1352C-Plus 5.1 VECTOR Troubleshooting Guide

LED Indicators

Card Location	Name	LED Identification	Indication	Drive Size
A2	Control Card	H1	ON = Ready OFF = Not Ready or Running (GTO) FLASHING = Processor Fault	All
A3	Power Supply	V58	ON = Power Supply OK OFF = Power Supply Low	30-115 kVA
A4	Pulse Amplifier	H101	ON = Positive U Phase OK	30-115 kVA
		H201	ON = Positive V Phase OK	30-115 kVA
		H301	ON = Positive W Phase OK	30-115 kVA
		H401	ON = Negative U Phase OK	30-115 kVA
		H501	ON = Negative V Phase OK	30-115 kVA
		H601	ON = Negative W Phase OK OFF = Device Fault	30-115 kVA
A4 - A6	Pulse Amplifier	H1 (Positive) H2 (Negative)	ON = Normal Operation OFF = GTO Fault	140 kVA & Above 140 kVA 8 Above
A7	Chopper Card	V42	ON = Aux. Voltage OK OFF = Aux. Voltage Low	140 kVA & Above 140 kVA & Above
A9	Power Supply	V40	ON = Power Supply OK OFF = Power Supply Low	140 kVA & Above
CBU-A1	Capacitor Supv. Card	V27 V28 V29 V30	ON = Normal Voltage OFF = Low Voltage or Bypassed	140 kVA & Above

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
None	Drive Dead. Main Contactor will not close.	A. Main Disconnect not closed .	A. Close Disconnect.
		B. Maintained Emergency Stop depressed.	B. Reset Emergency Stop.
		C. Low or no voltage at supply to Drive.	C. Provide correct voltage. Voltage of all three phases must be ± 10% of nameplate rating & within 5% of the other phases.
		D. Blown Fuses.	D. Check or replace LSU fuses F1 through F8.
		E. Control voltages missing.	E. If applicable, check for 115V AC between terminals TB1-24 and TB1-25. Check for 215 VAC between TB1-9 and TB1-12.
		F. Fault Interlock open	F. If applicable, check for Interlock or jumper continuity at: Terminals TB1-20 & 21 Terminals TB1-21 & 22 Terminals TB1-22 & 23 Terminals TB1-15 & 16 Check that LSU-K1 has picked up. Check that LSU-K2 has picked up.
		G. 210 kVA units and above only. LCU cooling fan circuit breaker is off or tripped.	G. Reset Breaker F51 in LCU. Check fan for free rotation. Check heatsink thermostats S51 and S52 for open circuit.
None	CP1 Panel Blank. Drive seems to be dead, but cooling fans run.	A. Maintained Emergency Stop depressed.	A. Reset Emergency Stop.
		B. Blown fuses.	B. Check or replace LSU fuses F1 through F8.
		C. Control voltages missing.	C. If applicable, check for 115V AC between LSU Terminals TB 1-24 and TB 1-25. Check for 215V AC between LSU Terminals TB1-9 and TB1-12. Check for 215V AC between INU Terminals X1.1, 101 and 102.
None	CP1 Panel Blank. Drive seems to be dead, cooling fans do not run.	Cooling fan circuit breakers are off or tripped.	Reset breakers. F2 in INU (30 to 115 kVA) F11 in INU (140 to 870 kVA) F51 in LCU (210 to 870 kVA) If breaker trips again, check fans for free rotation. If INU fan breaker continues to trip, temporarily remove jumper on INU X1 (103-104). (Run at no load) If breaker trips, replace A3 Power Supply on units 115 kVA and smaller. On larger units, replace A9 Auxiliary Power Supply. If breaker doesn't trip, replace the cooling fan.

