1	DS200DACAG1	TC/DC2000 AC/DC CONV.B	23	IS200TBTCH1C	THEROCOUPLE TERMINAL
2	DS200TCPDG2	POWER DISTRIBUTION M	24	IS200TPROH1B	TERMINATION BD.,PRO
3	IS200ACLEH1A	ACLE	25	IS200TREGH1B	TERM.BD.,TRIP EMER
4	IS200DSPXH1D	DRIVE DSP CONTROL CARD	26	IS200TRLYH1B	TERMINATION BD.,REL
5	IS200EBKPG1A	EXCITER CONTROL BACKPLANE	27	IS200TRPGH1B	TERM.BD.,TRIP PRIM
6	IS200ECTBG1A	TERMINAL BD -EX2100	28	IS200TRTDH1C	MARK VI,RTD TERMINA
7	IS200EDCFG1A	BOARD - EX2100 DC FEEDBACK	29	IS200TSVOH1B	TERMINATION BD.,SER
8	IS200EDEXG1A	CARD -EX2100 DE-EXCIT	30	IS200TTURH1B	TERMINATION BD.,TUR
9	IS200EGDMH1A	CARD -EX2100 GND DETE	31	IS200TVIBH2B	TERMINATION BD.,VIB
10	IS200EHPAG1A	GATE PULSE AMPLIFIER	32	IS200VAICH1D	VME ANALOG INPUT CARD
11	IS200EISBH1A	EXCITER IN-SYNCH-BUS	33	IS200VCRCH1B	CONTACTS IN,RELAYS
12	IS200EMCSG1A	CONDUCTION SENSOR PWA	34	IS200VRTDH1D	MARK VI,VME RTD CARD
13	IS200EMIOH1A	CARD-EX2100 MAIN I/O	35	IS200VSVOH1B	VME SERVO CARD
14	IS200EPBPG1A	EXCITER POWER BACKPLANE	36	IS200VTCCH1C	MARK VI THMRMOCOUPLE
15	IS200EPCTG1A	CARD-EX2100 EPCT EXC	37	IS200VTURH1B	VME TURBINE CARD//
16	IS200EPDMG1A	EX2100-PWR DIST MOD	38	IS200VVIBH1C	VME VIBRATION CARD
17	IS200EPSMG1A	EX2100-POWER SUPPLY	39	IS2020RKPSG2A	POWER SUPPLY/MARK IV/NO-
18	IS200ESELH1A	EX2100-SELECTOR CAR	40	IS2020RKPSG3A	POWER SUPPLY/MARK IV/NO-
19	IS200EXAMG1A	BOARD - EXCITER ATTENUATION	41	IS215UCVEH2A	VME CONTROLLER CARD-
20	IS200EXHSG3A	EXCITER H.S. RELAY DRIVER	42	IS215UCVEH2A-	VME CONTROLLER CARD-
21	IS200TBAIH1C	TERM, BOARD,ANALOG INPUT(*2)	43	IS215VCMIH2B	VME COMM INTERFACE C
22	IS200TBCIH1B	TERMIN.BD,CONTACT	44	IS215VPROH2B	VME PROTECTION ASSEM

EDCF Board

The EDCF board measures field current and field voltage at the SCR bridge and interfaces to the EISB board over a high-speed fiber-optic link. The fiber-optic link provides voltage isolation between the two boards, and high-noise immunity. Field current is measured using a shunt in the dc field circuit. The field voltage feedback circuit provides seven selector settings to scale the bridge voltage, depending on the type of bridge application. For more information refer to *Chapter 4* and *GEI-100464*.

Note EDCF handles bridge dc voltage and current feedback.

EACF Board

The EACF board measures the exciter PPT ac supply voltage and current. The EACF terminal board contains transformers for a 3-phase voltage measurement, and terminals for two Flux/Air core coils. The outputs of the voltage and current circuits are fanned out to three DB9 connectors for cables to controllers M1, M2, and C. These cables can be up to 90 m in length. There are three versions of this board, EACFG1 is for inputs up to 480 V rms, EACFG2 is for inputs up to 1000 V rms, and EACFG3 is used for inputs up to 1400 V rms. For more information refer to *Chapter 4* and *GEI-100465*.

