, or ISDN networks. Each Gemini emulates one master and one slave, or two slaves. The master DTE port sends polls and collects responses. Gemini can manage up to 21 slave DTEs. Each slave DTE responds to poll messages from the master with a user-definable message.



*Gemini makes testing DDS multidrop networks a breeze.*

## Testing DDS DSU/CSU Transmission Performance

Combine Gemini with the TAS 2250 DDS Loop Emulator for complete and accurate testing of DDS DSU/CSU transmission performance. The TAS 2250 simulates cable attenuation and phase distortion characteristics, and Gemini measures bit error rate performance.



*Gemini and the TAS 2250 DDS Loop Emulator provide a complete, cost-effective test station for DDS DSU/CSU devices.*

## Gemini Warp Ordering Information

Item	Description
TAS Gemini Warp	High Speed Dual Terminal Emulator
TAS 1022-RM	Rack Mount Handles
TAS1022-0	Extra Operations Manual
TAS SWA-001	PC-POD Software Accessory
TAS 1022-HC	Hard Shipping Case

# Gemini Warp Specifications

## Test Interfaces

Type RS-232 (V.24), EIA 530-A

## Terminal Parameters for Test Modes

Data Formats SYNC, NRZ, SYNC NRZI, ASYNC  
 Clock Sources internal, DCE device, external  
 Flow Control CTS, XOFF, none  
 Internal Clock (Sync/Async) 45, 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 12000, 14400, 16000, 16800, 18000, 19200, 21600, 24000, 25600, 26400, 28000, 28800, 31200, 32000, 33600, 36000, 38400, 48000, 56000, 57600, 64000, 72000, 76800, 96000, 102400, 112000, 115200, 128000, 144000, 153600, 192000, 224000, 230400, 256000  
 (Sync Only) 280000, 320000, 336000, 384000, 392000, 448000, 504000, 512000, 560000, 576000, 616000, 640000, 672000, 704000, 728000, 768000, 784000, 832000, 840000, 896000, 952000, 960000, 1008000, 1024000, 1064000, 1088000, 1120000, 1152000, 1176000, 1216000, 1232000, 1280000, 1288000, 1344000, 1400000, 1408000, 1456000, 1472000, 1512000, 1536000, 1544000, 1568000, 1600000, 1624000, 1664000, 1680000, 1728000, 1736000, 1792000, 1848000, 1856000, 1904000, 1920000, 1960000, 1984000, 2016000, 2048000  
 Internal Clock Accuracy ±0.01%  
 Internal Clock Offset 0 to 10.0% in 0.1% steps  
 Internal Clock Accuracy with Offset ±0.111%  
 External Sync Clock 75 to 2048000 bits per sec.  
 External Async Clock 1200 Hz to 4.096 MHz (16 x 75 to 16 x 256,000)  
 DCE-Supplied Clock 75 to 2,048,000 Hz

## Async Format Options for Test Modes

Character Size 5, 6, 7, or 8 bits  
 Parity Options even, odd, none  
 Stop Bits 1, 1.5, 2

## Terminal Parameters for Call Setup

Protocols ASYNC, SYNC, HDLC, CCITT V.25 bis AYSNC, CCITT V.25 bis SYNC, CCITT V.25 bis HDLC  
 Clock Sources internal, DCE device, external  
 Flow Control Options CTS, XOFF, none  
 Internal Clock (Sync/Async) 45, 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 12000, 14400, 16000, 16800, 18000, 19200, 21600, 24000, 25600, 26400, 28000, 28800, 31200, 32000, 33600, 36000, 38400, 48000, 56000, 57600, 64000, 72000, 76800, 96000, 102400, 112000, 115200, 128000, 144000, 153600, 192000, 224000, 230400, 256000  
 Internal Clock Accuracy ±0.01%  
 Internal Clock Offset 0 to 10.0% in 0.1% steps  
 Internal Clock Accuracy with Offset ±0.111%  
 External Sync Clock 75 to 2,048,000 bits per second  
 External Async Clock 1200 Hz to 4.096 MHz (16 x 75 to 16 x 256,000)  
 DCE-Supplied Clock 75 to 2,048,000 Hz

## Async Format Options for Call Setup

Character Size 5, 6, 7, or 8 bits  
 Parity Options even, odd, none  
 Stop Bits 1, 1.5, 2  
 Inter-Character Delay 0 to 999 msec.

