GE Motors & Industrial Systems

DRIVE CONTROL / LAN COMMUNICATIONS BOARD

DS200LDCCG1A_ _

These instructions do not purport to cover all details or variations in equipment, nor to provide every possible contingency to be met during installation, operation, and maintenance. If further information is desired or if particular problems arise that are not covered sufficiently for the purchaser's purpose, the matter should be referred to GE Motors & Industrial Systems.

SAFETY SYMBOL LEGEND

WARNING Indicates a procedure, practice, condition, or statement that, if not strictly observed, could result in personal injury or death.

CAUTION Indicates a procedure, practice, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

NOTE Indicates an essential or important procedure, practice, condition, or statement.

CONTENTS

FUNCTIONAL DESCRIPTION

DEFINITION AND OVERVIEW

The DS200LDCC Drive Control/LAN Communications board (LDCC) provides primary drive and I/O control functions for GE's DIRECTO-MATIC® 2000 family of drives and exciters. Features include:

- Microprocessor control and processing of drive, motor, and customer I/O functions
- Microprocessor control of local area network (LAN) communications for drive I/O
- Application software and customer specific configuration data for the drive
- Onboard operator interface for software adjustments and diagnostic testing
- Hardware and software drive reset functions

These features and application details are described below, as outlined in the *Contents*.

In some applications, the LDCC can replace existing drive and LAN control boards (see *Renewal/Warranty Replacement* for details).

DRIVE AND MOTOR CONTROL

The LDCC contains four microprocessors for processing control, application, and I/O functions:

- Drive Control Processor (DCP) at location U1
- Motor Control Processor (MCP) at location U21
- Co-motor Processor (CMP) at location U35
- LAN Control Processor (LCP) at location U18

Board selftesting checks the correct functioning of these microprocessors and their associated circuitry. (See the drive manual for fault codes related to the microprocessor selftests.)

DCP Function

The DCP includes built-in I/O peripherals, such as address decoding, interrupt controllers, timer/counters, and a direct memory access (DMA) controller. The DCP and associated circuitry provides analog-to-digital (A/D) and digital-to-analog (D/A) signal conversion, and voltage-controlled oscillator (VCO) inputs.

The DCP software consists of user interfaces, regulating loops (such as speed and position), and system-level functions.

MCP Function

The MCP contains several types of I/O, most buffered and connected to 1PL (see Table 3) for use in motor control. The MCP and associated circuitry control both high speed and conventional digital I/O, analog I/O, timer/counters, and a "watchdog" timer.

The MCP software consists of inner loops (such as current regulators), and motor/technology specific functions (such as dc phase control, ac motion control, and ac general purpose).

CMP Function

The CMP performs math-intensive functions to support motor control algorithms beyond the MCP's capability. The LDCC uses this processor and its associated circuitry only when the drive requires additional processing ability.

COMMUNICATIONS CONTROL

The LDCC controls LAN communications with its LAN Control Processor (LCP). It provides both isolated and non-isolated input circuits. The LDCC can process I/O from any of five different bus systems:

- DLAN+, GE's ARCNET®-based drive LAN protocol
- DLAN, GE's drive LAN used for smaller drives and earlier larger drives
- Genius® bus via an interface board, such as the DS200ADGI
- CPL (Control Party Line) serial link via an interface board, such as the DS200ADCI
- C-bus, a parallel differential bus, via an interface board, such as the DS200ADCI

ONBOARD SOFTWARE

The LDCC board stores onboard software in memory chips. Six flash PROMs (U6, U7, U11, U12, U22, and U23) contain **configuration data**. They are programmed at the factory, but can be reprogrammed in the field, if needed. EEPROM (U9) contains the **field-adjustable parameters**, which are downloaded using the drive configuration tools. (See *Reprogramming Firmware.)*

OPERATOR INTERFACE

The LDCC includes a 16-character digital display and connector KPPL for adding an optional operator interface module. The module, called the Programmer, consists of an alphanumeric keypad and display window. It is used for software adjustments and diagnostic testing. (Refer to the drive manual for details on using the Programmer.)

RESET OPTIONS

CAUTION

The system trips when a *hard* reset (interruption of power to the chips) is initiated; the system should not normally be reset when running.

The LDCC circuitry provides four ways to generate a reset for drive applications:

- By pressing the RESET pushbutton (see Figure 1)
- By applying +5 to +24 V dc to connector 6PL pin 30 via the drive terminal board (such as the 531X305NTB or DS200STBA).
- By programmed software control
- By automatic internal hardware watchdog protection

A *soft* reset can only be initiated through software or the Programmer module's reset key. It is used to clear faults.