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
Any Display	Drive stopped but appears to be running.	Electronic noise	Verify that grounding practices have been followed. (Section 2)
Display Character •	Displays are strange. Drive doesn't operate as programmed. All memory appears to be lost.	Electronic noise has erased EEPROM.	Verify grounding. (Section 2) Replace D16 Chip with another chip containing new software or reload your program.
None	Main fuses blown	A. Insufficient Precharge time.	A. Verify precharge timer TR1 is set to value shown on schematic diagram, but not less than 0.5 seconds.
		B. Precharge resistor open.	B. Measure precharge resistor values (typically 10 ohms each) replace if necessary. Check that K3 energizes during precharge time and de-energizes after precharge time.
		C. Malfunctioning Main Contactor Unit. (K4)	C. Open Main Disconnect and verify contactor operates freely.
		D. Malfunctioning diode rectifier.	D. Replace G1, G2, or G3 (30 to 180 kVA), G51, G52, or G53 (210 to 340 kVA), or V41-V56, on 460 to 870 kVA units. Check/replace bad diodes.
		E. Cap. bank or inverter shorted " +" to "-".	E. Inspect/measure capacitors and bus circuits.
		F. Excessive voltage at input to Drive terminals.	F. Measure input voltage. Voltage must be within ± 10% of nameplate rating (460V AC or 575V AC) and within 5% of other phases.
None	Main Fuses blow periodically while running.	A. Diode rectifier is weak and malfunctioning.	A. Replace G1, G2, or G3 (30 to 115 kVA units). G51, G52, or G53 (210 to 340 kVA). Check/Replace bad Diodes V51-V56 (460 to 870 kVA).
		B. Capacitor bank or Inverter Intermittently shorted " + " to " - ".	B. Inspect/measure capacitors and bus circuits. Check for loose wires or material in bus circuits. Check for worn or cracked insulation on main power conductors.
		C. Excessive voltage at input to Drive terminals.	C. Check input voltage. Voltage must be within ± 10% of nameplate rating (460V AC or 575V AC).
		D. Intermittent single phasing of incoming 3-phase power.	D. Check supply network cables, termination's and switches.
		E. Phase voltage unbalance greater than 6.5%.	E. Correct cause of voltage imbalance in supply lines.

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
None	DC Bus fuses blow while running or starting Inverter. (140 kVA and above only)	A. Capacitor bank or inverter intermittently shorted " + " to " - "	A. Inspect/measure capacitors and bus circuits. Check for loose wires or material in bus circuits. Check for worn or cracked insulation on main power conductors.
None	DC fuses blow when main contactor K4 is closed.	A. Short circuit in the inverter. B. Misfiring of GTO Thyristors C. Inverter intermittently shorted " + " to "-" or to chassis.	A. Check for short circuit in semiconductor and replace if necessary. B. Check data of fault queue Parameters 176-181. C. Inspect/measure capacitors and bus circuits. Check for loose wires or material in main circuits. Check for worn or cracked insulation on main power conductors.
FL01 (CP1) **CHOP UNDERVOLT (CP5)** (140 kVA and larger)	C9 Capacitor circuit voltage too low.	A. Loose connections	A. Verify solid connections at chopper bus bars. Reseat connectors on INU A7 Chopper Control Card. Verify connections at Thyristor V17.
		B. INU A7 Chopper Control Card malfunctioning	B. Inspect/Replace fuse F1 on A7 Chopper Control Card. Replace INU A7 Chopper Control Card Verify that the INU Cooling Fan Breaker F11 and Temperature Sensor S1 are closed.
		C. Short circuited capacitors C9.1 - C9.N	C. Disconnect the chopper capacitors from the circuits at the Bus Bars. Inspect and measure capacitors for short circuits.
		D V17 Chopper Thyristor malfunctioning	D. Replace V17 and V28 Thyristors. Check/Replace INU A8 Snubber Card. Check Chopper Snubber diodes.
		E. INU A4 Pulse Amplifier malfunction	E. Replace A4 Pulse Amplifier.
		F. Chopper charge time too short	F. Check that CHARGETIME 158EE is set to at least 6.
FL02 (CP1) **CHOP OVERVOLT (CP5)**	C9 Capacitor circuit voltage too high.	A. Loose connections	A. Tighten connections at chopper bus bars. Reseat connectors on INU A7 Chopper Control Card.
		B. INU A7 Chopper Control Card malfunctioning	B. Replace INU A7 Chopper Control Card

