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## INSTRUCTIONS

MODELS AVX-CA-SEMA  
TEST JIG FOR USE WITH  
AVTECH AVR-EB2A-B  
REVERSE RECOVERY TEST SYSTEMS

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 disassembled, 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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Manual Reference: /files/server1/officefiles/instructword/avx-ca/AVX-CA-SEMA,ed1.odt.  
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## INTRODUCTION

The AVX-CA-SEMA test jig is designed for use with the AVR-EB2A-B series of reverse recovery time test systems. Two customer-specified Loranger sockets are installed on the jig. The standard Loranger 03186 021 6215 socket will accept DO-41 and similar axial packages. The special-order Loranger 03453 041 X215 socket, provided by the customer, will accept certain SQMELF packages.

This test jig can be used as a replacement or an alternative for the test jigs originally supplied with the Avtech AVR-EB2A-B units.

## REGULATORY NOTES

### FCC PART 18

This device complies with part 18 of the FCC rules for non-consumer industrial, scientific and medical (ISM) equipment.

This instrument is enclosed in a rugged metal chassis and uses a filtered power entry module. The main output signal is provided on a shielded connector that is intended to be used with shielded coaxial cabling and a shielded load. Under these conditions, the interference potential of this instrument is low.

If interference is observed, check that appropriate well-shielded cabling is used on the output connectors. Contact Avtech ([info@avtechpulse.com](mailto:info@avtechpulse.com)) for advice if you are unsure of the most appropriate cabling. Also, check that your load is adequately shielded. It may be necessary to enclose the load in a metal enclosure.

If any of the connectors on the instrument are unused, they should be covered with shielded metal "dust caps" to reduce the interference potential.

This instrument does not normally require regular maintenance to minimize interference potential. However, if loose hardware or connectors are noted, they should be tightened. Contact Avtech ([info@avtechpulse.com](mailto:info@avtechpulse.com)) if you require assistance.

### EC DECLARATION OF CONFORMITY



We                    Avtech Electrosystems Ltd.  
                          P.O. Box 5120, LCD Merivale  
                          Ottawa, Ontario  
                          Canada K2C 3H5

declare that this pulse generator meets the intent of Directive 2004/108/EG for Electromagnetic Compatibility. Compliance pertains to the following specifications as listed in the official Journal of the European Communities:

EN 50081-1 Emission

EN 50082-1 Immunity

and that this pulse generator meets the intent of the Low Voltage Directive 72/23/EEC as amended by 93/68/EEC. Compliance pertains to the following specifications as listed in the official Journal of the European Communities:

EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use

#### DIRECTIVE 2002/95/EC (RoHS)

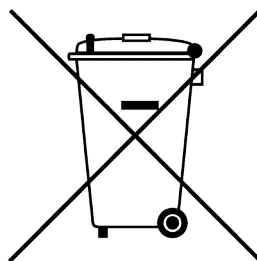
This instrument is exempt from Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment. Specifically, Avtech instruments are considered "Monitoring and control instruments" (Category 9) as defined in Annex 1A of Directive 2002/96/EC. The Directive 2002/95/EC only applies to Directive 2002/96/EC categories 1-7 and 10, as stated in the "Article 2 - Scope" section of Directive 2002/95/EC.

#### DIRECTIVE 2002/96/EC (WEEE)

European customers who have purchased this equipment directly from Avtech will have completed a "WEEE Responsibility Agreement" form, accepting responsibility for WEEE compliance (as mandated in Directive 2002/96/EC of the European Union and local laws) on behalf of the customer, as provided for under Article 9 of Directive 2002/96/EC.

Customers who have purchased Avtech equipment through local representatives should consult with the representative to determine who has responsibility for WEEE compliance. Normally, such responsibilities will lie with the representative, unless other arrangements (under Article 9) have been made.