A nonmaskable interrupt to the DCP initiates a thorough board selftest.

APPLICATION DATA

CAUTION

To prevent component damage caused by static electricity, treat all boards with static sensitive handling techniques. Use a grounding strap when handling boards or components.

Store boards in anti-static bags or boxes.

REPROGRAMMING FIRMWARE

Configuration Data (Flash PROMs)

The LDCC's flash PROMs are programmed at the factory with the current version of configuration software. However, if needed, these PROMs can be reprogrammed from a personal computer (PC) connected to the drive. GE provides the necessary files and programming utility on a diskette labeled DS206LDCCG1Axx (see *Replacement Parts*).

To reprogram the LDCC's flash PROMs:

1. Make sure the drive is stopped.
2. Connect the PC's COM port to the drive's COM port (COMPL), located on the Drive Terminal Board (for example, the 531X305NTB or DS200STBA board). Recommended maximum cable length is 6 ft.
3. Insert the DS206LDCCG1Axx diskette into the PC's "floppy" drive slot (for example, drive A:). Copy all files from the diskette to the PC's hard drive.
4. From DOS (the utility will not run with Windows® open), run the supplied batch file by typing:

   FLSHLDCC

   Then pressing the Enter key.
5. For the remaining procedures, follow the instructions on the PC screen.

Field Adjustable Parameters (EEPROM U9)

U9 is programmed by downloading the drive configuration values to the LDCC using the drive configuration tools. Refer to the tools' manual for these procedures.

This firmware can also be transferred to an LDCC by moving U9 from another drive control board. For procedures, see *Replacing/Inserting EEPROM U9*.

DCOM STIFFENER FOR LAN INTERFACE

The LDCC includes a stab connection, COM1 (see Figure 1) for use in high noise environments when the common reference to the LAN interface boards needs stiffening. Most applications do not require this stab connection because the connections in the LNPL ribbon cable (see Table 13) provide an adequate tie.

