Agilent 1049A Electrochemical Detector

Service Handbook

Agilent Technologies

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Service Handbook

Using This Handbook

Installation, performance verification and test features of the Agilent 1049A electrochemical detector are described in the *Operator's Handbook*.

This *Service Handbook* contains informations about the hardware, cables and connectors and a parts reference list.

Contents

7 Parts Identification

1

Main Power Supply

Main Power Supply

MPS-board 01046-66501

Exchange Part Number: 01046-69501

The Main Power Supply works with a switching frequency of 50 kHz and is covered with sheet metal to prevent high frequency radiation and shock hazard.

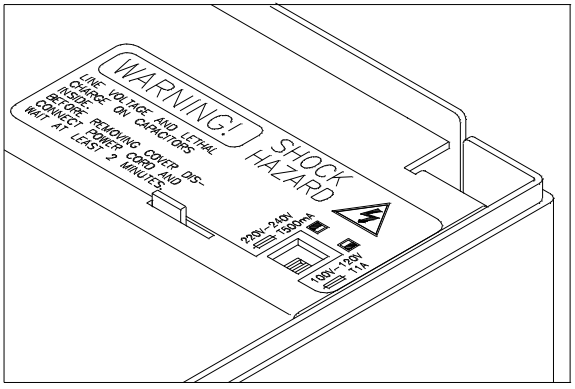
The line voltage is routed through the line filter, line fuses and power switch to the Main Power Supply (MPS).

Values of the fuses are:

- 100-120V: 1 A slow (part number 2110-0007)
- 220-240V: 0.5 A slow (part number 2110-0202)

WARNING **Hazardous voltage are present at the output connector with instrument power cord connected to the AC line.**

Figure 1 **Warning Label and Power Select Switch**



Voltage Distribution

All boards with analog circuits have their own +15 V regulators. The GND line separates in the Main Power Supply and forms analog GND line (AGND) and a digital GND line (DGNG).

The following voltages can be measured on the Electrochemical Detector Controller Board:

Voltage	Variation
+ 5 V	+ 10%
+ 19 V	+ 10 %
+ 24 V	+ 10 %
- 19 V	- 10 %
- 35 V	- 15 %

Each voltage is fused. LED's indicate the proper function of the fuses.

Figure 2 **Main Power Supply Board**

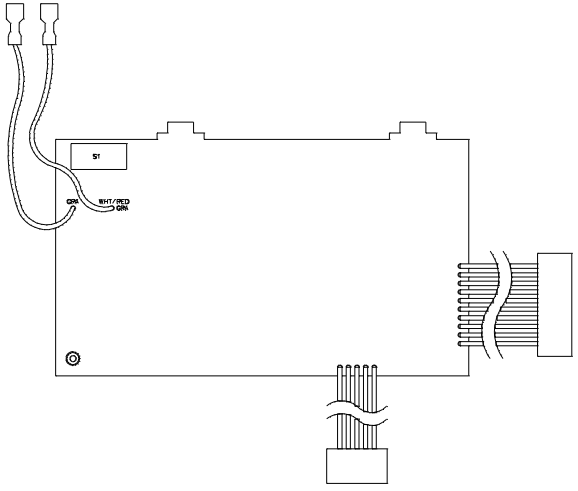
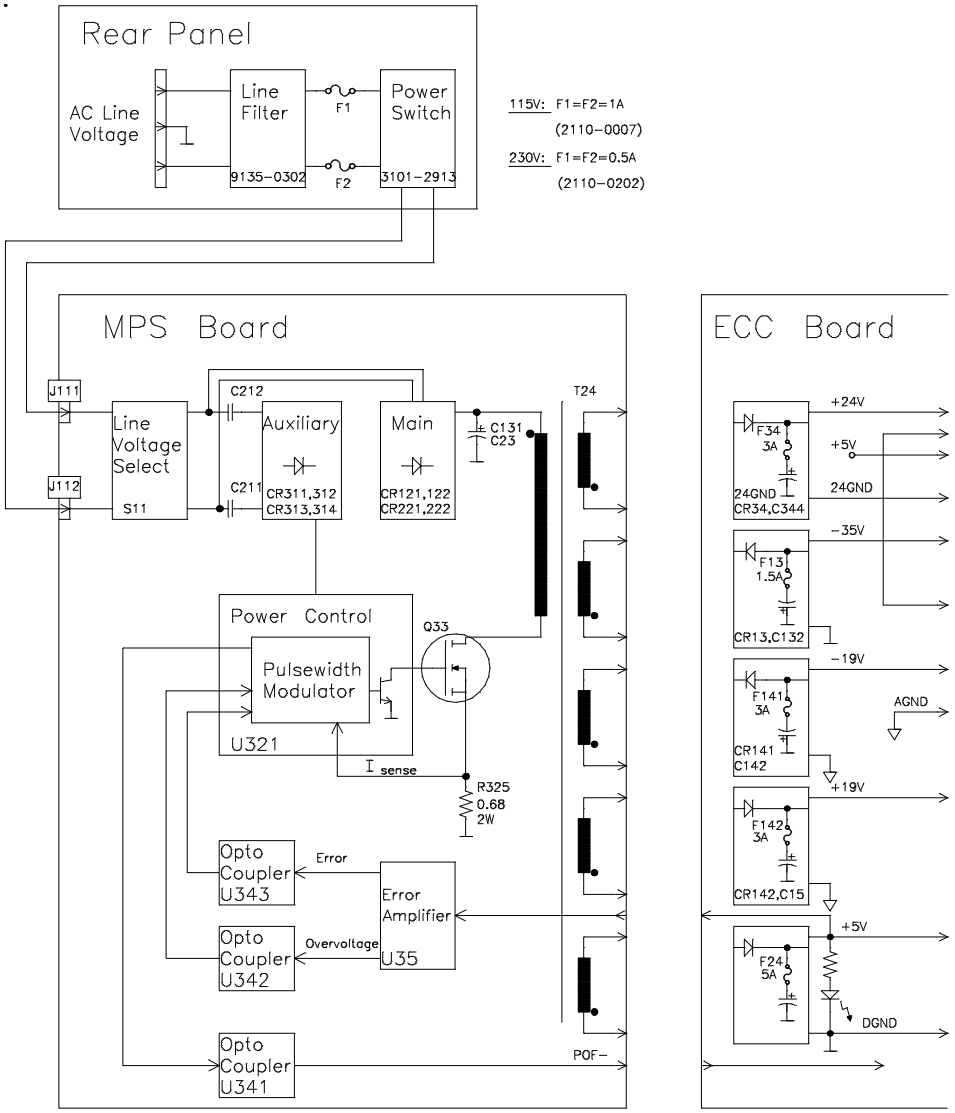


Figure 3 **Agilent 1049A Voltage Distribution**



Main Power Supply Board (MPS)

The line voltage selector switch S1 inside the instrument selects either 220-240V or 100-120V.

The Main Power Supply contains the electronics of the switched power supply. The output voltage on the secodary side of the transformer depends on the duty cycle for the Power-FET (pulse-width modulation).

A main rectifier supplies the switching transformer, whereas a second auxiliary rectifier supplies the regulation circuit.

Regulation is implemented only for the +5 V DC line. Regulation of other DC voltages depends on power coupling by the transformer core. These DC voltages are regulated on the respective boards.

The error amplifier senses the +5 V DC line which has PID characteristics due to noise on the +5 Volts. The voltage on the sense line is compared with a reference voltage and an error signal is generated. This error signal is fed through an analog opto coupler into the error sense input of the power control circuit, where it is used to control the duty cycle of the pulse-width modulated signal. The pulse width is inversely proportional to the error signal, and has less than 45% duty cycle. To prevent the transformer working at saturation, and causing current spikes which may destroy components, no more than 45% duty cycle is used.

The power control cicuit limits the current through the switching transformer with the help of sense line. It senses the voltage drop and compares it with a reference voltage. As soon as an overcurrent condition is reached, the pulse-width signal at the output of the control circuit is reduced. This results in a limited current through the switching transformer.

The error amplifier senses an overvoltage condition on the +5 Volt line. Overvoltage turns-OFF the power control circuit. After a short delay, the power control circuit turns-ON again. If the over voltage condition, remains it turns-OFF again. The oscillating frequency is approximately 1 Hz which can be observed at the green LED.

The power control circuit senses an undervoltage condition on the auxiliary rectifier. The power control circuit turns-OFF, as long as its supply voltage is below +9 Volt. When sensing this undervoltage condition, the power control circuit generates the power fail signal (POF-) and feeds it through an opto coupler to the input latch on the detector controller board (ECC). If power fails, the controller stores all setpoints in the battery backed-up memory.

2

Keyboard and Display Module

Keyboard and Display Module

KDM-assembly (01049-66508)

Exchange Part Number: 01049-69508

The keyboard and display module (KDM) is located behind the front panel of the instrument.

