



Toshiba TOSVERT VF-S15 Series Manual

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TOSHIBA TOSHIBA15 / VF-AS3 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 / VF-AS3 series. ®

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. For details of its general handling, see an instruction manual attached with the option unit.

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[Page 5: Scope](#)

Type form CAN003Z Connector 5 pin open type 1.3. EDS file When CAN001Z/CAN002Z/CAN003Z is used, please use following EDS (Electronic data sheet) file for VF-S15/VF-AS3. Please contact your Toshiba distributor. EDS file Applicable model VF-S15_CANopen.eds VF-S15 VF-AS3_CANopen.eds VF-AS3 (CPU1 version is 112 or more)

[Page 6: Hardware Setup](#)

E6581911 2. Hardware Setup When using this product with VF-S15, the optional adapter (SBP009Z) is required. 2.1. Mounting and removing 2.1.1. Mounting/removing insert type option of VF-S15 Refer to [Optional external devices] of E6581611. Warning ▼ Mounting/removing option should be performed 15 minutes or more after the power is shut off, and checking the charge lamp of the drive is OFF.

[Page 7](#) E6581911 4. Hang the hook of option adapter on the control terminal cover. Insert the connector in the direction of arrow Hook 2.1.1.2. Earth wire wiring Grounding terminal of option adapter Recommended tightening torque: 0.5N m Connect attached grounding wire to grounding terminal of drive. Grounding terminal of drive 2.1.1.3.

[Page 8: Mounting/Removing Insert Type Option Of Vf-As3](#)

E6581911 2.1.2. Mounting/removing insert type option of VF-AS3 Refer to [Mounting/removing insert type options] of E6582062. Warning ▼ Mounting/removing option should be performed 15 minutes or more after the power is shut off, and checking the charge lamp of the drive is OFF. The drive and option may be damaged.

[Page 9: Led Information](#)

E6581911 3. LED information 3.1. VF-S15 LED location CANopen LED indicator GREEN : CAN RUN : CAN ERR Refer to E6581838 about VF-S15 Option adapter (SBP009Z) 3.2. VF-AS3 LED location When the option is mounted to VF-AS3, please attach the LED label (RUN/ERR *1) for the option to lower side of communication indicator of VF-AS3.

[Page 10: Led Indicator \(Cia303-3\)](#)

E6581911 3.3. LED indicator (Cia303-3) CAN LED indicate CANopen communication Status and Error condition. 3.4. CAN LED indicator The flashing pattern of RUN LED depends on each state at the normal status. See the following table. CAN RUN Status Green LED State Description CAN ERR Status Red LED...

[Page 11: Command & Setpoint Selection \(Local/Remote\)](#)

E6581911 3.5. Command & Setpoint selection (Local/Remote) CANopen communication command and setpoint (= Frequency) are activated on remote mode. Drives have some switches to select the command and setpoint location. Following figure shows the diagram. Refer to the drive instruction manual for the parameter in detail. Example: VF-S15 Input Terminal Function Input Terminal Function...

[Page 12: Cable Specification](#)

E6581911 3.6. Cable Specification Recommended cable specification is below AC parameters: 120 ohm impedance and 5ns/m specific line delay Selected recommended cable is below.
Manufacture : JMACS Japan Co., Ltd. www.jmacs-j.co.jp Distributor : KOSHOW Co., Ltd
www.koshow.jp Model No. CANC-22 Conductor size 24 AWG, 0.22mm Number of pairs...

[Page 13: Bus Cable Length \(Cia303-1\)](#)

E6581911 3.8. Bus cable length (CiA303-1) 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 14: Example Of Scan Time](#)

E6581911 3.9. 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 15: Parameters](#)

E6581911 4. Parameters 4.1. Command and Freq. Reference setting Set up the parameters as follows when command via CiA402 drive profile. From CANopen network, the parameters can be commanded directory. The latest commanded parameters are activated when same run command / frequency reference command. Refer to the below table and the figure and the capture "3.5 Command &...

[Page 16](#) E6581911 Example: VF-S15 fmod FA01(Hz) RS485 communication FA13(min FA05(Hz) CANopen 6042(min FA07(Hz) Network option C906(min Example: VF-AS3 fmod FA37(Hz) Embedded Ethernet FA41(min FA01(Hz) RS485 com.(CN1) FA13(min FA05(Hz) RS485 com.(CN2) FA19(min FA07(Hz) Network option C906(min FA07(Hz) CAN open 6042(min Figure 2 Frequency reference command source...

