# Digital Compression Card
# Operation Manual

Channel Card for the Series KMX 9000





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## STATUTORY NOTICES

**APPROVALS**

The safety status of the backplane connector is SELV.

CE

Case Communications Ltd declare that this product conforms with the protection requirements of Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic protection.

This equipment has been tested using shielded cables supplied by Case Communications Ltd. These cables, or equivalents, must be used to ensure compliance with this declaration.

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All PCB assemblies contain Electrostatic Sensitive Devices (ESDs) which may be permanently damaged if incorrectly handled. This equipment must be handled in accordance with BS5783 code of practice for the handling of electrostatic sensitive devices.



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# Digital Compression Card

## 1. General Description

The Digital Compression Card is a channel interface card for installation in the Series KMX 9000 range of TDM multiplexers. This manual assumes that the user is familiar with the control of the Series KMX 9000 multiplexers and installation procedures for channel cards. This manual applies to DCC cards fitted in 9240 series multiplexers fitted with TLM/QLM firmware V3.10 or later. Refer to the Series KMX 9000 multiplexer manual (part number X729-300051) for further details.

The DCC card must *not* be used in the 9220 multiplexer due to excessive heat dissipation. A maximum of seven cards may be fitted in a 9240 series chassis which must have two fully operational power units fitted and the ejector cover plate correctly installed.

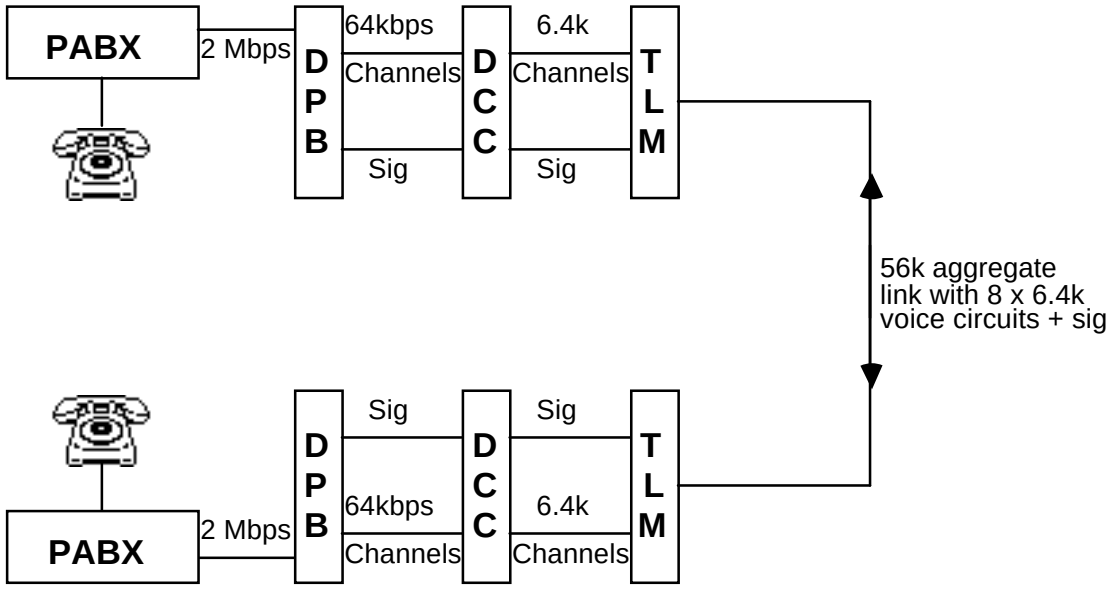


**Figure 1-1 Typical Application**

The DCC (Digital Compression Card) provides CELP speech compression for 64kbps PCM channels from the DPB, Digital PBX interface card. The resulting compressed voice channels can be passed over 64kbps aggregates via the aggregate link module (TLM/QLM).

The DPB card is described in the DPB Operation Manual (part number X729-301051).

Two versions of the DCC are available: one which provides speech compression at 4.8kbps and 6.4kbps; and the other, the Enhanced Digital Compression Card (EDCC) which provides speech compression at 6.4kbps and 9.6kbps. Three channel formats are available for both the DCC and the EDCC of either 4, 6 or 8 channels. In this manual references to DCC apply to both the DCC and the EDCC.

The card is capable of decoding Group 3 fax tones in the 64kbps PCM data, and digitally transmitting the fax data across 9.6k or 6.4k channels. Fax transmission will not function with 4.8k compressed channels.

The CELP speech compression algorithm and the method used for the transmission of fax data on this card are the same as that used on other Series KMX 9000 compressed voice cards, therefore a DCC at one end of an aggregate link will inter-work with a compressed voice card operating at the same compression rate at the other end.

