

Fast Switching Cycle Testing

Model FTN

Electric Vehicle
And Telecom
Battery Test
Equipment



Model FTN300-48

Drive Simulations with Standard Electric Vehicle Tests: FUDS, SFUDS, GSFUDS, DST & ECE-15L

Standby Power and Supercapacitor Testing

Current Ranges From 1A to 1000A and Higher

Voltage Configurations for Single Cells, Monoblocs or Battery Packs 1 to 500 Volts

Flexible Network Control with Bitrode's VisualCN[®] Software for Windows[®] '98



Fast Switching Cycle Testing

Model FTN



FAST SWITCHING Test Systems

Bitrode Corporation's Model FTN is a cycle life test system designed to perform standard electric vehicle, standby battery and supercapacitor tests. Designed for fast switching capability and high speed data acquisition, the FTN is the ideal solution for demanding FUDS, SFUDS, GSFUDS, DST, ECE-15L and other electric vehicle drive simulation regimes.

How Does It Work?

Based on linear transistorized current control, the FTN is built to customer specifications in current ranges from 1 to 1000 Amperes. Modules can be configured in voltages from 1 to 500 nominal volts. These ranges make the FTN a solid choice for testing cells, monoblocs and full battery packs. Circuitry is designed around analog and digital control, and is driven by Bitrode's high performance VisuaLCN software for Windows 98 and Windows NT. Each FTN circuit uses a 16 bit analog to digital converter for high accuracy; measurement and control are designed to provide accuracy to within 0.1% of full scale.

Electric Vehicle drive simulations require fast switching capability, and the FTN is designed with this in mind; switching from charge to discharge, discharge to charge, or open circuit to charge or discharge can be accomplished in 170 milliseconds.

Switching from one charge rate to another, or from discharge to discharge can be done in 100 milliseconds. These values will vary slightly with different module configurations; consult a Bitrode representative for exact figures for the model which meets your specifications.

Each FTN module operates from its own isolated power supply, allowing a single cell to be discharged to zero volts. This power supply isolation also makes possible separate cycling of multiple cells within a battery, or multiple batteries within a pack.

Data acquisition in EV test environments must happen quickly as well, and again, Bitrode designed the FTN to handle these requirements. When an FTN circuit is connected to a dedicated computer, test data is acquired in time increments as short as 100 milliseconds continuously.

The FTN connects to a host computer running Bitrode's VisuaLCN software for circuit control and data acquisition. This can be done on a standard Bitrode VisuaLCN network, or the FTN can communicate directly with the network PC through a standard RS232 connection. Due to the high speed and volume of data generated by the FUDS and other simulation regimes, Bitrode recommends that FTN circuits be connected to a dedicated computer.

Full Featured Test System for Electric Vehicle and Telecom Battery Testing

Circuitry is Designed for High Reliability and Accuracy

Modular Design for Ease of Maintenance and Troubleshooting

Data Recording, Viewing and Analysis With VisuaLCN Software Control

Reliable Modular Construction

The modular design and construction of the Model FTN are guided by the need for ease of use, reliability and simple, efficient maintenance.

FTN circuits are housed in a rugged steel cabinet with a durable paint finish. Circuits are packaged in convenient rollaway cabinets. With most units, circuit modules can be removed from the cabinet quickly on slide-out rails for ease of maintenance.

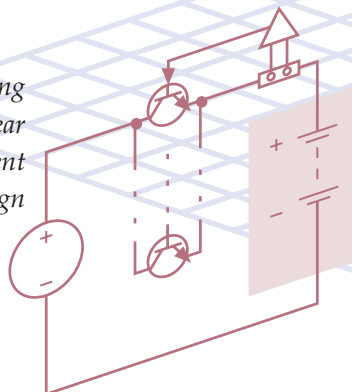
An easily removed front panel provides access to circuit boards, making board swap procedures fast and simple. Circuit calibration adjustments are also accessible behind this front panel.

On many of the FTN modules, the power electronics circuitry is mounted on a modular heatsink assembly, readily removed through access doors for inspection or servicing.