[Page 17: Communication Parameters](#)

E6581911 4.2. Communication parameters Set up the parameters before the communication is started. The parameters with hatching are communication profile. Normally, these parameters are downloaded by SDO server object. Refer to "5.1 Communication Profile (DS 301)". Default Title Parameter function Note Value Number of motor poles for f856...

[Page 18](#) E6581911 Default Title Parameter function Note Value Receive: COB-ID entry 0x1400 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 0x1400 subidx 02 Asynchronous c713 0x0FF type Transmit: COB-ID 0x1800 subidx 01...

[Page 19](#) E6581911 Default Title Parameter function Note Value 0x1600 subidx 02 Command Index No. c752 Command 2 0x6042 0x6042: vl target velocity c753 0x1600 subidx 03 Command Index No. Command 3 0x0000 c754 0x1600 subidx 04 Command Index No. Command 4 0x0000 0x1A00 subidx 00 Transmit PDO1 Number of monitor...

[Page 20: Communication Object](#)

E6581911 5. Communication Object Object dictionary has mainly 3 object set. Communication profile area (Index 0x1000 to 0x1FFF) Manufacturer specific profile area (Index 0x2000 to 0x5FFF) CiA402 drive profile area (Index 0x6000 to 0x9FFF) 5.1. Communication Profile (DS 301) 5.1.1. Communication Profile (0x1000 to 0x1018) These object are CANopen communication configuration settings for example Node-ID etc..

[Page 21: Sdo Sever Object](#)

0x01 ID object: Number of objects 1018 ID object: Supplier ID 0x00000284 0x00000284 : Toshiba Schneider Inverter Co. *1: If VF-AS3 is used, the upper value is 0x7FFF. 5.1.2. SDO sever object SDO COB-ID object type is only read. Index...

[Page 22: Pdo Object](#)

E6581911 5.1.3. 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 23](#) E6581911 Index Access Type Default value Description (Hex) index Receive 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 value of the corresponding sub-indices then set the number of mapped objects (=Enable).

[Page 24: Tpdo Object](#)

E6581911 5.1.5. 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 set + Node-ID data is used for COB-ID(=new data).

[Page 25: 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 value of the corresponding sub-indices then set the number of mapped objects (=Enable).

[Page 26: Device Profile \(CiA402\)](#)

E6581911 5.3. Device Profile (CiA402) VF-S15 / VF-AS3 supports CiA402 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 27: Running By Cia402 Drive Profile](#)

E6581911 6. Running by CiA402 drive profile Using CiA402 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[VF-S15], 5[VF-AS3]), Frequency setting mode selection 1 to CANopen (fmod=6[VF-S15], 23[VF-AS3]) and Number of motor poles for communication (f856) parameters.

[Page 28: Object 0X603F: Error Code](#)

E6581911 6.1.1. Object 0x603F: Error Code Below table describes the relations of the error code and drive error. Error Drive Drive code trip code Meaning error Drive condition name 0x0000 No error 0x00 0x0E Motor overload err2 0x15 Main unit RAM fault err3 0x16 Main unit ROM fault...

[Page 29](#) E6581911 Error Drive Drive code trip code Meaning error Drive condition name Undervoltage fault (main circuit) 0x1E 0x3120 Mains under-voltage eph1 0x3130 Phase failure 0x08 Ground fault eph0 0x09 Output phase failure Output over-voltage 0x0F Dynamic braking resistor overload trip 0x3310 e-39 0x47...

[Page 30: Object 0X6040: Controlword](#)

E6581911 6.1.2. Object 0x6040: 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 31](#) 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 32: Object 0X6041: Statusword](#)

E6581911 6.1.3. Object 0x6041: 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 33: Object 0X6046: VI_Velocity_Min_Max_Amount](#)

E6581911 6.1.7. Object 0x6046: 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 value. The vl_velocity_min amount sub-object is mapped internally to the vl_velocity_min positive and vl_velocity_min negative value.

[Page 34: Object 0X605A: Quick Stop Option Code](#)

E6581911 6.1.11. Object 0x605A: Quick stop option code This object shall indicate what action is performed when the quick stop function is executed. The slow down ramp is the deceleration value of the used mode of operations. Value Definition -32768 to -1 No function Disable drive function Slow down on slow down ramp and transit into Switch On Disabled...