Note EACF handles bridge ac voltage and current feedback.

Bridge and Protection Boards and Modules

The exciter bridge and protection boards are as follows:

- IS200EGPA Exciter Gate Pulse Amplifier board (EGPA)
- IS200EHPA Exciter Gate Pulse Amplifier board (EHPA)
- IS200EHFC 100 mm Fan Control board (EHFC)
- IS200EXCS Conduction Sensor board (EXCS or EMCS)
- IS200EDEX Exciter De-Excitation and crowbar board (EDEX)
- IS200EGDM Exciter Field Ground Detector Module (EGDM)
- IS200EXAM Exciter Attenuator Module (EXAM)

EGPA and EHPA Boards

The EGPA or EHPA board interfaces the control to the power bridge. The gate pulse amplifier board takes the six gate commands from the ESEL and controls the gate firing of up to six SCRs on the bridge. It is also the interface for current conduction feedback, and the bridge airflow and temperature monitoring.

Note Bridge control passes through EGPA or EHPA. One gate pulse amplifier board is required per PCM.

A nominal 125 V dc power source from EPDM supplies an on-board dc-to-dc converter that provides power for SCR gating over the full range of input supply voltage. LEDs provide visual indication of the status of the output firing, currents into the bridge, gate power supply, line filter, cooling fan rotation, and bridge temperature and alarm or fault conditions. EGPA card is used on all systems with 77 mm thyristors or smaller. The EHPA is used on 100 mm thyristors. For more information refer to Chapter 4 and GEI-100461 or GEI-100532.

EHFC Board

The EHFC board can be supplied to control cooling fans on the 100 mm EX2100. It can provide automatic start/stop control of a single power converter cooling fan, or lead/lag control of redundant power converter cooling fans. For more information, refer to *GEI-100548*.

EXCS Board

The EXCS board has four conduction sensors. It is used to detect the presence of current in the ac bus. The output is a logic signal. For more information, refer to *GEI-100510*. On 100 mm, a similar board EMCS is used.

EDEX Board

The EDEX board is the main board in the de-excitation module and is also used in the crowbar module. EDEX provides de-excitation SCR firing, conduction sense feedback of the de-excitation module, and voltage retention to ensure operation in the event of a power failure. EMIO initiates de-excitation on the EXHS board. The EXHS board opens the 41 dc contactor (41A/41B) or breaker, and then transfers de-excitation signals from the auxiliary contacts to SCR firing circuits on the EDEX. For more information refer to *Chapter 4* and *GEI-100466*.

Note EDEX is usually controlled by EXHS, but can initiate de-excitation if control fails.

EGDM or EROC Board

The EGDM or EROC is a double-slot, double height (6U) form factor board that mounts in the Exciter Power Backplane rack (EPBP). A simplex system typically has one EROC, while a redundant system has three EGDM boards. These boards detect field leakage resistance from any point in the field circuit of the generator to ground, either on the ac or dc side. The field ground detector applies a low frequency square wave to the sense resistor connected to the field circuit. EXAM, the attenuator module located in the auxiliary cabinet, senses the voltage across the ground resistor and sends the signal to the EGDM or EROC through a nine-conductor cable.

Note EGDM and EXAM work together to detect field ground leakage current.

In a redundant system, the set of three EGDM boards are configured as a Controller (C), Master 1 (M1) and Master 2 (M2). The configuration for each EGDM is controlled by a set of program pins on the P2 connector. The C controller receives information from the active DSPX on which EGDM master should provide the drive signal to the sense resistor in the attenuator module. The active master receives an oscillator signal over the fiber-optic link that it converts to a ±50 V signal. This is applied to one end of the sense resistor in the attenuator module.