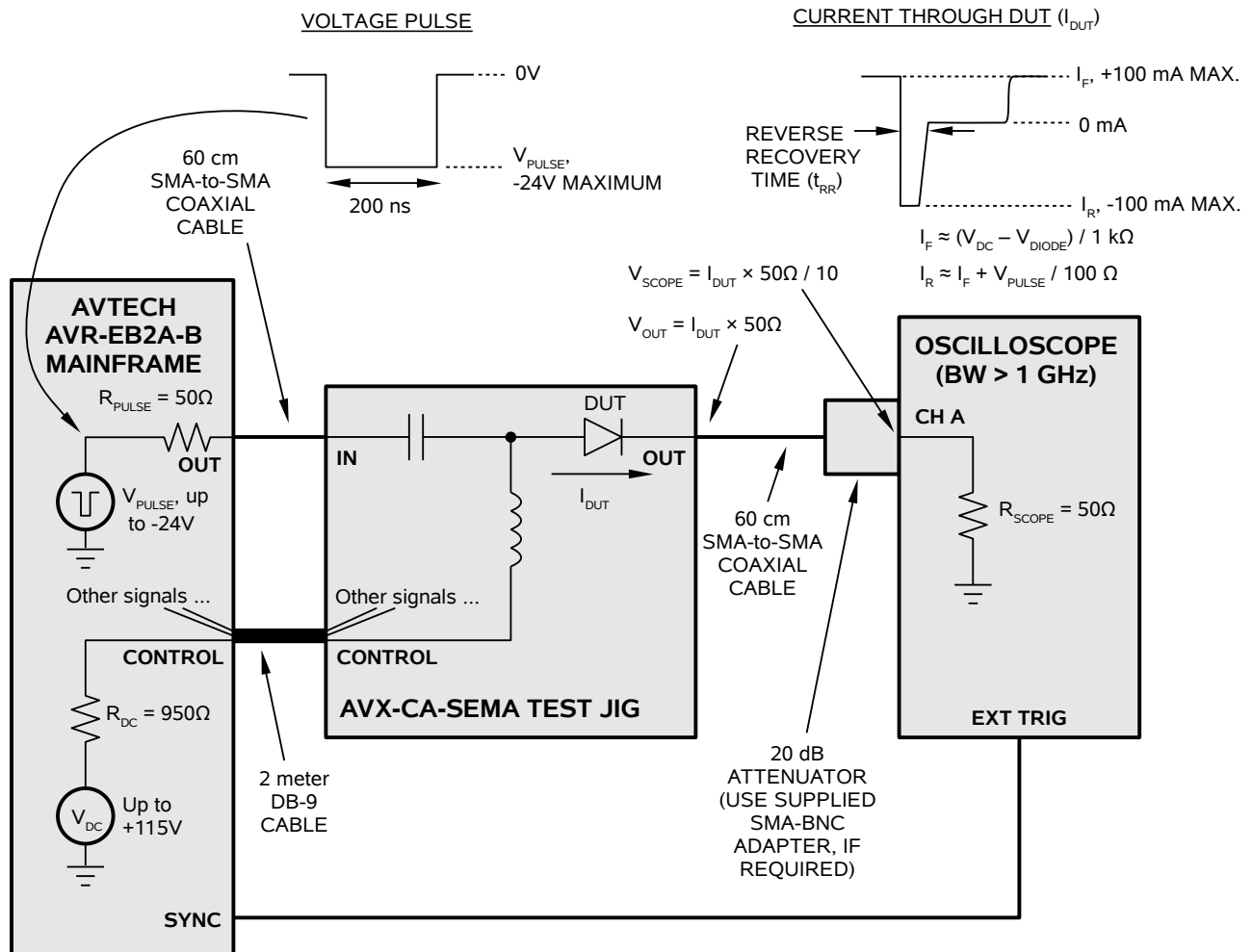
Requirements for WEEE compliance may include registration of products with local governments, reporting of recycling activities to local governments, and financing of recycling activities.



## BASIC AMPLITUDE CONTROL

The AVX-CA-SEMA is intended for use with an Avtech AVR-EB2A-B reverse recovery test system, ordered separately. Please refer to the manual supplied with the AVR-EB2A-B instrument for detailed usage instructions.

The basic test arrangement for the AVR-EB2A-B is shown in the figure below. The OUT output on the instrument mainframe is connected to the IN input on the test jig using the coaxial cable supplied with the AVR-EB2A-B, and the control cable is connected using the supplied DB-9 cable.



