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INSTRUCTIONS

MODEL AV-1011B1-C

0 TO ±100 VOLTS, 2 AMP, 2 ns RISE & FALL TIME

LAB PULSE GENERATOR AND LASER DIODE DRIVER

SERIAL NUMBER: _____

WARRANTY

Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech shall at its option repair or replace said defective item. This warranty does not apply to units which have been dissembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

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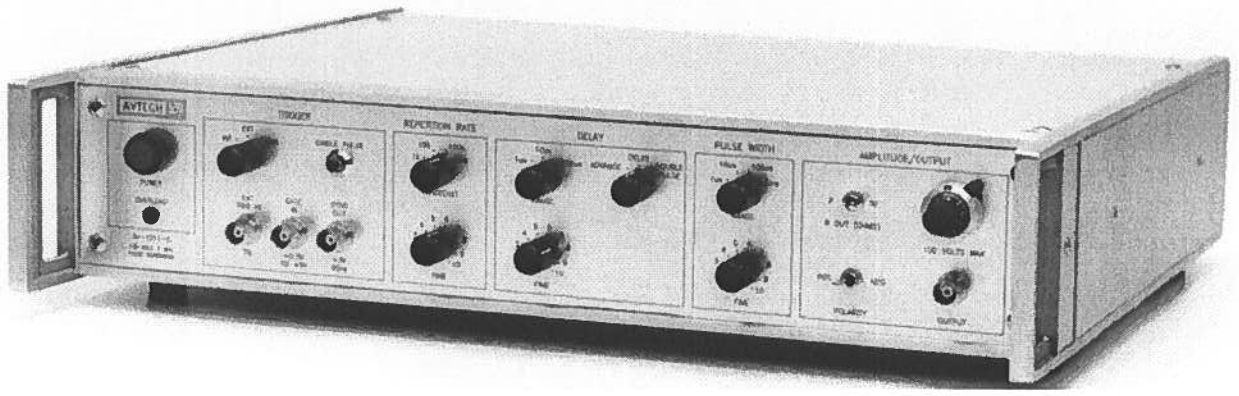
INTRODUCTION

The AV-1011B1-C is a high performance instrument capable generating amplitudes up to ±100 V into 50 Ω at repetition rates up to 100 kHz. Pulse widths are variable up to 1 ms. Rise and fall times are fixed at less than 2 ns. The AV-1011B1-C provides single or double pulse output and can be triggered or gated by an external source. A front-panel pushbutton can also be used to trigger the instrument. The output pulse width can be set to follow an input trigger pulse width and the output amplitude can be controlled by an externally applied 0 to +10 Volts DC control voltage.

The source resistance can be set at either 2 or 50Ω. In the 2Ω setting, the output amplitude is variable from 0.5 to 100V. In the 50Ω setting the amplitude is variable from 0.3 to 50V to 50Ω. The output amplitude can also be controlled externally by applying a 0 to +10V DC control voltage to a rear panel BNC connector.

The MOSFET output stages will safely withstand any combination of front panel control settings, output open or short circuits, and high duty cycles. An internal power supply monitor removes the power to the output stage for five seconds if an average power overload exists. After that time, the unit operates normally for one second, and if the overload condition persists, the power is cut again. This cycle repeats until the overload is removed. With a 50Ω load the unit will withstand duty cycles as high as 5%. The output stage will source up to 2.5 Amps (and will automatically shut down if the load current exceeds 2.5 Amps).

Application notes describing the use of the AV-1010 and AV-1011 families of pulse generators are available on the Avtech web site, http://www.avtechpulse.com.



