Fluke A90 Current Shunt

Der Fluke A90 Current Shunt ist sowohl für Gleich- als auch für Wechselstrom geeignet. Da früher viele Voltmeter und Differentialvoltmeter keinen Strom messen konnten, wurden solche Stromwiderstände auch für kleiner Ströme eingesetzt. Da viele Multimeter heute bis zu 10A messen können, werden diese speziellen Shunts nicht mehr benötigt.

Abbildung des Shunts

Im folgenden werden Kopien des Handbuches gezeigt:

Fluke A90 Current Shunt

Beschreibung des Shunts:

ACCESSORY INFORMATION

MODEL A90 CURRENT SHUNT

6-1. INTRODUCTION

6-2. The Model A90 Current Shunt is designed for use with any high-impedance ac or dc voltmeter capable of accurately measuring 100 millivolts. Six Fluke precision wire wound and strip resistors provide a 100 millivolt full-scale output for each of six pushbutton current ranges: 0.1, 1, 10, 100, and 1000 milliamperes and 10 amperes (ac or dc). Basic accuracy is specified over a frequency range of dc to 4 kHz for the 10 ampere range and dc to 10 kHz for the milliampere ranges.

6-3. The instrument is supplied in half-rack case so that it may be conveniently mounted side-by-side with other half-rack instruments in a standard 19-inch rack. A carrying handle detents into custom non-marring feet and serves as a tilt-up bail for bench use.

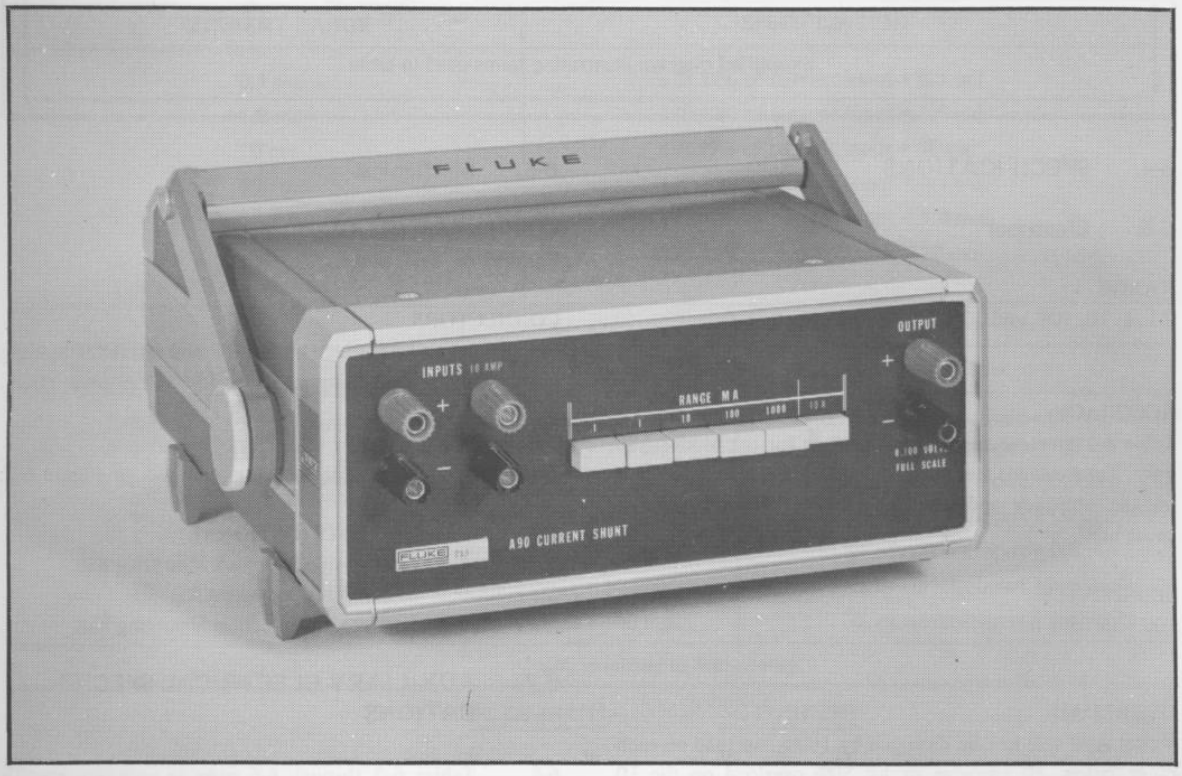
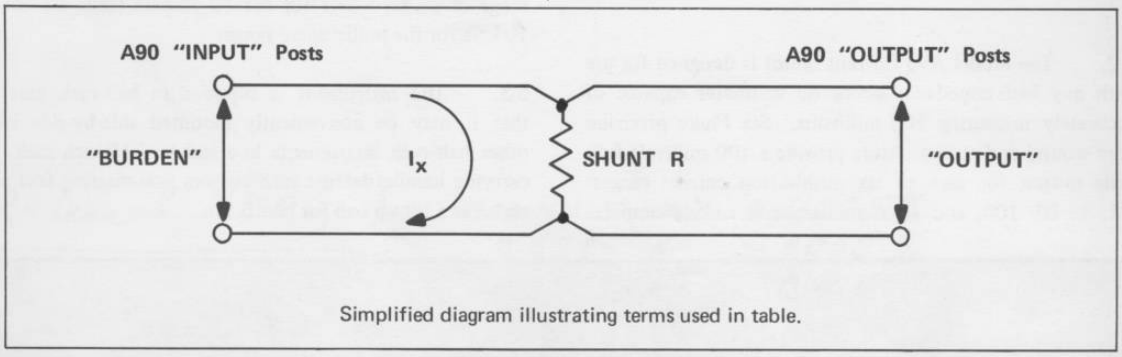