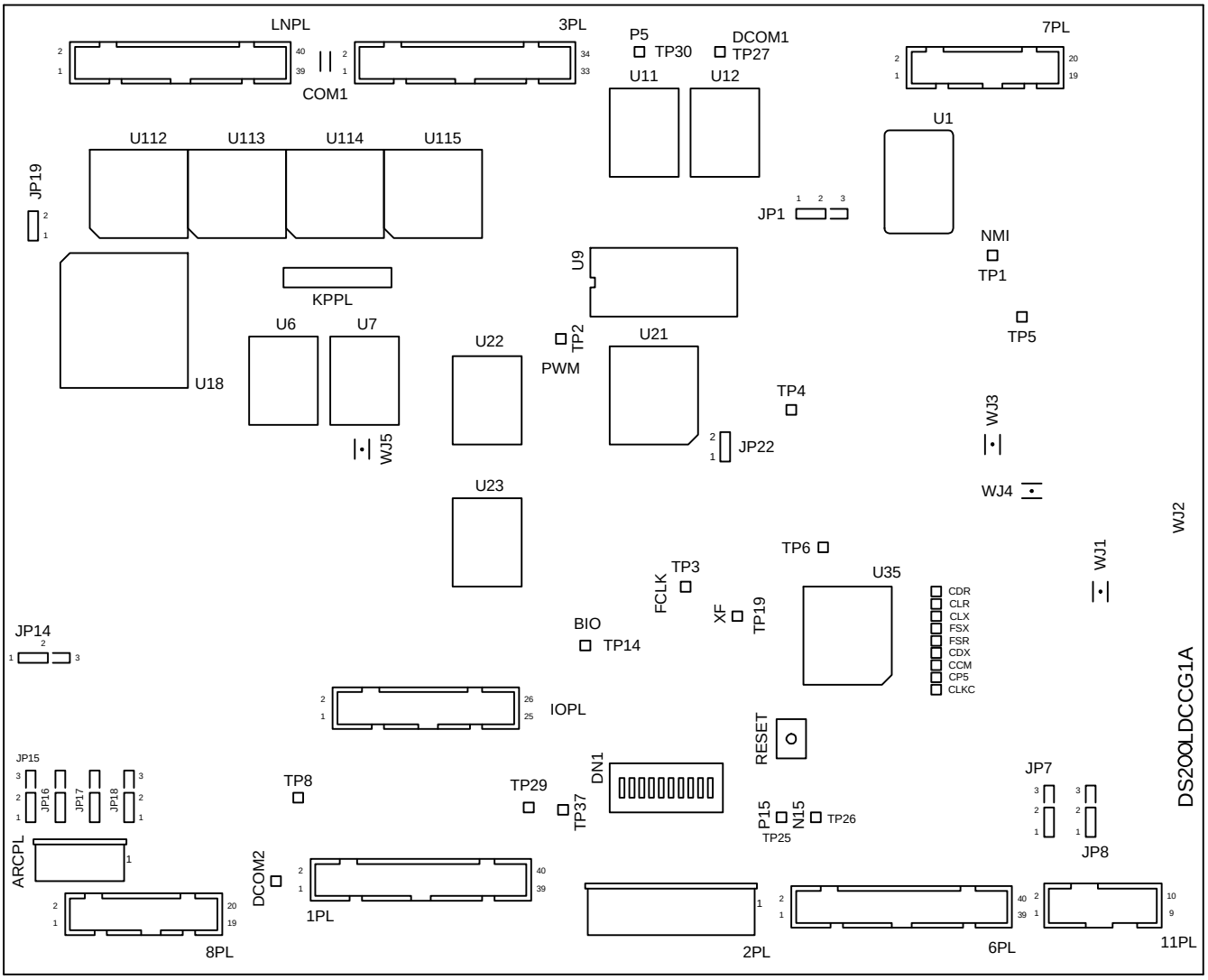


Figure 1. LDCC Board Layout Drawing

Board component	For definition, see
LEDs (DN1)	Figure 2 with text
Testpoints	Table 1
Jumpers	Table 2
Connector 1PL	Table 3
Connector 2PL	Table 4
Connector 3PL	Table 5
Connector 6PL	Table 6
Connector 7PL	Table 7
Connector 8PL	Table 8
Connector 11PL	Table 9
Connector ARCPL	Table 10
Connector IOPL	Table 11
Connector KPPL	Table 12
Connector LNPL	Table 13

INDICATING LIGHTS

The LDCC provides two onboard indicators for displaying drive fault codes: the Programmer digital display (see *Operator Interface*) and the DN1 bar graph LEDs. (For specific fault codes and their definitions, refer to the drive manual.)

The LEDs display fault codes as follows (see Figure 2):

- Faults 1 to 399
  - Slow blink rate
  - BCD pattern (leftmost 2 LEDs encode the 100s digit; next 4 LEDs, the 10s digit; right-most LED, the units digit
- Faults 400 to 1023
  - Faster blink rate
  - Binary pattern (leftmost LED is 2^9 [or 512], next LED is 2^8 [or 256], and so on
- No fault or drive not running
  - Sequential blinking, two at a time
  - Blinking from outer positions inward to center, and back

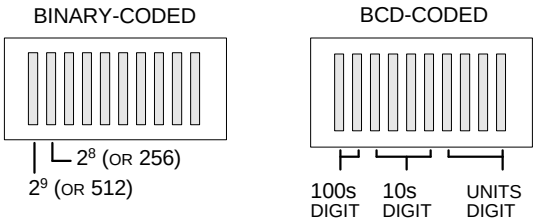


Figure 2. LED Pattern Fault Code Display

These same LEDs can be set by software jumper to also coarsely display drive variables when running. (For example, displayed in an absolute or signed bar graph mode). However, this setting does not inhibit the LED fault display.

TESTPOINTS

The LDCC includes onboard testpoints for use in troubleshooting. (Testpoints are metal posts located on specific signal paths.)

Figure 1 shows and identifies the LDCC testpoints. Table 1 defines the testpoints that may be useful to drive maintenance and troubleshooting.

*Table 1. Testpoint Definitions**

Name	No.	Definition
FCLK		"I'm alive" 8 MHz oscillator output from MCP (motor control processor).
----------	TP8	Specific to drive type, represents motor current.
		In the DC2000, this testpoint is an analog representation of the motor armature current (via the primary shunt IA1 of this bridge only), with a nominal dc offset of about +2 volts. A deviation of 0.5 V represents approximately 1 per unit shunt current. In DS200DCFB board applications, which use dual shunts, TP8 does **not** represent any of the current in shunt IA2 or from shunts in other bridges of a multibridge drive.
		In the AC2000 drive, this testpoint is an analog representation of phase A motor current, with a nominal dc offset of +2.5 volts.
P15	TP25	Testpoint for regulated +15 volt (±5%) power supply.
N15	TP26	Testpoint for regulated -15 volt (±5%) power supply.
DCOM1 & DCOM2	TP27 & TP31	0 volt common reference point for test signals.
	TP29	Drive type specific testpoint. Represents input line frequency.
P5	TP30	Testpoint for regulated +5 volt (±5%) power supply.
----------	TP37	Drive type specific TP. On the DC2000 drive, shows motor armature voltage, scaled 3.4 volts = 1 pu. Not used on the AC2000 drive.

