# E&M Voice Cards

## Features

- **Two different E&M voice cards for cost-effective deployment.**
- **Supports Type I, II, IV & V or transmission only (TO) operation.**
- **Robust diagnostic evaluation and fault isolation through extensive loopbacks and test tone selection.**
- **Encodes analog signals into 64 Kbps PCM format for connection to digital networks.**
- **Ability to specify, on a port-by-port basis, North American ANSI standard AB signaling or ITU (CCITT) ABCD signaling.**
- **Compatible with all IMACS voice compression server cards.**
- **Extended range options for long line connectivity.**

E&M cards can be installed in any of the user slots of the IMACS chassis. E&M cards encode the incoming analog voice signals into 64 Kbps PCM format before transmission onto the network. E&M cards can use the voice-compression features of the ADPCM card.

Each E&M card provides a single 50-pin female Amphenol connector (RJ27X). Both cards support E&M signaling types I, II, IV, and V.

Most port parameters are software selectable on a port by port basis including the mode of each port ("e&m", "e&mR2" or "to"), the PCM coding to be used ("u-law", "a-law" or "a-inv" for inverted a-law), the trunk conditioning ("busy" or "idle") to be applied towards the attached equipment should the WAN facility that the port is connected to fail.

The user may also specify, on a port-by-port basis, whether to use North American ANSI standard AB signaling (which is the default) or ITU (CCITT) ABCD signaling by turning the signaling conversion setting "on" or "off".

Software-initiated testing and diagnostics supported on E&M cards include the setting of both analog ("anlg") and digital ("dgtl") loopbacks towards the network and the generation of a digital milliwatt signal on a port-by-port basis. A robust set of test functions allows the user to monitor and set the state of the analog E and M leads of any port and to set and monitor the state of the ABCD signaling bits of the digitized voice signal. In cross-connect systems, the test functionality also includes the ability to generate test tones ("300Hz", "1 kHz", "3 kHz" and "quiet") and transmit those toward either the user side or the network side of the system.

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|---|---|---|---|
| **Card Specification** | Number of Ports | 8 | |
| | Physical Interface | 1 female 50-pin RJ-27X telco connector | |
| | Transmission Performance | Exceeds requirements of ITU-T G.712 (4-wire) and ITU-T G.713 (2-wire). | |
| | Signaling | | |
| | Signaling types | Switch selectable per card | types I, II, IV, & V<br>normal (toward user) and trunk/tandem (toward CO) |
| | Signal modes | Software selectable per port | Transmit only (TO)<br>Standard type I, II, IV or V E&M (E&M)<br>Symmetrical R2 signaling (E&M R2)<br>Modified R2 (R2 Mod) |

**VF transmission characteristics**

| | | |
|---|---|---|
| Nominal transmit/receive TLPs | 2 Wire (810860) | 4 Wire (811960) |
| | TX TLP -16.3dB to +7.5dB | TX TLP -17.5dB to +14.5dB |
| | RX TLP -16.3dB to +7.5dB | RX TLP -16.3 dB to +7.5dB |
| Termination Impedance: | 810860: Termination 900ohms/2.15uF | 811960: 600ohms |
| PCM encoding | Software selectable Mu-law A-law A-law bit inverted | |
| Attenuation versus frequency | As per ATT TR43801; relative to 1 kHz with 0 dBm0 input | |
| Frequency response | 300-3khz <-0.15, +0.15dB, typical 0.05dB; 3200hz <-0.75dB, typical 0.07dB<br>3400hz <-1.5dB, Typical 0.4dB | |
| Return Loss | Against 600ohm in series with 2.16 uF with additional 25ohm resistor between the channel unit and the return loss measurement set. | |
| 4W Return loss (at 1 kHz): | >20dB | typical > 27dB |
| 2W Return loss (at I kHz): | >15dB | typical > 20dB |
| | Relative transhybrid loss against 600ohm in series with 2.16 pF termination. | |
| | ERL 34.5dB SRL LO 20.5dB | SRL HI 20.5dB |
| Idle channel noise (rcv and xmt): | <-65 dBmop typical <-70 dBmop or < 20 dBmop <20 dBmop | |
| Interchannel Crosstalk | Typical <-75 dBm0 using 7 adjacent channels being disturbed with a signal of 0.0 dBm0 | |

Total distortion including quantization (signal to distortion ratio) input frequencies 1004-1020 Hz:

| Input Level | Rcv or Xmt | Overall |
|---|---|---|
| -30 to 0 dBm0 | >35dB | >33.9 dB |
| -40 dBm0 | >29dB | >27.6dB |
| -45 dBm0 | >25 dB | >23 dB |

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|---|---|
| Absolute group delay | < 600 microseconds |
| Group delay distortion vs. frequency: | Within boundaries of ITU-T Rec.G712 figure 2 |
| Longitudinal Balance | >46 dB Typical > 50 dEl |
| Variation of gain with input level | Within boundaries of ITU-T Rec. G713 figure 7(2 wire)<br>Within boundaries of ITU-T Rec. 0.712 figure 7(4 wire)<br>Typical gain variation is within +0.25 dEl from +3 to -50 dBm0 |
| Diagnostic capabilities | Analog loopback and digital loopback<br>Extensive support for test tone insertion, termination, and signaling lead set and monitor. |
| Trunk Conditioning | Idle or busy |
| **Standards Compliance** | Bell Systems TR43801, EN 60 950/Al, ITU-T G.711, ITU-T G.712, ITU-T G.714, FCC Part 68, FCC Pant 15-Subpart J. |
| **Product Numbers** | 810860 - 2-wire, 8 port, stainless steel faceplate<br>811960 - 4-wire, 8 port, extended range. stainless steel faceplate, CE marked in TO mode only. |

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| **Physical Specification** | Card height | 8 inches (20 cm) | |
| | Card width | 15/16 inches (2.35cm) | |
| | Card depth | 71/2 inches (18.75cm) | |
| | | Model 8l0860 | Model 811960 |
| | Power consumption | 1.1 Watts | 1.75 Watts |
| | BTU/hr | 3.75 | 5.97 |
| | Operating temperature | 0 to 50C, 32 to 122 F | |
| | Storage temperature | -20 to 80 C, -4 to 176 F | |
| | Humidity | 0 to 95% humidity, non-condensing | |
| **IMACS Platform** | IMACS chassis | 891630 IMACS 600, 891830 MACS 800, or 891930 IMACS 900 | |
| | Control CPU card | 880460 bus-connect or 880370 cross-connect CPU | |
| | System Host Code | 3.6 & 6.0 or later | |
| | Interface card | | |
| | Release 3.6 | 892060 & 892560 | |
| | Release 6.0 | 892260, 892360 & 892460. | |
| | Power supply options | In TO mode, 8901 AC or 890220 DC<br>For E&M types I, II, IV and V requires 8901 with 8905/8906 (voltage converters) or 890220 DC | |