Figure 4 **Front Panel of Agilent 1049A**

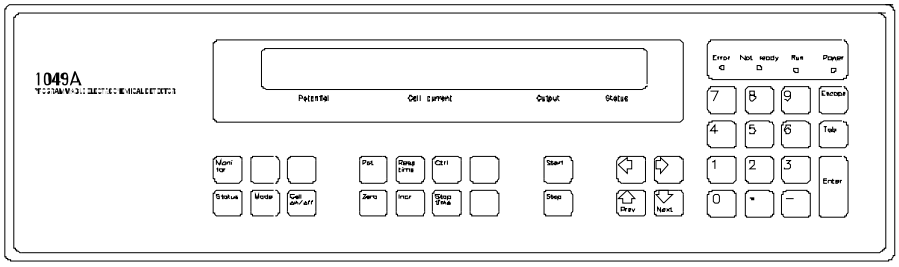
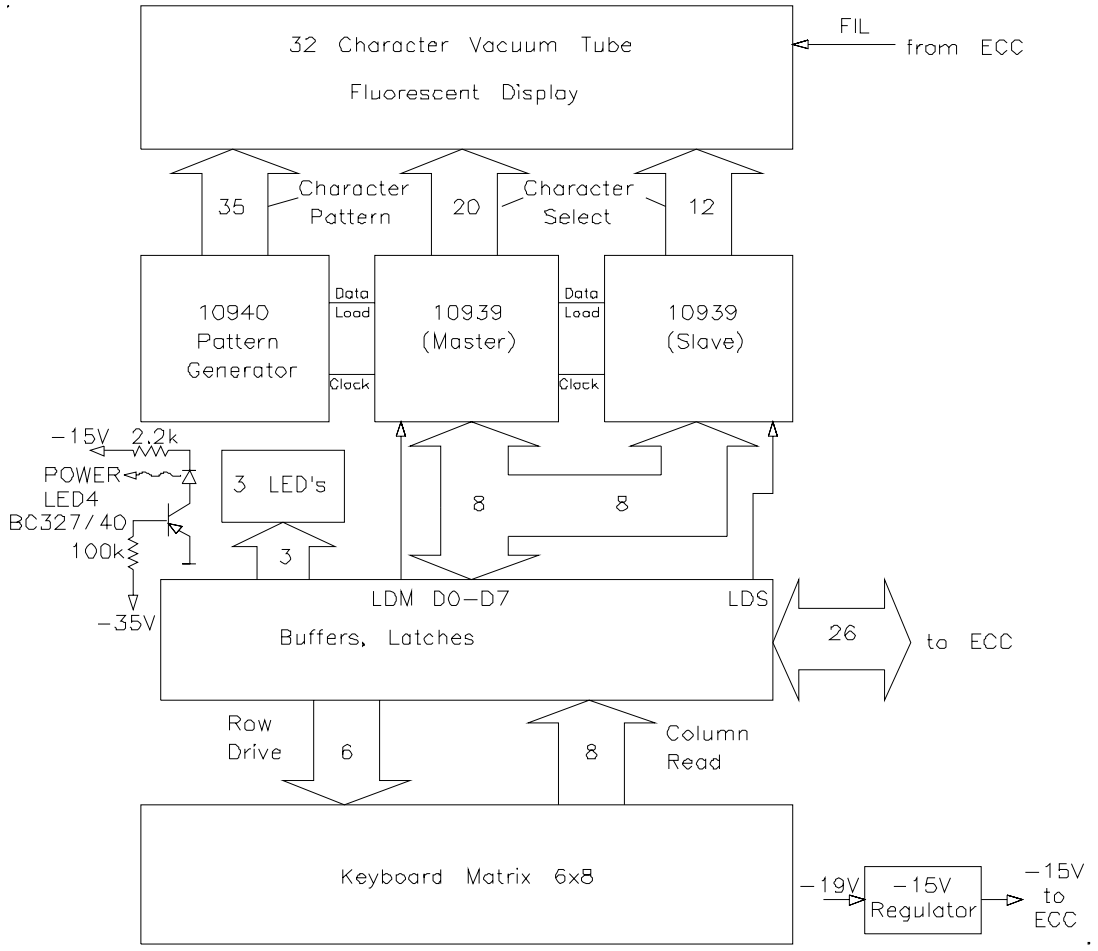


Figure 5 **Agilent 1049A KDM Block Diagram**



General Description:

Two grid drivers select the position of the character to be displayed, and drive the 32-character vacuum tube fluorescent display. The controller loads the characters sequentially from the data bus via buffer, using the load master (LDM) and load slave (LDS) lines. The pattern generator determines which character pattern will be displayed. It is loaded from the grid drivers.

The Electrochemical Controller Board (ECC) supplies the filament voltage (FIL) with a frequency of 22 kHz.

Latches drive the RUN LED, ERROR LED and NOT READY LED, whereas the POWER LED is connected to the -35V line.

Buffers drive the keyboard matrix through 6 lines (row drive). The controller reads the keyboard matrix through 8 lines (column read).

3

Electrochemical Detector Controller Board

Electrochemical Detector Controller Board

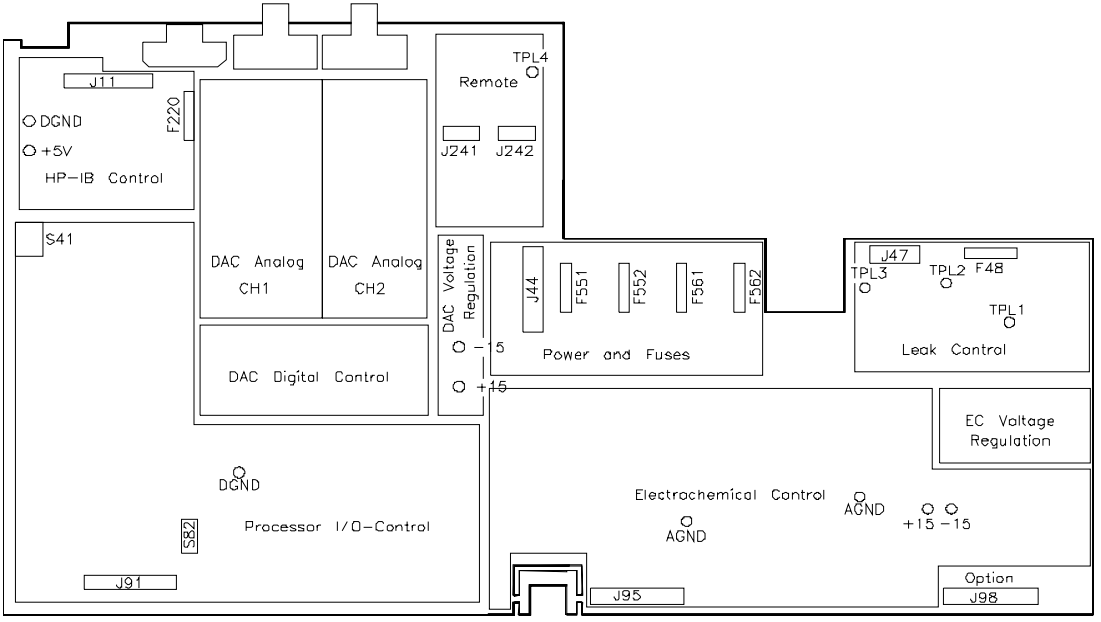
ECC-board 01049-66501

Exchange Part Number: 01049-69501

The Electrochemical Detector Controller Board (ECC) is the heart of the Agilent 1049A. This one board contains the whole management of Potentiostat, D/A and A/D Conversion, Amplification, Input/Output Devices, Analog Outputs, GPIB and Options. Connected to the ECC Board are the Pre-Amplifier Board (ECP), Keyboard Display Module (KDM), and the Flow Temperature Controller (FTC). Common Agilent 1049A functions for the processor are:

- display handling
- keyboard polling
- remote control input and output
- leak sensing
- option interfacing
- time programming
- method storage
- cell control

Figure 6 **Agilent 1049A ECC Board**



General Description

The heart of the controller hardware is a 6809 processor. The local bus system, which consists of a Control Bus, a 16 bit Address Bus and an 8 bit Data Bus, connects all functional groups on this board. The firmware is stored permanently in a 64 kbyte ROM. Data are stored temporarily in an 8 kbyte RAM which has an internal battery back-up to prevent loss of setpoints.

The power-ON logic supplies a reset to the processor when the power supply comes ON. It also gives a reset if undervoltage spikes occur on the 5 V power line. The programmable timer 68B40 delivers an input to the CPU with a frequency of 220 Hz.

