Troubleshooting Guide

Packaged Rooftop Air Conditioners
Precedent™

Variable Speed Compressor Inverter
5 Tons — 60Hz

T/YZC060E3

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

September 2016

RT-SVD007B-EN

Ingersoll Rand

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.
All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS/SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

Copyright

Trademarks

All trademarks referenced in this document are the trademarks of their respective owners.

Revision History

- Updated “Installation”,“Parameter Settings”, and “Diagnostics” sections.
- Added “Complementary information for VF-S15 with safety function” table in “Diagnostics” section.

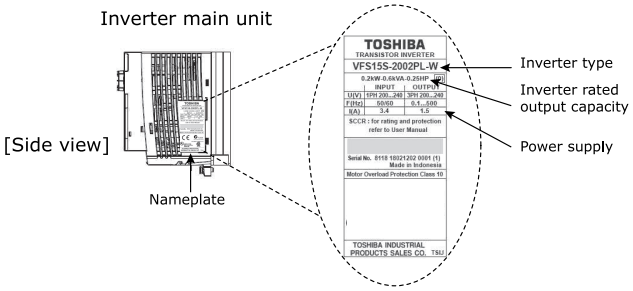
Table of Contents

Overview

General Information

Look at the inverter nameplate and make sure it is the same type as your order.

Figure 1. Inverter nameplate



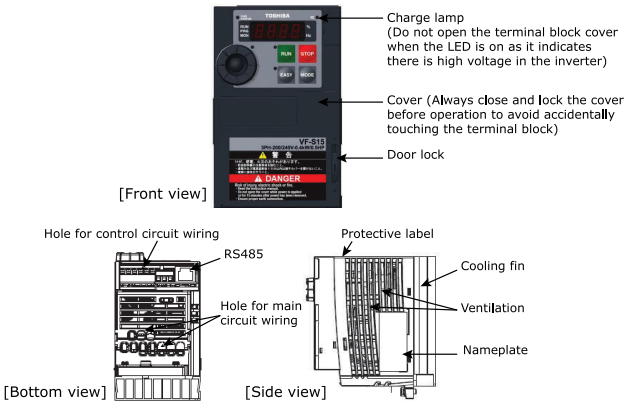
Inverter Overview

Each variable speed system is equipped with an electric inverter whose main function is to control the variable speed compressor. Each inverter is programmed specifically for the variable speed compressor in the system and any change to the parameter values without Trane authorization could result in permanent damage to the compressor or the system.

Trane Variable Speed Module (VSM) is used to receive and transmit commands from the Trane unit controller to the inverter. It serves as the main connection hub for nearly all of the control circuitry wiring for the variable speed compressor inverter. Compressor run command (24VAC) and compressor speed signal (0-10VDC) are both generated by the VSM board whereas the inverter alarm (10VDC) signal is generated by the inverter itself and transmitted to the VSM board.

The inverter is programmed such that it can only be operated by external signals. Front key pad operation is disabled to prevent improper sequence of system operation. The inverter control wiring must be connected according to system wiring diagrams for proper operation.

Figure 2. Inverter outside view



To open the inverter, insert a small flat blade screw driver in the door lock and slide it upward to unlock the cover. Slide the lock downward to lock the cover. See Figure 3, p. 5

Figure 3. Opening controls cover

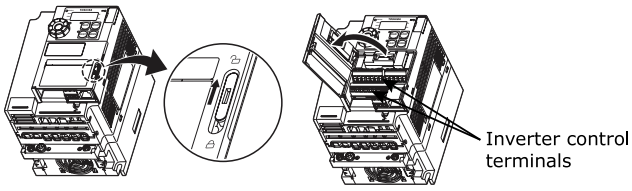


Figure 4. Inverter LED display

0	1	2	3	4	5	6	7	8	9	-
0	1	2	3	4	5	6	7	8	9	-

LED display (letters)

Aa	Bb	C	c	Dd	Ee	Ff	Gg	H	h	I	i	Jj	Kk	Ll
A	b	C	c	d	E	F	G	H	h	I	i	J		L

Mm	Nn	O	o	Pp	Qq	Rr	Ss	Tt	Uu	Vv	Ww	Xx	Yy	Zz
M	n	O	o	P	q	r	S	t	U	u			y	

Installation

⚠ WARNING

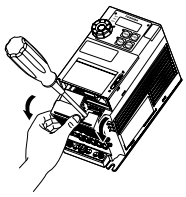
Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