CAS signalling is supported by the DCC. CAS in timeslot 16 is converted to signalling 'on' and 'off ' states by the DPB and passed to the DCC. The signalling data is transmitted and received from a remote DCC or a compressed voice card in message form via the TLM/QLM. If the remote channel card is a compressed voice card (eg. TVF or QVF) the signalling will be presented as E & M signals, or as AC15 tones.

CCS signalling from the DPB will be passed transparently across the aggregate link at 64kbps to the remote PBX if the DPB is fitted with firmware V2.1.01 or later, and the TLM/QLM is fitted with firmware V3.20 or later.

Note, if CCS is used, then the remote target must be a DCC/DPB combination (not TVF/QVF etc.).

## Tandem Working

To avoid multiple compression/de-compression occurring when a call is 'tandemed' through more than one DPB/DCC link, a tandem bypass facility is provided.

Tandem bypass facilities are automatically supported at all rates provided the gain of the digital voice path through the PBX in both directions is unity, i.e. a transparent 64k PCM connection.

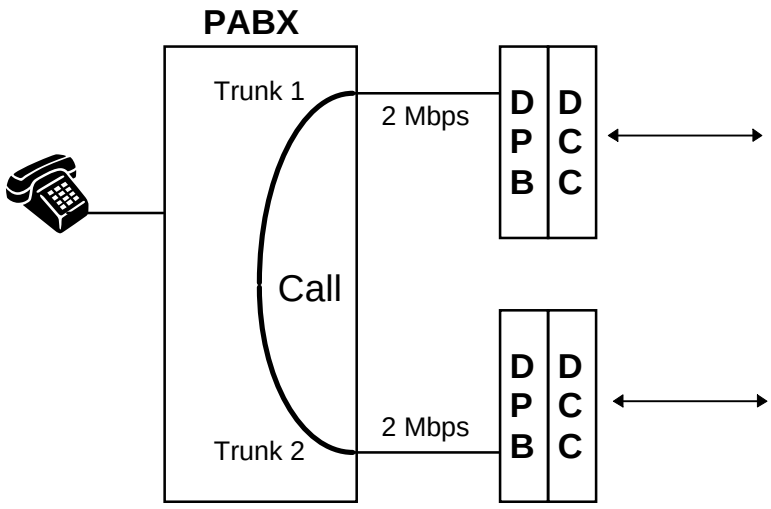


**Figure 1-2 Typical Tandem Call Routing**

The drawing in Figure 1-2 shows a call received by the PBX on trunk 1 which is then re-routed out on a separate timeslot to another DCC channel. The DCC channels will detect that the call is being routed via a unity gain circuit and so pass the call digitally through the PBX without any local compression/de-compression. No additional quantisation distortion is introduced.

The tandem bypass facility is normally disabled in order to prevent potential problems where transparent channels (unity gain) have not been provided. Tandem by-pass can be enabled by removing R20 from the DCC printed circuit board.

## Fax

The DCC supports 'Group 3 Fax' which is automatically detected, demodulated and carried to the remote end digitally for regeneration. After call clear down, the card will default to compressed voice operation.

Fax operation is supported when set to 9.6kbps or 6.4kbps.

When operating on a 9.6kbps speech channel, the DCC supports:

- Group 3 fax machines with V.29 and V.27ter image transfer capabilities.
- Fax operation according to the ITU-T T.30 (1988) protocol with 300bps V.21 channel 2 signalling and V.29 image transfer at 9600bps and 7200bps.
- Fax operation according to the ITU-T T.30 (1988) protocol with 300bps V.21 channel 2 signalling and V.27ter image transfer at 4800bps and 2400bps.

- The optional T.30 error correction mode of operation.
- Automatic support of fax fallback speeds, without need to change speech channel speed.
- Support of standard (100 x 200 dpi) and fine (200 x 200 dpi) resolution for fax transmission.

When operating on a 6.4kbps speech channel, the DCC supports:

- Group 3 fax machines with V.29 and V.27ter image transfer capabilities.
- Fax operation according to the ITU-T T.30 (1988) protocol with 300bps V.21 channel 2 signalling and V.27ter image transfer at 4800bps and 2400bps.
- Automatic support of fax fallback speeds, without need to change speech channel speed.
- Support of standard (100 x 200 dpi) and fine (200 x 200 dpi) resolution for fax transmission.

The DCC will *not* support:

- Proprietary or non-standard feature operation, allowed via the NSF frame within T.30.
- 2400bps binary coded signalling.
- T.2 (Group 1) and T.3 (Group 2) operation.
- Tandem links that have satellite delay in both legs of the tandem link.

# 2. Specifications

## 2.1 Compressed Voice Channel

### Channel Delay

The channel delay for a compressed voice circuit is 80ms (40ms for a compression at the local end, plus 40ms for expansion at the remote end).

