



IC3K

Automatic Test Equipment with PXI Subsystem



ProductionLine has expanded their line of mixed-signal testers by combining the standard IC100-S tester with an upgraded test head, a 5 amp VI-Source, an Agilent 6-1/2 digit DMM, an 8-slot PXI subsystem and USB and LXI front panel ports. This new IC3K test system also includes ProductionLine's new quad precision SMU card in the PXI bus.

Software for the IC3K includes the proven and popular fill-in-the-blank GUI, a new tester front panel GUI with all the instrumentation on one screen and DLL's for VB6 and C++.

IC3K Overview

Features:

- Space saving footprint, integrated computer, small light-weight test head
- PXI subsystem includes a quad, high-precision SMU and 6 spare slots
- LXI ethernet connections on front panel, using an independent PCI card
- Fill-in-the-blank software for easy, intuitive test development
- Summary sheets, Datalogs and a Prober/Handler interface are included
- Base: 4 SMU's, 16 digital inputs, 16 outputs, 2 serial ports, 32 relay controls

Applications:

- Power Management Device with serial microcontroller interfaces
- Serially-programmable Analog Switches, Multiplexers, DAC's and ADC's
- Analog and Mixed-Signal IC's like Op Amps, Regulators, References

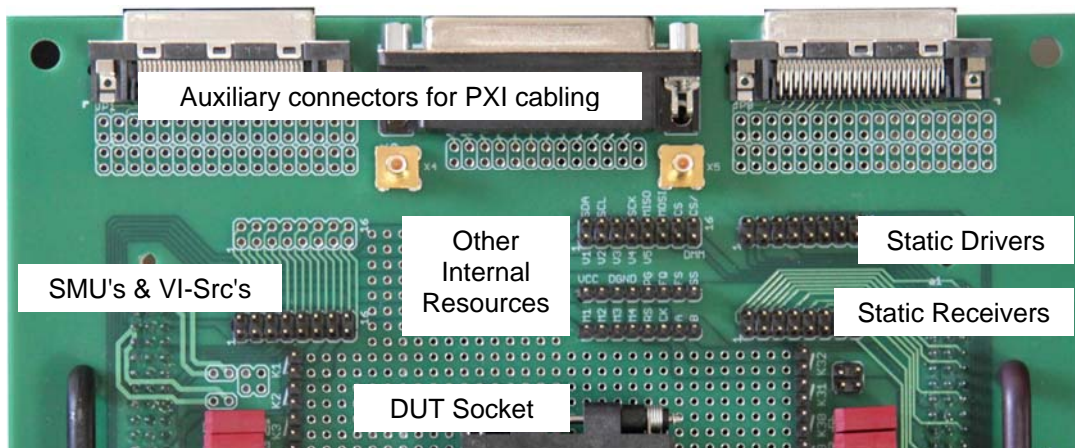
Instrumentation:

- 4 precision, 4-quadrant SMU's with Kelvin and ground sense, $\pm 10V$, $\pm 200mA$
- 2 VI-Sources with Kelvin, $\pm 20V$, $\pm 400mA$
- 1 high-current VI-Source, $\pm 6V$, $\pm 5A$
- I²C serial interface to 3.4MHz and SPI serial interface to 20MHz
- 16 static drivers and 16 receivers with programmable Vih and Vt
- Agilent 34410A 6½ digit DMM wired to test head using rear connectors
- 24-bit ADC in test head with programmable conversion speed and resolution
- 5 16-bit DAC's with $\pm 10V$ outputs, 32 independent loadboard relays

