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C10 amplifier isolated buffer

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C10 AMPLIFIER ISOLATED BUFFER

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Background:

A 1:2 isolation/fanout buffer has been designed to isolate the C10 Pre-Amp from the remote monitoring systems using its output. Currently, the spill servo system, AGS video and MCR use the "raw" pre-amp output, and in the past this has created ground loop problems. Now, it is desired to supply the Siemens with this signal as well. Since a new grounding system would be introduced, it was decided to provide separate and isolated outputs for the systems using the C10 signal. Therefore the 1:2 isolation/fanout buffer (Fig. 1) was constructed and installed in the TBH-East rack. The amplifier design is a two-port non-inverting unity-gain isolation amplifier. One output will drive a signal to the terminal room "55-Board" for use with the spill servo, AGS video, and MCR monitoring while the other output will drive a signal to the Siemens (Fig. 2).

Design and Construction:

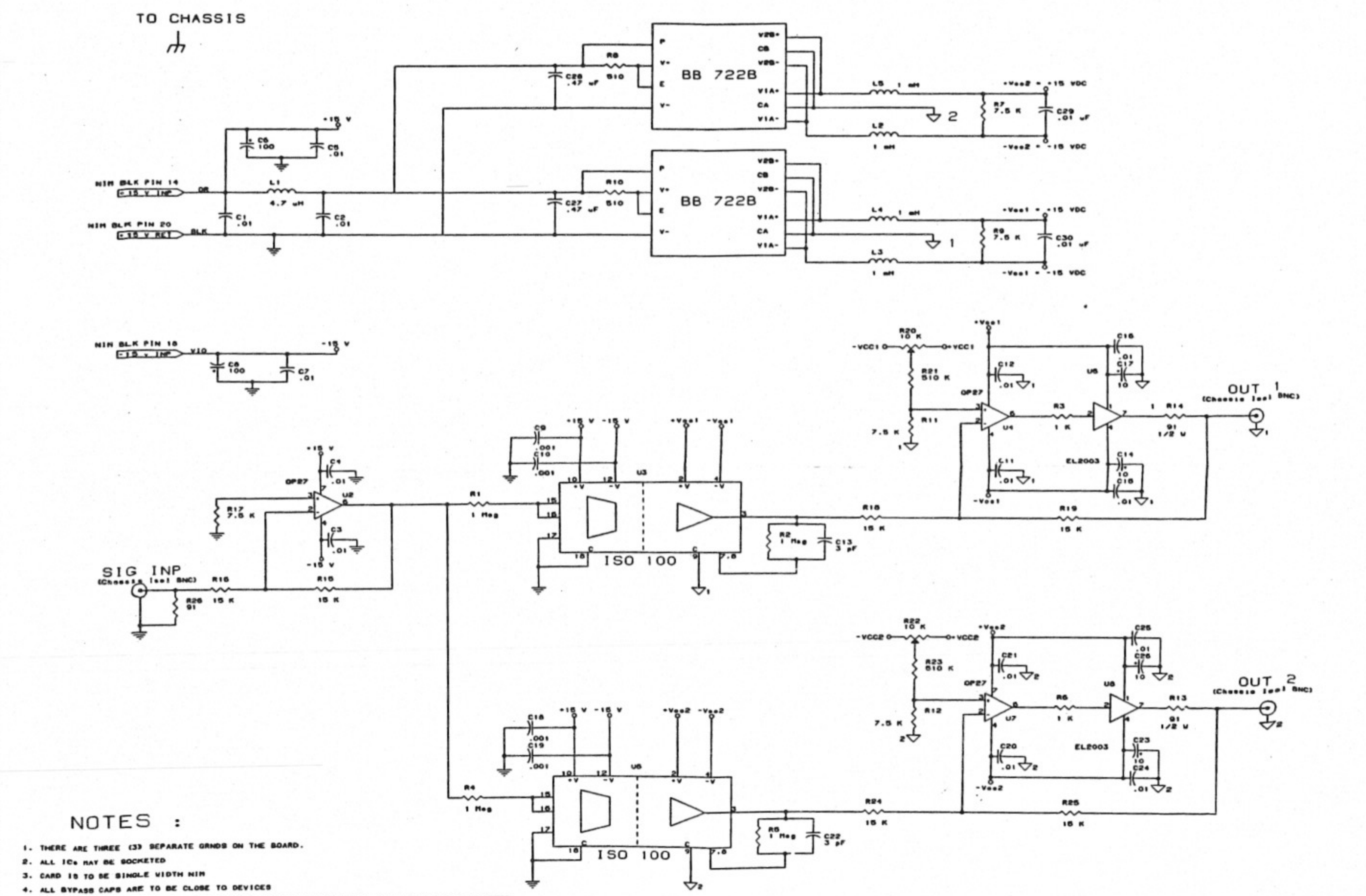
The input signal is connected to the first stage via a chassis isolated BNC. This keeps the local chassis grounds from contaminating the signals. The input stage is an inverting unity-gain stage. The first stage output is then split into two channels.

