



Toshiba TOSVERT VF-S15 Series Communication Function Manual

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TOSHIBA TOSHIBA15 series

Communication Function Manual

1. Read this manual before installing or operating. Keep this instruction manual on hand of the end user, and make use of this manual in maintenance and inspection.
2. All information contained in this manual will be changed without notice. Please contact your Toshiba distributor to confirm the latest information.

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CANopen

NOTICE

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Summary of Contents for Toshiba TOSVERT VF-S15 Series

[Page 1](#) 1. Read this manual before installing or operating. Keep this instruction manual on hand of the end user, and make use of this manual in maintenance and inspection. 2. All information contained in this manual will be changed without notice. Please contact your Toshiba distributor to confirm the latest information.

[Page 2](#) E6581911 Introduction Thank you for purchasing TOSVERT VF-S15 series Inverter. ® Before using CANopen communication function, carefully read this function manual in order to completely and correctly utilize its excellent performance. After reading this function manual,

please keep it handy for future reference.

[Page 3: Table Of Contents](#)

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Page 4 E6581911	7. Example communication	37	7.1. Asynchronous communication	37	7.2. SYNC communication	39	8. Specifications	41	8.1. Data and operating specification	41	8.2. CANopen device specification	41	8.3. Connecting of CANopen communication option	42	- 3	...
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[Page 5: Scope](#)

E6581911 1. Scope 1.1. Overview Thank you for purchasing TOSVERT VF-S15 inverter. VF-S15 can connect with open field network ® CANopen network and data communications with the VF-S15 CANopen option supports up to 64 nodes for one segment. ® By using CANopen function, the monitor of run/stop and the setting change of the parameter become possible from the network, and it can cope with various applications.

[Page 6: Led Indicator \(Cia 303-3\)](#)

E6581911 2.2. LED indicator (CiA 303-3) ® CAN LED indicate CANopen communication Status and Error condition. 2.3. CAN LED indicator RUN status LED display. Those functions are below table. CAN RUN Status Green LED State Description CAN ERR Status Red LED Blinking The device is in state PRE-OPERATIONAL...

[Page 7: Command & Setpoint Selection \(Local/Remote\)](#)

E6581911 2.4. Command & Setpoint selection (Local/Remote) ® CANopen communication command and setpoint are activated on Remote mode. Inverters have some switches to select the command and setpoint location. Following figure shows the diagram. Refer to the inverter instruction manual for the parameter in detail. cmod Input terminal function Input terminal function...

[Page 8: Network Configuration](#)

E6581911 2.6. Network configuration Make up the network as follows. - Transmission/reception signals (CAN_H, CAN_L) Make up the communication path by connecting twisted cables with shield. - Signal common (CAN_GND) GND is the signal common. - Grounding the shield of cable (CAN_SHLD) Connect the all shield lines of network cable.

[Page 9: Bus Cable Length \(Cia 303-1\)](#)

E6581911 2.7. Bus cable length (CiA 303-1) Bus cable length depends on the below items. a) Number of the slave b) Cable type c) Bit rate Master R Slave □ □ □ Slave Slave Slave Slave AC parameters : 120 ohm impedance and 5ns/m specific line delay Number of Node and Bit rate.

[Page 10: Example Of Scan Time](#)

E6581911 2.8. Example of SCAN time Below table is the recommended scan time depend on the number of the drive and the baud rate. 1 unit : Tx 8byte(4word) / Rx 8byte(4word) □□□ total 129bit (include stub 5 bits) Delay : 3.5ms Margin : 80% SCAN time (ms) Drive Unit No.

[Page 11: Parameters](#)

E6581911 3. Parameters 3.1. Command and Freq. Reference setting Set up the inverter parameters as follows when command via CiA 402 profile. From CANopen network, the drive parameters can be commanded directory. The latest commanded parameters are activated when same run command / frequency reference command.