Figure 7 **a. Agilent 1049A ECC Board Block Diagram**

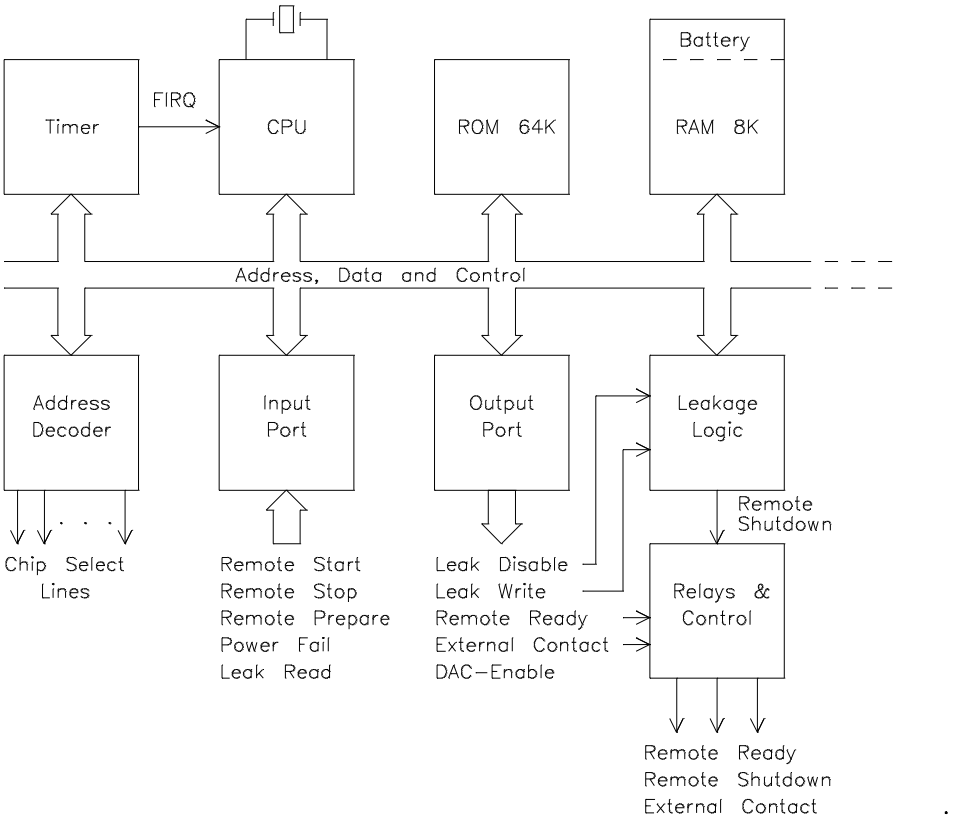


Figure 8 **b. Agilent 1049A ECC Board Block Diagram**

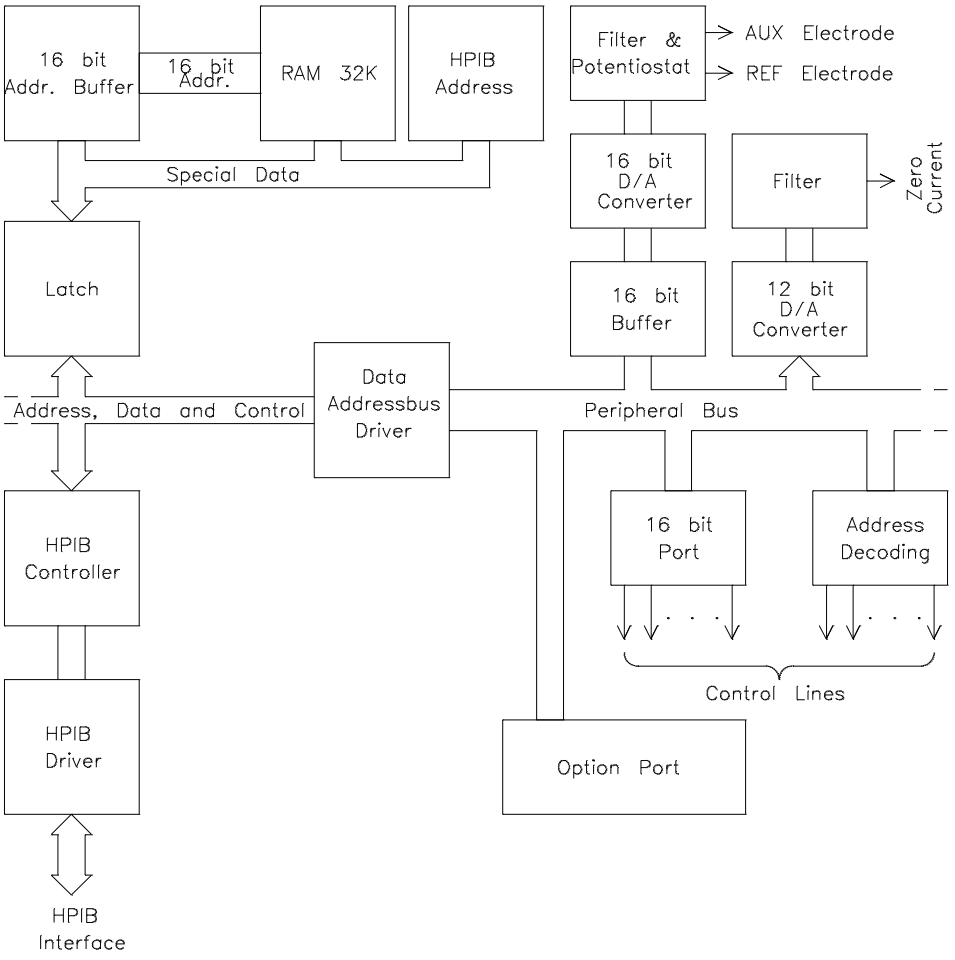
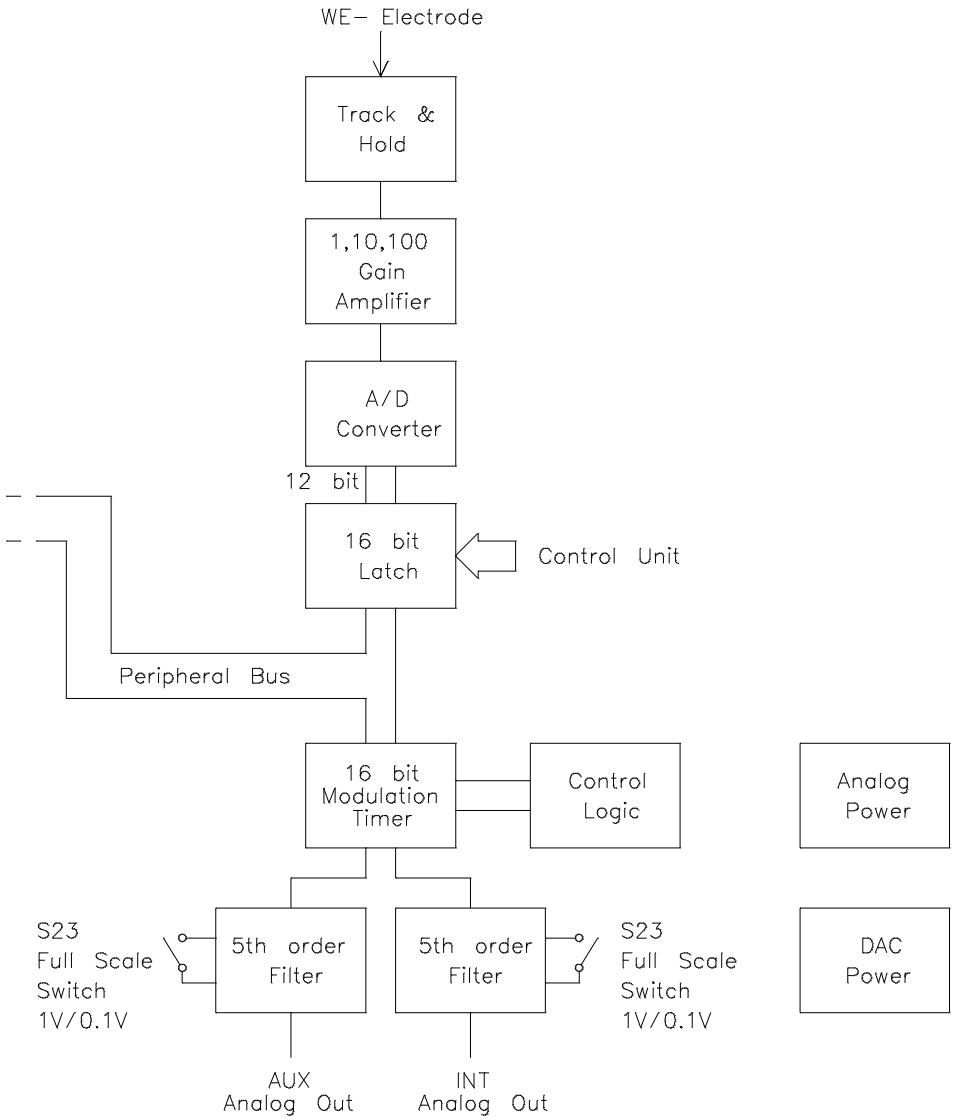


Figure 9 **c. Agilent 1049A ECC Board Block Diagram**



Processor & Control

The ECC board controls the signals going to and coming from the ECD cell. The potentiostat provides a voltage POTENTIAL to the auxiliary electrode and the reference electrode through a 16 bit D/A-Converter. This voltage works against a virtual ground. The solvent is now able to accept electrons (reduction-mode) or donates electrons (oxidation-mode), if it is 'electrochemical active'.

