

Channel Interface Cards for TMS-3000 Systems

Introduction to CIC Modules

Channel Interface Cards (CIC) are installed in one more slots of the TMS-3000 Main Shelf to connect channel cards in an TMS-3000 Expansion shelf, a TMS Compact, or the OCM2000. The CIC also interfaces with the 16.896 MHz Fast Bus which carries controls and data between CICs and other common modules in the node. The CIC is also responsible for frame calculation, channel control, and communication with the ESCCs and RCCs.

CIC firmware has the minimum code required for node initialization, and contains all the circuitry necessary to control, frame, multiplex, and demultiplex up to 64 channels onto the Fast Bus (58 for TMS Compact). All other code is stored, downloaded, and verified by the TMS-3000 Controller. As upgrades become available, the controller downloads new module firmware via the ESCC.

Table 1: CIC Types

CIC Module Type	GDC Part No.
CIC-II	036M304-003

Flexible & Scalable

A CIC card can connect up to four expansion shelves mounted under the Main Shelf in order to achieve voice and data channel capacity at the node. Each expansion shelf holds 16 channel cards and two Expansion modules. The expansion shelf number and channel slot number comprise a unique number (from 1 to 64) for each channel communicating to a single CIC. To expand channel capacity, CIC cards can connect additional expansion shelves in adjacent racks. Ribbon cables and Flex Cards connect the CICs to their associated expansion shelves.

Data Paths & Bandwidth

TMS-3000 transfers TMS class data by creating a path from a channel card through the CIC and across an aggregate path. Data arrives at the other node's CIC, and then the destination channel card. A CIC requires a destination address for each bit of transmit data from a channel card. [Figure 1](#) shows data paths in a two-node TMS system.

Bandwidth & Overhead

A fraction of the node's total bandwidth is allocated to each CIC: 1.056 MHz or 2.112 MHz. This will be the rate at which the CIC exchanges data with ACCs or other CICs at the node. When 1.056 MHz is selected, 32 kHz of bandwidth is allocated toward overhead data. When 2.112 MHz is selected, 64 kHz of bandwidth is allocated toward overhead data.

Channel Select

The CIC selects transmit data from up to 64 channel cards as often as required to ensure that data does not overflow in any channel card buffer. The CIC also contains a routing table, which indicates where data bits and controls are to be transferred (to a local circuit or to an aggregate to another node).

Bit Select

At the destination node, the bit is placed on the node Fast Bus with a destination address that specifies a CIC. The addressed CIC accepts the bit from the Fast Bus, determines whether it is a data or control bit, and distributes the bit to the channel card specified by the destination address.

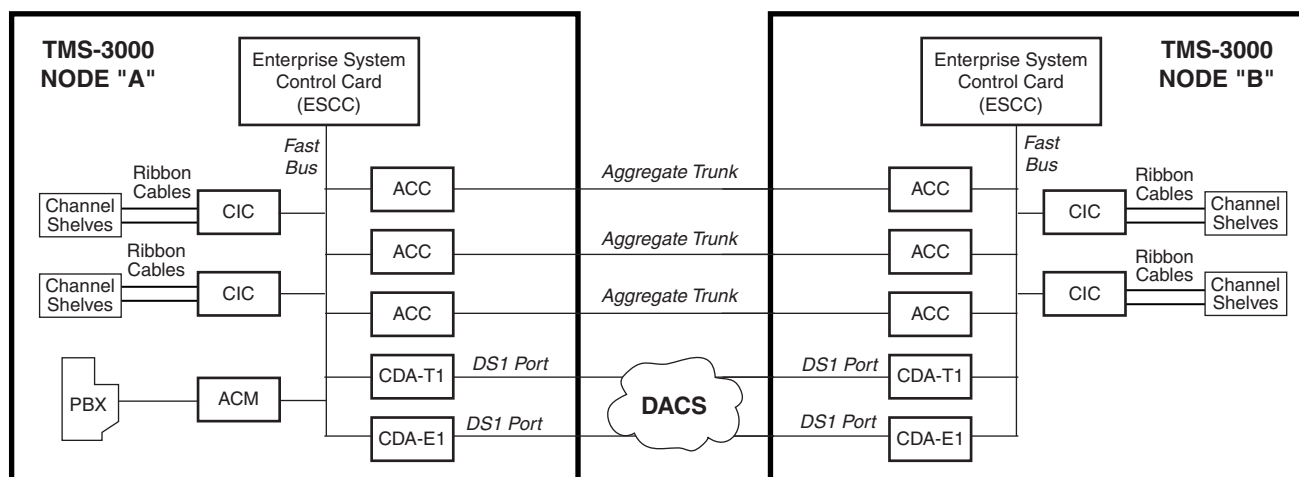


Figure 1: Data Paths in a Typical TMS-3000 System

Redundancy & Diversity

The CIC provides redundancy capabilities, in conjunction with the ESCC and RCC common modules. The ESCC determines the redundant status of each redundant pair of CIC modules. This status is transferred to the RCC on a regular basis, or whenever conditions warrant a redundant switch for some pair.

Redundancy is under the direct control of the RCC which determines if a second CIC card is present in each of the paired slots. If only one CIC is present, or if it is configured for nonredundant operation, that card remains in service. In a redundant application, primary and secondary CIC modules are installed in paired slots and are fully operational.

If a major alarm condition occurs requiring a CIC switchover, the ESCC signals the RCC to switch between the primary and secondary CICs until the system is fully operational again. During a redundant switchover, there is minimal data loss. The CIC itself controls redundant switching of the Expansion module in its connected Expansion Shelf.

[Table 2](#) below details the aggregate and channel capacity of a TMS node with intermixed aggregate and channel interface cards. Additional TMS nodes may be added to increase capacity as needed.

Table 1: TMS-3000 Redundant Configurations

Active Aggregate Ports	ACCs	Channels Traveling over Aggregates	CICs	Local Channels
0	0	0	16 (8 RDN Pairs)	512
1	2 (1 RDN Pair)	127	14 (7 RDN Pairs)	448
2	4 (2 RDN Pairs)	254	12 (6 RDN Pairs)	384
3	6 (3 RDN Pairs)	381	10 (5 RDN Pairs)	320
4	8 (4 RDN Pairs)	508	8 (4 RDN Pairs)	256
5	10 (5 RDN Pairs)	635	6 (3 RDN Pairs)	192
6	12 (6 RDN Pairs)	762	4 (2 RDN Pairs)	128
7	14 (7 RDN Pairs)	889	2 (1 RDN Pair)	64
8	16 (8 RDN Pairs)	1016	0 (0 RDN Pairs)	0

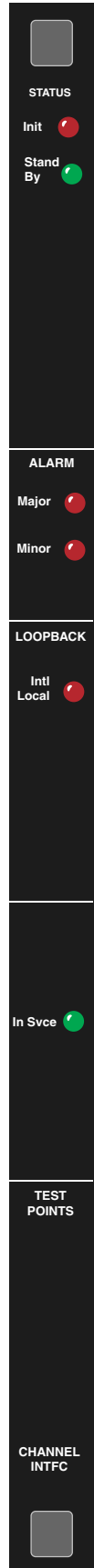


Figure 2: CIC Front Panel