[Page 12: Communication Parameters](#)

E6581911 3.2. Communication parameters Default P No. Parameter function Note Value Number of motor poles for 2: 4 pole f856 communication 0: Terminal board, Panel keypad or FA00 reset command rests the drive. CANopen (CiA 402, FA04) and COM option (CiA 402, FA06) reset command f898 Inverter reset mode selection only reset fault condition.

[Page 13](#) E6581911 Receive: COB-ID entry #1400 subidx 01 c711 PDO1 High word If the setting is default setting, COB-ID is 0x00000200 below value. c712 Low word COB-ID=0x00000200+Node- RPDO transmission type #1400 subidx 02 Asynchronous c713 0x0FF Transmit :COB-ID #1800 subidx 01 c714 High word If the setting is default setting, COB-ID is...

[Page 14](#) E6581911 Default P No. Parameter function Note Value #1600 subidx 00 Receive PDO1 Number of command c750 PDO1 0x02 assignment: Number of objects assigned objects #1600 subidx 01 Command Index No. Command 1 0x6040 c751 0x6040: Controlword #1600 subidx 02 Command Index No. c752 Command 2 0x6042...

[Page 15](#) E6581911 Warning Set up "Communication error trip function (c100 ~ c103)" to stop the inverter when CANopen communication is deactivated. When CANopen state is "OPERATIONAL", the CANopen communication parameters Mandatory can not be changed. Set the CANopen state to "PRE-OPERATIONAL." action When the parameters are changed, the power must be cycled to the VF-S15 for the changes to take effect.

[Page 16: Communication Object](#)

E6581911 4. Communication Object Object Dictionary has mainly 3 object set. □Communication Profile Area (Index 1000 to 1FFFh) □Manufacturer Specific Profile Area (Index 2000 to 5FFFh) □Standard Device Profile Area (Index 6000 to 9FFFh) 4.1. Communication Profile (DS 301) 4.1.1. Communication Profile (1000 to 11FFh) These object are CANopen communication configuration settings for example Node-ID etc..

[Page 17: Sdo Sever Object](#)

Node Guarding protocol is deactivated on the drive (Guard Time = 0). 0x01 ID object: Number of objects 1018 ID object: Supplier ID 0x00000284 0x00000284 : Toshiba Schneider Inverter Co. 4.1.2. SDO sever object SDO COB-ID object type is only read. Index Access Type Default value...

[Page 18: Pdo Object](#)

E6581911 4.1.3. PDO object PDO1 to PDO3 and PDO21. PDO set RPDO TPDO Note Controlword Statusword COB-ID is variable mapping. vl_target_velocity vl_velocity_actual_value PDO1 TPDO1 : 0x00000180+Node-ID variable mapping variable mapping RPDO2 : 0x00000200+Node-ID variable mapping variable mapping variable mapping variable mapping COB-ID is variable mapping.

[Page 19](#) E6581911 0x02 Receive PDO21: Number of objects Receive PDO21 COB-ID entry The default value is 0x80000500 (parameter data c741) 0x80000500 +Node-ID. If set other than 0x80000500 except bit31, new set 1414 + Node-ID data is used for COB-ID(=new data). Bit31 is an enable/disable flag of RPDO21 data set. Receive PDO21: Transmission type 0x0FF "asynchronous"...

[Page 20: Tpdo Object](#)

E6581911 4.1.5. TPDO object Index Access Type Default value Description (Hex) index 0x05 Transmit PDO1: Number of entries Transmit PDO1: COB-ID The default value is 0x00000180 (parameter data c713) 0x00000180 +Node-ID. If set other than 0x00000180 except bit31, new + Node-ID set data is used for COB-ID(=new data).

[Page 21: Manufacturer Specific Profile](#)

E6581911 Index Access Type Default value Description (Hex) index Transmit PDO1 assignment: Number of objects assigned Set 0(=Disable) before changing Sub-index 01-04 of this 0x02 Object, and set Sub-index 01-04 values of the corresponding sub-indices then set the number of mapped objects (=Enable).