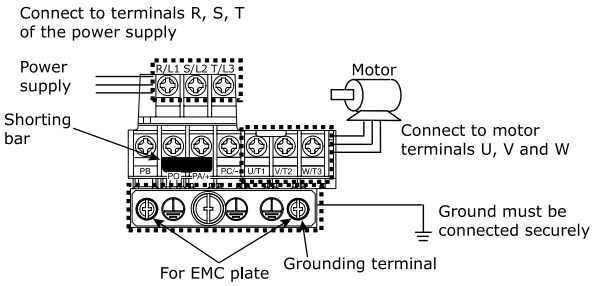
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

Important: *Inverter must be installed in the specified location inside a Trane system. Installation of the inverter in non-specified locations could result in intermittent or complete loss of operation.*

1. Disconnect power.
2. Remove the terminal block cover:
   a. Insert a screwdriver or other thin object into the hole indicated with the unlock symbol.
   b. While pressing on the screwdriver, rotate the terminal cover downward to remove it. See **Figure 5. Remove terminal block cover**

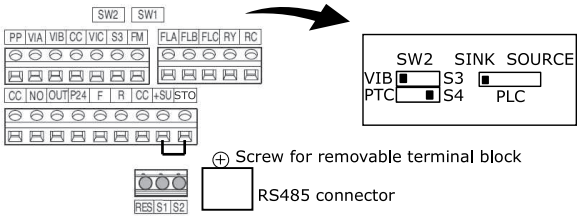


   c. Remove the inside terminal block cover.
3. Wire power supply and motor. See **Figure 6. Connect inverter to power supply and motor**



Power circuit terminal block

Figure 7. Control circuit terminal block



Screw size: M3, torque: 4.4 lb.in (0.5 N.m)
Wire size: 1 AWG 22-16 or 2 AWG 22-18

Important: *PLC switch must be set to SINK.*

Parameter Setting

NOTICE

Compressor Damage!

Failure to follow instructions below could result in compressor or system damage.

- **Each inverter is factory programmed specifically for the variable speed compressor in the system. Do no change parameter values without Trane authorization.**
- **Do not connect controls and output power wiring to the inverter when adjusting parameters to eliminate the risk of starting the compressor with incorrect inverter parameters. Only connect input power wiring (R/L1, S/L2, T/L3) to the inverter during programming.**

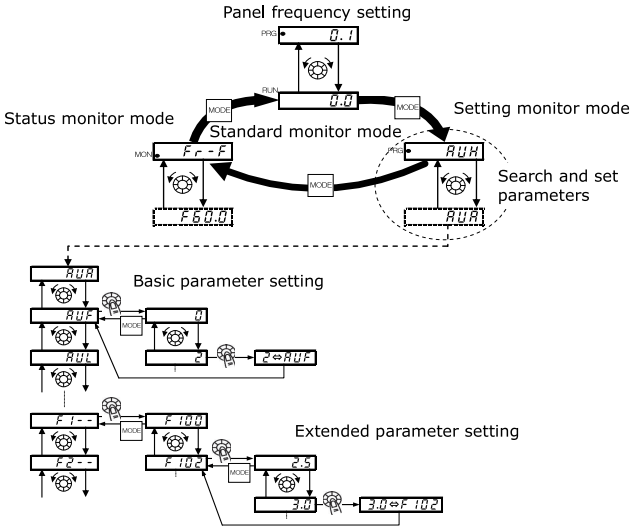
Important Information

- All parameters on the inverter are locked and cannot be adjusted until setting F700 is set to “0”. Do not adjust F700 back to "1" until all other parameters have been set and checked.
- Setting "typ" to “8” loads parameter settings previously saved by setting "typ" to “7”.
- Setting "typ" to “13” will re-initialize the system and all parameters will return to their default settings. After initialization, the parameters need to be adjusted to the values shown in Table 1, p. 7.

  Note: *Complete initialization is not required on new inverters. Prior to performing complete initialization on factory shipped inverters in the system, it is recommended to perform steps above first and check if all parameters values return back to factory saved values as shown per Table 1, p. 7.*

- When AUL parameter is adjusted the screen will flash "HELLO" to confirm that it has been adjusted.
- After all parameters are set and locked, set "typ" parameter to “7” to save current settings.