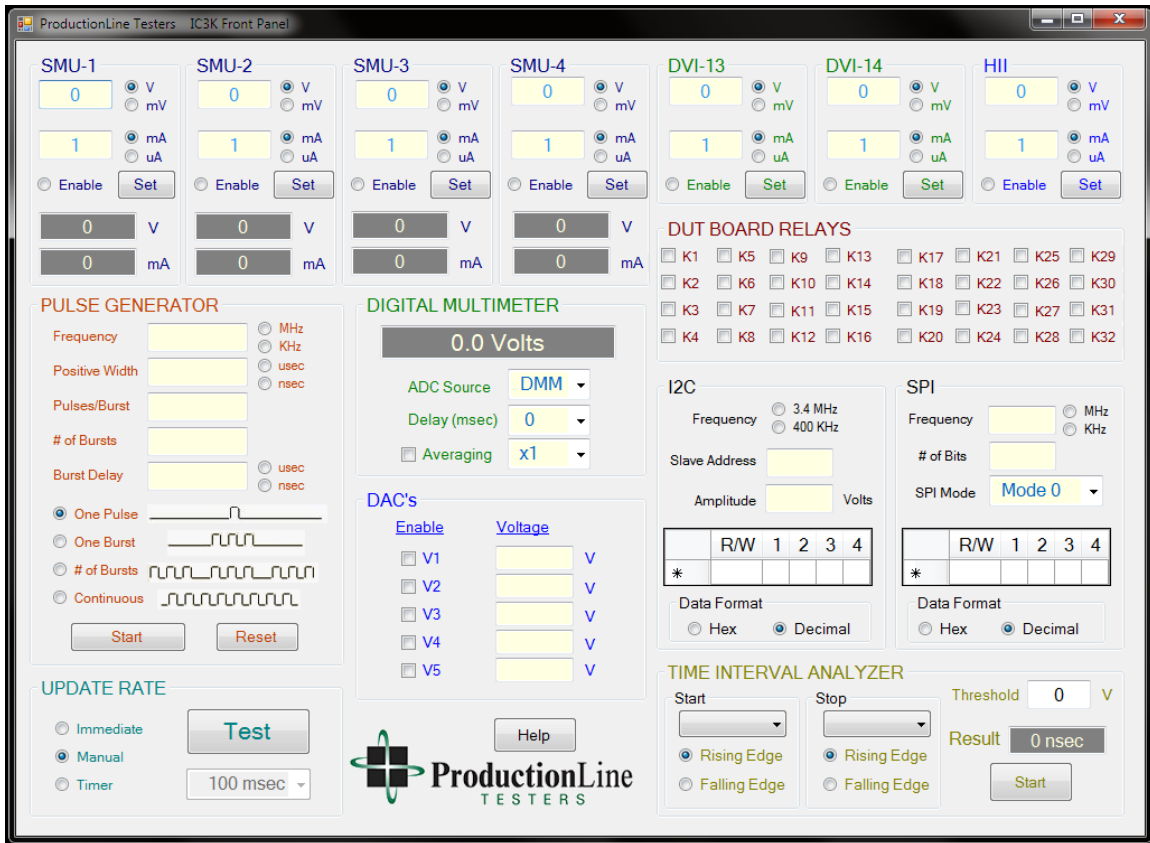
Factory Requirements:

- 110VAC or 240VAC, less than 1kW
- 19" Rack (7U): 19.8" (503mm) deep x 20.5" (521mm) wide x 13.5" (343mm) tall
- Test Head Box: 12" (305mm) long x 8.35" (212mm) wide x 3.5" (89mm) tall

Simple connections between tester and DUT



Front Panel Programming



Most of the instruments included in the standard IC3K may be controlled by the convenient Front Panel Graphical User Interface (GUI) as seen here. This gives the user a quick and simple way to use the instrumentation in the tester as a collection of lab equipment.

The source code for this Front Panel GUI is also included with the tester. It is programmed in Microsoft's Visual Studio 2010 .Net, using C++. This gives an example of the application Dynamic Link Libraries (DLL's). One may cut and paste the code to a new software project or use this existing one to implement a customized user environment.

Fill-in-the-blank Programming

Each cell of each test may be individually programmed.

Test Name	Relays	Sources	Digital	Serial	AD/DA	PUT	Min	Max	Units	Bin
1 ICC	1, 3, 29	5.5 V			22 bit	VCC	0	200 uA		2
2 Write Reg1	3, 19	0	3F45	I2C		SDA	0	0	I2C Wr	8
3 ReadReg 1	3, 19	0	7FFF	I2C		SDA	255	255	I2C Rd	7

Double-clicking main spreadsheet here ...