* Testpoints not listed are for factory use only.

JUMPERS

The LDCC contains Berg-type (manually movable) hardware jumpers, identified with a *JP* nomenclature. It also includes hard-wired jumpers, identified with a *WJ* nomenclature.

Figure 1 shows the locations of these jumpers and Table 2 lists and defines them.

Table 2. Jumper Definitions

Name	Description
JP1	EEPROM parameter write protect. Position: 1.2 Writes inhibited, safe mode 2.3 Writes enabled (required to modify EEPROM)
JP14, JP15, JP16	Selects the RS-422 DLAN drivers or the isolated DLAN circuit. Position: 1.2 Isolated DLAN circuit 2.3 RS-422 drivers and receivers
JP17, JP18	Puts the DLAN termination resistors into the DLAN circuit The termination jumpers should be added to the drives located at the end of a daisychain RS-422 LAN. Never exceed 5 sets of termination resistors in an RS-422 DLAN circuit. Position: 1.2 Termination resistors in 2.3 Termination resistors out
JP19	Connects the crystal to the processor. Position: 1.2 Normal running condition 2.3 Manufacturing testing
JP22	Enable 16 MHz clock input to MCP (motor control processor). Position: 1.2 Enabled (required for normal operation) 0 Manufacturing test only
JP7	Enable 6:1 gain increase for feedback VCO circuitry Position: 1.2 Normal gain 2.3 Increase gain 6:1
JP8	Enable absolute value circuit for feedback VCO circuitry Note that, because of the 10-volt maximum voltage available on the DS200STBA terminal board, the FB VCO is not normally suitable for analog tachs unless the 531XNTB/3TB terminal board is used. Position: 1.2 Bipolar mode, for dc tachometers 2.3 Absolute mode, for analog ac AN tachometers
WJ1 – WJ4	Jumper omitted on LDCCG1. Feature reserved for future applications, as follows.: WJ1 – Remap MET3 D/A to DAC1 output WJ2 – Remap MET4 D/A to DAC2 output WJ3 – Provide 10 V full scale reference for D/A outputs. (LDCCG1 uses internal reference from a 12-bit D/A.) WJ4 – Identifies LDCC group no. to firmware. (Jumper “out” identifies LDCCG1.)

I/O CONNECTIONS

The LDCC connects to power, customer I/O, and the LAN through 10 onboard cable connectors, shown in Figure 1. Tables 3 through 13 define the I/O connector pin assignments, as follows:

Table	Connector	LDCC connection with
3	1PL	Bridge Interface Board
4	2PL	Signal-Level Power Supply Board
5	3PL	EX2000 Micro-Application Board
6	6PL	Terminal Board
7	7PL	Signal Interface Daughterboard
8	8PL	Drive Terminal Board
9	11PL	Meter Driver Module
10	ARCPL	ARCNET/DLAN Interface Board
11	IOPL	LAN Terminal Board
12	KPPL	Programmer Module
13	LNPL	Genius/CPL Bus Interface Board

NOTE

These tables describe the I/O signal functions. For specific use and interconnection within a drive, refer to the drive manual and system connection diagrams.

Table 3. Connector 1PL, Ribbon Cable Connection to Bridge Interface Board

Pin No.	Nomen-clature	Direc-tion	Description
1 – 6.	FAN0 – FAN5	Input	Analog input signal (application dependent).
7	FIG5	Input	Frequency or discrete input signal (application dependent).
8 – 10	FIN0 – FIN2	Input	Frequency input signal (application dependent).
11 – 13	FIN4 – FIN6	Input	Frequency input signal (application dependent).
14	SYOSC	Output	25 kHz firing oscillator.
15	FIG4	Input	Frequency or discrete input signal (application dependent).
16 – 19	FH00 – FH03	Output	High speed output signals.
20 – 27	FP10 – FP17	Output	Discrete output signals (application dependent).
28	FT2R	Input	Timer reset (application dependent).
29, 30	FHI0, FHI1	Input	High speed input signals.
31	/RST1	Output	System reset.
32, 33	FP26, FP27	Output	Discrete output signals (application dependent).
34	MAC	Input	MA contactor drive.
35, 36	P135, P136	Output	Discrete output signals (application dependent).
37	VTP	Output	Dc voltage feedback testpoint (see Table 1).
38	DTYPE	Input	Drive type.
39, 40	FIN7, FIN8	Input	Frequency input signal (application dependent).