### VF Interface

64kbps A-law encoded speech via the KMX 9000 backplane to the locally connected DPB.

### Signalling Interface

Interface to the local DPB via the KMX 9000 backplane.

### Signalling Distortion

CAS information is transmitted within the TDM supervisory channel. The dial pulse strings are sampled, transmitted and normally re-timed with a pulse rate of 10pps and a make:break ratio of 34:66, 40:60 or 50:50. Other rates and ratios can be incorporated to special order.

Received signalling pulse widths are handled by the DCC as follows:

1. All pulses greater than 10ms are passed.
2. Make/break pulse tolerance is ± 20% of the nominal value e.g. ±20% of 34ms make pulse.
3. Minimum inter digit pause = 230ms.
4. Minimum clear down = 230ms.
5. Pulses between 10ms and 228ms that are neither a make or break pulse are transmitted transparently.

Signalling pulses are transmitted by the DCC as follows:

1. Make/break pulses are dialled at their nominal value (e.g. 34:66).
2. Inter digit pause = 800ms (min).
3. Clear down = 300ms (min).

### Voice Encoding Technique

VQ-CELP (Vector Quantised - Codebook Excited Linear Predictive).

### Voice Data Rate

Selectable to be: DCC 4800 bps or 6400 bps.

EDCC 6400 bps or 9600 bps.

### Overall Gain

Tx and Rx gain = 0dB

### Channel Busy Out

A voice channel will busy out automatically if:

power is lost

or the channel is not configured

or reliable communications with the remote channel cannot be maintained.

### Quantisation Distortion

3 qdu @ 9600bps )
5 qdu @ 6400bps ) Estimates subject to CCITT ratification
7 qdu @ 4800bps )

## 2.2 Loops

The cards can be instructed from the front panel to provide loops on all available voice channels. Loops can be applied or removed individually on a channel by channel basis.

The channel loop is bi-directional.

Data emanating from a remote voice channel or BERT channel is reflected back to its distant source, similarly locally encoded voice data from the DPB is reflected back.

Echo cancellors are not disengaged when loopbacks are activated, and hence continuous tone testing of a looped circuit will not result in the reflection of clean tones.

## 2.3 Power Consumption

8 channel card - 18 Watts

6 channel card - 14 Watts
4 channel card - 9 Watts

Note: Care must be taken not to exceed the rating of the chassis power supply. Refer to the power calculator in the Series KMX 9000 multiplexer manual.

## 2.4 Environmental

Operating Temperature: 5 to + 40$^{o}$C.

Humidity: 5 to 95% non condensing at + 40$^{o}$C.

## 2.5 MTBF

The MTBF calculated to HRD4 is as follows:

| 8 channel card | 6 channel card | 4 channel card |
|---|---|---|
| 7.0 years | 9.5 years | 14.5 years |

# 3. Card Restrictions

Features normally associated with a specific fax machine manufacturer or model (NSF Non Standard Features) are not supported. Any NSF requests are absorbed by the card and are not transmitted to the remote fax machine.

Fax T30 protocol transfers at 2400bps are not supported. All T30 protocol transfers will be forced to operate at 300bps.

Operation over satellite circuits is possible with certain fax machines only, this is due to the nature of T30 inter-protocol timeouts allowed in the ITU-T recommendation.

Tandem fax operation will need to be verified on a machine by machine basis. This should be organised via your supplier.

# 4. Configuring the DCC

Configuration of the DCC is controlled from the multiplexer front panel menu.

When a DCC channel is selected in the modify configuration menu, the channel type will be displayed as LBFX since the channel supports both voice and fax operation. The following selections are made from the configuration menu:

## 4.1 Data Rate

The option of two speeds will be presented for the voice compression depending on the version. These are 9.6k and 6.4k for the EDCC and 6.4k and 4.8k for the DCC. If 0k is selected, the channel will be removed from the configuration.

## 4.2 Remote Address

Select either a physical channel number for the remote address, A1 to H8, or a midpoint channel, 65 to 96, if mid-pointing is required at the remote end.

## 4.3 Dial Pulse Rate and Make/Break Ratio

Only one selection is currently available for the pulse rate, this is 10pps.

Currently there are three options available for the make/break ratio, these are 36:64, 40:60 and 50:50.

## 4.4 Allocation of DCC Channels to 64kbps Timeslots

The DCC may be fitted into any channel card position in the chassis. The allocation of DCC channels to 64kbps timeslots on the 2Mbps streams connected to the DPB is controlled by the DPB menu.