SPECIFICATIONS

Model:	AV-1011B1-C
Pulse output amplitude[1]: (R_L = 50 Ω)	0 to 100 Volts (for Z_{OUT} = 2Ω) 0 to 50 Volts (for Z_{OUT} = 50Ω)
Required load impedance:	R_L = 50Ω
Rise time, fall time:	≤ 2 ns
Pulse width[2,3]:	100 ns to 1 ms
Pulse repetition rate:	1 Hz to 100 kHz
Maximum duty cycle:	5%
Output impedance:	2Ω or 50Ω
Output polarity:	Positive or negative
Jitter:	Pulse width:≤ 0.1 %, (typically ≤ 0.01 %) Delay/Advance: ≤ 0.1%, + 0.5 ns Period: ≤ 0.1%, + 0.5 ns
Pulse aberrations:	≤ ±0.5V ±5% of amplitude
Double pulse spacing:	100 ns to 1 ms
Sync delay:	± 100 ns to ± 1 ms (between sync out and main pulse output)
Sync output:	+ 3 Volts, 50 ns (R_L > 1 K)
Gated operation:	Has a programmable high/low synchronous/asynchronous gate
External trigger:	+3 to +5V, ≤ 100 kHz, PW ≥ 50 ns
Minimum propagation delay external trigger modes:	Advance: 200 ns Delay: 200 ns Double pulse: 200 ns PW_{IN} = PW_{OUT}: 120 ns
Output protection:	The output is protected against short circuits, open circuits, and high duty cycle
Connectors:	BNC female
Power source:	120/240 Volts, ± 10 % (switchable) 48 Hz to 66 Hz, 100 VA maximum
Dimensions (H x W x D):	100 mm x 430 mm x 375 mm (3.9" x 17" x 14.8")
Weight:	≤ 10 kg (22 lbs)
Chassis material:	Aluminum. Anodized aluminum front panel with cast aluminum side panels (with blue-gray plastic trim) and aluminum top and bottom panels with blue-gray plastic trim.
Operating temperature:	+ 10° C to + 50° C
Accessories furnished:	one detachable 6' power cord, one operation-maintenance manual
Option available:	19" rack mount kit (-R5)

1) The output amplitude may also be controlled by applying 0 to +10 Volts DC to a rear panel BNC connector.

2) The output pulse width may also be controlled externally by applying a TTL level trigger of the desired width to a rear panel BNC connector (PW IN = PW OUT mode).

INSTALLATION

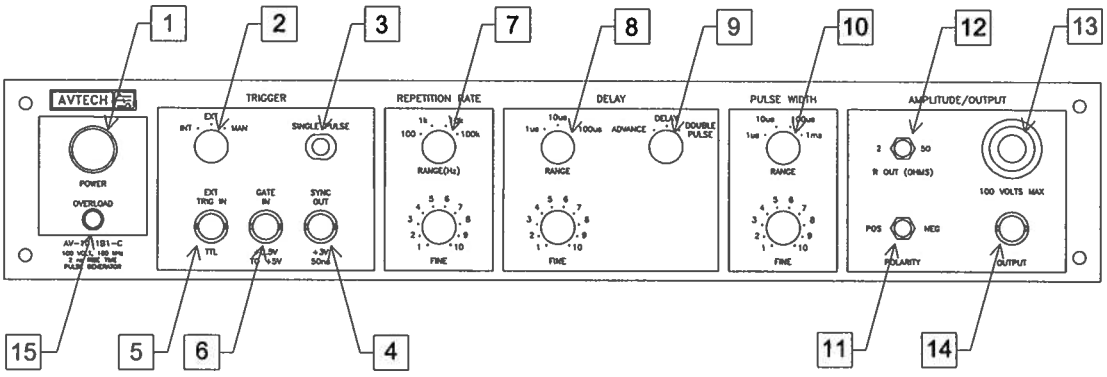
VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs, and handles. Confirm that a power cord and an instrumentation manual (this manual) are with the instrument. If the instrument has been damaged, file a claim immediately with the company that transported the instrument.

PLUGGING IN THE INSTRUMENT

Examine the rear of the instrument. There will be a male power receptacle, a fuse holder and the edge of the power selector card visible. Confirm that the power selector is in the correct orientation - it should be marked either 120 or 240, indicating whether it expects 120V AC or 240V AC. If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse. In the 120V setting, a 1.0A slow blow fuse is required. In the 240V setting, a 1/2A slow blow fuse is required.

FRONT PANEL CONTROLS



1. POWER Switch. The POWER push button switch applies AC prime power to the primaries of the transformer, turning the instrument on. The push button lamp (#382 type) is connected to the internal +15V DC supply.

2. INT/EXT/MAN Switch. In the "INT" position the instrument is internally triggered and the "SYNC OUT" connector provides a SYNC output which allows one to trigger other instruments, such as oscilloscopes. In the "EXT" position the instrument is triggered by a +5 Volt 50 ns (or wider) input pulse on the "TRIG IN" connector. In the "MAN" a single pulse can be generated by pressing the "SINGLE PULSE" push button.

3. SINGLE PULSE Push Button. The "SINGLE PULSE" push button will trigger the instrument manually for one cycle of output, when the "INT/EXT/MAN" switch is in the "MAN" position. Otherwise, the push button has no effect.