Table 4. Connector 2PL, Power Cable Connection to Signal-Level Power Supply Board

Pin No.	Nomen-clature	Direc-tion	Description
1	/PSEN	Input	Power supply enable (active low).
2	N15	Input	Power -15 V dc, ±5%.
3	P15	Input	Power +15 V dc.
4, 7	DCOM	Input	Digital common.
5, 6	P5	Input	Power +5 V dc, ±5%.
8	N24	Input	Power -24 V dc, ±20%.
9	P24	Input	Power +24 V dc, ±20%.

*Table 5. Connector 3PL, Ribbon Cable Connection to EX2000 Micro-application Board**

Pin No.	Nomen-clature	Direc-tion	Description
1 – 8	BD0 – BD7	Output	Buffered data bus lines 0 – 7 from Drive Control Processor (DCP).
9	DCOM	Input	Power digital common.
10	P5	Input	Power +5 V dc.
11	0RST3	Output	System reset signal (active low).
12	LINT	Output	Interrupt from DCP.
13	0LBSY	Output	Busy bus control handshake to DCP (active low).
14	BA12	Output	Buffered address line from DCP.
15	DCOM	Input	Power digital common.
16	0BCSL	Output	Buffered chip select from DCP (active low).
17	0BRD	Output	Buffered read control line from DCP (active low).
18	0BWR	Output	Buffered write control line from DCP (active low).
19, 20	BA8, BA9	Output	Buffered address lines 8 and 9 from DCP.
21	0BCSU	Output	SDCC microapplication chip select (active low).
22, 23	BA10, BA11	Output	Buffered address line 10 from DCP.
24, 25	DCOM	Input	Power digital common.
26	P5	Input	Power +5 V dc.
27 – 34	BA0 – BA7	Output	Buffered address lines 0 – 7 from DCP.

*3PL used only in EX2000 exciter applications.

Table 6. Connector 6PL, Ribbon Cable Connection to Terminal Board

Pin No.	Nomen-clature	Direc-tion	Description
1	CTLN1	Output	Control lines. CTLN1 and CTLN2 form part of the circuit that picks up the MA contactor pilot relay and must be connected together for the drive to run. They provide both a place to connect external interlocks and a fail-safe (microprocessor independent) way to stop the drive.
2	CTLN2	Input	Control line. (See CTLN1, above.)
3	LBIAS	Input	Power ±24 V dc bias for digital inputs (for + or – logic).
4	T0OUT	Output	Timer output.
5	RUN	Input	Run signal.
6	JOG	Input	Jog signal.
7	POL	Input	Reference polarity.
8	XSTP	Input	Auxiliary stop.
9	MSRF	Output	High speed output.
10 – 14	R01 – R05	Output	Software control signal to coils of relays K1 – K5.
15, 16	P3B, P4 B	Input	10-bit analog input.
17	ASP0	Input	10-bit analog input.
18	VC3NB	Input	Inverting differential analog input to LDCC auxiliary VCO #3.
19	VC3PB	Input	Non-inverting differential analog input to LDCC auxiliary VCO #3.
20, 21	P1B, P2B	Input	10-bit analog input.
22, 26, 27	MET3, MET1, MET2	Output	Outputs from 8-bit D/A converter. Can source ±10 V dc at no load or ±8 V dc at a 10 mA load (200 Ω series impedance). Any drive variable can be sent to this output and can be scaled to set the value corresponding to 10 V dc output. (Provided for meter driver functions.)
23	DVM	Input	10-bit analog input for digital voltmeter function.
24, 25	DA1, DA2	Output	Output from 12-bit D/A converter. Can source ±10 V dc at no load or ±8 V dc at a 10 mA load (200 Ω series impedance). Any drive variable can be sent to this output and can be scaled to set the value corresponding to 10 V dc output. If the variable exceeds this value, the output is clamped to ±10 V, rather than rolling over. (For diagnostics and system applications.)
28	MSSY	Input	High speed input.
29	T0IN	Input	High speed input.
30	RESET	Input	Hard reset input to the drive. +5 to +24 V dc resets all processors in the drive. Open or COM allows drive operation.
31	TDB	Output	RS-232C channel transmitted from DCP.
32	RDB	Input	RS-232C channel received by the DCP.
33	——	—	Not connected.
34	RTSB	Output	RS-232C handshake line.

Table 6. Connector 6PL, Ribbon Cable Connection to Terminal Board — Continued

Pin No.	Nomen-clature	Direc-tion	Description
35	VC4NB	Input	Inverting differential analog input to auxiliary VCO #4.
36	VC4PB	Input	Non-inverting differential analog input to auxiliary VCO #4.
37	RFNB	Input	Differential analog input to reference VCO, negative line.
38	RFPB	Input	Differential analog input to reference VCO, positive line.
39	FBNB	Input	Differential analog input to VCO, negative line.
40	FBPB	Input	Differential analog input to VCO, positive line.