...opens the Serial tab for programming Test 3 here.

The Serial programming interface shows the following settings:

- I2C Port:** Frequency 400 KHz, Slave Address 1f.
- Control Codes:**

R/W	1	2	3	4
Write	02	5A		
Write	06	00		
Read	5A			
- Data Format:** Hex (selected), Decimal.
- SPI Mode:** Mode 0 (POL=0, PHA=0) (selected), Mode 1 (POL=0, PHA=1), Mode 2 (POL=1, PHA=0), Mode 3 (POL=1, PHA=1).

This example shows how to program the I²C port. In the main spreadsheet, select the test (row) and the appropriate tester resource (column).

For this device, a latch is programmed through the I²C port with the date pattern "5A", using control code "02". Then the direction is changed to input using control code "06". Finally, the Read is done and the expected data is entered into bytes 1 and 2. (Note this data is NOT sent to the DUT, but is for comparison purposes.)

The tester calculates the first I²C byte (in column 0) and also takes care of the start bit, stop bits and acknowledge handshaking automatically. The actual data sent by the DUT will be compared to the "5A" expected pattern.

Test #	Test Name	Results	Min	Max	Units
1	ICC	0.583	0	1.2	mA
2	ICC2	0.815	0	2	mA
3	VOS	0.684	-10	10	mV
4	IOS	-1.328	-50	50	mA
5	IB+	15.399	-250	250	nA
6	IB-	-20.873	-250	250	nA
7	VO+	13.293	13	20	V
8	VO-	-13.528	-20	-13	V
9	CMRR+	14.005	12	20	V
10	CMRR-	-13.540	-20	-12	V
11	CMRR	97.374	65	999	dB
12	PSRR+	0.576	-10	+10	mV
13	PSRR-	-7.134	-10	+10	mV
14	PSRR	161.603	64	999	dB
15	AVOL+	0.595	-10	10	mV
16	AVOL-	0.715	-10	10	mV
17	AVOL	83.379	25	999	V/V

Realtime Results

The Loadboard Relays configuration window shows the following settings:

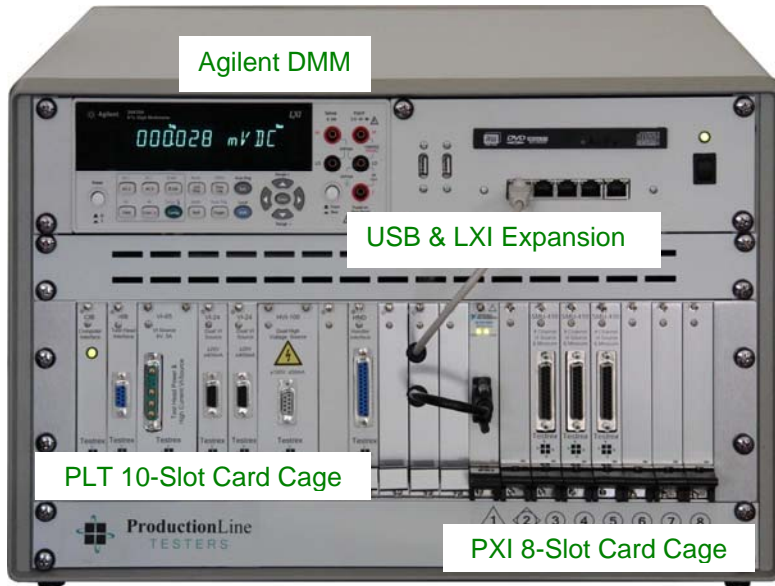
- Relays:** K1, K2, K3, K4, K5, K6, K7, K8, K9, K10, K11, K12, K13, K14, K15, K16, K17, K18, K19, K20, K21, K22, K23, K24, K25, K26, K27, K28, K29, K30, K31, K32.
- Setting Time:** 1 msec.

