



## MTS-5100 SPECIFICATIONS



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## CAPABILITIES

### Arbitrary Adjustment

- Independent adjustment and display of all output amplitudes and phase angles
- All output parameters can be set "off-line"
- Adjustment via continuous dial or numeric keypad

### Multi-Phase Adjustment

- AC output amplitudes, angles and frequencies controllable in a multi-phase fashion
- Control phase-phase and 3-phase voltage, current and phase angle via single parameter adjustment
- Rotation of fault quantities to improve 3-phase testing productivity
- Currents: 6ph, 3ph, 1ph paralleled

### Parameter Display

- All amplitude/angle/frequency parameters displayed numerically
- All AC outputs displayed in phasor graph form
- Parameter display active and updated while under computer control

### State Sequencing

<b>States</b>	Off, Prefault, Fault 1-8, Postfault
<b>State duration</b>	Infinite or 0-9999.9999 seconds
<b>State change control</b>	Infinite, fixed duration, or dynamic based on contact/voltage input
<b>Point-on-wave</b>	Programmable from 0-359 deg for Prefault to Fault1 transition
<b>DC offset</b>	Exponentially decaying, user controllable

### Waveform Playback

- Accepts IEEE C37.111 COMTRADE format files
- Reproduces analog and digital waveforms
- Channel assignment and scaling performed on front panel user interface
- Plays back from internal waveform memory

<b>Max duration</b>	1 minute
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### Time Measurement

<b>No. of timers</b>	5	
<b>Range</b>	0 - 99999 seconds 0 - 99999 cycles	
<b>Significant digits</b>	6	
<b>Accuracy</b>	±0.5ppm of reading ±50µs	
<b>Resolution</b>	for times <1 sec	0.1 ms
	for times ≥1 sec	1 ms

### Sequence of Events Recording

- Records state changes on all contact/voltage inputs, contact outputs and output state changes

<b>Resolution</b>	0.1ms
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### Waveform Capture

- Functions as a 12ch oscilloscope on inputs 1-12

<b>Resolution</b>	±0.2 Vdc for signal levels ±300 Vdc
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### Display of Relaying Quantities

- V0, V1, V2
- I0, I1, I2
- Impedance (positive sequence 3-phase, phase-phase or phase-ground)
- V/Hz, % unbalance, power, impedance ratios

### Time/Phase/Frequency Synchronization

- Synchronizes phase, frequency and time of multiple instruments

<b>Synchronization Sources</b>	<ul style="list-style-type: none"> <li>• Internal clock</li> <li>• Internal GPS receiver</li> <li>• External IRIG-B</li> </ul>
<b>Time</b>	<ul style="list-style-type: none"> <li>• Synchronize start of prefault and Fault1 in non-waveform playback mode</li> <li>• Synchronize start of record in waveform playback mode</li> </ul>
<b>Internal GPS 1pps accuracy</b>	± 1 microsecond (subject to selective availability)
<b>Frequency sources</b>	2 (for testing synchronizing devices, and islanding conditions)

### Ramping

- Independent linear ramps settable for each state

<b>AC current</b>	(each output)	0 - ± 100000 A/s
<b>AC voltage</b>	(each output)	0 - ± 100000 V/s
<b>Phase angle</b>	(each output)	0 - ± 9000.0 °/s
<b>Frequency</b>	(each frequency source)	0 - ± 20.00 Hz/s

### Relay Test Modes

- Synchronizing for testing synchrocheck elements
- Synchronizing / Synchrocheck
- Differential
- Overcurrent
- Reclosing
- Distance
- Meter and Transducer

### Automatic Control

- All instrument capabilities controllable via RS-232 and Ethernet communication interfaces

### Preferences & Defaults

- User programmable, non-volatile defaults for system frequency, line-to-line voltage, phase sequence, phase naming and display colors, DC voltage, and communication settings

Note: Due to technical progress, all specifications are subject to change without notice.

## OUTPUTS

### AC/DC Current Outputs

<b>Range</b>	6-phase AC	0-30 Arms
	3-phase AC	0-60 Arms
	1-phase AC	0-180 Arms <sup>1</sup>
	DC	0-5 A
<b>Maximum power</b>	6-phase AC	each 450 VA
	3-phase AC	3 x 900 VA <sup>1</sup>
	1-phase AC	1 x 2400 VA <sup>1</sup>
	DC	60 W
<b>Accuracy<sup>2</sup></b>	for > 5% of range	Greater of 0.25% setting or 10mArms (15mAdc)
		0.001 Arms
<b>Resolution</b>		0.001 Arms
<b>Superimposed harmonic</b>	2 <sup>nd</sup> to 50 <sup>th</sup> harmonic	0 - 50%
<b>Bandwidth</b>	(-3dB)	3 kHz
<b>Noise &amp; distortion</b>	at maximum power	<1% (for >3% range)
<b>Protection</b>	Overload, overtemperature, transient overvoltage, open circuit	
<b>Paralleling</b>	<ul style="list-style-type: none"> <li>2, 3, or 6 channels</li> <li>&gt;6 channels when using multiple MTS-5100's</li> </ul>	

### AC Outputs – Frequency/Phase

<b>Freq. range</b>		10 – 3000 Hz
<b>Freq. resolution</b>		0.001 Hz
<b>Freq. accuracy</b>	Without GPS	< ±1ppm typ. <sup>2,3</sup>
	With GPS	< ±1µs
<b>Phase Angle</b>	Range	0 - 359.99°
<b>Phase Resolution</b>		0.01°
<b>Phase Angle</b>	Accuracy <sup>2</sup>	< ±0.25° guar. < ±0.10° typ.