A current (signal) can be measured at the working electrode (WE). The signal can be compensated by a ZEROCURRENT. With the AutoZERO function this current can be choosen automatically. During a chromatogram the ZEROCURRENT remains stable.

On the Preamplifier Board (ECP), the current is converted to a voltage. With the INSTRUMENT FULLSCALE function, three gain factors can be selected. The converted voltage is fed to a Track&Hold circuit and a programmable gain amplifier on the ECC board for getting higher resolution with a standard 12 bit successive approximation converter. This value represents the signal current. The data processing section of the processor shows the value on the display, and guides it to the analog outputs.

Data Processing

Data is delivered to the Electrochemical Detector Controller Board (ECC). Data tasks include data bunching, boxcar filtering, and offset adjustment. The data bunching stage averages a certain number of datapoints. The boxcar filter takes a certain number of bunched data points (in this example 3) from the bunched signal and averages them to form the first boxcar filtered data point. The boxcar filter then leaves out the first bunched data point, adds the next bunched data point (n+1) and calculates a new average i.e. a new boxcar filtered data point. The length of the boxcar filter is called n. The resulting signal therefore contains the same number of data points as the originally bunched signal.

D/A Conversion

The main functions of the Digital to Analog conversion are:

- conversion of digital data into analog signals compatible with external integrators;
- provide two independent analog signals

The D/A- logic comprises two independent pulse-width modulated 18 bit D/A converters.The repetition rate for the data per channel is 90Hz. The two analog outputs can be used for integrators and recorders.

Output voltage	-4 ...996mV (1V)
or	-0.4 ...99.6mV
	(100mV)
	hardware switchable
Rise Time (10/90%):	0.1 sec
Noise :	<4µV (at 0.1 sec rise time)

Timers

Three 16 bit timers are available on the D/A section. One is fixed as a divider, and provides the 90 Hz clock for the control logic. The other two timers work as Pulse Width Modulators for channel 1 and 2. They are loaded with the digital word stored in the data storage area and activated with a 90 Hz clock. Starting with the loaded word, each counter will count downwards with the 6.555 MHz cycle.

Pulse Width Modulator

The pulses generated in the counter section are fed to diode switches that are responsible for switching ON or OFF the constant current source to the low pass filter section.

Low Pass Filter

There are three low pass filters in series. All filters suppress the 90 Hz cycle. The cutoff frequency is <4 Hz and suppresses the 90 Hz with >100 dB. The third low pass filter has a variable gain, which allows a scale factor for the analog output voltage at 1V or 0.1V.

Power Supply

The +/- 19V from the Power Supply is used to generate +/- 15V and + 10V as a reference voltage for the constant current source.

Output Voltage Check

Check of outputvoltage is possible with an integrator or a voltmeter after a balance has been done. Following values are measurable (+/- 10%):

Zero%	Voltage [mV]
0	0
5	50
100	1000

If these values can not be measured, the Analog-Output part may be defective. See chapter “Verifying the Performance of Your Detector” in the Operator's Manual.

Potentiostat

The potentiostat provides a fixed potential of the reference electrode (REF) referred to virtual ground of the amperometer. This is done by regulating the potentials in the +/- 14 V range applied to the auxiliary electrode (AUX) depending on changing signal currents or solvent impedances. Connected to the peripheral-data-bus, two 8 bit buffers create a 16 bit word. A 16 bit D/A-converter converts the word in an analog signal, and sends it to two active filters. The first filter converts the current to a voltage. The second filter is driven by the processor. The processor selects it either as a low-pass filter with a low frequency or as a low-pass filter with higher frequency. The low frequency is used in amperometric mode whereby the higher frequency in different pulse modes. The outputs of both filters are connected with the

op-amp which makes up the potentiostat together with Auxiliary (AUX) and Reference (REF)- electrodes.

Zero Current

The zero current compensates the current coming from the Electrochemical Detector cell, so that the amperometer is working in the optimum range (around 0 nA).

The zero current is adjusted with a 12 bit D/A converter which has a microprocessor compatible interface. The converter is driven by the peripheral DATA bus. It uses its own reference voltage (+10V). An OP amp converts the output, which is then filtered with a low pass filter. Current compensation occurs on the Preamplifier Board (ECP).

Amperometer

On the ECP board, the signal coming from the detector cell is amplified and converted into a voltage. This voltage is measured.Relays define actual gain of the amperometer. With a programmable gain amplifier the voltage is supplied to the A/D converter with a resolution of 12 bit. The processor selects the amplification factor of the gain amplifier and gets by that a real resolution of 15 bit. Two 8 bit latches provide the digital signal to the processor. Digital filtering will perform then an analog output resolution of more than 18 bit.

Leak Detection

The leak detection circuit uses a PTC resistor as leak sensor. The sensor is part of the ECP-board. If there is a leak, the PTC is cooled by the fluid, and the resistance of the PTC decreases. Hence a cooled PTC results in an increased voltage at TPL1. As soon as the voltage exceeds the voltage applied by the resistor divider to the positive input of comparator, its output goes LOW at TPL3. If the PTC is disconnected or any connection to it is broken, a comparator provides a low going output signal at TPL3, since the voltage is lower than the voltage applied to the negative input of a comparator. Outputs are read via LKRD- line from the processor.

- LKRD- is LOW (TPL3), if the voltage on TPL1 is less than 80 mV (defective) or if the voltage on TPL1 is greater than 5.8 V (leak).
- LKRD- (TPL3) delivers pulses from LKWR-, if the voltage on TPL1 is in the range of 150 mV to 4.4 V.

If LKRD- line is LOW (TPL3), the processor generates the Error Message: ERROR: leak detected. In addition, the LKRD-signal is used to switch a relay. The relay (contact closure in case of leak) can be used to turn-OFF external instruments (e.g. LC pumps). The relay acts independently of the controller. A NTC resistor is used for ambient temperature compensation.
An automatic selfcheck is implemented in the leak detection circuit. The processor sends a LKWR- signal of 10 µs pulse width and a repetition rate of 0.6 seconds. This signal (TPL2) is fed into a circuit to simulate a leak for the duration of the pulse. The processor which reads the LKRD- line is able to decide if the leak detection circuit is functioning properly.

The 10 µs pulses have no effect on the relay as they are filtered out by a low pass filter. LKDIS- line inhibits the leak detection circuit for the first minute after power-ON to ensure proper operation.

Working condition of the PTC

Normal:	About 75°C/400 … 500 Ω
Error:	Below 55°C/about 150 Ω

Actions:

- Check for a leak.
- Check voltage at TPL1 and resistance of leak sensor.
- Change ECP board.

GPIB Interface

The Electrochemical Detector has a built-in GPIB Interface. It consists of a 32 kByte RUN buffer, circuits for IN/OUTput and GPIB control.

NOTE The Pascal Workstation doesn't support the electrochemical detector.

GPIB Controller

The main part of the GPIB section is the GPIB controller which communicates with the processor through the data and address bus. In addition the GPIB controller uses the Interrupt path (IRQ). A 4 MHz clock triggers the GPIB controller. Two drivers send the data to the IN/OUTPUT port of the GPIB interface.

Run Buffer Logic

A Run Buffer stores the data before they are sent to the GPIB interface. A latch creates a special bus system. This bus addresses the buffer. The 16 bit address is stored in two 8 bit buffers.

The buffer gets its address from two 8 bit buffers. The data transfer is done through the special data bus. The switch shows the GPIB address of the Electrochemical Detector. This information is also storable inside the buffer.

LEDs

If the green LED labeled IRQ- is ON, all interrupts have been served (if LED is OFF, CPU has a lock up); Five green LEDs indicate the voltages supplied to the controller. The LEDs are labelled +5 V, +/-19 V, +24 V and -35 V respectively. If a LED is ON, the corresponding voltage is supplied to the controller.