Figure 6-1. MODEL A90 CURRENT SHUNT

Table 6-1. ACCURACY OF A90 (1 year, 15°C - 35°C)

RATED CURRENT RANGE	E BURDEN (APPROX.)	SHUNT R	"OUTPUT" AT RATED CURRENT	"OUTPUT" ACCURACY AS % OF CURRENT INPUT	
				DC ONLY	DC TO 10 KHZ AC
0.1 ma	100 mv	1 kΩ	100 mv	±0.1%	±0.1%
* 0.1 ma	100 mv	1 kΩ ±0.05%	100 mv	+0.0% −0.2%	+0.0% −0.2%
1.0 ma	100 mv	100Ω ±0.07%	100 mv ±0.05%	±0.1%	±0.1%
10 ma	100 mv	10Ω ±0.08%	100 mv	±0.1%	±0.1%
100 ma	102 mv	1Ω 〃	100 mv	±0.1%	±0.1%
1A	120 mv	0.1Ω 〃	100 mv	±0.1%	±0.2%
10A	300 mv	0.01Ω 〃	100 mv	±0.1% ±0.2%	±0.3% (to 4 kHz)

* With 1 MΩ Input R Voltmeter.
When Input R is ⩾10 MΩ, use non-asterisked 0.1 ma specification.



Simplified diagram illustrating terms used in table.

6-4. SPECIFICATIONS

6-5. Electrical

RANGE
0.1, 1, 10, 100, and 1000 milliamps and 10 amperes.

ACCURACY
Table 6-1 gives accuracy specifications for the Model A90 only. Total current measurement accuracy is also dependent on the accuracy and input impedance of the voltmeter being used.

SENSITIVITY
100 millivolts full scale.

OVERLOAD
Model A90 will not be damaged by 100% overload on each range below 10 amperes or by 50% overload on the 10 ampere range.

6-6. Mechanical

CURRENT SELECTION
Pushbutton, each range.

CONNECTORS
Positive (+) and negative (–) INPUT and OUTPUT binding posts with separate input posts for 10 ampere range.

DIMENSIONS
The Model A90 outline drawing is shown in Figure 6-2.

RACK MOUNTING KITS (OPTIONAL)
MEE-7014: Side-by-side Half-rack Mounting Kit
MEE-7006: Center Rack Mounting Kit
MEE-7013: Left or right of center Mounting Kit.