Table 7. Connector 7PL, Ribbon Cable Connection to Signal Interface Board

Pin No.	Nomen-clature	Direc-tion	Description
1	SPA1	Input	±5 V dc SPC analog channel #1.
2	SPA2	Input	±5 V dc SPC analog channel #2.
3	E1Z	Input	Marker channel from encoder #1 interface.
4	E2Z	Input	Marker channel from encoder #2 interface.
5	N15	Input	Power -15 V dc.
6	P15	Input	Power +15 V dc.
7	DCOM	Input	Digital common.
8	SPRS	Output	Digital output for multibridge drives.
9	DCOM	Input	Digital common.
10	P5	Input	Power +5 V dc.
11	E1UP	Input	Up channel output from encoder #1 interface.
12	E1DN	Input	Down channel output from encoder #1 interface.
13	E2UP	Input	Up channel output from encoder #2 interface.
14	E2DN	Input	Down channel output from encoder #2 interface.
15	/RST7	Input	System reset (active low).
16	DCOM	Input	Digital common.
17	SPSYN	Input	External line sync input.
18	SPSYNO	Output	External line sync output.
19	SPTX	Input	+5 V dc output from Motor Control Processor (MCP) UART.
20	SPRX	Input	+5 V dc input to MCP UART.

Table 8. Connector 8PL, Ribbon Cable to Drive Terminal Board

Pin No.	Nomen-clature	Direc-tion	Description
1	FA	Output	RS-422 communications interface.
2	FB	Output	RS-422 communications interface.
3	DCOM	Output	Digital common.
4	EXSY	Input	High speed MCP input.
5	———	—	Not connected.
6	E0AB	Input	Encoder interface Channel A non-inverted differential input.
7	0E0AB	Input	Encoder interface Channel A inverted differential input.
8	E0BB	Input	Encoder interface Channel B non-inverted differential input.
9	0E0BB		Encoder interface Channel B inverted differential input.
10	EOMB	Input	Encoder interface marker non-inverted differential input.
11	0EOMB	Input	Encoder interface marker inverted differential input.
12	RF24	Input	Discrete input reference.
13	CI1	Input	CI1 – CI8 are general-purpose control inputs, ± 24 V dc maximum, with 27 kW input impedance and a 2 ms hardware filter. Each input is automatically sampled 45 times per second by default. Beginning with DCP revision 2.24, CI1 – CI8 may be sampled faster, at 90 to 720 times per second by scheduling a foreground block, BLK.372, CIINS, at the appropriate rate. CI1 is also accessible through CI1PL. CI1PL is a 2-position plug, with pin 1 as RF24, and pin 2 as CI1. The connector is mainly for factory use, where CI1 is wired as a status input (feedback) of a local panel-mounted device.
14 – 20	CI2 – C18	Input	See CI1 (pin 13).

Table 9. Connector 11PL, Ribbon Cable Connection to Meter Driver Module

Pin No.	Nomen-clature	Direc-tion	Description
1, 2, 9, 10	-----	------	Not connected.
3, 8	DCOM	Output	Digital common.
4	MTR4	Output	Meter output 4.
5	MTR3	Output	Meter output 3.
6	MTR2	Output	Meter output 2.
7	MTR1	Output	Meter output 1.

Table 10. Connector ARCPL, Ribbon Cable Connection to ARCNET / DLAN Interface Board

Pin No.	Nomen-clature	Direc-tion	Description
1	TXAN	Output	Transmitting signal, channel A, negative line.
2	TXAP	Output	Transmitting signal, channel A, positive line.
3	TXBN	Output	Transmitting signal, channel B, negative line.
4	TXBP	Output	Transmitting signal, channel B, positive line.
5	P5	Output	Power +5 V dc.
6	DCOM	Output	Power digital common.
7	TXB	Output	Transmitting signal, channel B, selected by JP15 (see Table 2) as isolated DLAN circuit or RS-422.
8	TXA	Output	Transmitting signal, channel A, selected by JP15 (see Table 2) as isolated DLAN circuit or RS-422.

Table 11. Connector IOPL, Ribbon Cable Connection to LAN Terminal Board

Pin No.	Nomen-clature	Direc-tion	Description
1, 26	P24	Input	Power +24 V dc.
2 – 8	1I2 – 1I8	Input	Input data lines 2 – 8.
9 – 16	----------	--------	Not connected.
17	N24	Input	Power -24 V dc.
18	1I1	Input	Input data line 1.
19 – 25	1O1 – 1O7	Output	Output data lines 1 – 7.