Remote Control

The processor drives the IN/OUTput ports and the External Contacts. The output port delivers the following signals:

- READY: for the ready relay (contact closure);
- LKWR-: leads to the input from leak detection circuit. A pulse of 10 µs duty cycle is delivered from the processor approximately every 0.6 seconds;
- LKDIS-: to disable the leak detection circuit for 1 minute after power-ON;
- DACEN: to enable the analog outputs AUXILIARY and INTEGRATOR.
- EXT CONTACT: an addition connector; activated (contact closure) for pen up/down or remote start of non Agilent-devices.

The input port senses:

- external contacts: START- and STOP- (TTL level);
- LKRD-: from output of the leak detection circuit. The response from leak detection circuit is read on this line. If LKRD- does not follow LKWR-, the leak detection circuit is defective;
- POF: to indicate a Power-OFF failure.
- PREPARE: external contacts: activates prepare controlled operations

Remote control allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

Connector

For the Agilent 1049A Electrochemical Detector the subminiature D connector is used. Two remote connectors are provided which are both parallel and both inputs and outputs.

To provide maximum safety within a distributed analysis system, one line is dedicated to SHUT DOWN the system's critical parts in case a leak is detected.

Control of the analysis is maintained by signal readiness READY for the next analysis, followed by START of run and optional STOP of run triggered on the respective lines. In addition PREPARE may be issued.

The signal levels are defined as standard TTL levels (0V is logic true, + 5V is logic false).

To help you make the correct connections, the signals carried on each pin are listed below (the colors refer to wires of remote cable 01046-60201).

Pin	Signal	Active	Color
1	Digital ground		white
2	Prepare run	LOW	brown
3	Start	LOW	gray
4	Shut down	LOW	blue
5	Reserved		pink
6	not used		
7	Ready	HIGH	red
8	Stop	LOW	green
9	not used		

A full description is done in chapter 'Connectors and Cables' in this manual.

Signal description

SHUT DOWN	(L) The system has a serious problem (e.g. leak: stops pump). The receiver is any module capable of reducing the safety risk.
POWER ON	(H) All modules connected to the system are switched on. The receiver is any module relying on the operation of others.
READY	(H) The system is ready for the next analysis. The receiver is any sequence controller.
PREPARE	(L) Request to prepare for analysis (e.g. zero balance, pretreatment). The receiver is any module performing preanalysis activities.

4

Electrochemical Detector Preamplifier Board

Electrochemical Detector Preamplifier Board

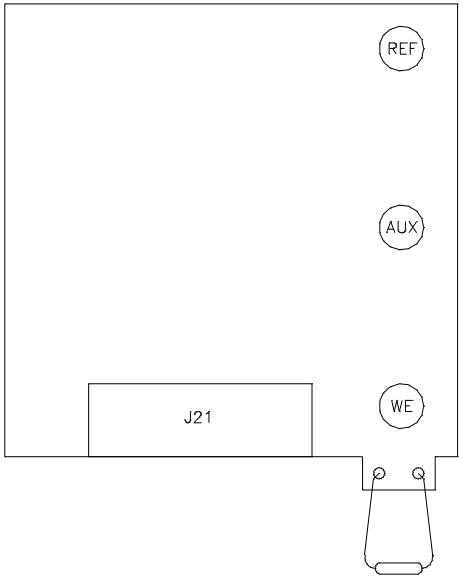
ECP-board 01049-66502

Exchange Part Number: 01049-69502

The Preamplifier Board (ECP) is the interface between the Electrochemical Detector Cell and the Processor Board (ECC). Three electrodes are connected to the Preamplifier Board:

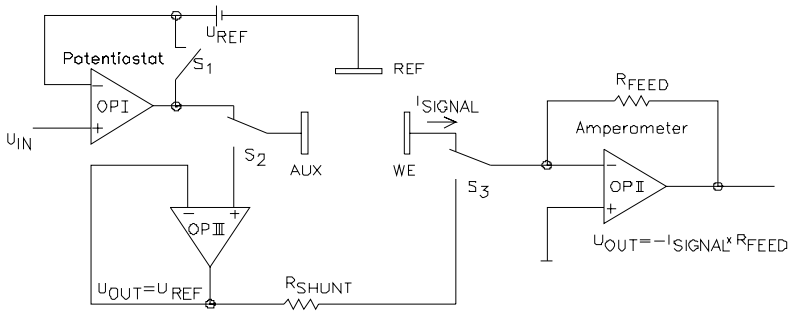
- working electrode (WE)
- reference electrode (REF)
- auxiliary electrode (AUX)

Figure 10 **Agilent 1049A ECP Board**



General Description:

Figure 11 **Agilent 1049A Operating Schematic**



The reference electrode is connected to the potentiostat through pin 9 (labelled blue), and to the auxiliary electrode through pin 5 (labelled red). Opening S2 isolates the auxiliary electrode from the potentiostat. In addition, relay S1 can connect the reference and auxiliary electrodes together. The cell current, which is the signal of the working electrode, is guided to an OP-amplifier (OPII). The OP-amp is connected to 'virtual ground'. Relay S3 disconnect the working electrode from the electronic for test purpose (dummy cell test).

With relays, three ranges are selectable (50 nA, 500 nA and 500 uA). The output signal of the preamplifier is guided through connector J21 to the amplifier of the data aquisition electronics on the Electrochemical Detector Controller Board (ECC). Compensation of the measurent current is done with the zero current which is delivered from the ECC board through connector J21.

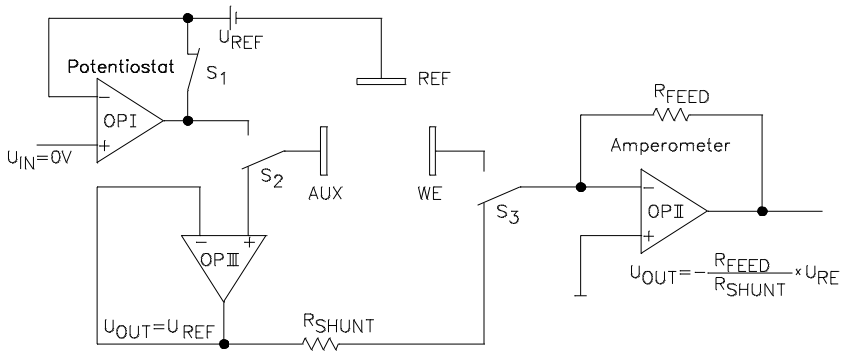
The local bus system, consisting of a Control Bus, a 16-bit Address Bus and an 8-bit Data Bus, connects all functional groups on this board. All relays are driven from the processor.

Diagnose

For diagnostic purposes a 1 MΩ shunt resistor can be connected instead of the detector cell. This is done with the dummy cell test mode from the instrument keyboard (MODE = TEST1; dummy cell test). This enables a complete electronic test to be done.

Reference electrode

Figure 12 **Schematic of the Reference Electrode Test**



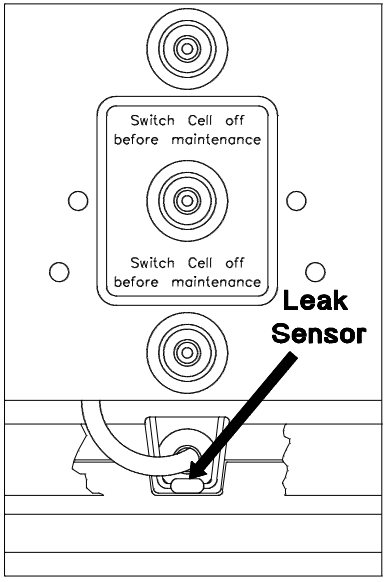
To diagnose the reference electrode, the REF-connection is grounded and the equilibrating potential of the redox-preaction (Ag/AgCl) is measured by means of the auxiliary electrode.

Working electrode

To diagnose the working electrode, a cyclovoltamogram with the background current of the solvent should be done. Now, compare this with a cyclovoltamogram done with a 'good' working electrode.

Leak sensor

Figure 13 **Location of the leak sensor**



The leak sensor is soldered to the ECP board. During operation the leak sensor should be placed inside the leak tray.

CAUTION In case of a leak, dry the leak sensor with a tissue. Do not blow on the leak sensor or use a fan to dry the leak sensor.