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
FL03 (CP1) AUX UNDERVOLTAGE (CP5)	Voltage Supply to the Circuit Boards is insufficient	A. Voltage Supply to the Drive is too low.	A. Check incoming supply voltage. Voltage must be within ± 10% of nameplate rating and each phase within 5% of each other.
		B. DC Bus voltage (UC) is low or DC Bus is not charged .	B. Check condition of DC bus.
		C. Auxiliary 215V AC supply to INU is low or missing.	C. Measure 215V AC supply to INU at Terminals. Replace Auxiliary power card if necessary. Verify INU cooling fan breaker F2 or F11 is closed .
		D Power Supply INU - A3 or Auxiliary Power Card INU A9 is malfunctioning	D. Check fuses on INU-A3 Power Card (INU-A9 on units 140 kVA and larger). Check status of LED on Power Supply Card INU A3. Replace card if necessary. Check status of LED on Auxiliary Power Supply Card INU A9. Replace card if necessary.
FL04 (CP1) OVERTEMPERATURE (CP5)	INU Heatsink temperature is too high.	A. Obstructed cooling air flow.	A. Remove any obstructions from louvers or heatsinks.
		B. Room air temperature too high.	B. Cool air temperature to below 104°F (40°C).
		C. INU cooling fan is malfunctioning or is stalled.	C. Check Cooling fan circuit breaker. Check that the fan rotates and remove any obstructions. Replace fan if necessary.
		D. Heatsink thermal switch has malfunctioned or has open connection.	D. Check that the thermal switch located at the top of the INU is not open, replace if required. Check continuity to A-3 power supply or A-7 Chopper Control.
		E. Overtemperature circuitry has malfunctioned.	E. Replace the INU- A3 power supply (115 kVA and smaller drives). Replace the INU - A7 Chopper Control (140 kVA and larger Drives).
		F. Unbalanced phase voltage.	F. Correct cause of unbalanced phase voltages to within 5%.
FL05(CP1) OVERCURRENT (CP5)	The Instantaneous Peak Current has exceeded 230% of Drive rating	A. A sudden increase in motor load occurred	A. Check the process for unusual load or jam.
		B. A mechanical bind has caused high currents	B. Check for bearing, belt or gear failure.
		C. Problem exists in motor circuit.	C. A motor winding has shorted or grounded. A motor winding or connection has an open circuit. Check motor circuit with appropriate meter.
		D. IR Compensation setting incorrect	D. Check and reset IR Compensation Check and reset current limit.
		E. Problem with accel/decel rates	E. Check and reset accel/decel rates. Try to adjust so that the Drive does not go into current limit, but follows the ramp instead.
		F. Attempted to start before motor EMF decayed	F. Increase **Parameter 75** Restart Delay (1000 = 1 Sec.).

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
FL06 (CP1) **DC OVERVOLT** **(CP5)**	The DC Bus (UC) Capacitor Voltage has exceeded 130% of rated.	A. Supply voltage to the drive is too high.	A. Maximum permissible supply voltage is 110% of rated. Transformer taps must be changed to reduce AC voltage.
		B. The load has overhauled the motor.	B. The decel ramp is too rapid. Extend the decel ramp by increasing **Parameter 66** value.
		C. Regen torque limit too high.	C. Reduce value of the Regen Torque Limit **Parameter 80 for** Scalar Drives and **Parameter 58, 59, 60, 61** for Vector Drives. Controlled braking may be required.
		D. INU A3 Power Supply UC voltage measurement erroneous.	D. Check that **Parameter 207** is between 900 and 1100. If the value is beyond these limits, replace INU- A3. Measure the actual DC Bus voltage with a meter. It should be 621V DC (460V). Verify values with **Parameter 207**. If the DC Bus voltage is OK, see Section 5 to adjust or, replace INU- A-13. *Note: At no load, DC voltage may be as high as 716 volts with 460V input + 10% .
FL07 (CP1) **DC UNDERVOLT**	DC Bus Voltage (UC) Capacitor Voltage is less than 70% of rated.	A. DC Bus not charged.	A. Check if main contactor is closed.
		B. DC Bus fuse blown.	B. Replace fuse.
		C. INU- A3 Power Supply UC voltage measurement erroneous.	C. Measure the actual DC Bus Voltage with a meter and verify the value with **Parameter 207**. If the D.C. Bus voltage is within $\pm$ 10% of 621V DC, see Section 5 to adjust or replace INU-A3.
FL09, V11 - U1 FAULT **FL10, V14 - U2 FAULT** **FL11, V12 - V1 FAULT** **FL12, V15 - V2 FAULT** **FL13, V13 - W1 FAULT** **FL14, V16 - W2 FAULT** (GTO Only) (140 to 870 kVA only)		A. Power semiconductor device or pulse amplifier malfunction. For example: V12-V1 FAULT refers to the power semiconductor of positive branch of "V" phase or its pulse amplifier.	A. Reset the fault. Drive will check for shorted cells, motor leads or ground faults. Fault 15 will be the acknowledgment if they are present. If the fault repeats check that pulse amplifier (cards A4,A5 and A6) LED's are lit. If not, check power supply connector X3 and condition of Fuses F1 and F2. Check fuses on Power Supply Card A3 and Aux Power Supply A9. If the fault cannot be located, it may actually be a FL 05 Fault. If it is not possible to reset the fault, check that the flat cables of control and pulse amplifier cards are firmly connected. Check the fuses F2 through F5 on the Power Supply Card. If a fuse is blown, check the power semiconductor device. If the fault isn't found, replace the pulse amplifier card or control card as required. Check Snubber diodes.