The OUT output on the test jig must be connected (using the 60 cm SMA-to-SMA cable and 20 dB attenuator supplied with the AVR-EB2A-B) to the 50 Ohm input of a high-bandwidth (> 1 GHz) user-supplied oscilloscope. The voltage on the output is proportional to the current through the DUT. By observing the current waveform through

the DUT, the reverse recovery time may be determined. When connected as shown above, the oscilloscope voltage waveform is related to the device current by:

$$V_{\text{SCOPE}} = I_{\text{DUT}} \times 50\Omega / 10$$

This is the key equation for relating the observed voltage waveform to the DUT current.

### SETTING THE AMPLITUDE LEVELS

The test jig contains a “bias tee” circuit to combine a DC forward bias with a reverse bias pulse.

An adjustable DC voltage of up to +115V is generated in the AVR-EB2A-B mainframe. This DC voltage is controlled by the front-panel OS menu, or by the “source:voltage:low” command. The DC voltage source has  $R_{\text{DC}} = 950\ \Omega$  in series with it, inside the mainframe. The DC forward bias current through the DUT is then given by:

$$I_{\text{F}} = (V_{\text{DC}} - V_{\text{DIODE}}) / (R_{\text{DC}} + R_{\text{SCOPE}})$$

$$I_{\text{F}} = (V_{\text{DC}} - V_{\text{DIODE}}) / 1000\ \Omega$$

where  $V_{\text{DIODE}}$  is the diode forward voltage drop (typically 0.7V).

The reverse bias pulse is capacitively coupled “on top” of this DC bias current. The pulse generator has an adjustable amplitude of up to -24V, controlled by the front-panel AMP menu, or by the “source:voltage” command. The pulse generator has  $50\ \Omega$  in series with it, inside the mainframe, as well as the  $50\ \Omega$  of the oscilloscope, so the size of the current change will be  $V_{\text{PULSE}} / (50\ \Omega + 50\ \Omega)$ . Thus, the reverse current will given by:

$$I_{\text{R}} \approx I_{\text{F}} + V_{\text{PULSE}} / 100\ \Omega$$

In this equation,  $I_{\text{F}}$  is positive,  $V_{\text{PULSE}}$  is negative, and  $V_{\text{PULSE}}$  must be set sufficiently high such that  $I_{\text{R}}$  is negative. This equation is only approximate, because the diode itself may introduce some poorly-defined parasitic resistance during the switching transient.

This basic arrangement of DC and pulse sources is specified by MIL-STD-750E Method 4031.4 Test Condition A.

### AMPLITUDE ACCURACY

The amplitude settings *should not be relied upon for any degree of accuracy*, because the diode characteristics (forward voltage drop, reverse parasitic resistance) are not known accurately in advance. Instead the voltage at the OUT terminal on the test jig should be *measured* with a calibrated oscilloscope.



### CURRENT MONITOR

The AVR-EB2A-B monitors the actual forward bias current through the DUT. If the DUT has been incorrectly seated, and the forward bias current can not flow properly, the instrument will detect this problem, display an error message, and turn off the output. If this occurs, check the seating of the DUT and close both lids again.

The monitored forward current level is displayed on the front panel LCD, for the user's convenience. The accuracy is  $\pm 2\% \pm 1 \text{ mA}$ .

### INCORRECT ORIENTATION

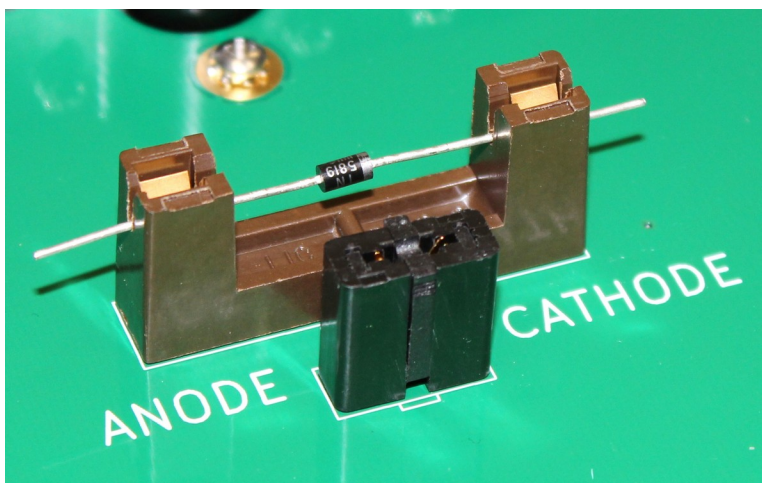
The instrument and the DUT will not be damaged if the diode is installed with the incorrect orientation (i.e., with the anode and cathode reversed). However, incorrect waveforms will be generated.