4. SYNC OUT. When the "INT/EXT/MAN" switch is in the "INT" position, this connector supplies a SYNC output that can be used to trigger other equipment, particularly oscilloscopes. This signal leads, or lags, the main output by a duration set by the "DELAY" controls and has an approximate amplitude of +3 Volts to R_L > 1K with a pulse width of about 50 ns.

5. TRIG IN. When the "INT/EXT/MAN" switch is in the "EXT" position, the external trigger (+5 Volts, PW ≥ 50 ns) is applied to this connector. This input presents a high impedance (1 M Ohm).

6. GATE Input. The GATE input will suppress the triggering of the instrument if taken to a TTL HIGH level (i.e. 0.5 to 5.0V). If it is left open or taken to a TTL LOW, normal triggering will occur (R_{IN} = 1K).

7. REPETITION RATE Controls. The rotary switch marked "RANGE" selects the pulse repetition rate for the internally triggered mode. The venier (labeled "MIN- MAX")

provides continuously variable control of each range. There are four ranges and the instrument is set to the rate indicated on the front panel when the vernier is in the "MAX" position.

100 Hz - 1 kHz
1 kHz - 10 kHz
10 kHz - 100 kHz
100 kHz - 1.0 MHz

8. DELAY Controls. The rotary switch selects one of three ranges and the vernier provides continuously variable control of each range. The instrument is set to the delay indicated on the front panel when the vernier is in the "MAX" position.

100 ns - 1 us
1 us - 10 us
10 us - 100 us

9. ADVANCE, DELAY, DOUBLE PULSE. With this three position switch in the ADVANCE position, the leading edge of the output pulse precedes the leading edge of the SYNC output. When in the DELAY position, the leading edge of the SYNC output precedes the leading edge of the main output. When in the DOUBLE PULSE position, the main output provides two successive output pulses having a separation determined by the DELAY (8) controls.

10. PULSE WIDTH Controls. The rotary switch selects one of four ranges and the vernier provides continuously variable control of each range. The instrument is set to the pulse width indicated on the front panel when the vernier is in the "MAX" position.

100 ns - 1 us
1 us - 10 us
10 us - 100 us
100 us - 1 ms

Note: When switching to wider pulse width ranges at high output amplitudes, the output amplitude may drop as the duty cycle is suddenly increased. To return the amplitude to its proper value, reduce the duty cycle briefly (by rotating the pulse width vernier control counterclockwise, or reducing the repetition rate). The internal power supply will recover, and the controls can be returned to their original settings.

11. POLARITY Switch. If the polarity switch is in the "+" position, the main output pulse will pulse upwards (i.e. to a more positive level). If it is in the "-" position, the output will pulse downwards to a more negative level. If the setting of the polarity switch is changed when the output amplitude is relatively high (eg. > 25 Volts in the 2 Ohm range or ≥ 12 Volts in the 50 Ohm range), the output pulse will vanish for several seconds until the high voltage levels on the output stage decay to a safe level. At that time the output will again become active.

12. R OUT RANGE Switch. A two-position switch which sets the output resistance at 2 Ohms or 50 Ohms. In the 2 Ohm range, the unit will provide up to 100 Volts (to a 50 Ohm load) while in the 50 Ohm range, the unit will provide up to 50 Volts to a 50 Ohm load.

13. AMPLITUDE FINE. The ten turn amplitude vernier provides continuously variable control of the peak amplitude of the main output from 0 to 50 Volts (50 Ohm range) or 0 to 100 Volts (2 Ohm range). When the unit is operating at a low duty cycle and an attempt is made to reduce the output amplitude, the amplitude will decay slowly with a time constant of several seconds.

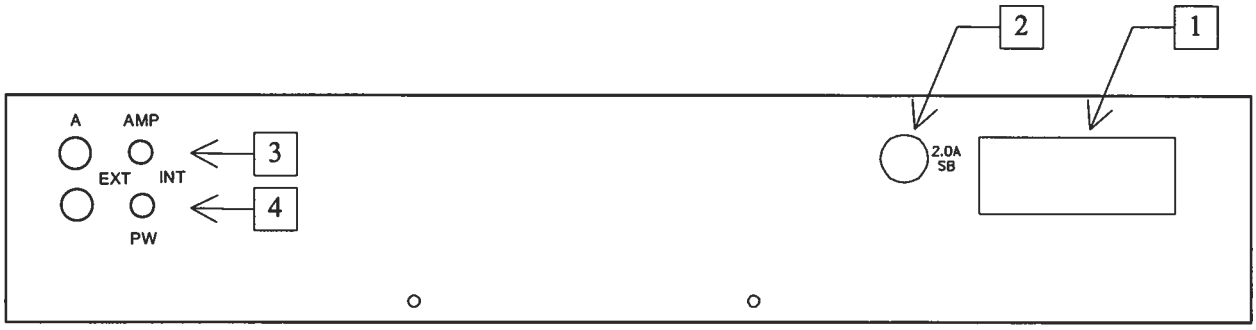
14. OUT. This BNC connector provides the main output signal, into load impedances of 50Ω. (The instrument will not function properly into other impedances.)