[Page 22: Device Profile \(CiA 402\)](#)

E6581911 4.3. Device Profile (CiA 402) VF-S15 supports CiA 402 Drives and motion control device profile, velocity mode objects. Index Access Type Default value Description (Hex) index Mapping 603F 0x0000 Error code 6040 0x0000 Controlword 6041 0x0000 Statusword 6042 0x0000 VI_Target_Velocity (min 6043 0x0000...

[Page 23: Drive Profile](#)

E6581911 5. Drive profile Using CiA 402 Drive profile, form CANopen network, the drive can be controlled. When using the drive profile command, please set the command mode selection to

CANopen (cmod=3), Frequency setting mode selection 1 to CANopen (fmod=6) and f856
Number of motor poles for communication () parameters.

[Page 24: Object 603Fh: Error Code](#)

E6581911 5.1.1. Object 603Fh: Error Code Below table describes the relations of the error code and inverter error. Inverter Inverter Error trip error Meaning Inverter condition code code name
0000h No error 0x0E Motor overload 0x15 Main unit RAM fault err2 0x16 Main unit ROM fault...

[Page 25](#) E6581911 0x2F Step-out (for PM motor drive only) sout 8331h Torque fault 8501h
0x45 Servo lock fault e-37 0x11 Emergency stop 9000h External malfunction 0x2A Analog input
terminal overvoltage e-10 Additional functions FF00h 0x54 Auto-tuning error etn1 - generic
error Device specific 0x1D Low-current operation Trip...

[Page 26: Object 6040H: Controlword](#)

E6581911 5.1.2. Object 6040h: Controlword ms = manufacturer-specific; r = reserved; oms =
operation mode specific; h = halt; fr = fault reset; eo = enable operation; qs = quick stop; ev =
enable voltage; so = switch on Bold bits shall be supported, other may be supported. From any
state START Fault reaction active...

[Page 27](#) E6581911 Transition events and action (CiA DS402-2 DSP V3.0 Table 26) Transition
Event(s) Action(s) Automatic transition after power-on or reset Drive device self-test and/or self
application initialisation shall be performed. Automatic transition Communication shall be
activated. Shutdown command from control device or local None signal Switch on command
received from control device...

[Page 28: Object 6041: Statusword](#)

E6581911 5.1.3. Object 6041: Statusword rtso ms = manufacturer-specific; oms = operation
mode specific; ila = internal limit active; tr = target reached; rm = remote; w = warning; sod =
switch on disabled; qs = quick stop; ve = voltage enabled; f = fault;...

[Page 29: Object 6046: vl_Velocity_Min_Max_Amount](#)

E6581911 5.1.7. Object 6046: vl_velocity_min_max_amount This object indicates the configured
minimum and maximum amount of velocity (unit min). The vl_velocity_max amount sub-object
is mapped internally to the vl_velocity_max positive and vl_velocity_max negative values. The
vl_velocity_min amount sub-object is mapped internally to the vl_velocity_min positive and
vl_velocity_min negative values.

[Page 30: Object 6060: Modes Of Operation](#)

E6581911 5.1.12. Object 6060: Modes of operation This object shall indicate the requested
operation mode. With the VF-S15, only velocity mode is supported as the operation mode,
therefore any request to this object would make no sense. Value Definition -128 to -1
Manufacture-specific operation modes No mode change/no mode assigned Profile position
mode...

[Page 31: Control From Canopen Network](#)

E6581911 6. Control from CANopen Network 6.1. NMT state machine Below figure describes
NMT state machine. Power-on Initializing Pre-Operational Stopped Operational State NMT
Service COB-ID Data0 Data1 Data2 ~ 7 Start Remote Node 0x000 0x001 Node-ID 0x00,...,0x00
Stop Remote Node 0x000 0x002 Node-ID...

[Page 32: Read Object \(Upload Object\)](#)

E6581911 6.2.1. Read object (Upload object) Sending below data, the object data can be read.
Send data to read object COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 0x600+
Obj. No. Node-ID index Response data for read object (byte) COB-ID Data0 Data1...