## TEST JIG MECHANICAL ASPECTS

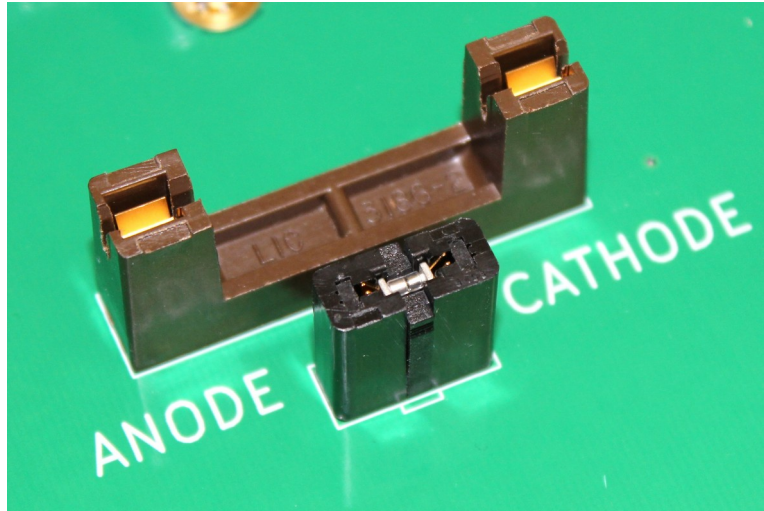
The AVX-CA-SEMA test jig will accept a variety of axial and SQMELF packages. To install a DUT, open the main (black) lid like this:



Install a diode in one of the two sockets. An example of an axial DO-41 diode installed is shown below:



An example of a SQMELF package installed is shown below:



The two sockets are wired in parallel. Only one DUT may be installed at a time, or the resulting waveforms will be incorrect.

Once the DUT is installed in the appropriate socket, close the main lid. It must be closed for proper operation.

The AVR-EB2A-B monitors the actual forward bias current through the DUT. If the DUT has been incorrectly seated, and the forward bias current can not flow properly, the instrument will detect this problem, display an error message, and turn off the output. If this occurs, check the seating of the DUT and close both lids again.

The instrument and the DUT will not be damaged if the diode is installed with the incorrect orientation (i.e., with the anode and cathode reversed). However, incorrect waveforms will be generated.

The IN, OUT, and CONTROL connectors are on the rear of the jig, below the hinges:



## SAFETY INTERLOCK

The AVX-CA-SEMA contains safety interlock devices, for use with the AVR-EB2A-B mainframe. The DB-9 female “CONTROL” connector should be connected to the corresponding connector on the AVR-EB2A-B mainframe using the straight-through DB-9 cable supplied with the AVR-EB2A-B.

The DB9 “CONTROL” connector pinout is as follows:

Pin 1 - To test jig switch 1.

Pin 2 - To test jig switch 2.

Pin 5 - Ground.

Pin 6 - To test jig switch 1.


Pin 7 - To test jig switch 2.

Pin 9 - Safety sensor power supply (+15V through 680 Ohms).