15. OVERLOAD. An automatic overload protective circuit controls the front panel overload light. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a very low impedance), the protective circuit will turn the output of the instrument OFF and turn the indicator light ON. The light will stay ON (i.e. output OFF) for about 5 seconds after which the instrument will attempt to turn ON (i.e. light OFF) for about 1 second. If the overload condition persists, the instrument will turn OFF again (i.e. light ON) for another 5 seconds. If the overload condition has been removed, the instrument will turn on and resume normal operation. Overload conditions may be removed by:

    - Reducing PRF (i.e. switch to a lower range)
    - Reducing pulse width (i.e. switch to a lower range)
    - Removing output low load impedance (if any)
    - Reducing the output amplitude (i.e. switch to a lower range)

    Note that the output stage will safely withstand a short-circuited load condition.

REAR PANEL CONTROLS



1. AC POWER INPUT. A three-pronged recessed male connector is provided on the back panel for AC power connection to the instrument. Also contained in this assembly is a 1.0A slow blow fuse and a removable card that can be removed and repositioned to switch between 120V AC in and 240V AC in.

2. 2.0A SB. This fuse protects the output stage if the output duty cycle rating is exceeded.

3. AMP. To voltage control the output amplitude, set the switch in the EXT position and apply 0 to +10 Volts to the "A" BNC connector ($R_{IN} \geq 10K$).

4. PW. The pulse generator may be triggered externally in a $PW_{OUT} = PW_{IN}$ mode by setting this switch in the EXT position and the front panel INT/EXT/MAN switch in the EXT position and applying a TTL level pulse of the desired pulse width to the A BNC connector.

OPERATIONAL CHECK

This check is to confirm that the instrument is fully functional. Set the controls to the following values:

FRONT PANEL

- INT/EXT Switch: INT position
- REPETITION RATE RANGE Switch: 10 kHz
- REPETITION RATE Vernier: MAX
- DELAY RANGE Switch: 1 us
- DELAY Vernier: MID range
- ADVANCE, DELAY, DOUBLE PULSE: DELAY
- PULSE WIDTH RANGE Switch: 1 us
- PULSE WIDTH Vernier: MAX
- POLARITY Switch: +
- R OUT RANGE Switch: 50 Ohms
- AMPLITUDE Vernier: 2.0

REAR PANEL

- AMP: INT
- PW: INT

Connect a cable from the SYNC OUT connector to the TRIG input of an oscilloscope. Connect a 2W (or higher) 50 Ohm load to the OUT connector and place the scope probe across this load.

Set the oscilloscope to trigger externally with the vertical setting at 5 Volts/div and the horizontal setting at 1 us/div. Then follow the instructions below and compare what is seen on the oscilloscope to what is described. Only approximate values are needed to confirm operation.

STEP	CONTROL	OPERATION	RESULTS
1	POWER	Push in (ON)	+10V pulses at the main output, with period 100 us, pulse width 1.0 us, <2ns rise & fall times.
2	REPETITION RATE VERNIER	Rotate to MIN, then to MAX	Period rises to about 1 ms then falls to about 100 us.
3	DELAY VERNIER	Rotate to MAX, then to MIN	Pulses shift to the right on the oscilloscope by 1 us, then back.
4	PULSE WIDTH VERNIER	Rotate to MIN, then to MAX	Pulse width varies from 100 ns to 1.0 us.
5	POLARITY SWITCH	Switch to -, then to +	Pulse polarity becomes negative & then positive.
6	R OUT SWITCH	Switch to 2 Ohms and then back to 50 Ohms	The output pulse amplitude will jump to 20 Volts and then to 10 Volts. The voltage will then decay slowly to 10 Volts.

OTHER INFORMATION

LOAD IMPEDANCE

The main output requires a load impedance of 50Ω. The instrument will not function properly into other impedances.

TOP COVER REMOVAL

The interior of the instrument may be accessed by removing the four Phillips screws on the top panel. With the four screws removed, the top cover may be slid back (and off).