[Page 33: Abort Code](#)

E6581911 6.2.3. Abort code The abort code in the below table are set in the error response
data. Abort Code Contents 0503 0000 Toggle bit not alternated. 0504 0000 SDO protocol timed
out. 0504 0001 Client/server command specifier not valid or unknown. 0504 0002 Invalid block
size (block mode only).

[Page 34: Pdo Communication](#)

E6581911 6.3. PDO communication Using PDO (Process Data Object) communication, send and receive inverter command and monitor data with synchronously or asynchronously. 6.3.1. TxPDO and RxPDO communication type TxPDO (Inverter send PDO) can be set below condition in table. TxPDO1 Transmission type : Object 1800h subindex 02 TxPDO2 Transmission type : Object 1801h subindex 02 TxPDO3 Transmission type : Object 1802h subindex 02 TxPDO21 Transmission type : Object 1814h subindex 02...

[Page 35: Rtr \(Remote Transfer Request\) Communication](#)

E6581911 6.3.2. RTR (Remote Transfer Request) communication When set RTR setting into TxPDO Transmission type (1800h, 1801h, 1802h, 1814h subindex 02), sending the RTR (Remote Transfer Request) message, Inverter send TxPDO message. TxPDO1 RTR message data COB-ID Data0 Data1 Data2 Data3 Data4 Data5...

[Page 36: Communication Disconnection Detection Function](#)

E6581911 6.4. Communication disconnection detection function ® VF-S15 CANopen supports Heartbeat service and Node Guarding service to detect the communication disconnection. Heartbeat service and Node Guarding service function can not be active at the same time. □ Heartbeat service □ Heartbeat Consumer Watching the heartbeat message of the specific Node-ID, and checking the interval time, the inverter can detect the network abnormal condition.

[Page 37: Nmt Boot-Up](#)

E6581911 Node Guarding send data COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 0x700+ Node-ID Response data of Node Guard COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 0x700+ bit7:toggle Node-ID bit6-0:State Data0 State bit7 bit6-0 Initialising Disconnected Connecting toggle Preparing...

[Page 38: Example Communication](#)

E6581911 7. Example communication 7.1. Asynchronous communication This is a example communication to control run/stop the inverter and set frequency command. Termination resistor Factory Parameter Function Comments setting 3: command from CANopen cmod Command mode setting 6: command from CANopen fmod Frequency command selection 1 ~ 127...

[Page 39](#) E6581911 1. NMT Boot-up (Inverter power on) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 0x701 → 2. NMT Module Control (Change Operational state) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 0x000 ←...

[Page 40: Sync Communication](#)

E6581911 7.2. SYNC communication This is a sample communication using SYNC message. Factory Parameter Function Comments setting Command from CANopen Network cmod Command mode selection Command from CANopen Network fmod Frequency setting mode selection 1 ~ 127 c701 Node-ID Board rate CAN baud rate setting 4: 500k c702...

[Page 41](#) E6581911 5. SYNC (Update RxPDO received data to control data) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 0x080 ← 6. RxPDO1 (Change to "Switch on" state) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7...

[Page 42: Specifications](#)

E6581911 8. Specifications 8.1. Data and operating specification Item Specification CiA DS301 V4.02 Communication Profile CiA DR 303-3 V1.3 Indicator specification CiA DSP 402 Ver1.1 Drives and motion control device profile, Velocity mode Communication medium CAN (ISO 11898) 8.2. CANopen device specification Item Specification Comments...

[Page 43: Connecting Of Canopen Communication Option](#)

E6581911 8.3. Connecting of CANopen communication option ■Connector diagram of CAN001Z Type form CAN001Z 2×RJ45 Connector Socket Plug...

[Page 44](#) E6581911 ■Connector diagram of CAN002Z Type form CAN002Z Connector 9pin D-sub Socket Plug...