5

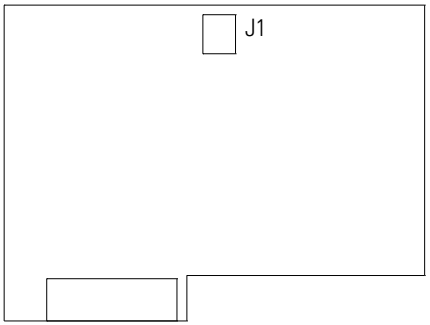
Flow Temperature Controller Board

Flow Temperature Controller Board

FTC-board 01049-66503

Exchange Part Number: 01049-69503

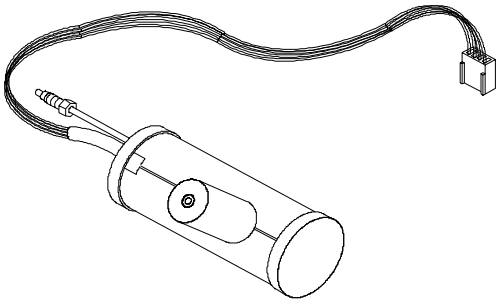
Figure 14 **Agilent 1049A FTC Board**



Heat exchanger: 01049-66901

Exchange Part Number: 01049-69901

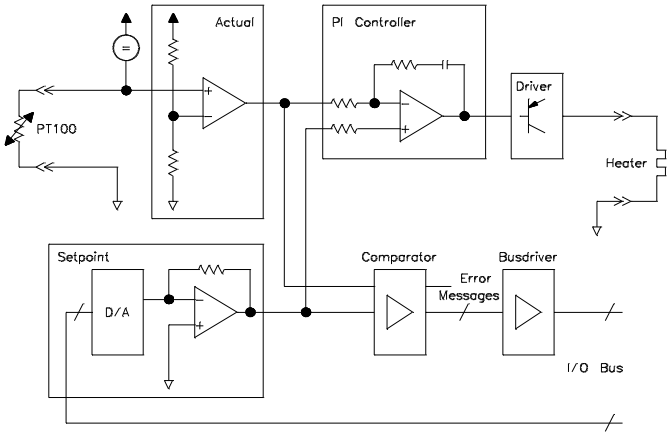
Figure 15 **Agilent 1049A Heat Exchanger**



The Flow Temperature Controller Board (FTC) and the Heat Exchanger are optionally installed in the 1049A. The board includes a temperature control circuity with a 8 bit D/A-converter which makes the temperature setting controllable by the processor. The board is connected to the Electrochemical Detector Controller Boeard (ECC). Hardware interfacing at this place is universally defined for future option handling.

General Description

Figure 16 **Schematic of Flow and Temperature control**



The flow temperature controller as an option is realized by sensing the temperature of the heat exchanger with a Platinium resistor (PT 100). The heat exchanger is installed nearby the inlet steel capillaries of the detector. It is isolated in an aluminium/PU-foam sandwich for better energy transfer and low ambient temperature interference. The capillaries are bent around a heating element which is fed by a special power line (+24V).

The controller compares the voltage across the Platinium resistor with the voltage which is get by the 8 bit D/A-converter according to temperature range of 20 to 60°C. The differential signal is now transferred to a pulse width modulator with a PI-behaviour. The modulator limits power losses in the power regulation circuit. Feedback is done thermally in the heat exchanger element.

For controlling present states of the circuit there are three window comparators for checking whether regulation is above or under the required setting or even out of specified temperature range. Out of range will cause an ERROR (shutdown), over/under temperature will cause a NOT READY on the remote bus and status will be seen.

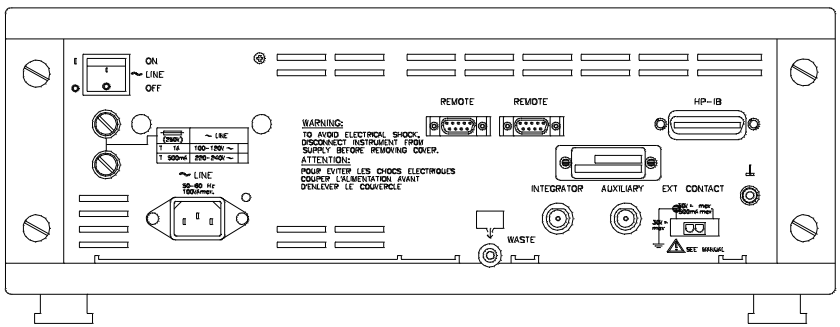
Depending on the flow rate of the chromatographic system, the time for definite temperature setting will be different from seconds to some minutes.

6

Connectors and Cables

Integrator and Auxiliary Output

Figure 17 **Agilent1049A Rear Panell**



The Integrator and the Auxiliary Output connectors provide either a 100 mV or a 1 V maximum signal output at the BNC-connectors. The full-scale voltage range of both outputs is presetted at the factory at 0 to 1 V. Changing the full-scale voltage range can be done by a switch on the ECC-board individually for each output.

Available analog cables for the Agilent 1049A Electrochemical Detector are listed below and on the following pages.

Agilent 1049A to HP 3390/2/3 Integrators

or Signal Distribution Module 01090-60300

Connector (Part Number 01040-60101)	Pin 3390/2/3	Pin 1049A	Signal Name
	1	Shield	Ground
	2		Not connected
	3	Center	Signal +
	4		Connected to pin 6
	5	Shield	Analog -
	6		Connected to pin 4
	7		KEY
	8		Not connected

Agilent 1049A to HP 3394 and Agilent 3396 Integrators or Agilent 35900 Interface

Connector (Part Number 35900-60750)	Pin 3394/6	Pin 1049A	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Signal +

Agilent 1049A to HP 18562 Interface

Connector (Part Number 01046-60103)	Pin 18562	Pin 1049A	Signal Name
	3	Shield	Analog -
	4	Centr	Signal +
	F		KEY

Agilent 1049A to HP 1084 LC

Connector (Part Number 8120-1840)	Pin 1084	Pin 1049A	Signal Name
	Shield	Shield	Analog -
	Center	Center	Signal +
	3		

Agilent 1049A to General Purpose

Connector (Part Number 01046-60105)	Wire Color	Pin 1049A	Signal Name
	BLACK	Shield	Analog -
	RED	Center	Signal +

Remote

Both remote connectors are identical and connected in parallel.

The Prepare Run, Start and Stop are low active TTL level inputs.

The prepare run signal can be used to get some features of the Agilent 1049A Electrochemical Detector e.q. Pretreatment for cleaning the working electrode before run.

If the detector is not ready it generates a contact closure not ready signal. If a leak is detected, a shut-down signal is activated, which can be used to stop a solvent pump.

The table below lists signals which are used by the Agilent 1049A Electrochemical Detector.

Table 1 **Pin assignment 1049A**

Pin#	Signal	Action
1	Digital Ground	
2	Prepare Run	Low active input
3	Start	Low active input
4	Shut down	Contact closure output
5	NC	
6	NC	
7	Ready	Contact closure output
8	Stop	Low active input
9	NC	

NC = Not Connected

Agilent 1049A to HP 3390 Integrator

Connector (Part Number 01046-60203)	Pin 3390	Pin 1049A	Signal Name	(Active)
	2	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	7	GRA 3	Start	(LOW)
	NC	BLU 4	Shut Down	(LOW)
	NC	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	NC	RED 7	Ready	(HIGH)
	NC	GRN 8	Stop	(LOW)
	NC	BLK 9	Not Connected	

NC = Not Connected

Agilent 1049A to HP 3392/3 Integrator

Connector (Part Number 01046-60206)	Pin 3392/3	Pin 1049A	Signal Name	(Active)
	3	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	11	GRA 3	Start	(LOW)
	NC	BLU 4	Shut Down	(LOW)
	NC	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	9	RED 7	Ready	(HIGH)
	1	GRN 8	Stop	(LOW)
	NC	BLK 9	Not Connected	
	4 - KEY			

Agilent 1049A to HP 3394 Integrator

Connector (Part Number 01046-60210)	Pin 3394	Pin 1049A	Signal Name	(Active)
	9	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	3	GRA 3	Start *	(LOW)
	NC	BLU 4	Shut Down	(LOW)
	NC	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	5, 14	RED 7	Ready	(HIGH)
	3	GRN 8	Stop **	(LOW)
	1	BLK 9	Not Connected	
	13, 15		Not Connected	

* = START and STOP are connected via diodes to pin 3 of the HP 3394 connector.
** = START and STOP are connected via diodes to pin 3 of the HP 3394 connector.