Table 12. Connector KPPL, Plug-in for Programmer Module

Pin No.	Nomen-clature	Direc-tion	Description
1 – 8	KP1 – KP8	Output	Processor output to Programmer module keypad.
9	KP9	Input	Keypad input to processor.
10	LODIN	Output	Display; input to U1 pin 38.
11	LDCLK	Output	Display; clock.

Table 13. Connector LNPL, Ribbon Cable Connection to Genius/CPL Bus Interface Board

Pin No.	Nomen-clature	Direc-tion	Description
1, 2, 11, 14, 16, 18, 21, 39, 40	DCOM	Input	Power digital common.
3 – 10	BLD0 – BLD7	Output	Buffered data lines 0 – 7.
12	B0RST	Output	Buffered reset.
13	0DPINT2	Output	Interrupt 2.
15	LDPBSY1	Output	LAN board sync.
17	BLALE	Output	Address latch.
19	B0LRD	Output	Read enable.
20	B0LWR	Output	Write enable.
22 – 34	BLA0 – BLA12	Output	Address lines 0 12.
35	P5	Input	Power + 5 V dc.
36	B0LACS	Output	LAN board select.
37	B0LCS1	Output	LAN board select.
38	B0LCS2	Output	LAN board select.

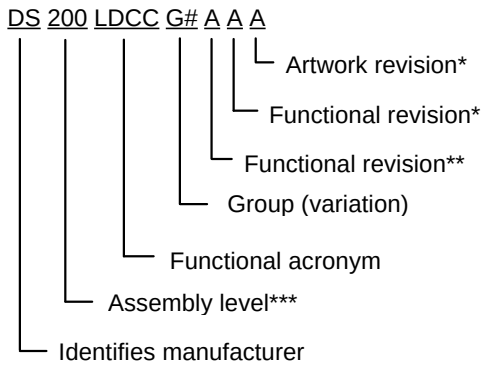
RENEWAL/WARRANTY REPLACEMENT

BOARD IDENTIFICATION

A printed wiring board is identified by an alphanumeric part (catalog) number stamped on its edge. For example, the LDCC is identified by part number DS200LDCCG#. Figure 3 describes each digit in the part number.

NOTE

All digits are important when ordering or replacing any board.



* Backward compatible

** Not backward compatible

*** *200* indicates a base-level board; *215* indicates a higher-level assembly or added components (such as PROM)

Figure 3. Board Part Number Conventions

PROCEDURE FOR REPLACING BOARDS

Because of upgrades, boards of different revision levels may not contain identical hardware. However, GE ensures backward compatibility of replacement boards.

WARNING

To prevent electric shock, turn off power to the board, then test to verify that no power exists in the board before touching it or any connected circuits.

CAUTION

To prevent equipment damage, do not remove boards or connections, or re-insert them, while power is applied to the drive.

Treat all boards as static-sensitive. Use a grounding strap when changing boards and always store boards in anti-static bags or the boxes they were shipped in.

To replace an LDCC board in the drive:

1. **Turn off power to the drive,** then wait a few minutes for the power supply's capacitors to discharge. Test any electrical circuits before touching them to ensure that power is off.

2. Open the drive's cabinet door to access the printed wiring boards. The LDCC board faces the front, and may have the Signal Processor Board and Programmer module mounted on it.

3. Carefully disconnect all cables (including those to any board mounted on the LDCC), as follows:

   – For a ribbon cable, place one hand on each side of the cable connector that mates with the board connector. Gently pull the cable connector with both hands.

   – For a cable with a pull tab, carefully pull the tab.

4. The LDCC is held in place by plastic snaps (holders). Push these holders back to remove the board.

5. If the Signal Processor Board is mounted on the LDCC, it can be removed with standoffs still attached. Do this by unscrewing the standoffs from the backside of the LDCC. Be sure to place both the board and screws in a safe location.

6. If the Programmer module is included, it mounts directly onto the LDCC board. It's four legs snap into mounting holes, while its connector plug inserts into the LDCC's KPPL receptacle connector.

   Remove the Programmer by pulling each leg from its mounting hole as you squeeze the snap from the backside of the LDCC.

7. On the replacement (new) board, set all configurable items in the exact position as those on the board being replaced (old board).

   When replacing an LDCC board, if a board revision has added or eliminated a configurable component, or re-adjustment is needed, refer to Table 2.

NOTE

Because of upgrades, boards of different revision levels may not contain identical hardware. However, GE ensures compatibility of its replacement boards.

If replacing an (S)DCC with an LDCC, refer to the guidelines under *Replacing Drive and LAN Control Boards with the LDCC*.

