# Chapter 3 Printed Circuit Boards Overview

## Introduction

This chapter describes the EX2100 printed circuit boards and their operation. These boards fall into four functional groups; control rack boards including controller boards and I/O processors, I/O terminal boards, bridge control and protection modules, and power supply boards.

## Control Boards

The control boards are located in the control module. This module consists of the exciter backplane (EBKP) and the metal chassis that holds the boards (refer to the figure Control Module (Redundant)). In simplex controls applications, an ESBP backplane is used (refer to the figure Control Module (Simplex)). The control boards are as follows:

- IS200DSPX Digital Signal Processor control board (DSPX)
- IS215ACLE Application Control Layer Module (ACLE or ACLA)
- IS200EISB Exciter ISBus Board (EISB)
- IS200EMIO Exciter Main I/O board (EMIO)
- IS200ESEL Exciter Selector board (ESEL)
- IS200EROC Exciter Regulator Options (EROC) (simplex only)

### EBKP Backplane

The EBKP provides the backplane for the control boards and the connectors for the I/O terminal board cables. EBKP has three sections for controllers M1, M2, and C. Each section has its own independent power supply. Controllers M1 and M2 have the ACLE or ACLA, DSPX, EISB, EMIO, and ESEL boards. Section C only has the DSPX, EISB, and EMIO. Two overhead fans cool the controllers.

The upper part of the backplane contains DIN connectors for the plug-in control boards. The lower part of the backplane contains D-SUB connectors for I/O interface cables, and circular DIN connectors for keypad interface cables, power supply plugs, and test rings. Labels on the connectors in the figure *Control Module (Redundant)* refer to the boards and devices to which the cables are connected. For more information refer to *Chapter 4* and *GEI-100460.*

For more information refer to *Chapter 4* and *GEI-100434*.

**Note** ACLE or ACLA handles network communications and outer loop functions.

## EISB Board

The EISB is a communication interface board for the M1, M2/C controllers. ISBus is a high-speed communication bus used in many GE systems. The EISB provides communication between the three DSPX boards in M1, M2, and C. EISB receives and transmits fiber-optic feedback signals through the backplane connectors. It also communicates between the DSPX and the toolbox and keypad ports using RS-232C. EISB is a single-slot, 3U high module that is located in the backplane below the DSPX. From six fiber-optic connectors on the front cabinet, it accepts current and voltage signals from the generator field (and from the exciter if required) using Exciter dc Feedback Board(s) (EDCF). For more information refer to Chapter 4 and GEI-100454.

**Note** EISB manages all the fiber-optic communication in the cabinets.

## EMIO Board

The EMIO is a single-slot, double height VME-style board, that manages the I/O from the EPCT, ECTB, EACF, and EXHS terminal boards. The I/O includes PT and CT signals, contact inputs, output relay drivers, and pilot trip relay drivers. It also sends logic level gate pulse signals over the backplane to the ESEL board, which sends them to EGPA or EHPA in the power conversion cabinet. For more information refer to *Chapter 4* and *GEI-100453*.

