

1 DESCRIPTION

The serial TIC UPS driver allows the ProtoNode to transfer data to and from devices over RS-232 using TIC UPS protocol. The ProtoNode can emulate a Client.

This driver is intended for use with Toshiba models UPS and is implemented to:

- Read information from the UPS such as battery life, voltages etc. This will be done in user mode on the UPS.
- Write information and commands such as shutdown commands to the UPS.
- Advanced options such as reading/writing EEPROM is not supported. No date/time reads or writes are supported. No string type commands are supported.

While the driver has both Server and Client implementations, the Server is intended for emulation and test purposes by FieldServer only.

FieldServer Mode	Nodes	Comments
Client	1	As the Toshiba protocol only allows for 1:1 communication, only 1 Client is allowed per RS-232 port.
Server	1	The Server is implemented for emulation purposes only. It has a static address as per the Toshiba spec.

2 FORMAL DRIVER TYPE

Serial

Client Only

3 COMPATIBILITY MATRIX

FieldServer Model	Compatible with this driver
FS-x2010	No
FS-x2011	No
FSx25	No
FS-x30	No
FS-x40	No
SlotServer	No
ProtoCessor	No
ProtoNode	Yes

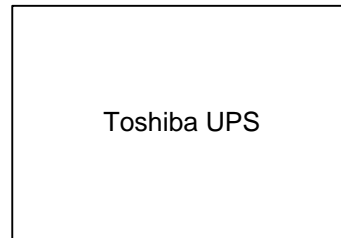
4 CONNECTION INFORMATION

Connection type: RS-232
Baud Rates: 1200; 2400; 4800; 9600
Data Bits: 7
Stop Bits: 1
Parity: Even
Multidrop Capability: No

5 DEVICES TESTED

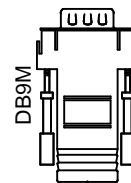
Device	Tested (FACTORY, SITE)
TIC UPS model 1600	FACTORY
TIC UPS model G900	FACTORY
TIC UPS model G8000MM	SITE

6 CONNECTION CONFIGURATIONS



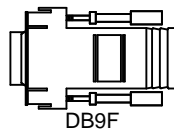
8917-03 WIRE LIST

FUNCTION	FROM	TO	COLOUR
Rx	RJ45-01	DB9M-02	GREY
GND	RJ45-04	DB9M-05	GREEN
Tx	RJ45-08	DB9M-03	BLUE



8917-02 WIRE LIST

FUNCTION	FROM	TO	COLOUR
Rx	RJ45-01	DB9F-03	WHITE
GND	RJ45-04	DB9F-05	GREEN
Tx	RJ45-08	DB9F-02	BLUE



PROTONODE

6.1 Connection Notes

- The cable connecting a ProtoNode to the UPS should be a NULL modem cable.
- Note that no hardware handshaking is supported.
- The connector to the UPS is a DB9 male connector.

7 COMMUNICATIONS FUNCTIONS - SUPPORTED FUNCTIONS AT A GLANCE:

7.1 Read Operations supported

ProtoNode as a Client	ProtoNode as a Server	Description
ALARM	ALARM	Alarm data
BC	BC	Battery current
BECR	BECR	Battery estimated charge remaining
BEMR	BEMR	Battery estimated minutes remaining
BLR	BLR	Battery life remaining
BPV1	BPV1	Bypass voltage phase 1
BPV2	BPV2	Bypass voltage phase 2
BPV3	BPV3	Bypass voltage phase 3
BPC	BPC	Bypass current
BPFREQ	BPFREQ	Bypass frequency
BRHT	BRHT	Battery rated holding time
BT	BT	Battery temperature
BVP	BVP	Battery voltage percentage
DCBV	DCBV	DC bus voltage
FAULT	FAULT	Fault data
IC1	IC1	Input current phase 1
IC2	IC2	Input current phase 2
IC3	IC3	Input current phase 3
IFRQ	IFRQ	Input frequency
IV1	IV1	Input voltage phase 1
IV2	IV2	Input voltage phase 2
IV3	IV3	Input voltage phase 3
OC1	OC1	Output current phase 1
OC2	OC2	Output current phase 2
OC3	OC3	Output current phase 3
OFRQ	OFRQ	Output frequency
OLP1	OLP1	Output load percent phase 1
OLP2	OLP2	Output load percent phase 2
OLP3	OLP3	Output load percent phase 3
OV1	OV1	Output voltage phase 1
OV2	OV2	Output voltage phase 2
OV3	OV3	Output voltage phase 3
SOB	SOB	Seconds on battery
SAD	SAD	Shutdown after delay
OV12	OV12	Output voltage between phase 1 & 2
OV23	OV23	Output voltage between phase 2 & 3
OV31	OV31	Output voltage between phase 3 & 1