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
FL09, V1 FAULT **FL10, V4 FAULT** **FL11, V2 FAULT** **FL12, V5 FAULT** **FL13, V3 FAULT** **FL14, V6 FAULT** (GTR Only) (30 to 115 kVA only)		A. Power semi-conductor device or pulse amplifier malfunction. For example: V5 FAULT refers to the power semi-conductor of positive branch of "V" phase or its pulse amplifier.	A. Reset the fault. Start-up the inverter. If the fault occurs again, there is a short circuit in the output connector or phase power semi-conductor device of the phase indicated by the fault code or pulse amplifier malfunction. In the case of no short circuit in the output connector, check the condition of the power semi-conductor device. If it is not possible to reset the fault, check that the flat cables of control and pulse amplifier cards are firmly connected. Check the fuses F2 through F5 on the Power Supply Card. If a fuse is blown, check the power semiconductor device. If the fault isn't found, replace the pulse amplifier card or control card as required.
FL15(CP1) **SHORT CIRCUIT /** **GROUND FAULT** **(CP5)** (140 kVA and Larger)	A Low resistance Phase-to-Phase or Phase-to-Ground is detected.	A. Moisture in wire or motor insulation .	A. Dry out or replace.
		B. Cracked or stripped wire insulation or termination tape.	B. Replace wire or tape.
		C. Motor circuit incorrectly wired or terminated.	C. Verify, inspect, correct and test with megohmeter.
		D. Motor winding shorted.	D. Replace Motor.
		E. ES Limit incorrect.	E. Parameter 275 should be set to 100.
FL17 (CP1) **COMMUNICATION** **FAULT** **(CP5)**	Serial Data Communication has been interrupted or lost	A. Drive improperly grounded.	A. See Section 2 for proper grounding procedures.
		B. A1 Supply Card LED not illuminated.	B. Check that the cables connecting A9 auxiliary power supply and control card are firmly connected.
		C. A1 Supply Card LED is illuminated.	C. Baud rate values are set incorrectly or A1 IOC Card is malfunctioning. Replace IOC Card if necessary.
		D. Fiber optic cables damaged or disconnected .	D. Check connections, and replace cables if damaged or broken.
FL18 (CP1) **TACH LOSS** **(CP5)**	Tach pulses faulty or nonexistent, or motor has stalled.	A. Tach cables faulty or disconnected. B. Process overload has caused motor to stall.	A. Check condition of cables and that they are installed correctly. B. Check the motor and load for jamming and correct.

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
FL19 (CP1) CURRENT MEASURING FAULT or CURRENT FEEDBACK ERROR (CP5)	A current signal is sensed when the inverter is stopped.	A. Current is being backfed from the motor. B. A Hall Effect transducer is giving an erroneous signal. C. The signal conversion to digital data is incorrect. D. Current Offset limit incorrect.	A. A bypass or alternate supply voltage is present. Isolate the Drive output from the motor circuit. B. A ribbon cable connection to the Hall Effect Transducers is bad, or the transducer itself is malfunctioning and must be replaced. C. Check **Parameters 219 and 220** for excessive value, they should be less than 1000. (**Parameter 219** monitors U-Phase Current, and **Parameter 220** monitors V Phase Current.) Recheck calibration of the current measurement in Startup Section 5-7. Replace control card if necessary. D. Check **Parameter 190**. Value should be 50.
FL20 (CP1) MOTOR STALLED (CP5) (SCALAR ONLY)	Drive has been in current limit and below stall frequency too long.	A. Stall protection feature improperly adjusted. B. Load is too great for motor C. Stall Time setting is too low D. IR Comp level is too low.	A. Refer to Section 5 for adjustment procedure. B. Reduce load. C. Correct Stall Time setting at **Parameter 83** ("0" = Infinity). D. Readjust IR Comp. (Section 3)
FL21 (CP1) MATCHING CARD FAULT (CP5)		A. Matching Card INU A-2.2 Connection is loose or missing. B. Matching Card is malfunctioning	A. Check that the matching card is firmly connected and that the matching card type corresponds to the inverter type. B. Replace Matching Card.
FL22 (CP1) PROCESSOR FAULT (CP5)	Processor information is erroneous.	EPROM's D17 and D18 faulty or Control Card INU-A2 malfunctioning. S-5 and S-6 set for wrong size EPROM.	Turn power on and off and wait two minutes. Try operation again. Replace EPROM's D17 and D18 on Control Card if malfunction remains. Replace Control Card INU-A2. S-5 and S-6 = A-C.
FL25 (CP1) INTERLOCK or CUSTOMER FAULT (CP5)	An Interlock at a Digital Input is missing .	A. Custom Programmable Fault Signal.	A. Check Custom software drawing for application.
FL26 (CP1) INTERLOCK or CUSTOMER FAULT (CP5)	Same as FLT 25. (Normally used for motor overload, RTD Monitor, Motor Thermostat, etc.	A. Motor running hot. B. Blocks run before 10C card ready.	A. Check for proper cooling air flow through motor. If motor is operating at below base speed, it may require a separate cooling fan. B. Reset faults.
SA50 (CP1) NO BACKUP / NEW EPROM (CP5)		There is no information in the EEPROM Memory.	
SA51 (CP1) STORED TO BACKUP		Writing to EEPROM Memory.	