## SYNC Format Options for Call Setup

Character 8 bits no parity, 7 bits odd parity, 7 bits even parity, 7 bits mark parity, 7 bits space parity

## HDLC Format Options for Call Setup

Character 8 bits no parity, 7 bits odd parity, 7 bits even parity, 7 bits mark parity, 7 bits space parity  
 Character Code ASCII, EBCDIC  
 Address 0 to 0xFF

## Call Setup / Message Transfer

Analyzer Configuration xmt A/rcv A, xmt A/rcv B, xmt B/rcv A, xmt B/rcv B  
 Max. Transmit Message Length 80 characters  
 Max Receive Message 2,048 characters  
 Message Transfer Termination Conditions match expected response, receive expected number of characters, receive buffer full, receive time out, STOP command

## DCE Performance Tests

Test Types Bit Error Rate and Throughput (BERT), Call Connect Reliability (CALLS), File Transfer/Data Compression (DCMP), Multipoint Polling (MPOL), Message Error Rate (POLL), Character Echo (CHAR ECHO), Block Acknowledgment (BLK ACK)

## General Test Parameters

Self-Loop (yes/no) Insert Errors (yes/no/trigger)

## Bit Error Rate and Throughput Test (BERT)

Maximum Rate 2.048 Mbps (sync), 256 kbps (async)  
 Test Configurations xmt A/rcv A, xmt A/rcv B, xmt B/rcv A, xmt B/rcv B, xmt A&B/rcv A, xmt A&B/rcv B, xmt A&B/rcv A&B  
 Number of Blocks/Test 1 to 1,000,000 or constant  
 Max. Test Duration 231 - 1 blocks received  
 Block Size 2 to 100,000,000 bits  
 Test Pattern 63, 511, 2047, 215 - 1, 220 - 1, 223 - 1, MARK, SPACE, ALT user patterns B1 and B2  
 Max User Pattern Size 256 characters  
 Test Execution Options manual, semi-automatic  
 Test Results blocks analyzed, bit errors/rate, character errors, block errors/rate, bits/sec., chars/sec., blocks/sec., transmit clock freq., receive clock freq., sync losses, sync duration, total test seconds, error analysis seconds, no sync seconds, error free seconds, errored seconds

## File Transfer Efficiency (Data Compression) Test (DCMP)

Maximum Rate 2.048 Mbps (sync/HDLC), 256 kbps (async)  
 Test Patterns ascii, base, c\_source, combo, exe, fox, graphic, image, mixed3, random, spreadsheet, text, user-defined pattern (includes five patterns specified by EIA TS30.3 committee)  
 Max. User Pattern Patterns/File 90 kilobits  
 # File Transfers/Test 1 to 1,000,000 or continuous  
 File Transfer Timeout 1 to 9,999 sec  
 Inter-Transfer Delay 1 to 100 sec  
 Test Configurations xmt A/rcv A, xmt A/rcv B, xmt B/rcv A, xmt B/rcv B, xmt A&B/rcv A&B  
 Test Execution Modes manual, semi-automatic  
 Max. Errors/Transfer 1 to 1,000,000 or no limit  
 Max Failed Transfers/Test 1 to 1,000,000 or no limit

Specifications continued on next page.