# 5. Links

There are 3 links on the card. These must be left in the following positions:

| | |
|---|---|
| JP1 (WDOG) | position 1-2 |
| JP3 (VPP) | position 1-2 |
| JP4 (LCA2) | position 1-2 for 6 and 8 channel cards |
| | position 2-3 for the 4 channel card |

# 6. LED Indicators

The DCC has one green LED indicator and eight yellow LED indicators, one for each channel.

The green LED indicates the card status and also illuminates the card type indicator:

8C for the 8 channel DCC card

6C for the 6 channel DCC card

4C for the 4 channel DCC card

E8 for the 8 channel EDCC card

E6 for the 6 channel EDCC card

E4 for the 4 channel EDCC card

The green LED will be permanently illuminated when the card is inserted and self test is passed. The LED will flash if self test fails.

The yellow LEDs indicate the signalling state of the channels and they will be illuminated if either the signalling input or output is in the busy condition.

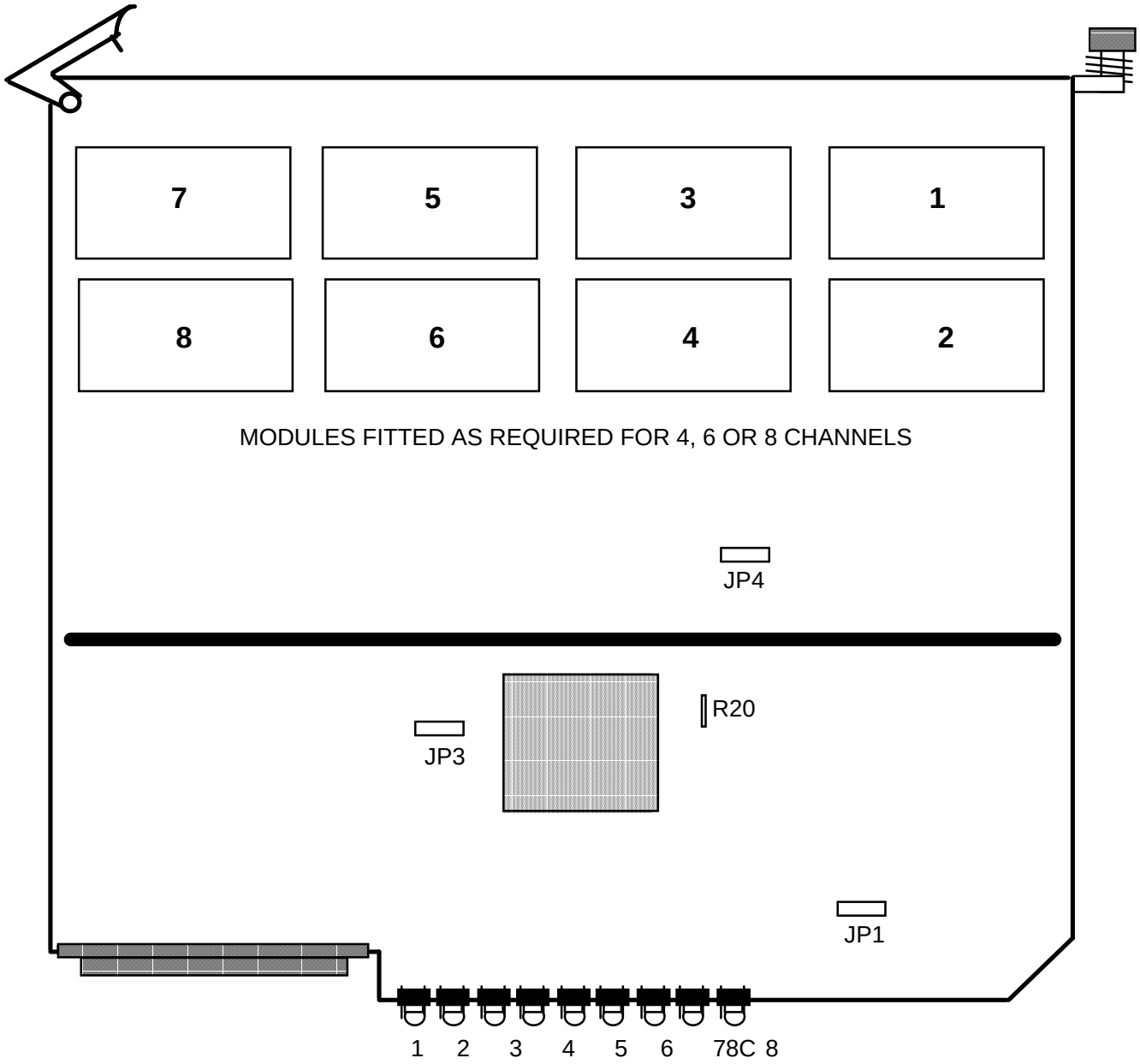


**Figure 1-3 Eight Channel DCC Board Layout**