Agilent 1049A to Agilent 3396 Integrator

Connector (Part Number 03394-60600)	Pin 3396	Pin 1049A	Signal Name	(Active)
	9	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	3	GRA 3	Start	(LOW)
	NC	BLU 4	Shut Down	(LOW)
	NC	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	5, 14	RED 7	Ready	(HIGH)
	6	GRN 8	Stop	(LOW)
	1	BLK 9	Not Connected	
	13, 15		Not Connected	(LOW)

Agilent 1049A to HP 1050 or Agilent 35900 A/D converter

Connector (Part Number 5061-3378)	Pin 1050	Pin 1049A	Signal Name	(Active)
	1	WHT 1	Digital Ground	
	2	BRN 2	Prepare Run	(LOW)
	3	GRA 3	Start	(LOW)
	4	BLU 4	Shut Down	(LOW)
	5	PNK 5	Not Connected	
	6	YEL 6	Not Connected	
	7	RED 7	Ready	(HIGH)
	8	GRN 8	Stop	(LOW)
	9	BLK 9	Not Connected	(LOW)

Agilent 1049A to HP 18562 Interface

Connector (Part Number 01046-60204)	Pin 18562	Pin 1049A	Signal Name	(Active)
	B	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	C	GRA 3	Start	(LOW)
	NC	BLU 4	Shut Down	(LOW)
	NC	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	NC	RED 7	Ready	(HIGH)
	NC	GRN 8	Stop	(LOW)
	NC	BLK 9	Not Connected	

Agilent 1049A to HP 1090 LC or Signal Distribution Module

Connector (Part Number 01046-60202)	Pin 1090	Pin 1049A	Signal Name	(Active)
	1	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	4	GRA 3	Start	(LOW)
	7	BLU 4	Shut Down	(LOW)
	8	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	3	RED 7	Ready	(HIGH)
	6	GRN 8	Stop	(LOW)
	NC	BLK 9	Not Connected	
	5 - KEY			

Agilent 1049A to HP 1081B LC

Connector (Part Number 01046-60200)	Pin 1081	Pin 1049A	Signal Name	(Active)
	E	WHT 1	Digital Ground	
	NC	BRN 2	Prepare Run	(LOW)
	B	GRA 3	Start	(LOW)
	D	BLU 4	Shut Down	(LOW)
	C	PNK 5	Not Connected	
	NC	YEL 6	Not Connected	
	NC	RED 7	Ready	(HIGH)
	NC	GRN 8	Stop	(LOW)
	NC	BLK 9	Not Connected	

Agilent 1049A to HP 1084 LC or Universal

Connector (Part Number 01046-60201)	Pin Universal	Pin 1049A	Signal Name	(Active)
		WHT 1	Digital Ground	
		BRN 2	Prepare Run	(LOW)
		GRA 3	Start	(LOW)
		BLU 4	Shut Down	(LOW)
		PNK 5	Not Connected	
		YEL 6	Not Connected	
		RED 7	Ready	(HIGH)
		GRN 8	Stop	(LOW)
		BLK 9	Not Connected	(LOW)

7

Parts Identification

Parts Identification

This chapter gives diagrams for parts identification and the complete parts listings respectively.

- Overall Diagram
- Keyboard
- Rear Panel
- Flow Cell
- Miscellaneous Parts

Agilent 1049A illustrated parts breakdown

Figure 18 **Exploded View**

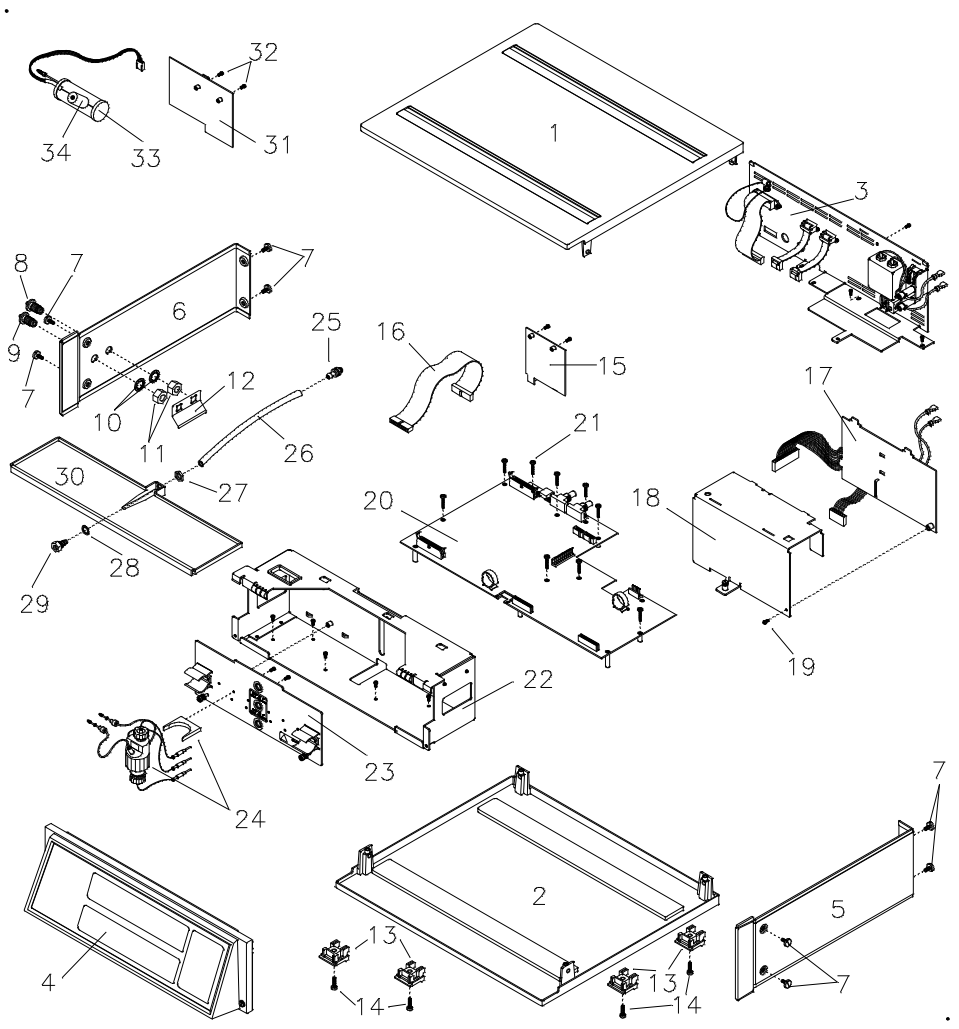


Table 2 **Agilent 1049A Exploded View**

#	Description	Part number
1	Cover top	5021-3663
2	Cover bottom	5021-3662
3	Rear panel assembly	01049-60015
4	Keyboard assembly	no part number
5	Cover side	5061-8320
6	Side panel	01049-00202
7	Screw	0515-0750
8	ECD inlet	01049-27601
9	ECD outlet	01049-27602
10	Washer	2190-0596
11	Nut hex	0535-0116
12	Leak drawer	01049-44502
13	Foot	4040-2098
14	Screw	0515-1118
15	ECP-board	01049-66502
16	Cable assy	5061-3359
17	MPS-board	01046-66501
18	Cover MPS-board	01046-04101
19	Screw	0515-0886
20	ECC-board	01049-66501
21	Screw	0515-1507
22	ECD cabinet	01049-04401
23	Assy sheet	01049-06501
24	ECD cell	01049-68700
24a	Mounting clamp	5021-1866

Table 2 **Agilent 1049A Exploded View, continued**

#	Description	Part number
25	Waste tube	01049-27301
26	Tube flex	0890-1711
27	Nut	0100-0771
28	Gasket	01049-07101
29	Connector tube	01049-27302
30	Leaktray	01049-44501
31	FTC-board (opt.)	01049-66503
32	Screw	0515-0886
33	Heat exchanger (opt.)	01049-66901
34	Insulation	4324-0159

Agilent 1049A Keyboard

Figure 19 **Keyboard Exploded View**

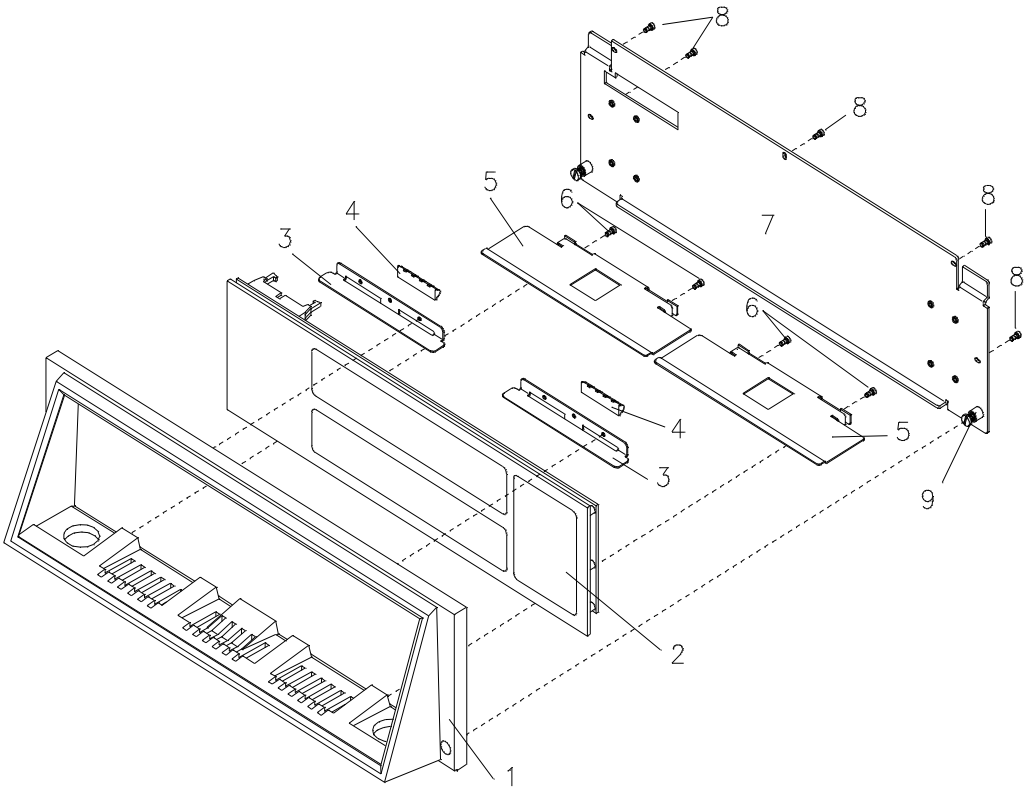


Table 3 **Keyboard**

#	Description	Part number
1	Frontpanel	01049-40201
2	Keyboard	01049-66508
3	Holder upper	01046-02301
4	RFI strip	8160-0392
5	Holder lower	01046-02302
6	Screw	0515-0886
7	Frontpanel cover	01049-04101
8	Screw	0515-0886