6-7. AUXILIARY ELECTRICAL SPECIFICATIONS

6-8. Tables 6-2 through 6-6 provide accuracy specifications for the Model A90 when used with Fluke Models

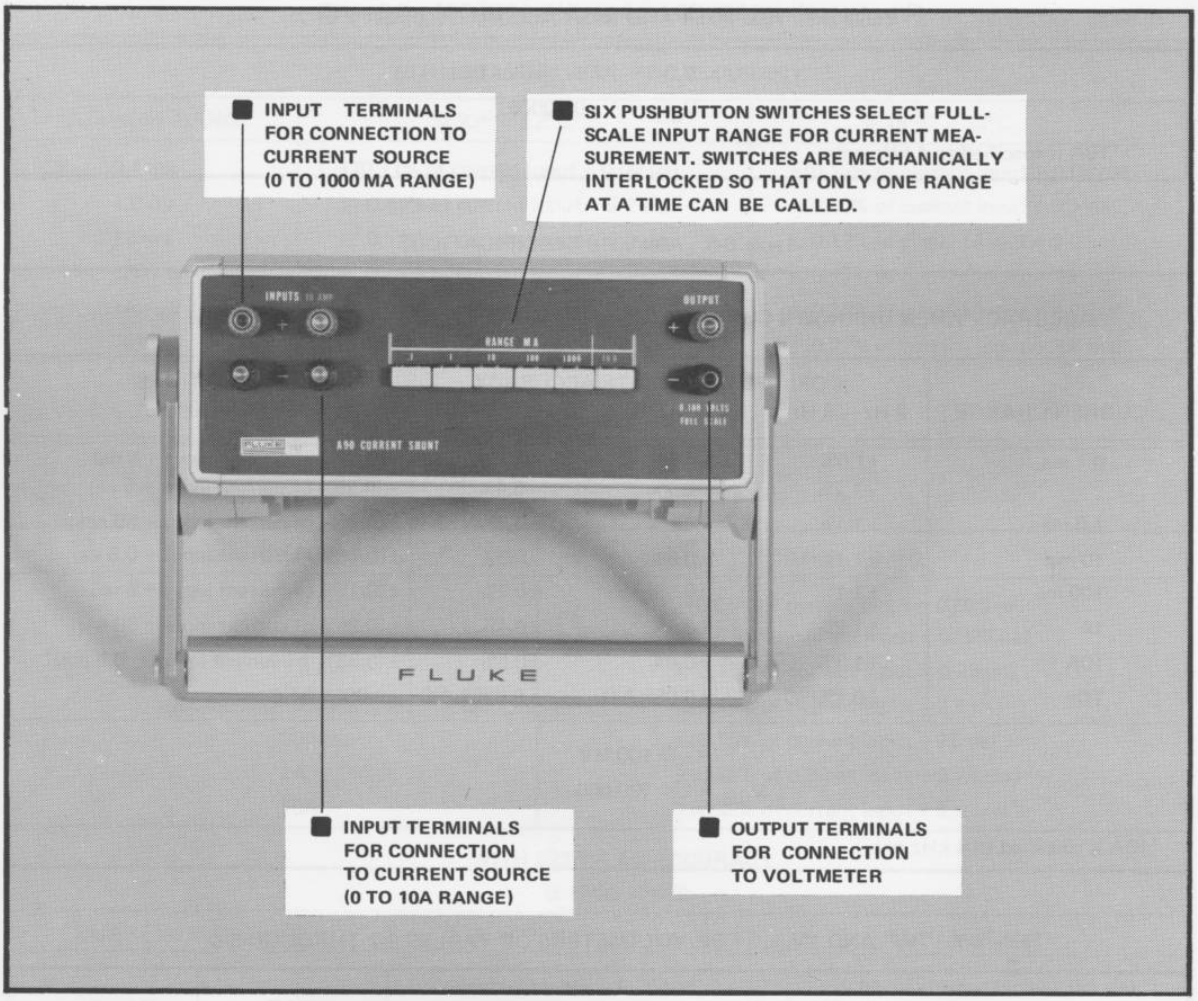


Figure 6-3. MODEL A90 CONTROLS AND TERMINALS.

6-15. At high ac currents, performance of the A90 may depend upon the manner in which the current leads are connected to the input binding posts. Optimum performance is obtained when the input current leads are twisted.

6-16. Voltmeter Impedance

6-17. The input impedance of the voltmeter which is used with the Model A90 is significant with regard to total measurement accuracy. As indicated in the specifications, Model A90 measurement accuracy is derated for voltmeters having finite input impedance. As the voltmeter input capacity increases, the Model A90 response rolls off at the high end; and as the voltmeter input resistance decreases, the response shifts downward, resulting in negative measurement errors.

6-18. Combining Model A90 And Voltmeter Specifications

6-19. Combined specifications for the A90 when used with various Fluke voltmeters is given in Tables 6-2 through 6-6. When the A90 is used with other voltmeters, the following information may be used to combine specifications.