Troubleshooting Guide Cont.

Diagnostic Display	Symptom	Probable Cause	Recommended Solutions/Comments
SA52 (CP1) **NO WRITE TO EEPROM**	Writing to EEPROM Memory is inhibited.	A. Position of S4 switch must be A-B to write.	A. Check switch position.
		B. EEPROM D16 is faulty.	B. Replace D16 EEPROM with known good EEPROM.
SA53 (CP1) **PARAMETER OUT of LIMITS (CP5)**	Drive will set parameter value to min/max allowable.		Re-Check value being entered for validity.
SA55 (CP1) **ILLEGAL PARAMETER - CHANGE NOT PERMITTED (CP5)**	Parameter remains at original value.		
SA56 (CP1) **NO BATTERY BACKUP**	Insufficient voltage from NiCad battery.	A. Switch S-3 is in A-C (battery OFF position).	A. Change switch position
		B. Battery has malfunctioned or discharged.	B. Allow 20 hours with power on for battery to recharge. Cycle power on and off to clear fault message. If message refuses to clear replace battery or Control Card INU - A2.
SA57 (CP1) **LOW AC/DC Volt**		Auxiliary Power is low.	Check Supply Voltage.
SA58(CP1) **START INHIBIT (CP5)**		Start is inhibited by the processor.	A stop signal overrides a start signal. Check logic sequencing external to drive. Check Start/Stop buttons.
SA59 (CP1) **SYSTEM RESTART (CP5)**		The processor is initializing its operation. This normally occurs when power is first applied to a Control Card.	

Troubleshooting Guide Cont.

Changing Printed Circuit Boards

The Drive incorporates printed circuit boards that require no adjustments as part of the normal troubleshooting and maintenance. This feature also helps simplify board replacement.

Circuit Board Replacement - The following steps should be adhered to when changing the printed circuit boards:

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CAUTION: The CMOS circuits utilized on the control circuit cards can be destroyed by static charges generated by friction of materials made of synthetic fibers. Use of damaged circuit cards may also damage related components.

A. Remove power by opening the disconnect switch and verify with a meter that all circuits are voltage free.

B. Carefully detach all ribbon cables, noting their location and orientation and whether the connectors were properly seated.

C. Remove small metric mounting hardware with a screwdriver, taking care not to drop associated washers into other circuits of the Drive.

D. Lift out the circuit board in question, and check that the replacement board is correct before attempting installation. Install the new circuit board by replacing the mounting hardware and reinserting the connectors and switches in their correct location on the new board.

IMPORTANT: A grounded wrist strap should be used when replacing circuit boards to guard against static discharge damage to the boards!

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Steps A through D apply to replacement of all printed circuit boards in Drive. Control Card (3500 - 187 / 187 - CON) Replacement - In addition to the previous steps, the Control Card of the Drive requires the additional transfer of the following components when changing cards:

A. Transfer EPROM's D17 & D18 to the corresponding locations on new Control Card using an IC. removal/insertion tool for CMOS Circuits.

B. In order to retain the application software values and program, it will be necessary to transfer the EEPROM D16 to the new card.

CAUTION: EPROM's and EEPROM cannot be transferred from a 103 CON to a 187 CON.

NOTE: If the new EEPROM D16 is left in the replacement control card, it is important that you observe item "D" when first reapplying power.

C. Transfer the matching card and its spacers from the suspect board to the new control board by removing the four mounting screws from behind the card and reinstalling them in the proper location on the new card. Be sure to attach the X-2 connector firmly into its socket and latch the connector tabs.

D. When reapplying power to the Drive after installing a new control card, You must wait at least 2 minutes after the red LED in the control card lights before interrupting power .or adjusting parameters. If you choose to use the new EEPROM (D16) which was supplied with the card,, it can take as long as 3 or 4 minutes after the LED lights. If power is interrupted, process restarts.