Figure 8. Parameter setting



1. Select the parameter. (Turn the setting dial.)
2. Read the setting value. (Press the center of the setting dial.)
3. Change the setting value. (Turn the setting dial.)
4. Determine the setting value. (Press the center of the setting dial.)

Parameter Values

Note: *Refer to Table 1, p. 7 to search parameters and set them according to table below. Prior to adjusting the parameter values, please verify that the compressor model and inverter model no. information matches the column table.*

Table 1. Parameter values

Comm No.	Parameters		Unit	Drive Model No.: VF-S15 2055PM-W/W1 Compressor Model No.: VRJ044T
	Title	Function		Parameter Values
3	*CΠOd*	Command mode selection		0
4	*FΠOd*	Frequency setting mode selection 1		1
9	*ACC*	Acceleration time 1	sec	37.5
10	*dEC*	Deceleration time 1	sec	37.5
11	*FH*	Maximum frequency	Hz	225

Table 1. Parameter values (continued)

Comm No.	Parameters		Unit	Drive Model No.: VF-S15 2055PM-W/W1 Compressor Model No.: VRJ044T
	Title	Function		Parameter Values
12	*UL*	Upper limit frequency	Hz	225
13	*LL*	Lower limit frequency	Hz	45
14	*uL*	Base frequency 1	Hz	210
15	*Pt*	V/F control mode selection		6
17	*OLП*	Electronic-thermal protection characteristic selection		5
94	*AUL*	Overload characteristic selection		1
99	*SEt*	Region Setting		2
201	F201	VIA input point 1 setting		23
202	F202	VIA input point 1 frequency	Hz	45
203	F203	VIA input point 2 setting		67
204	F204	VIA input point 2 frequency	Hz	225
300	F300	PWM carrier frequency	kHz	4
302	F302	Regenerative power ride-through control		1
402	F402	Automatic torque boost value		2.6
405	F405	Motor rated capacity	kW	6.6
409	*uLu*	Base frequency voltage 1	V	147
415	F415	Motor rated current	A	29
417	F417	Motor rated speed	min-1	4200
458	F458	Motor specific coefficient 2		25
600	*tHr*	Motor Electronic-thermal protection level 1		85
601	F601	Stall prevention level 1		147
605	F605	Output phase failure detection		4
657	F657	Overload alarm level		100
701	F701	Current/Voltage unit selection		1
702	F702	Frequency free unit display magnification		20
910	F910	Step-out detection current level		58
911	F911	Step-out detection time	sec	0.07
912	F912	q-axis inductance	H	2.55
913	F913	d-axis inductance	H	2.15
A900	A900	Input function target 11		1010
A901	A901	Input function command 12		14
A902	A902	Input function target 12		928

Table 1. Parameter values (continued)

Comm No.	Parameters		Unit	Drive Model No.: VF-S15 2055PM-W/W1 Compressor Model No.: VRJ044T
	Title	Function		Parameter Values
A903	A903	Input function command 13		19
A904	A904	Input function target 13		21
A906	A906	Input function target 21		21
A907	A907	Input function command 22		14
A908	A908	Input function target 22		929
A909	A909	Input function command 23		20
A910	A910	Input function target 23		21
A928	A928	My output time data 1		120
A929	A929	My output time data 2		0.5
A973	A973	Virtual input terminal selection 1		8
A977	A977	My function selection		2
700	F700	Parameter Protection Selection		1

Sequence of Operation

When there is a demand for cooling and there is no alarm on the inverter, a 24VAC compressor run command signal is sent from the Variable Speed Module (VSM) to close the relay contacts across F & CC terminals on the inverter. A 0-10VDC speed signal is also sent to the inverter by the VSM board. This enables the inverter to run the compressor at the requested speed. The inverter displays the requested speed on the LED display.

When an inverter fault occurs causing the variable speed compressor to shut off, an error code is displayed on the inverter and a 10VDC alarm signal is present between the FLA & CC terminals of the inverter.

Normal Operation

During normal operation, the inverter LED display shows the running compressor speed (RPM). For example; if the LED displays “3600” it means the running compressor speed is 3600 rpm.

Note: *When the compressor is not operating, the LED display shows “0.0”.*

Abnormal Operation

When a fault occurs, the inverter LED is either off or displays an error code. For a complete list of error codes, please refer to “Diagnostics,” p. .