# TAS Gemini™ WARP Dual Terminal Emulator

## Gemini Warp Specifications - Continued

### File Transfer Efficiency (Data Compression)

#### Test (DCMP) *continued*

Transfer Start Time Out	1 to 9,999 sec
Transfer Start Check Length	1 to 9,999 bytes
HDLCL Frame Size	1 to 65,536 bytes
HDLCL Inter-Frame Delay	0 to 9,999 msec
HDLCL Last Frame to RTS Delay	0 to 9,999 msec
HDLCL Frame Address	00 to FF
HDLCL Control Field	00 to FF
Test Statistics	number of transfer, min., max., and average transfer rates, current number of characters (async) or frames (sync) received, current transfer time, current transfer rate
Error Reports	cumulative errors, cumulative transfer errors, number of transfer start time-outs, number of transfer completion time-outs, number of failed transfers

### Call Connect Reliability Test (CALLS)

Maximum Rate	256 kbps
Number of Calls/Test	1 to 9,999,999 or continuous
Max Modem Command Length	80 characters
Modem Response Buffer Length	80 characters
Test Pattern	63, 511, 2047, user pattern C1 and C2
Max User Pattern Length	256 characters
Test Configuration	xmt A/rcv A, xmt A/rcv B, xmt B/rcv A, xmt B/rcv B, xmt A&B/rcv A, xmt A&B/rcv B, xmt A&B/rcv A&B
Test Execution Modes	manual, semi-automatic
Test Results	number of call attempts, number of call failures, number of NO CARRIER events, number of BAD RESPONSE events, number of NO CTS events, number of data transfer time-outs, number of startup errors in test message, number of data errors in test message

### Character Echo Test (Async Only)

Maximum Rate	256 kbps
Flow Control	CTS, none
Test Configurations	xmt A/rcv B, xmt B/rcv A
Number of Iterations	1 - 9999999
Test Protocol Options	random inter-character delay, filter consecutive identical characters, fixed or random test pattern
Inter-Character Delay:	
Minimum Delay	10 to 1000 milliseconds
Span of Random Delay	0 to 1000 milliseconds
Error Detection Options	response time-out
Test Results	number of iterations, errored iterations, iterations timed-out, one way character latency (min, max, avg, last), round trip character latency (min, max, avg, last)

### Block Acknowledgment Test (Async Only)

Maximum Rate	256 kbps
Flow Control	CTS, none
Test Configurations	xmt A/rcv B, xmt B/rcv A
Number of Iterations	1 - 9999999
Block Size	1 to 9999 characters

### Multipoint Polling Test (MPOL)

Maximum Rate	256 kbps
Gemini Configurations	either A or B is master, or both A and B are slaves
Number of Slave Stations	up to 21, two per Gemini
Protocols	monosync, bisync, HDLC, async
Number of Polls/Test	1 to 1,000,000 or continuous
Poll Message	up to 80 characters
Response Message	up to 80 characters
Master Address	up to 8 characters
End of Message-to-RTS Inactive	0 to 1,000,000 msec
Test Results (master)	number of polls total, current/min/max/avg RTS-CTS delay the master DTE maintains the following results for each slave in the network: number of polls sent, number of polls received, number of response time-outs, number of response errors, number of address field errors, number of message field errors, current/min/max/avg poll response times
Test Results (slave)	number of polls received, number of message field errors

### Message Error Rate Test (POLL)

Maximum Rate	256 kbps
Number of Polls/Test	1 to 1,000,000 or continuous
Poll Delay	1 to 2,000 msec.
Poll Messages	SYN-SYN-EOT, FOX, user patterns P1 and P2
User Pattern Size	up to 256 characters
Test Configurations	xmt A/rcv A, xmt A/rcv B, xmt B/rcv A, xmt B/rcv B, xmt A&B/rcv A, xmt A&B/rcv B, xmt A&B/rcv A&B
Execution Modes	manual, semi-automatic
Test Results	polls analyzed, sync errors, message errors, false polls, RTS-CTS delay, transmit clock, receive clock

### Frequency Measurement

Range	45 Hz to 2.048 MHz
Resolution	100 ppm
Accuracy	±0.01% +1 digit

### Interface Lead Timing Measurement

Range	0.01 to 99,999.99 msec.
Resolution	0.01 msec
Accuracy	±0.005 msec

### AC Power

Voltage	100 to 250 VAC
Frequency	48 to 63 Hz
Dissipation	50 Watts max.

### Operating Environment

Temperature	0 to 50 degrees C (32 to 122 degrees F)
Humidity	10 to 90% non-condensing

### Dimensions and Weight

Height	3.5 inches
Width	11.5 inches
Depth	14.5 inches
Weight	9 lbs.

