

5B Series Signal Conditioning Subsystems in RFI/EMI Fields

The 5B Series Signal Conditioning Subsystem has been tested and passed the stringent “heavy industrial” requirements of the European Union’s electromagnetic compatibility (EMC) directive.

In order to comply with the European Standards in a typical heavy industrial application we recommend the following setup:

1. The modules must be mounted on a standard 5B Series backplane.
2. The 5B backplane must be mounted inside a standard metal cabinet that fully encloses the modules on all sides. The cabinet must be earth grounded at a convenient point and good electrical contact between all side panels must be assured.
3. All wiring must be routed through a metal conduit or wire chase (flexible or rigid).
4. The conduit must be earth grounded and electrically connected to the cabinet.
5. Due to the low input levels, it is recommended that all input, output and power lines be shielded.

When used according to these installation directions, any errors caused by EMI/RFI interference will be less than 0.1% of the full-scale 5B measurement range (typical @ +25°C), for field strengths up to 10 V/m and frequencies up to 1 GHz.

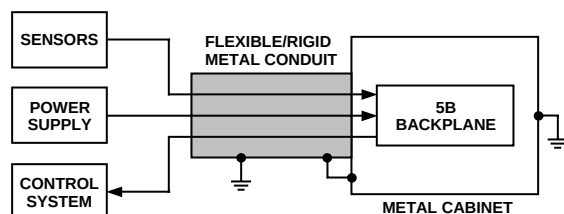


Figure 1. General Wiring Configuration

CE CERTIFICATION TESTS

The 5B Series modules have been tested and certified according to the rigorous electromagnetic constraints of the EN50082-2 and EN50081-2 European Standards. A description of each test is given below, followed by Table I listing the standards for each test.

Test Descriptions

1. Radiated RF Immunity

The units were subject to an RF field using a log-periodic antenna, maintained at 10 V/m by an amplifier placed outside the RF chamber. The field was swept from a frequency of 80 MHz to 1 GHz, with a 1 kHz modulation. The frequency increment size was 0.2% of the current frequency and the settling time at each frequency was two seconds. The field strength was supervised by an RF field monitor located next to the cabinet holding the units. The amplifier was adjusted accordingly to maintain the 10 V/m field strength. The antenna was placed exactly 1 m from the units. Readings were taken for both horizontal and vertical polarizations. The outputs of the units under test were acquired at every frequency through a crosspoint matrix scanner and a precision digital voltmeter. By subtracting the baseline reading taken with no RF field, the change was obtained and then expressed and stored as a percentage of span change. This test simulated the effect of system operation in an environment that is exposed to strong (heavy industrial) radiated electromagnetic waves.

2. Conducted RF Immunity

The units were subject to conducted EMI via an RF-generated signal resistively injected into the conductive layer of a standard flexible wire chase housing the wires from the system backplane. The point of contact was approximately 20 cm from the units. The field was swept from a frequency of 150 kHz to 80 MHz, with a 1 kHz modulation. The frequency increment size was 1% of the current frequency and the settling time at each frequency was two seconds. Ferrite beads were placed outside the RF chamber on the wires to ensure that the disturbance was not reflected to the test measurement instrumentation. As in the radiated RF immunity tests, the outputs of the units were scanned in and the percentage of span change was stored.

3. Fast Transient Immunity

All field wires external to the system console are subjected to and must withstand transients occurring within the normal environment of operation. The test configuration, routing field wires through a single wire chase, requires transient testing be applied to the wire chase; thus the conduit carrying the wires were placed in a metal enclosure for testing. Positive and negative polarities of 0.5 kV, 1 kV and 2 kV with 5 ns/50 ns rise/fall times were capacitively injected into the conduit. The outputs were scanned before and after the transients and the percent of span change was calculated and stored. (The test instrumentation and supporting test equipment were removed from the proximity of the wires during the application of the transients to avoid damage to the test equipment.)

4. Pulsed RF Immunity

The units were subjected to radiated RF at 900 MHz, 10 V/m, 100% square wave modulated at 200 Hz inside the RF chamber using a log-periodic. About 180 readings were taken with a settling time of two seconds for each reading. Both vertical and horizontal polarization were tested. Once again, the percentage of span change was calculated and stored.

5. Magnetic Field Immunity

The units were placed within two coils carrying current to generate a magnetic field of 30 A/m @ 50 Hz. The field strength was measured using a loop antenna and an oscilloscope. The units were placed in three configurations, X, Y and Z relative to the magnetic field. The outputs of the units were scanned and the percentage of change calculated. This tested the units' behavior under stray magnetic fields.

6. ESD—Contact

The units were subjected to the contact method following the human model by an ESD gun four times, using positive and negative polarities at 4 kV. The ESD was applied to the units' cases, mounting screws and the DB-25 connector backshell. After exposure, the units were retested to ensure proper functionality.

7. ESD—Air

The units were subjected to the air discharge method following the human model by an ESD gun eight times, using positive and negative polarities at 2 kV, 4 kV, 6 kV and 8 kV. The ESD was applied to the units' cases, mounting screws and the DB-25 connector backshell. After exposure, the units were retested to ensure proper functionality.

8. Voltage Surges Immunity

Five positive and five negative 2 kV pulses with 1.2 μ s/50 μ s. Its rise/fall times, each lasting 1 minute, were applied directly onto the shields at the input end of the field wiring. A capacitor was connected from shield to ground near the module end of the field wiring. When a particular shield was under test, it was ensured that its shield did not contact any other shields, forcing the surge to enter the unit. The units were retested after exposure to ensure proper functionality.

9. Emissions

The units were tested for radiated and conducted emissions. The units were biased at maximum output and readings of field strength from 30 MHz to 1000 MHz in both vertical and horizontal polarization were taken. Readings from the ac main of the dc power supply from 50 kHz to 30 MHz were also taken.

Table I. List of Test

No.	Test	Test Specification	Basic Standard	Test Setup	Criteria
1	Radiated RF Immunity	800 MHz–1000 MHz, 10 V rms, Modulated, 1 kHz, 80%	ENV 50140	ENV 50140	A
2	Conducted RF Immunity	0.15 MHz to 80 MHz, 10 V rms 80% Amplitude Modulated (1 kHz)	ENV 50141	ENV 50141	A
3	Fast Transient Immunity	1 kV, 2 kV	IEC 801-4	IEC 801-4	B
4	Pulsed RF Immunity	900 MHz, 50% Duty Cycle , 200 Hz	ENV 50140	ENV 50140	A
5	Magnetic Field Immunity	50 Hz, 30 A/m	EN 61000-4-8	EN 61000-4-8	A
6	ESD Immunity Contact	4 Contact	EN 61000-4-2	EN 61000-4-2	B
7	ESD Immunity Air	8 Air Discharge	EN 61000-4-2	EN 61000-4-2	B
8	Voltage Surge Immunity	2 kV, 5 Positive, 5 Negative			B
9	Emissions	Radiated and Conducted			