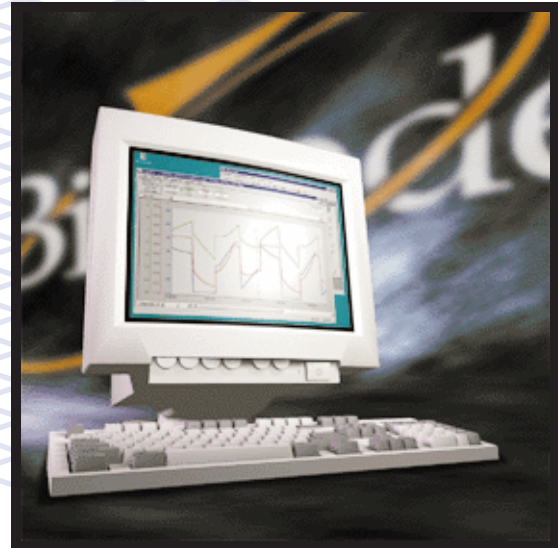
LED circuit status indicators are positioned on a removable front panel, indicating power on/off and circuit activity (charge, discharge and rest). A push button switch is available for stopping or restarting a test locally. An over temperature warning light and connections for voltage and current calibration are located on the front of each module.

Schematic demonstrating Model FTN's linear transistorized current control design



Get In And Drive

The Model FTN is controlled by Bitrode's VisuaLCN software package. VisuaLCN, written for Windows 98 and Windows NT, is a complete circuit control and test data reporting solution for Bitrode's network based charge and test equipment.



VisuaLCN's client-server architecture gives users control of any Bitrode FTN circuit, from anywhere on a computer network. Using software controls in a Windows interface, an operator can develop test profiles to meet customer specified guidelines. Up to 2000 steps of charge, discharge and rest can be programmed to user specifications. Steps can be controlled with up to 8 limit conditions, chosen from variables such as time, voltage, current, ampere- or watt-hours, temperature, pressure or other customer specified test parameters.

Tests in progress can be easily monitored with VisuaLCN; circuit activity is viewable in both tabular and graphical formats. Test data can be sampled in user-specified time increments, with data acquisition available every 100 milliseconds. Test data can include information regarding voltage, current, cell voltage (optional), temperature, pressure (optional), and other customer-determined information. Test data is stored in a Microsoft Access format. This data can be viewed in graphic format for post-test analysis using VisuaLCN's Dataview graphing software, or can be presented to users in an Access report of their own design.

For more information about using VisuaLCN to command the Model FTN (as well as Bitrode's other network-based charge and test equipment), contact a Bitrode representative.

Note the Features:

- ▶ Testing for cells, monoblocs and full battery packs
- ▶ Circuit isolation for separate cycling of battery cells or batteries within a pack
- ▶ Current ranges from 1 to 1000 Amperes
- ▶ Voltages from 1 to 500 Volts (nominal) for testing single cells or multiple batteries
- ▶ Accuracy to within $\pm 0.1\%$ of full scale
- ▶ Fast switching capabilities (These values will vary slightly with different module configurations; consult a Bitrode representative for exact figures for the model which meets your specifications)
 - ▶ CHG to DCHG, DCHG to CHG <170 ms
 - ▶ Open circuit to CHG or DCHG <170 ms
 - ▶ CHG to CHG or DCHG to DCHG <100 ms
- ▶ Data acquisition as fast as 100 ms continuously when FTN circuit is connected to dedicated computer
- ▶ Current or power ramping up to 1000 minute duration
- ▶ Driving simulation test enhancements
- ▶ Models designed for supercapacitor testing
- ▶ Bipolar testing capability
- ▶ Use with NiMH, Li-Ion or lead-acid technologies
- ▶ FUDS, SFUDS, GSFUDS, DST and ECE-15L compatible, with auto scaling of W/Kg
- ▶ Modular design and construction allow efficient maintenance and service
- ▶ Full-featured easy to use software on the Windows 98 and Windows NT platforms
- ▶ Up to 2000 control program steps, with up to 8 limit conditions per step
- ▶ Graphical data presentation and analysis with VisualLCN's Dataview software, or tabular data review in customer-designed Microsoft Access format

Beyond the Basics:

Optional features make the Model FTN a robust testing system, custom designed for specific laboratory environments. Build the module which fits your testing needs with the options listed below.