Note: *When the inverter is tripped as the result of an error code, there is a minimum delay of 2 minutes before the inverter can be reset.*

Resetting the Inverter After a Trip

NOTICE

Equipment Damage!

Turning the inverter off and on repeatedly could result in system or motor damage.

Cycling the inverter off and on resets it immediately. Do not use this method to reset the inverter unless there is an immediate need for it.

Important: *Resetting the inverter before eliminating the problem that caused it to trip will result in the inverter tripping again.*

The inverter can be reset using any of the following methods:

1. By turning off the power (keep the inverter off until the LED turns off).
2. By using the keypad:
   a. Press the STOP key and make sure *'CLr'* is displayed.
   b. Press the STOP key again to reset the inverter.

When any overload function (*OL 1*: inverter overload, *OL 2*: motor overload, *OL 3*: braking resistor overload) is active, the inverter cannot be reset before the virtual cooling time has passed.

Virtual cooling time:

- *OL 1*: about 30 seconds after a trip occurs.
- *OL 2*: about 120 seconds after a trip occurs.
- *OL r*: about 20 seconds after a trip occurs.

Notes:

- *There is no virtual cooling time for OL 3.*
- *In case of a trip due to overheat (OH), wait until the temperature in the inverter falls sufficiently before resetting the inverter.*
- *The inverter cannot be reset while the terminal is sending an emergency stop signal.*
- *The inverter cannot be reset while in pre-alarm.*

Diagnostics

Important: *If the variable speed compressor does not run and there is no alarm displayed on the inverter screen, please verify that the Compressor Run Command (24VAC) and 0-10VDC speed signals are present from Trane Variable Speed Module (VSM). Compressor run command (24VAC) is used to close the relay contacts across F & CC terminals of the inverter. 0-10VDC speed signal is used to adjust compressor speed and is applied across VIA & CC terminals of the inverter.*

When a problem occurs with the inverter itself, diagnose it using the following tables. If the problem cannot be diagnosed and solved using the solutions described in tables below, **contact Toshiba technical support line at 855-803-7089**. For inverter replacement, please contact Trane.

Alarms Causes and Solutions

Table 2. Prealarm display

Display	Meaning
C	Overcurrent alarm — Same as *OC* (overcurrent)
P	Overvoltage alarm — Same as *OP* (overvoltage)
L	Overload alarm — Same as *OL 1* and *OL 2* (overload)

Table 2. Prealarm display (continued)

Display	Meaning
H	Overheat alarm — Same as *OC* (overheat)
t	Communication alarm — Same as *OC* (communication fault)

Note: *If two or more problems occur simultaneously, one of the following alarms appears and blinks: CP, PL, CPL. The blinking alarms C, P, L, H, T are displayed in this order from left to right.*

Table 3. Trip error codes and solutions

Error Code	Failure Code	Problem	Possible Causes	Solutions
OC 1	0001	Over current during acceleration	• The acceleration time *ACC* is too short. • The V/F setting is improper. • A restart signal is sent to the rotating motor after a momentary stop.	• Make sure the acceleration time matches the value defined in Table 1, p. 7. • Check the V/F parameter setting. • Use *F301* (auto-restart) and *F302* (ride-through control).
OC 2	0002	Over current during deceleration	The deceleration time *dEC* is too short.	Make sure the deceleration time matches the value defined in Table 1, p. 7
OC 3	0003	Over current during constant speed operation	• The load fluctuates abruptly. • The load is in an abnormal condition.	Check the load.
OCL	0004	Overcurrent (an overcurrent on the load side at start-up)	• The insulation of the output main circuit or motor is defective. • The motor impedance is too small.	Check the secondary wiring and insulation state.
OCA	0005	Overcurrent at startup	A main circuit element is defective.	Contact Toshiba tech support line.
EPH1	0008	Input phase failure	A phase failure occurred in the input line of the main circuit.	Check the main circuit input line for phase failure.
EPH0	0009	Output phase failure	A phase failure occurred in the output line of the main circuit.	• Check the main circuit output line, motor, etc. for phase failure. • Select output phase failure detection parameter *F605*.