### IRIG-B Output

<b>Type</b>	5V TTL, isolated
<b>Connector</b>	BNC

<sup>1</sup> Transient, dependant on line and channel configuration.

<sup>2</sup> For frequencies 47-63Hz

### AC/DC Voltage Outputs

<b>Range</b>	3-phase AC	0-250 Vrms
	1-phase AC	0-750 Vrms
	DC	0-350 V
<b>Maximum Power</b>	3-phase AC	3 x 85 VA
	1-phase AC	1 x 250 VA
	DC	100 W each phase
<b>Accuracy<sup>2</sup></b>	for >5% of range	Greater of 0.15% setting or 10 mVrms
<b>Resolution</b>		0.01 Vrms
<b>Superimposed harmonic<sup>4</sup></b>	2 <sup>nd</sup> to 50 <sup>th</sup> harmonic	0 – 50%
<b>Bandwidth</b>	(-3dB)	3 kHz
<b>Noise &amp; distortion</b>	at maximum power	<0.5% guaranteed <0.2% typical (for >3% range)
<b>Protection</b>	Overload, short circuit, overtemperature, transient overvoltage	

### 4th Voltage Output

<b>Range</b>	10 - 350 Vdc, 0-250 Vrms
<b>Max. power</b>	150 W, 200 VA
<b>Current</b>	0.5 Arms cont. max, 1.5 Apk surge
<b>Accuracy</b>	Greater of 0.15% setting or 10 mVrms (for >1% range)
<b>Resolution</b>	0.01 V
<b>Noise &amp; distortion</b>	<0.5% guaranteed (at max power) <0.2% typical (for >3% range)

### Contact Outputs

<b>Type</b>	4 x form A
<b>Rating</b>	5 A / 240 VAC
	0.4 A / 300 VDC
<b>Isolation</b>	each output independently isolated
<b>Functions</b>	52A, 52B, unblock, permissive
<b>Transition delay</b>	programmable 6.0 - 9999.9 ms

<sup>3</sup> Less than 10ppm guaranteed

<sup>4</sup> Maximum 353.55Vpk (fundamental + harmonic)

## INPUTS

### Analog Transducer Measurement

<b>Input range</b>	0 to ±10 VDC or 0 to ± 20 mADC
<b>Accuracy</b>	0.1% of reading or 0.05% of range
<b>Connector</b>	4mm banana

### Contact/Voltage Inputs

<b>Type</b>	12ch dry contact or AC/DC voltage	
<b>Voltage range</b>	±300 VDC, 0 - 225 VAC	
<b>Accuracy</b>	±1.5% of reading ±0.5% of range	
<b>Threshold range</b>	Channels 1-12	0.1V - 250 V
	Channels 1-12	0.1V
<b>Threshold resolution</b>	0.1V	
<b>Debouncing/ Deglitching</b>	0.0 - 999.9 ms programmable	
<b>Isolation</b>	each input independently isolated	

### Antenna

<b>Type</b>	Active, low gain
<b>Connector</b>	BNC

### IRIG-B

<b>Type</b>	AM or TTL, isolated
<b>Connector</b>	BNC

### Power Input

<b>Rated range</b>	100-240 VAC
<b>Frequency</b>	47 - 63 Hz
<b>Consumption</b>	1800 VA typical maximum

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## OTHER

### Communication Interfaces

- 2x USB 2.0 type "A" receptacle – Host Port
- 1x USB 2.0 type "B" receptacle – Slave Port (opt.)
- 10/100/1000 Base-TX Ethernet (RJ45)  
(IEC - 61850 Capable)
- RS-232 (9600 to 115200 baud, DB-9)

### Communication Protocols

- USB 2.0
- IEC-61850 / GOOSE
- HTTP, FTP
- ASCII commands

### Physical

<b>Weight</b>	49 lbs (22.2 kg)
<b>Width</b>	18.9 in. (48.0 cm)
<b>Height</b>	14.5 in. (36.8 cm)
<b>Depth</b>	11.7 in. (29.7 cm)
<b>Operating Temperature</b>	14° to 122°F (-10 to 50°C)
<b>Relative Humidity</b>	5% to 90%, non-condensing
<b>Storage Temperature</b>	-22° to 158°F (-30 to 70°C)

### Accessories Included

- Front panel cover
- Rugged, watertight HPX shipping/transport case with wheels & extension handle
- Manual
- GPS antenna with 100' extension cable
- AC power cord

### Application Software

- RapidReporter®
- Remote Console

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