The signal conditioner receives an attenuated (10:1) differential signal from the sense resistor. This is a simple unity gain differential amplifier with a high common-mode rejection ratio followed by an A-to-D converter (Voltage Controlled Oscillator VCO). This feeds a fiber-optic transmitter that is cabled to EISB. The signal conditioner circuitry is powered by an isolated power supply to maintain personnel and equipment safety due to the high common-mode voltage at the sense resistor. For more information refer to *Chapter 4* and *GEI-100467*.

EXAM Board

The EXAM mounts in the auxiliary cabinet and contains a sense resistor connected to a resistor network across the field. EXAM applies the low frequency ±50 V square-wave signal, supplied from the EGDM, to one end of the sense resistor. The resulting current generates a voltage across the resistor that is sent back to the EGDM.

In a redundant system, the test signal can come from either, M1 or M2. EXAM has a relay that switches between the two under the control of controller C. A single cable carries the control and sense signals between the EGDM and EXAM modules. For more information refer to *Chapter 4* and *GEI-100467*.

Alterrex applications may use two EXAM boards and two EROC boards to provide two simplex ground detectors. One is used for the exciter field circuit and the other is used for the generator field circuit.

Power Supply Boards and Modules

The exciter power supply boards are as follows:

- IS200EPDM Exciter Power Distribution Module (EPDM)
- IS200EPBP Exciter Power Backplane (EPBP)
- IS200EPSM Exciter Power Supply Module (EPSM)
- DACA Module

EPDM Module

The EPDM provides the power for the control, I/O, and protection boards. It is used in redundant control applications, and is mounted on the side of the EPBP. EPDM accepts a 125 V dc supply from the station battery, and one or two 115 or 220 V ac supplies. In simplex control applications, it is mounted on the side of the ESBP. All supply inputs are filtered. Each ac supply is rectified to 125 V dc in an ac-to-dc converter (DACA). The resulting two or three dc voltages are diode-coupled together to create the dc source supply, designated as P125V and N125V. With the center grounded, these voltages are nominally +62.5 V and –62.5 V to ground.

Note EPDM revision B or later is required to support 220 ac control power supplies. The DACA module must be set correctly for the supply voltage level.

Individual supply outputs to the exciter boards are fused. They have an on/off toggle switch, and a green LED indicator to display supply power availability. These outputs supply up to three EGPA boards, the EXHS board, and three EPSM modules serving the three controllers. Outputs are wired to the EPBP for distribution. For more information, refer to *Chapter 4*.

Note Any of the exciter power supply modules can be switched off from the EPDM.

Related Board Publications

For a more detailed description of each board's circuitry and application data, refer to the following documents:

- GEI-100267 IS200DSPX Digital Signal Processor Board
- GEI-100434 IS215ACLEH1 Application Control Layer Board
- GEI-100453 IS200EMIO Exciter Main I/O board
- GEI-100454 IS200EISB Exciter ISBus board
- GEI-100456 IS200ESEL Exciter Selector board
- GEI-100457 IS200ECTB Exciter Contact Terminal Board
- GEI-100459 IS200EPCT Exciter PT/CT board
- GEI-100460 IS200EBKP Exciter Backplane
- GEI-100461 IS200EGPA Exciter Gate Pulse Amplifier board
- GEI-100462 IS200EPSM Exciter Power Supply Module
- GEI-100463 IS200EPBP Exciter Power Backplane
- GEI-100464 IS200EDCF Exciter DC Feedback board
- GEI-100465 IS200EACF Exciter AC Feedback board
- GEI-100466 IS200EDEX Exciter De-Excitation board
- GEI-100467 IS200EGDM Exciter Ground Detector Module
- GEI-100475 IS200EXHS Exciter High Speed Contactor Driver board
- GEI-100509 IS200EXAM Exciter Attenuation board
- GEI-100510 IS200EXCS Exciter Conduction Sensor board
- GEI-100511 IS200EPDM Exciter Power Distribution board
- GEI-100526 IS200EROC Exciter Regulator Options board
- GEI-100532 IS200EHPA Exciter Gate Pulse Amplifier board
- GEI-100548 IS200EHFC Fan Controller board
- GEI-100601 IS200EMCS Exciter Conduction Sensor board