Each channel is isolated by a Burr-Brown ISO100 configured as a non-inverting unity gain stage. The 1 Meg resistors are required so that the ISO100 can provide a full $\pm$ 10 V swing. The capacitor in the feedback loop of the ISO100 compensates the frequency response for input capacitance on the output stage of this device. The ISO100 limits the circuit's nominal small-signal bandwidth and slew rate to 60 KHz and .3 v/µs respectively. However, the full power bandwidth of the circuit is 5 KHz. Additionally, because the ISO100 has a large offset, the next stage has incorporated DC offset correction.

This stage corrects the DC offset by summing a small DC voltage derived from a pot into the signal path. The offset is trimmable to $< \pm 1$ mV after initial warm-up. The warm-up period is approximately 2 hours, and this time is required so that current sources internal to the ISO100 have stabilized. The output during warm-up is shown in Fig. 3. The output summing amplifier uses an Elantec 2003 as a current booster and cable driver. To maintain approximately unity gain, it is recommended to load the amplifier with 5.1 Kohm. However, a high impedance load and the capacitive nature of the output cabling may cause the circuit bandwidth, as measured across the load, to degrade. In this case a matched load of 91 ohms is recommended. In this case the maximum output swing is limited to $\pm$ 5 V to avoid saturating the output stage. At the output, the noise in the DC-100 KHz band is 2.5 mV (rms) into a 1 Megaohm load.

The 722s were chosen because their switching frequency is out of the ISO100s bandwidth. Lower frequency power supplies were tried, but the ISO100 merely amplified the noise on the supply pins at the output. Like the inputs, the outputs are available on isolated BNCs.

The only special notes for construction is to preserve good grounding practices and follow the manufacturers data sheet recommendations for both the ISO100 and 722s.



NOTES :

1. THERE ARE THREE (3) SEPARATE GRNDS ON THE BOARD.
2. ALL ICs MAY BE SOCKETED
3. CARD IS TO BE SINGLE WIDTH NIM
4. ALL BYPASS CAPS ARE TO BE CLOSE TO DEVICES
5. ALL CAPACITORS, RESISTORS AND INDUCTORS ARE IN uF, OHMS AND uH UNLESS OTHERWISE NOTED

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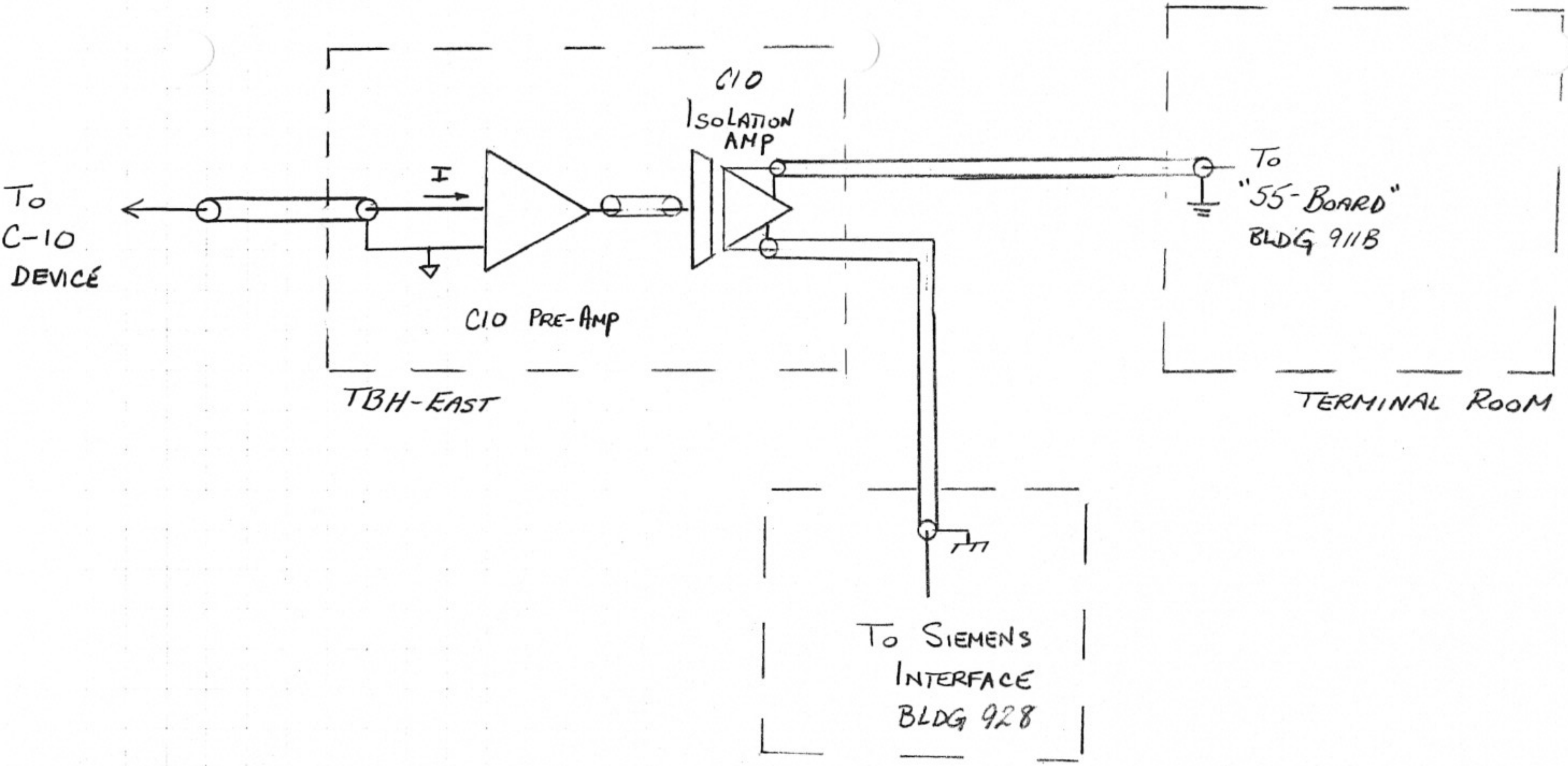