8. Install the new LDCC board, ensuring that all holders snap into position.

9. If applicable, install the Signal Processor Board and Programmer module that was removed from the old LDCC board.

10. Cables are labeled with the correct connector name, as marked on the board. Reconnect all cables to LDCC as labeled. Make sure that cables are properly seated at both ends.

NOTE

After replacing the LDCC in an application with critical analog I/O functions, the gains and offsets may require fine-tuning to compensate for variations in component tolerances between the old and new boards.

REPLACING DRIVE AND LAN CONTROL BOARDS WITH THE LDCC

In some GE applications, the LDCC can replace the drive control/LAN control board combination: 531X301DCC and 531X306LCC boards (DCC and LCC) for smaller or earlier large drives; DS200SDCC and DS200SLCC boards (SDCC and SLCC) for later large drives. The following guidelines should be used for this replacement:

(In this instruction, the term *(S)DCC* is used when either the SDCC or DCC board applies; the term *(S)LCC* is used when either the SLCC or LCC board applies.)

1. The LDCC can replace the (S)DCC and (S)LCC in all applications, except AC2000G, PCS2000, and TC2000 drives.

2. The EEPROM (U9) transfers directly from the (S)DCC to the LDCC, with full backward compatibility. (See *Replacing/Inserting EEPROM U9.)*

3. (S)DCC PROMs U11, U12, U22, and U23 and (S)LCC PROMs U6 and U7 cannot be transferred to the LDCC. The LDCC PROMs are already programmed for compatibility.

4. Although the PL (dual-row, plug-type) ribbon cable connectors on the LDCC have been rotated 180º from those on the (S)DCC, their pin orientation is the same. Therefore, plug all connectors into the LDCC in the same orientation as on the (S)DCC, **except for 11PL, which is a "keyed" connection**. (See the I/O tables in this section for the pin assignment.)

NOTE

When plugging the ribbon cable into the LDCC's 11PL connector (see Figure 1), rotate the ribbon cable 180º from the orientation that was used on the (S)DCC 11PL connector.

5. (S)LCC cable 2PL is not used on the LDCC, so should be taped off and secured safely out of the way.

6. The 3PL cable between the (S)DCC and (S)LCC is eliminated. However, in EX2000 applications:

   a. The 3PL cable running from the (S)DCC to the (S)LCC to the DS200TCCB board (TCCB) should be connected from the LDCC to the TCCB.

   b. Tape off the 3PL's (S)LCC tap and secure it safely out of the way.

7. Remove the (S)LCC's IOPL and ARCPL connection and connect it to the corresponding header on the LDCC in the same position and orientation.

8. LDCC jumpers have the same nomenclature and should be set identically as those on the (S)DCC and (S)LCC. (S)DCC jumper J23 was eliminated, but requires no additional configuration for the LDCC.

9. The Programmer module consists of a display cover and keypad. The module used with the SLCC does not fit on the LDCC, and must be ordered separately (see *Replacement Parts and Service*).

Before installing an LDCC board, refer to the instructions under *Procedure for Replacing Boards*.

REPLACING/INSERTING EEPROM U9

The LDCC's EEPROM U9 (see Figure 1) contains the drive's field-adjustable software parameters. This software can be transferred from an old LDCC or SDCC to a new LDCC by moving the chip.

CAUTION

To prevent damage to the EEPROM chip, make sure that it is properly oriented when inserting it into its socket.

Carefully remove the EEPROM chip (U9) from the old board and insert it into the correct socket on the new board.

If the same failure symptoms still exist, install the new EEPROM shipped with the new board. Program the new EEPROM by downloading the drive configuration from the software tools. (See the applicable drive configurator manual for procedures.)

REPLACEMENT PARTS

The LDCC has no fuses or other field serviceable parts. If it fails, it needs to be replaced as a unit.

The flash PROM software and the Programmer module are not included when ordering a spare or replacement LDCC board. The following components can be ordered separately, if needed:

Part Name	Part No.
Firmware (EEPROM U9)	DS200SDCCF0AAA (*AAA* is the revision no.)
Flash PROM software	DS200LDCCF
Programmer module	173C9250G2

OBTAINING REPLACEMENT PARTS AND SERVICE

To obtain a replacement board, part, or service assistance, contact the nearest GE Service Office.

Please have the following information ready to exactly identify the part and application:

- GE requisition or shop order number
- Drive serial number and model number
- Board number and description

WARRANTY TERMS

The *GE Terms and Conditions* brochure details product warranty information, including the warranty period and parts and service coverage.

The brochure is included with customer documentation. It may be obtained separately from the nearest GE Sales Office or authorized GE Sales Representative.

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