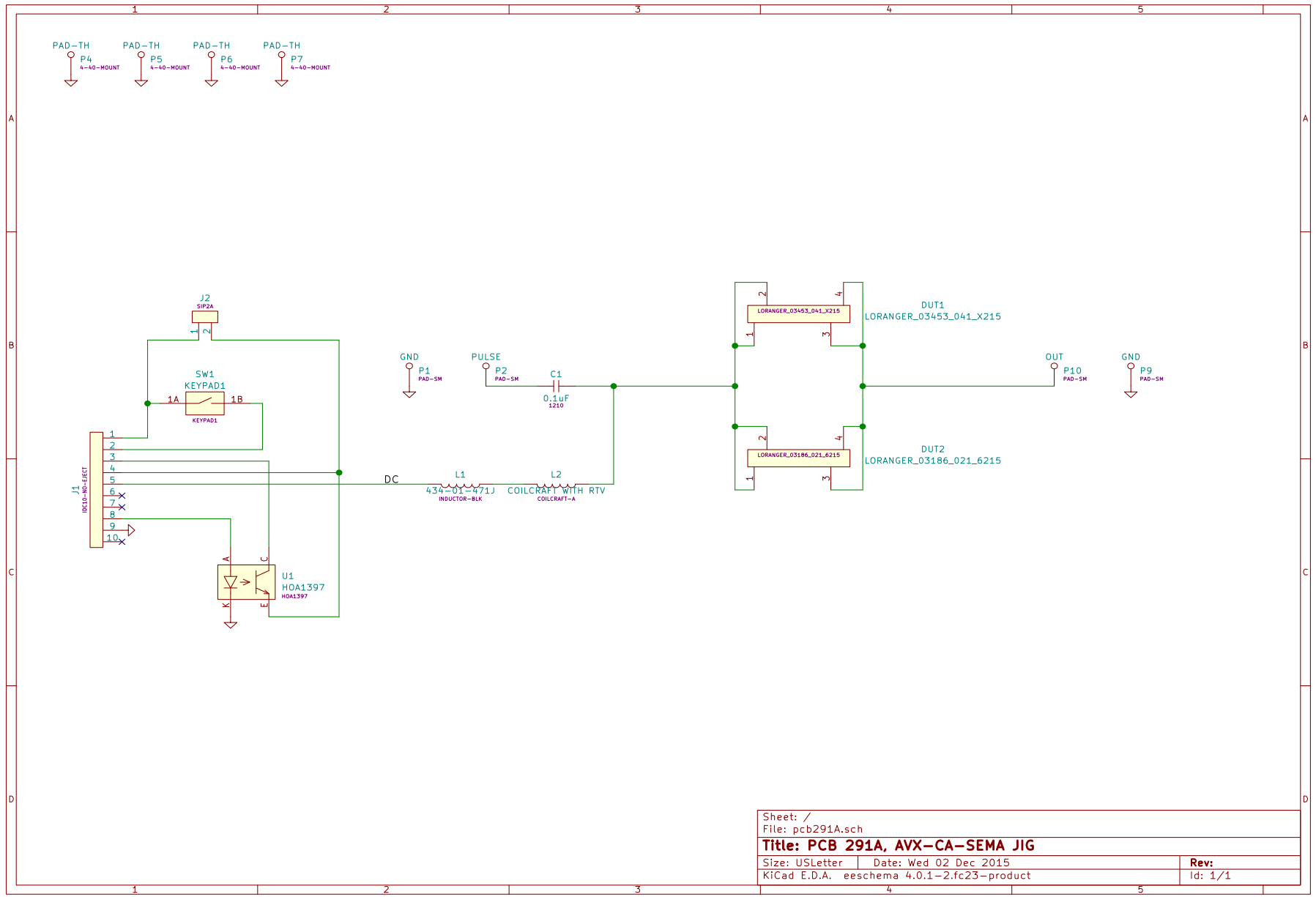
When the test jig lid is safely closed, Pin 1 is shorted to Pin 6, and Pin 2 is shorted to Pin 7. Switch 1 is a passive mechanical switch. Switch 2 is an active photosensor, which requires power from Pin 9.

## OVERRIDE

If the user has implemented other safety steps that make the interlock circuit unnecessary, it is possible to disable the interlock by installing a jumper across the two pins of header J2 on the jig.

 Caution: Voltages as high as +115V may briefly (< 100 us) be present on the jig when the output is on, if no DUT is installed. Protective circuits will disable the high voltage output if this condition occurs, but for maximum safety, the interlock circuit should not be overridden.

# WIRING DIAGRAM



Sheet: /		
File: pcb291A.sch		
<b>Title: PCB 291A, AVX-CA-SEMA JIG</b>		
Size: USLetter	Date: Wed 02 Dec 2015	Rev:
KiCad E.D.A.	eeschema 4.0.1-2.fc23-product	Id: 1/1

## PERFORMANCE CHECKSHEET