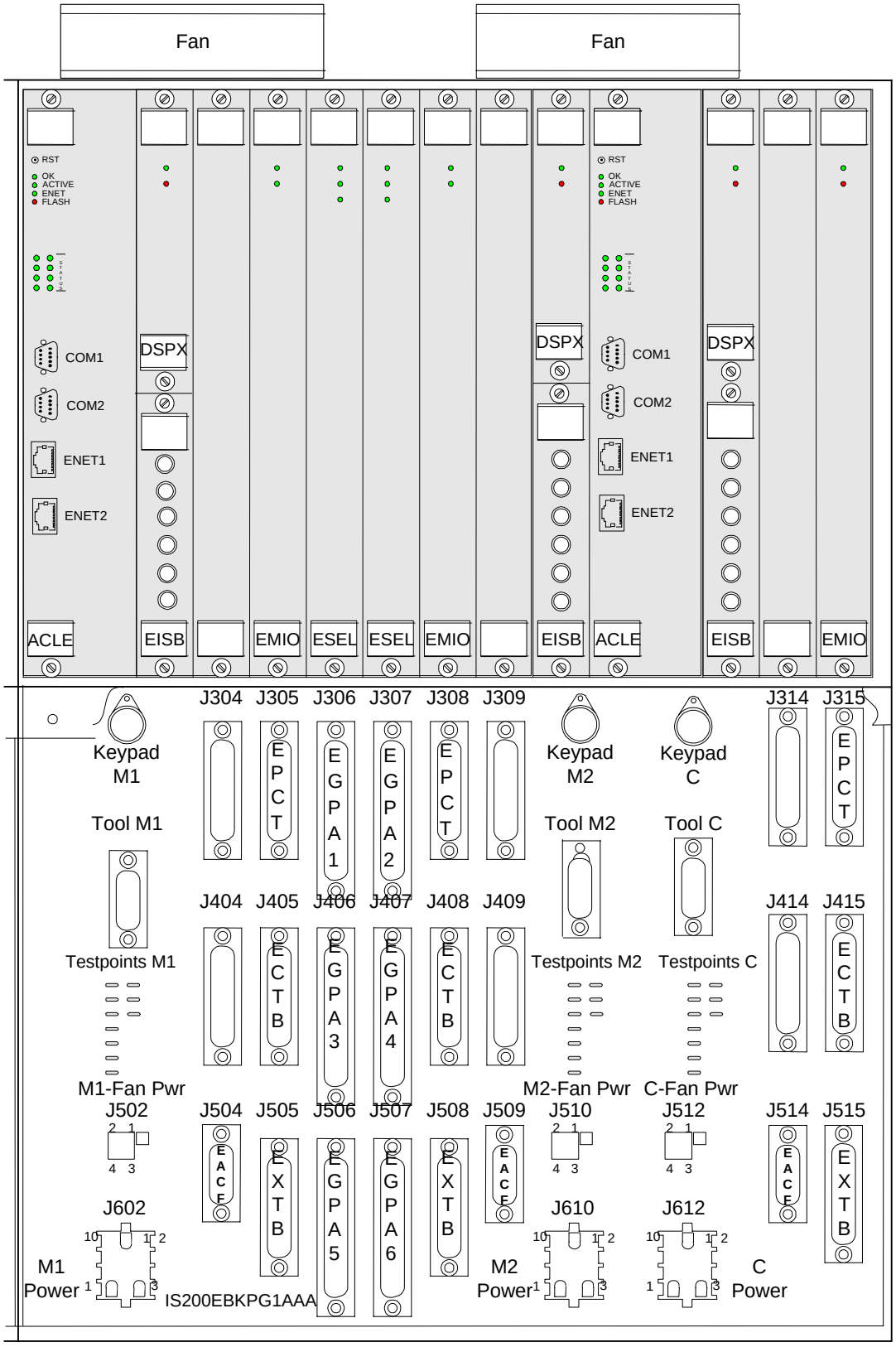
## ESEL Board

The Exciter Selector board receives six logic level gate pulse signals from its corresponding EMIO. These pulse signals drive up to six sets of cables, which are distributed, to the EGPA or EHPA boards. The gate pulse amplifier boards are mounted in the power conversion cabinet. If there are redundant controls, two ESEL are used, one driven by M1 and the other by M2. The active ESEL, selected by controller C, sends the necessary control signals to the gate pulse amplifiers.

Three groups of ESEL boards are available supporting increasing redundancy levels. ESELH1 contains a single bridge driver used on single bridge and warm backup applications, ESELH2 contains three bridge drivers used on 100 mm two bridge n+0 and 3 bridge applications, and ESELH3 contains six bridge drivers used on all 100 mm 4 bridge applications. For more information refer to *Chapter 4* and *GEI-100456*.

## EROC Board

The Exciter Regulator Options board is a single-slot, 6U high card mounted in the left most slot of the simplex control module card rack. In a simplex control rack, the EROC will provide the ground detector oscillator output and sensing voltages as described for the EGDM board. It interfaces with the EXAM board and sends information to the DSPX for ground detector functions. The EROC also provides the serial interface for the Control Systems Toolbox (toolbox) and the keypad interface connection. For more information refer to *Chapter 4* and *GEI-100526*.




*Control Module (Redundant)*