6-20. Equation 1 (Figure 6-5) is used to combine A90 and voltmeter specifications for overall accuracy. The "W" term is taken from Table 6-1, and the "X", "Y" and "Z" terms are taken from voltmeter specifications (data sheets). All Fluke voltmeter specifications, except the Model 910A, contain the "X" term; they usually list the "Y" term and occasionally the "Z" term. Model 910A accuracy specifi-

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Information zur Messunsicherheitsberechnung:

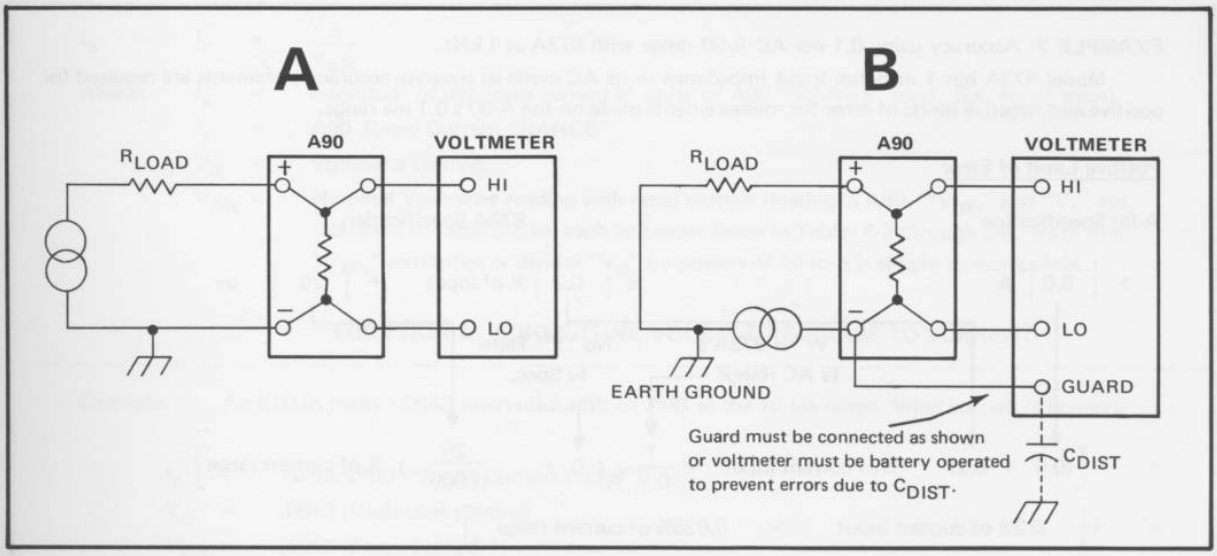


Figure 6-4. EQUIPMENT CONNECTIONS FOR CURRENT MEASUREMENT.

EQUATION 1. COMBINING A-90 SPECIFICATION WITH VOLTMETER SPECIFICATION.

A-90 Specification (from Table 6-1) — Voltmeter Specification (from Voltmeter Data Sheet)

$$\pm\ W\ \% \qquad \pm\ (\ X\ \%\ \text{of input} + Y\ \%\ \text{of range} + Z\ \text{uv}\ )$$

Vr = Lowest voltmeter range that will measure 100 MV

$$= \pm\left[\ (W + X)\ \%\ \text{of current input} + \frac{Vr}{0.1} \times \left(Y + \frac{Z}{10000}\right)\ \%\ \text{of current range}\right]$$

EXAMPLE 1: Accuracy using 10 ma DC A-90 range with 891A.

A-90 Specification (from Table 6-1) — 891A Specification (from 891A Data Sheet)

$$\pm\ 0.1\ \% \qquad \pm\ (\ 0.01\ \%\ \text{of input} + 0.001\ \%\ \text{of range} + 10\ \text{uv}\ )$$

Vr = 1.0 (891A's 1v DC Range)

$$= \pm\left[\ (0.1 + 0.01)\ \%\ \text{of current input} + \frac{1.0}{0.1} \times \left(0.001 + \frac{10}{10{,}000}\right)\ \%\ \text{of current range}\right]$$

$$= \pm\left[\ 0.11\%\ \text{of current input} + 0.02\%\ \text{of current range}\ \right]$$