	FAULT COMMAND	ALARM COMMAND	STATUS COMMAND
Bit #	Function	Function	Function
Bit 23:	Not used	Not used	
Bit 22:	1	1	
Bit 21:	Input over current	Low battery voltage	
Bit 20:	DC over current	Battery replacement alarm	
Bit 19:	DC bus over voltage	Parallel running mode	
Bit 18:	DC bus under voltage	0	
Bit 17:	Phase rotation error	0	
Bit 16:	DC Bus imbalance	UPS lifetime alarm	
Bit 15:	Not used	Not used	
Bit 14:	1	1	
Bit 13:	EEPROM error	Asynchronous operation	
Bit 12:	Battery or charger circuit fault	Ambient overheat	
Bit 11:	Battery overheat	Overload accumulation started	
Bit 10:	UPS overheat	0	
Bit 9:	0	0	
Bit 8:	Fuse has opened	0	
Bit 7:	Not used	Not used	Not used
Bit 6:	1	1	1
Bit 5:	Inverter over current	Countdown started for shutdown	UPS fault detected
Bit 4:	UPS overload	0	Input voltage out of spec
Bit 3:	Inverter overload	0	Low battery voltage detected
Bit 2:	Inverter under voltage	0	UPS output from bypass
Bit 1:	Overload 110% load	0	UPS output from inverter
Bit 0:	Inverter over voltage	0	UPS input and output voltage sync

7.2 Commands Supported by Different Models

COMMAND	1600:	1800	4200	G8000 & G8000MM	G9000
ALARM	✓	✓			
BC	✓	✓	✓	✓	✓
BECR		✓		✓	✓
BEMR	✓	✓			
BLR	✓	✓			
BPV1	✓	✓	✓	✓	
BPV2			✓		✓
BPV3			✓	✓	
BPC	✓	✓	✓	✓	✓
BPFREQ	✓	✓	✓	✓	✓
BRHT	✓	✓	✓	✓	✓
BT	✓	✓			
BVP	✓	✓	✓	✓	✓
DCBV		✓	✓	✓	✓
FAULT	✓	✓	✓	✓	✓
IC1	✓	✓	✓	✓	✓
IC2			✓	✓	✓
IC3			✓	✓	✓
IFRQ	✓	✓	✓	✓	✓
IV1	✓	✓	✓	✓	✓
IV2			✓	✓	✓
IV3			✓	✓	✓
OC1	✓	✓	✓	✓	✓
OC2			✓	✓	✓
OC3			✓	✓	✓
OFRQ	✓	✓	✓	✓	✓
OLP1	✓	✓	✓	✓	✓
OLP2			✓	✓	✓
OLP3			✓	✓	✓
OV1	✓	✓	✓	✓	✓
OV2			✓	✓	✓
OV3			✓	✓	✓
OV12					✓
OV23					✓
OV31					✓
SOB		✓			
SAD	✓	✓	✓		
STATUS	✓	✓	✓	✓	✓

7.3 Write (Control) Operations supported

ProtoNode as a Client	ProtoNode as a Server	Description
SAD	SAD	Shutdown after delay.
BTEST		Battery Test ¹

ProtoNode as a Client	ProtoNode as a Server
The following models support the listed commands	
1600; 1800; 4200	1600; 1800; 4200
SAD	SAD
BTEST	

7.4 Unsupported Functions and Data Types

Function	Reason
Programming messages	ProtoNode is a data transfer device, and as such, programming messages are not required
Date and time functions	Not supported by other protocols.
All string commands: Type form Serial number Manufacturer Software version	Not supported by other protocols.
E & F commands	Not supported by other protocols.
Write Commands	A limited set is supported only – refer to Section 7.3

¹ Due to battery health, this point can only be tested as specified by TIC