Loadboard Relays

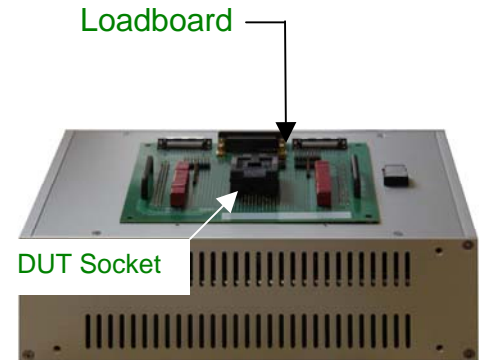
Source	DUT Pin	Force Value	Units	Compliance	Comp. Units
1	IN-	13.5 V		5 mA	
2	IN+				
3	V+	15 V		5 mA	
4	V-	-15 V		-5 mA	
5	LoopOut	1 mA		19 V	
6	LO100x				
7	Out100x				
8	Out				
9	LoopIn				

Programming VI-Sources

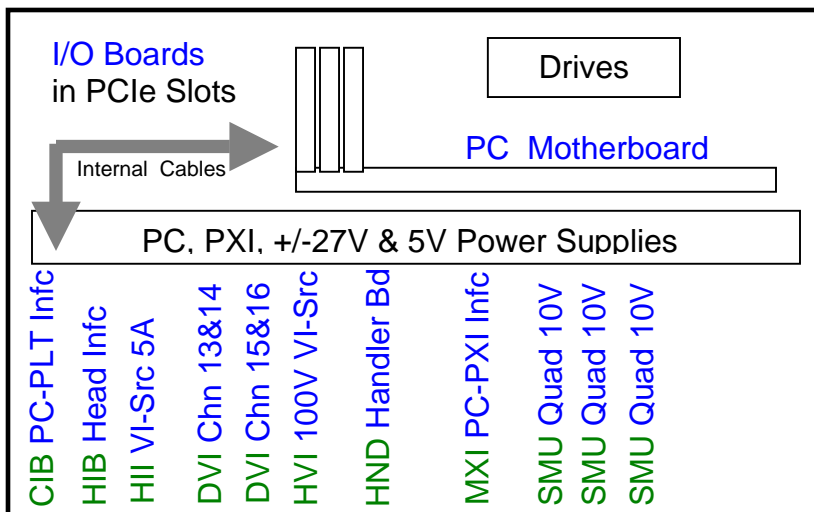
IC3K Block Diagram



19" RACKMOUNT MAINFRAME



TEST HEAD



Loadboard & DUT Socket

- I2C - I²C Serial Controller
- SPI - SPI Serial Controller
- DRV - 16 Static Drivers
- RCV - 16 Static Receivers
- 24B - 24-bit ADC
- DAC - Five 16-bit DAC's
- LBK - Relay Control Logic

IC3K Instruments

DVI	Dual VI-Source	4-quadrant Kelvin voltage & current sources, ±20V, ±400mA
I2C	I ² C Serial Port	Automated I ² C port, 64 byte buffer, various clock speeds
SPI	SPI Serial Port	Flexible SPI port, programmable mode, to 20MHz
DRV	Digital Drivers	16 Digital Drivers, 1.6 to 5V amplitude, up to 64 vectors per test
RCV	Digital Receivers	16 Digital Receivers, 0 to 5V threshold, 64 vectors per test
24B	24-bit Voltmeter	24-bit ADC, ±20V input, programmable speed and resolution
LBK	Loadboard Relays	32 independent and uncommitted, user-controlled relays
DAC	16-bit Voltage Srcs	5 precision voltage sources, ±10V outputs
SMU	Quad SMU	Precision Source/Measure Unit, ±10V, ±200mA
HII	High Current Src	4-quadrant voltage & current source, ±6V, ±5A
DMM	Digital Multimeter	High Precision 6-1/2 Digit Agilent 34410A Multimeter

(This configuration shows optional HVI module, optional HND module, 1 optional DVI (1 standard), and 2 optional SMU-410 (1 standard).)