Table 3. Trip error codes and solutions (continued)

Error Code	Failure Code	Problem	Possible Causes	Solutions
OP1	000A	Overvoltage during acceleration	The input voltage fluctuates abnormally: • The power supply has a capacity of 500kVA or more. • A power factor improvement capacitor is opened or closed. • A system using a thyristor is connected to the same power distribution line.	• Insert a suitable input reactor. • Verify input voltage to the inverter terminals (R,S,T) matches the voltage specified on the inverter label.
			A restart signal is sent to the rotating motor after a momentary stop.	Use *F301* (auto-restart) and *F302* (ride-through control).
OP2	000B	Overvoltage during deceleration	The deceleration time *dEC* is too short (regenerative energy is too large.)	Make sure deceleration time matches the value specified in Table 1, p. 7
			The input voltage fluctuates abnormally: • The power supply has a capacity of 500kVA or more. • A power factor improvement capacitor is opened or closed. • A system using a thyristor is connected to the same power distribution line.	Insert a suitable input reactor.
OP3	000C	Overvoltage during constant-speed operation	The input voltage fluctuates abnormally: • The power supply has a capacity of 500kVA or more. • A power factor improvement capacitor is opened or closed. • A system using a thyristor is connected to the same power distribution line.	Insert a suitable input reactor.
OL1	000D	Inverter overload	The acceleration time *A.C.C* is too short.	Make sure deceleration time matches the value specified in Table 1, p. 7
			The V/F setting is improper.	Check the V/F parameter setting.
			A restart signal is sent to the rotating motor after a momentary stop.	Use *F301* (auto-restart) and *F302* (ride-through control).
			The load is too large.	Verify abnormal load is not present in the system.
OL2	000E	Motor overload	The V/F setting is improper.	Check the V/F parameter setting.
			The motor is locked up.	Check the load (operated machine).
			An excessive load is applied to the motor during operation.	Make sure OLN value matches parameters in Table 1, p. 7.
OL3	003E	Main module overload	The carrier frequency is high and load current has increased at low speeds (mainly at 15Hz or less).	• Check for abnormal system load • Make sure carrier frequency matches parameters in Table 1, p. 7 • Set carrier frequency control mode selection *F316* to *1* (carrier frequency with automatic reduction).
OLr	000F	Dynamic braking resistor overload trip	The deceleration time is too short.	Make sure deceleration time matches the value specified in Table 1, p. 7
Ot	0020	Over-torque trip 1	Over-torque reached detection level during operation.	• Enable *F615* (over-torque trip selection). • Check system error.

Table 3. Trip error codes and solutions (continued)

Error Code	Failure Code	Problem	Possible Causes	Solutions
Ot2	0041	Over-torque trip 2	• Output current reached *F601* or more and maintained in *F452* during power running. • Power running torque reached *F441* or more and maintained in *F452* during power running.	• Make sure there is no abnormal load present in the system. • Raise the stall prevention level or power running torque limit level.
OtC3	0048	Over-torque / Overcurrent fault	Power running torque or output current reached *F593* or more and maintained in *F595* during power running.	• Reduce the load. • Check system error.
UtC3	0049	Small-torque / Small -current fault	Power running torque or output current fell decreased to*F593* or less and maintained in *F595* during power running.	Check system error.
OH	0010	Overheat	The cooling fan does not rotate.	The fan requires replacement if it does not rotate during operation.
			The ambient temperature is too high.	Resume operation by resetting the inverter after it has cooled down enough.
			The vent is blocked up.	Make sure there is adequate clearance around the inverter.
			A heat generating device is installed close to the inverter.	Do not place any heat generating device near the inverter.
			The ambient temperature is too low.	Operate at a specified ambient temperature.
			Wire of internal thermistor is broken.	Contact Toshiba tech support line.
OH2	002E	Thermal fault stop command from external device	A thermal trip command (input terminal function: *46* or *47*) is issued by an external control device.	The motor is overheated; check whether the current flowing into the motor exceeds the rated current.
E	0011	Emergency stop	During automatic operation or remote operation, a stop command is entered from the operation panel or a remote input device.	• Reset the inverter. • If the emergency stop signal is present, reset the inverter after clearing this signal.
EEP1	0012	EEPROM fault 1	A data writing error occurred.	Cycle the inverter OFF and ON. If it does not recover from the error, contact your Toshiba technical support line.
EEP2	0013	EEPROM fault 2	• Power supply was cut off during *typ* operation and data writing stopped. • The error occurred when various data were written.	• Turn the power off, turn it back on, and try *typ* operation again. • Write the data again. Contact your Toshiba technical support line if this problem occurs frequently.
EEP3	00014	EEPROM fault 3	A data reading error occurred.	Cycle the inverter OFF and ON. If it does not recover from the error, contact your Toshiba technical support line.
Err2	0015	Main unit RAM fault	The control RAM is defective.	Contact your Toshiba technical support line.
Err3	0016	Main unit ROM fault	The control ROM is defective.	Contact your Toshiba technical support line.
Err4	0017	CPU fault 1	The control CPU is defective.	Contact your Toshiba technical support line.
Err5	00018	Communication error	The communication was interrupted.	Check the remote control device, cables, etc.
Err8	001B	Optional unit fault 1	An optional unit has failed (such as a communication option).	Make sure the optional unit is connected properly.