Agilent 1049A Rear Panel

Figure 20 **Rear Panel**

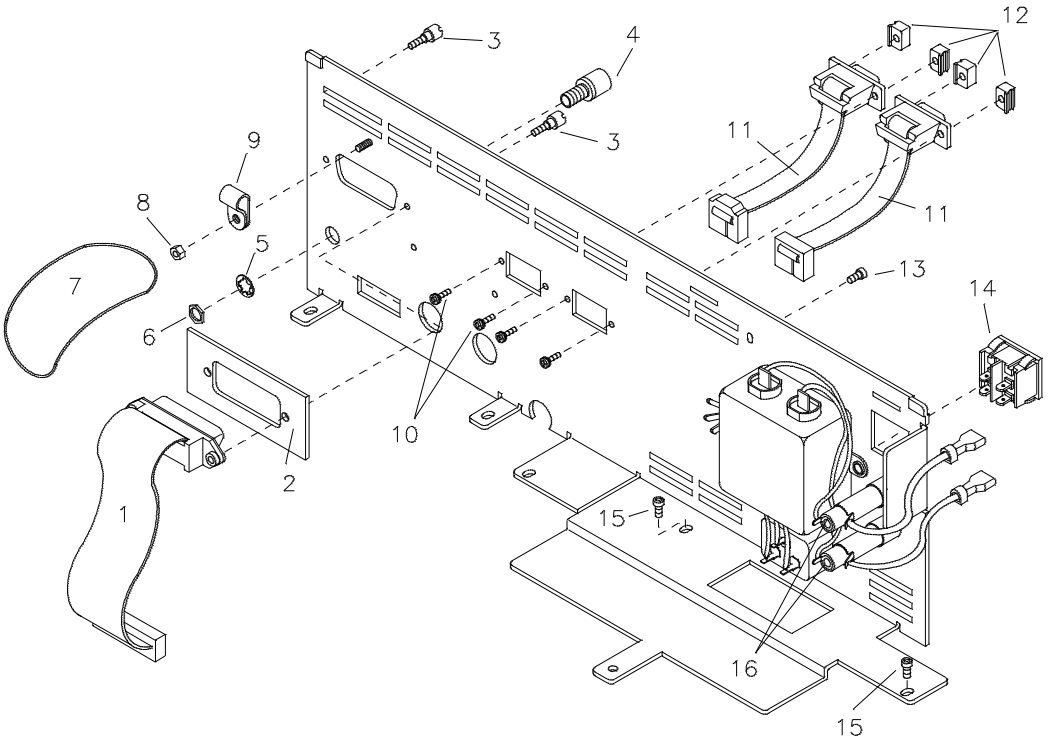


Table 4 **Rear Panel**

#	Description	Part number
1	Cable interface	5061-3352
2	Panel GPIB	01090-00215
3	GPIB scew Included in item 1	
4	BDG post	1510-0038
5	Wash lock	2190-0084
6	BDG post	1510-0038
7	O-ring	0905-1185
8	Nut hex	0535-0006
9	Cable clamp	1400-0024
10	Screw	2200-0105
11	Cable assy	01046-61604
12	Screw lock	1252-1518
13	Screw	0515-0886
14	Switch rocker	3101-2913
15	Screw M3.5	0515-0887
16	Fuse holder	2110-0610
16a	Fuse holder cap	2110-0565
16b	Nut hex plastic	2110-0569

Agilent 1049A Flow Cell

Figure 21 **Agilent 1049A Electrochemical Detector Cell**

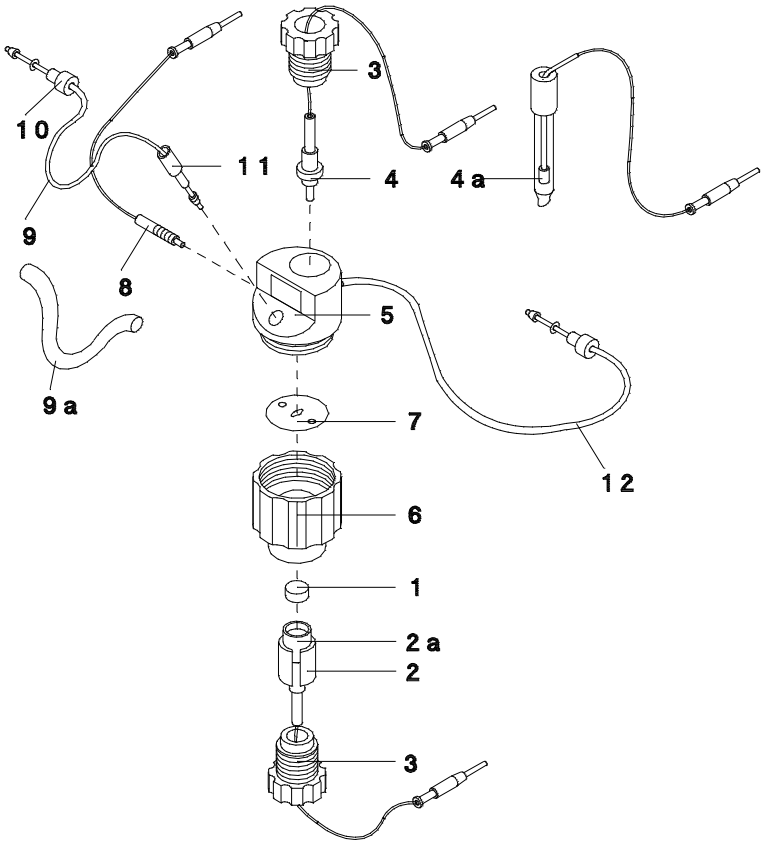


Table 5 **Agilent 1049A Flow Cell**

#	Description	Part number
1	Working electrode disc glassy carbon	01049-64105
1a	Working electrode disc platinum (opt.)	01049-28801
1b	Working electrode disc gold (opt.)	01049-28802
2	Working electrode assembly	01049-60013
2a	Silicon tubing	5062-2474
3	Electrode swifel nut	01049-25701
4	Reference electrode solid state	01049-62901
4a	Reference electrode intern. electrolyte (opt.) Seal reference electrode used for 4 and 4a	01049-62902 01049-47102
5	Cell body black (auxiliary electrode)	01049-27708
6	Electrode socket	no part number
7	FEP spacer	01049-24705
8	Auxiliary electrode connection	01049-27604
9	Inlet tubing PTFE, red	01049-27305
9a	Silicon tubing	5041-8355
10	Ferrule 20/Pk	5061-3321
10a	Gripper 20/Pk	5061-3322
10b	Male 20/pk	5061-3323
10c	Buffer disc 20/Pk	5061-3324
11	Inlet connection nut and ferrule	5021-1867
12	Outlet tubing PTFE, blue	01049-27306

Agilent 1049A Miscellaneous Parts

Table 6 **Agilent 1049A Miscellanous Parts**

#	Description	Part number
1	ECD inlet capillary	01048-87302
2	ECD outlet capillary	01040-67602
3	Plug external contact	1251-4782
4	Connector external contact	1251-3911
5	Fuse 1 A	2110-0001
6	Fuse 2 A	2110-0002
7	Fuse 0.5 A	2110-0012
8	Fuse 0.1 A	2110-0236
9	Pipe insulation 1 m	5021-7131
10	Polishing kit	01049-67001
10a	Diamond paste	no part number
10b	Polishing disc	5955-3794
11	KCL electrolyte solution	01049-92101

Agilent Technologies

In This Book

Installation, performance verification and test features of the Agilent 1049A electrochemical detector are described in the *Operator's Handbook*.

This *Service Handbook* contains informations about the hardware, cables and connectors and a parts reference list.

01049-90101