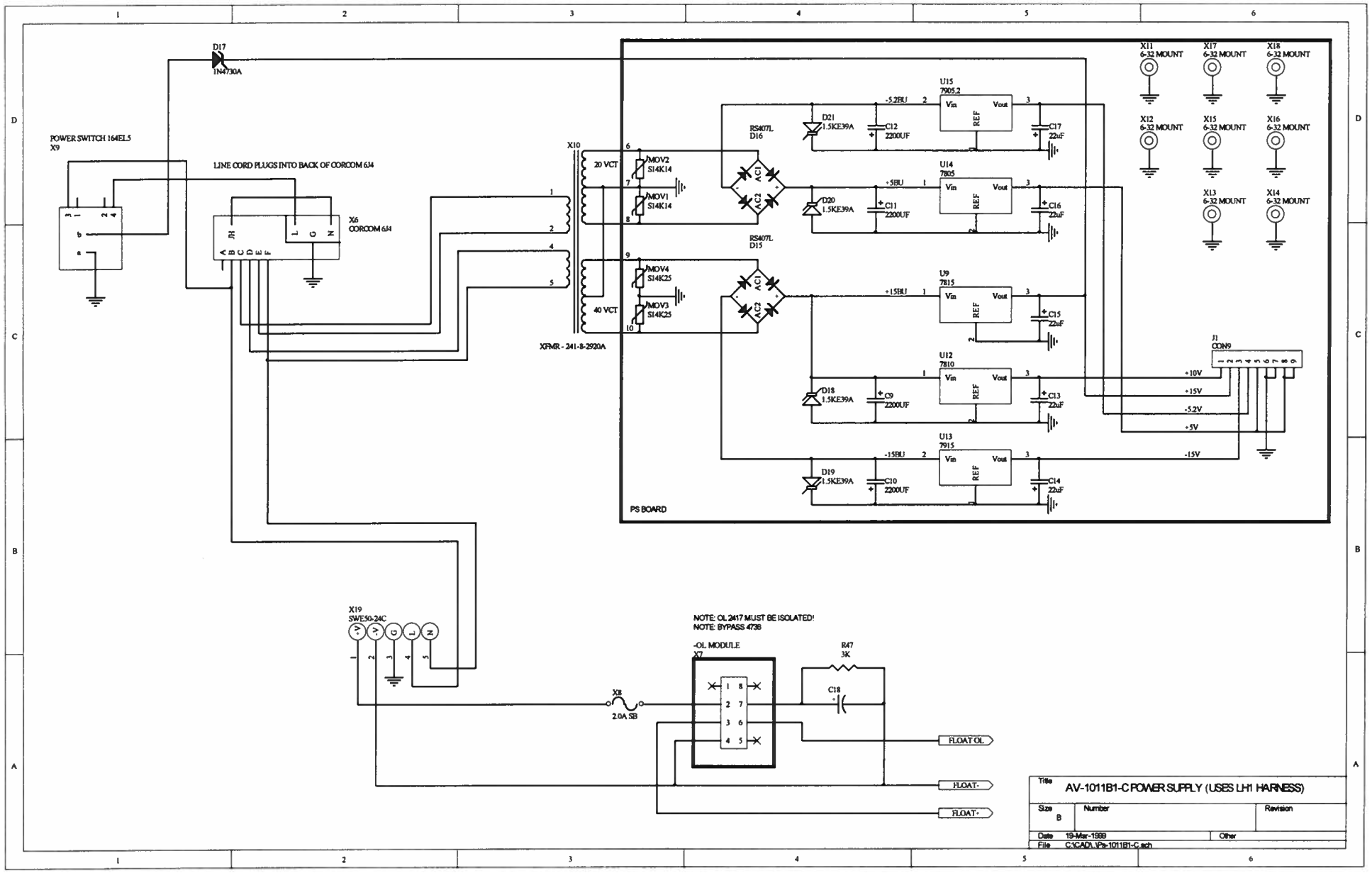
ELECTROMAGNETIC INTERFERENCE

To prevent electromagnetic interference with other equipment, all used outputs should be connected to shielded 50Ω loads using shielded 50Ω coaxial cables. Unused outputs should be terminated with shielded 50Ω BNC terminators or with shielded BNC dust caps, to prevent unintentional electromagnetic radiation. All cords and cables should be less than 3m in length.

RACK MOUNTING

A rack mounting kit is available. The -R5 rack mount kit may be installed after first removing the one Phillips screw on the side panel adjacent to the front handle.

WIRING DIAGRAM - POWER SUPPLY



PERFORMANCE CHECK SHEET

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