[Page 35: Control From Canopen Network](#)

E6581911 7. Control from CANopen Network 7.1. 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 0x01 Node-ID 0x00,...,0x00 Start Remote Node 0x000 0x02 Node-ID...

[Page 36: Read Object \(Upload Object\)](#)

E6581911 7.2.1. 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 Obj. No. 0x600+ Node-ID index Response data for read object (byte) COB-ID Data0 Data1...

[Page 37: Abort Code](#)

E6581911 7.2.3. 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 38: Pdo Communication](#)

E6581911 7.3. PDO communication Using PDO (Process Data Object) communication, send and receive command and monitor data with synchronously or asynchronously. 7.3.1. TxPDO and RxPDO communication type TxPDO (Drive send PDO) can be set below condition in table. TxPDO1 Transmission type : Object 0x1800 subindex 02 TxPDO2 Transmission type : Object 0x1801 subindex 02 TxPDO3 Transmission type : Object 0x1802 subindex 02 TxPDO21 Transmission type : Object 0x1814 subindex 02...

[Page 39: Rtr \(Remote Transfer Request\) Communication](#)

E6581911 7.3.2. RTR (Remote Transfer Request) communication When set RTR setting into TxPDO Transmission type (0x1800, 0x1801, 0x1802, 0x1814 subindex 02), sending the RTR (Remote Transfer Request) message, Drive send TxPDO message. TxPDO1 RTR message data COB-ID Data0 Data1 Data2 Data3 Data4 Data5...

[Page 40: Communication Disconnection Detection Function](#)

E6581911 7.4. Communication disconnection detection function VF-S15 / VF-AS3 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 □...

[Page 41: Node Guarding](#)

E6581911 7.4.3. Node Guarding When the Node Guarding message is received, the drive sends the Node Guarding message with the node state. When the drive does not receive the Node Guard message in the interval time (=Guard Time x Time Factor, Max time is limited internally 1 hour.) set by Object 0x100C (Guard Time) and 0x100D (Time Factor), the drive detects the network error and changes the drive condition according to the parameter setting (c100 ~ c103).

[Page 42: Example Communication](#)

E6581911 8. Example communication 8.1. ASYNC communication This is an example communication to control run/stop the drive and set frequency command. Termination resistor Parameter Function Setting Comments 3 [VF-S15] cmod Command from CANopen Command mode setting 5 [VF-AS3] 6 [VF-S15] fmod Frequency command selection Frequency from

CANopen...

[Page 43](#) E6581911 1. NMT Boot-up (Drive power on) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 → 0x701 *1: If VF-AS3 is used, EMCY (Drive power on) is sent. INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6...

[Page 44: Sync Communication](#)

E6581911 RxPDO1 RxPDO1 RxPDO1 RxPDO1 Module Ready to switch on Operation Setpoint Control switch on enable Inverter Boot-up Inverter TxPDO1 TxPDO1 TxPDO1 TxPDO1 TxPDO1 internal Process switch on Switch on Drive is run. Ready to Operation Time disabled switch on enable Communication between PC and Inverter 8.2.

[Page 45](#) E6581911 1. NMT Boot-up (Drive power on) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 → 0x701 *1: If VF-AS3 is used, EMCY (Drive power on) is sent. INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6...

[Page 46](#) E6581911 9. RxPDO1 (Set the speed to 1500min (0x05dc)) INV - PC COB-ID Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7 Control word vl_target_velocity ← 0x201 0x0f 0x00 0xdc 0x05 10. SYNC (Update RxPDO received data to control data) INV - PC COB-ID Data0 Data1...

[Page 47: Specifications](#)

E6581911 9. Specifications 9.1. 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) 9.2. CANopen device specification Item Specification Comments...

[Page 48: Connecting Of Canopen Communication Option](#)

E6581911 9.3. Connecting of CANopen communication option ■Connector diagram of CAN001Z Type form CAN001Z 2×RJ45 Connector Socket Plug - 47 -...

[Page 49](#) E6581911 ■Connector diagram of CAN002Z Type form CAN002Z Connector 9pin D-sub Socket Plug - 48 -...

[Page 50](#) E6581911 ■Connector diagram of CAN003Z Type form CAN003Z Connector 5 pin open type Socket...

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[Tosvert vf-as3 series](#)