- ▶ Cell Voltage Monitoring for cells or monoblocs
- ▶ High resolution (± 0.001 volt) cell voltage monitoring
- ▶ Thermocouple devices
 - ▶ Type J or T for temperatures ranging from -40° to 200°C ($\pm 0.5^{\circ}\text{C}$).
 - ▶ Type K for temperatures from -40° to 500°C ($\pm 1^{\circ}\text{C}$)
 - ▶ Other temperature ranges available
- ▶ Multiple temperature monitoring
- ▶ Temperature compensation - automatically compensate charge voltage as a function of battery temperature
- ▶ Pressure monitoring in user specified ranges
- ▶ Reference electrode inputs with input resistance up to 10^8 ohms
- ▶ Specific gravity monitoring
- ▶ Programmable analog or digital inputs and outputs
- ▶ Multiple current ranges - up to three per circuit
- ▶ High resolution float charge
- ▶ Constant resistance discharge
- ▶ Customer specified alarms and faults
- ▶ Custom designed test leads
- ▶ Custom designed cell or battery handling fixtures
- ▶ Up to 999,999 cycles per test

Model* **	Constant Current Amp Range (±0.1%)	Charge Voltage (±0.1%)	Discharge Voltage (±0.1%)	Constant Wattage	Ampere Hour	Watt Hour
FTN7-100-12	0-100.00	0-18.000	0-14.000	0-1800.0	±9999.9	±99999
FTN3-100-24	0-100.00	0-36.000	0-28.000	0-3600	±9999.9	±99999
FTN3-100-36	0-100.00	0-54.000	0-42.000	0-5400	±9999.9	±99999
FTN2-200-24	0-200.0	0-36.000	0-28.000	0-7200	±9999.9	±99999
FTN2-200-36	0-200.0	0-54.000	0-42.000	0-10800	±9999.9	±99999
FTN1-200-48	0-200.0	0-72.000	0-56.000	0-14400	±9999.9	±99999
FTN1-300-12	0-300.0	0-18.000	0-14.000	0-5400	±9999.9	±99999
FTN1-300-36	0-300.0	0-54.000	0-42.000	0-16200	±9999.9	±99999
FTN1-300-48	0-300.0	0-72.000	0-56.000	0-21300	±9999.9	±99999
FTN1-500/0.1-5 [‡]	0-500.0	0-5.000	0-5.000	0-2500	±9999.9	±99999
FTN1-500-48	0-500.0	0-72.000	0-56.000	0-36000	±9999.9	±99999
FTN1-500-400	0-500.0	100.0-400.0	100.0-400.0	0-150.00KW	±9999.9	±999.99KWh
FTN1-1000-12	0-1000	0-18.000	0-14.000	0-18000	±9999.9	±99999
FTN1-1000-24	0-1000	0-36.000	0-28.000	0-36000	±9999.9	±99999

Specifications

Measures

Model* **	Circuits per Cabinet	Cabinet Input Amps (50 or 60 Hz) Three Phase			Dimensions [†] In / Cm		
		230V	400V	460V	W	D	H
FTN7-100-12	7	10	6	5	28/71	36/91	78/198
FTN3-100-24	3	14	8	7	28/71	36/91	78/198
FTN3-100-36	3	18	11	9	28/71	36/91	78/198
FTN2-200-24	2	28	16	14	28/71	36/91	78/198
FTN2-200-36	2	36	21	18	28/71	36/91	78/198
FTN1-200-48	1	61	35	31	32/81	33/84	84/213
FTN3-300-12	3	28	16	14	28/71	36/91	78/198
FTN1-300-36	1	59	34	29	46/117	24/61	85/216
FTN1-300-48	1	89	51	44	46/117	24/61	85/216
FTN1-500-0.1-5 [‡]	1	38	22	19	32/81	24/61	87/221
FTN1-500-48	1	145	83	73	51/130	24/61	84/213
FTN1-500-400	1	-	229	199	112/284	30/76	78/198
FTN1-1000-12	1	101	58	51	51/130	24/61	84/213
FTN1-1000-24	1	147	85	74	51/130	24/61	84/213

*If required voltage, current, or number of circuits do not appear in this table, contact Bitrode Corporation: custom product engineering is one of our greatest strengths.

** Module names are interpreted as follows: FTNxx-yy-zz, where xx indicates number of circuits per cabinet, yy indicates amperage and zz indicates voltage.

†Dimensions may vary according to design requirements.

‡Secondary lower current range for current leakage measurement on modules designed for capacitor testing



All products are subject to change in physical appearance and circuitry which will not alter performance specifications.

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