Table 3. Trip error codes and solutions (continued)

Error Code	Failure Code	Problem	Possible Causes	Solutions
Err9	001C	Remote keypad disconnection fault	A disconnection occurred 10 seconds or more after the run signal was activated by the RUN key on the remote keypad.	• Press STOP key. • Set parameter *F731* to 1.
UC	001D	Low-current operation fault	The output current dropped to a low current detection level during operation.	Check the suitable detection level for the system (*F609*, *F611*, *F612*).
UP1	001E	Under voltage fault (main circuit)	The input voltage (in the main circuit) is too low.	• Check the input voltage. • Enable *F627* (undervoltage trip selection). • To remedy momentary power failure, set *F627=0*, Regenerative power ride-through control *F302*, and Auto-restart control selection *F301*.
Etn *Etn1* *Etn2* *Etn3*	0028, 0054, 0055, 0056	Auto-tuning error	The motor parameters *uL, uLu, F405, F415, F417* are not set correctly.	Set the left column parameters correctly per Table 1, p. 7.
			• The motor with the capacity of 2 classes or less than the inverter is used. • The output cable is too thin. • The inverter is used for loads other than those of three-phase motors.	Set the left column parameters correctly.
			The motor is not connected.	• Connect the motor. • Check the secondary magnetic contactor.
EF2	0022	Ground fault	A ground fault occurs in the output cable or the motor.	Check the cable and the motor for ground faults.
			An unexpected trip occurred while inverters were supplied by AC power and connected with common DC bus link.	Set the parameter *F614* to 0 "Disabled".
SOUt	002F	Step-out (for PM motor drive only)	The motor shaft is locked.	Unlock the motor shaft.
			One output phase is open.	Check the interconnect cables between the inverter and the motor.
			An impact load is applied.	Verify the acceleration / deceleration time.
Etyp	0029	Inverter type error	Possible breakdown failure.	Contact Toshiba technical support line.
E-13	002D	Over speed fault	The input voltage fluctuates abnormally.	Check the input voltage.
			Over speed fault due to the over voltage limit operation.	Install an optional dynamic braking resistor.
E-18	0032	Analog input break detection fault	The input signal from VIC is equal to or less than the *F633* setting.	Check the VIC signal cable for breaks. Also, check the input signal value or setting of *F633*.
E-19	0033	CPU communications error	A communications error occurred between control CPUs.	Contact Toshiba technical support line.
E-20	0034	Over torque boost fault	• The automatic torque boost parameter *F402* setting is too high. • The motor impedance is too low.	Set a lower automatic torque boost parameter *F402* setting.
E-21	0035	CPU fault 2	The control CPU is defective.	Contact Toshiba technical support line.
E-23	0037	Optional unit fault 2	An optional device is defective.	Contact Toshiba technical support line.
E-26	003A	CPU fault 3	The control CPU is defective.	Contact Toshiba technical support line.

Table 3. Trip error codes and solutions (continued)

Error Code	Failure Code	Problem	Possible Causes	Solutions
E-27	0057	Internal circuit fault	Internal circuit is defective.	Contact Toshiba technical support line.
E-31	0063	Frequent cycle ON/ OFF of main power	The main power is cycled ON and OFF too frequently during operation.	Do not cycle the power ON and OFF excessively during operation.
			Other reason	Contact Toshiba technical support line.
E-32	0040	PTC fault	The PTC thermal protection has been triggered.	Check the PTC in motor.
E-37	0045	Servo lock fault	The motor shaft is not locked in servo-lock operation.	Reduce the load in servo-lock operation.
E-39	0047	Auto-tuning error (PM motor)	• While in auto-tuning mode (related parameters are *Pt=6* and *F400=2*), the current of the permanent magnet motor exceeded the threshold level. • The inductance of the permanent magnet motor is too small.	Auto tuning for permanent magnet motor is not allowed for this motor, please measure inductance with the LCR meter.