FIGURE 2: SYSTEM OVERVIEW

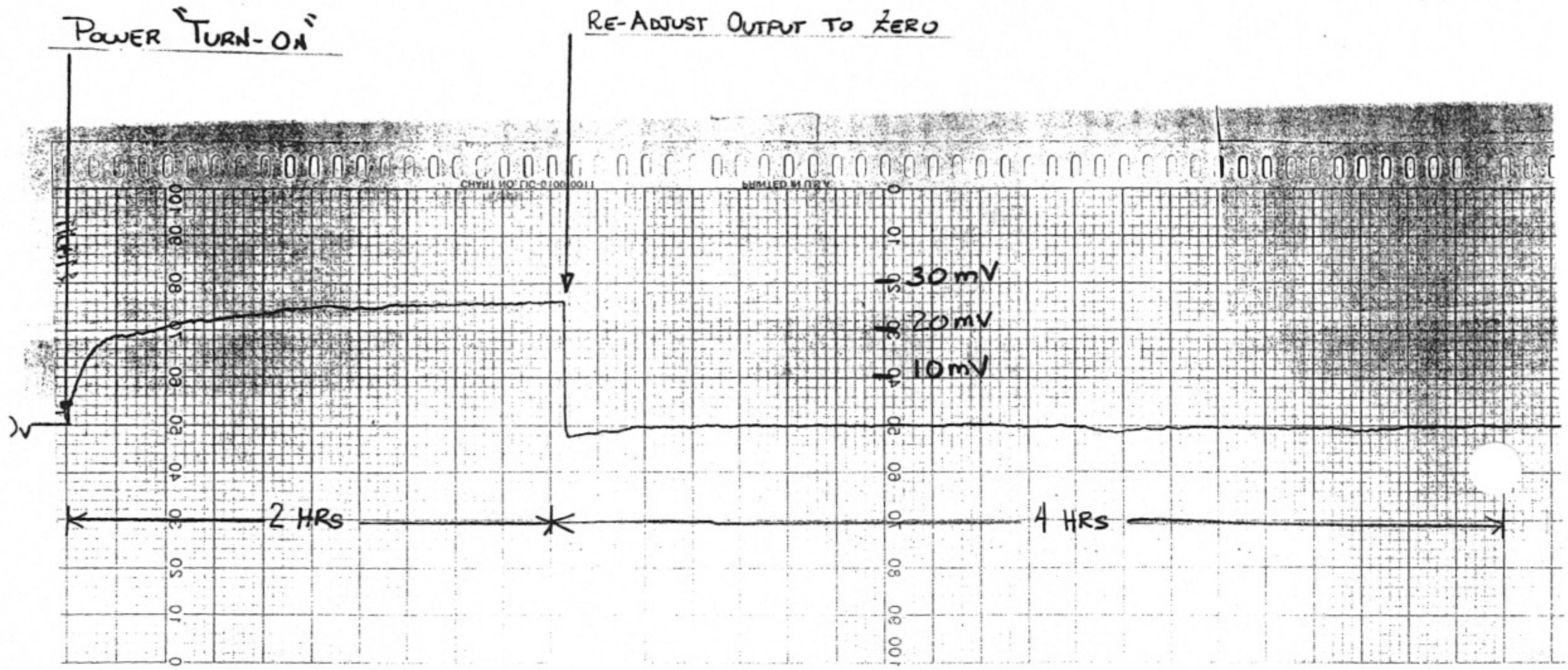

FIGURE 3: ZERO-INPUT DRIFT @ WARM-UP