Table 4. Alarm information (each error code in the table is displayed to give a warning but does not cause the inverter to trip)

Error Code	Problem	Possible Causes	Solutions
OFF	ST (assigned standby function) terminal OFF	The ST-CC (or P24) circuit is opened	Close the ST-CC (or P24) circuit.
ΠOFF	Under voltage in main circuit	• The supply voltage between R, S and T is too low. • Internal communication fault.	Measure the main circuit supply voltage. If the voltage is at a normal level, the inverter is faulty and needs to be repaired.
rtry	Retry in process	• The inverter is in retry mode. • A momentary stop occurred. The motor speed is being detected.	The inverter will restart automatically.
Err 1	Frequency point setting error alarm	The frequency setting signals at points 1 and 2 are set too close to each other.	Set the frequency setting signals at points 1 and 2 farther apart from each other.
CLr	Clear command acceptable	This message is displayed when the STOP key is pressed while an error code is displayed.	Press the STOP key again.
EOFF	Emergency stop command acceptable	The operation panel is used to stop the operation in automatic control or remote control mode.	Press the STOP key for an emergency stop. To cancel the emergency stop, press any other key.
HI/LO	Setting error alarm — An error code and data blink two times each alternately.	An error is found in a setting during data reading or writing.	Check whether the setting is made correctly.
HEAd/End	Display of first/ last data items	The first and last data item in the *AUH* data group is displayed.	Press MODE key to exit the data group.
db	DC braking	DC braking in progress	The message goes off within a few seconds if no problem occurs.
E1 *E2* *E3*	Flowing out of excess number of digits	The number of digits such as frequencies is more than 4. (The upper digits have a priority.)	Lower the frequency free unit magnification *F702*.

Table 4. Alarm information (each error code in the table is displayed to give a warning but does not cause the inverter to trip) (continued)

Error Code	Problem	Possible Causes	Solutions
STOP	Momentary power failure deceleration stop prohibition function activated.	The slowdown stop prohibition function set with *F302* (momentary power failure ride-through operation) is activated.	To resume operation, reset the inverter or send an operation signal again.
LStP	Auto-stop because of continuous operation at the lower-limit frequency	The automatic stop function selected with *F256* was activated.	This function is cancelled when frequency reference reaches LL+0.2Hz or operation command is OFF.
In It	Parameters in the process of initialization	Parameters are being initialized to default values.	Normal if the message disappears after a a few seconds.
A-01	Points setting alarm 1	If *Pt=7*, at least two of the following parameters have the same setting (except 0.0Hz): *uL, F190, F192, F194, F196, or F198*.	Set the parameters to different values.
A-02	Points setting alarm 2	If *Pt=7*, the inclination of V/f is too high.	Set the inclination of V/f to be flat.
A-05	Output frequency upper limit	An attempt was made to operate at a frequency higher than 10 times the base frequency (*uL* or *F170*).	Operate at a frequency that does not exceed 10 times the base frequency.
A-17	Operation panel key alarm	• The RUN or STOP key is held down for more than 20 seconds. • The RUN or STOP key is faulty.	Check the operation panel.
A-27	Control terminal block connection alarm	• Control terminal block has come off. • Internal circuit is defective.	Check the control terminal block and re-install it onto the inverter if it has come off. If the inverter is defective, please contact Toshiba tech support line.
A-28	S3 terminal alarm	Slide switch SW2 and parameter *F147* settings are different.	Match SW2 and *F147* settings, then turn power OFF and ON.
Atn	Auto-tuning	Auto-tuning in process	This message should disappear after a few seconds.
A-18	Break in analog signal cable	The signal input via VIC is below the analog signal detection level set in *F633* and the *F644*setting = 1 or more.	• Check the cables for breaks. • check *F633* and *F644* settings.
FIrE	In forced operation	*FIrE* and operation frequency are displayed alternately.	It is normal for the alarm to disappear after the forced fire-speed control operation is completed.
PASS/FAIL	Password verification result	After entering the password (*F738*), it is sent to *F739* (password verification).	If the password is correct, *pass* is displayed. If it is incorrect, *fail* is displayed.
EASY/Std	Switching display between Easy setting mode / Standard setting mode	The EASY key was pushed in the standard monitor mode.	When *EASY* is displayed, the inverter is in easy setting mode. When *Std* is displayed, the inverter is in standard setting mode.
SEt	Input requirement of region setting	• A region setting has not been entered yet. • The inverter is turned on for the first time. • While checking the region setting parameter, *set* is set to 0 causing the inverter to return to default setting. • *typ* is set to *13*, inverter returns to default setting.	Set a region setting by using setting dial.

Table 4. Alarm information (each error code in the table is displayed to give a warning but does not cause the inverter to trip) (continued)

Error Code	Problem	Possible Causes	Solutions
nErr	No record of past trip	No new record of past trip, after past trips were cleared.	Normal operation.
n– – –	No detailed information of past trip	Detailed information of past trips can be accessed by pressing the center of the setting dial while *nErr* ☐ *number* is blinking.	Normal operation. Press MODE key to return to previous menu.

Table 5. Other potential problems and solutions

Problem	Solutions
The motor runs in the wrong direction.	Invert the phases of the output terminals U/T1, V/T2, and W/T3.
The motor runs but its speed does not change normally.	• The system load is abnormal. • The maximum frequency *FH* and the upper limit frequency *UL* are not set properly. Set them according to Table 1, p. 7. • The frequency setting signal is too low. Check the signal set value, circuit, cables, etc. • Check the setting characteristics (point 1 and point 2 settings) of the frequency setting signal parameters. • If the motor runs at low speed, make sure the stall prevention function isn't activated due to the torque boost value being too large.
The motor does not accelerate or decelerate smoothly.	The acceleration time (*ACC*) or the deceleration time (*dEC*) are not set according to Table 1, p. 7.
Too much current flows into the motor.	The load is too heavy. Please verify system load is normal.
The motor runs at a higher or lower speed than the specified one.	• Verify 01-10 VDC speed signal supplied across VIA & CC is correct. • The motor terminal voltage is too low. Check the setting of the base frequency voltage parameter (*uLu*) . Replace the cable with a cable larger in diameter. • The output frequency is not set correctly. Check the output frequency range. • Adjust the base frequency per Table 1, p. 7.
The motor speed fluctuates during operation.	• The load is too heavy or too light. Reduce the load fluctuation. • Check whether the frequency setting signal changes.
Parameter settings cannot be changed.	• Change parameter setting *F700* to *0* (enabled) if it is set between *1* and *4* (prohibited). • For safety reasons, some parameters cannot be reprogrammed while the inverter is running.

Table 6. Complementary information for VF-S15 with safety function

<table>
<tr><th>Refer-ence</th><th>Item</th><th>Additional Contents</th></tr>
<tr><td>12.0</td><td>Common specification</td><td>Safety functionSafe Torque Off (STO) function according to EN/IEC 61508 SIL2 and ISO 13849-1 category 3 PL”d”.</td></tr>
<tr><td>11.7</td><td>Output Terminal Function</td><td>Table of output terminal functions
<table>
<tr><th>Function No.</th><th>Code</th><th>Function</th><th>Action</th></tr>
<tr><td>152</td><td>STO</td><td>Safe torque off signal</td><td>ON : Opening terminals between +SU and STO.
OFF: Shorting terminals between +SU and STO.</td></tr>
<tr><td>153</td><td>STON</td><td>Inversion of safe torque off signal</td><td>Inversion of STO</td></tr>
</table></td></tr>
<tr><td>13.1</td><td>Trip /Alarm causes and remedies</td><td>Trip information
<table>
<tr><th>Error code</th><th>Failure code</th><th>Problem</th><th>Possible causes</th><th>Remedies</th></tr>
<tr><td>PrF</td><td>003B</td><td>Safe torque off error</td><td>Error of safe torque off circuit</td><td>Contact the technical support line</td></tr>
</table>
Alarm information: The message in the table is displayed to give a warning but does not cause the inverter to trip.
<table>
<tr><th>Error code</th><th>Problem</th><th>Possible causes</th><th>Remedies</th></tr>
<tr><td>PrA</td><td>STO signal OFF</td><td>• STO terminal is in open-circuit.
• Input voltage of STO terminal is low.</td><td>• Close STO and + SU circuit.
• Check the load of P24 terminal, if STO and +SU is shorted.</td></tr>
</table></td></tr>
</table>

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RT-SVD007B-EN 06 Sep 2016
Supersedes RT-SVD007A-EN (May 2015)

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