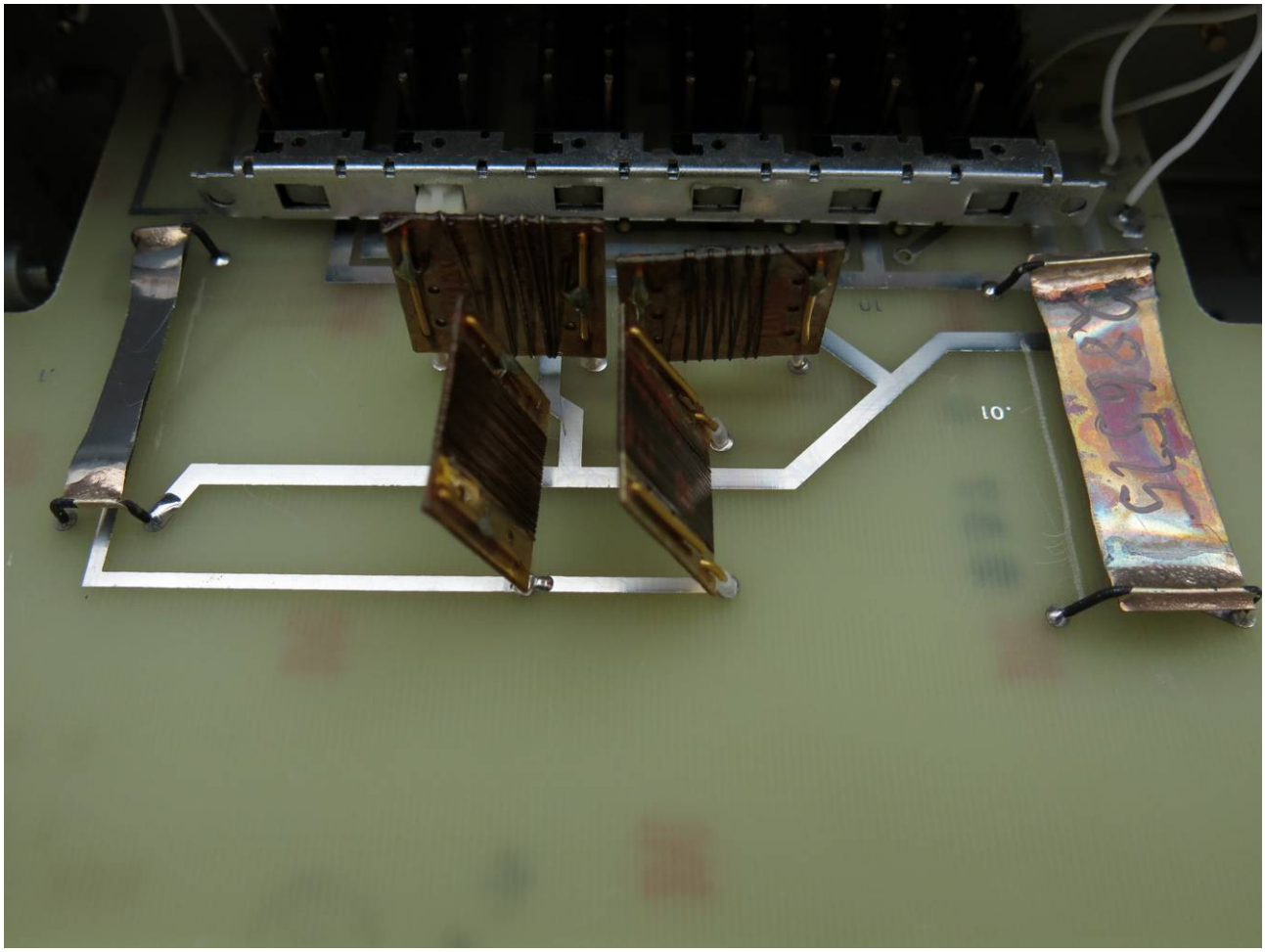
$$= \pm\left[\ 0.11\%\ \text{of current input} + 2\ \text{ua}\ \right]$$

Figure 6-5. EQUATION 1 – COMBINING A90 AND VOLTMETER SPECIFICATIONS (Sheet 1 of 2)

6-9

Fluke A90 Current Shunt

Innenaufnahme:



Die gewickelten Widerstände sind vermutlich aus Manganin.

Auf Grund des Aufbaus und der gewickelten Widerstände, sind die kapazitiven und induktiven Anteile nicht zu vernachlässigen. Deswegen ist das Wechselstromverhalten nicht sonderlich gut.

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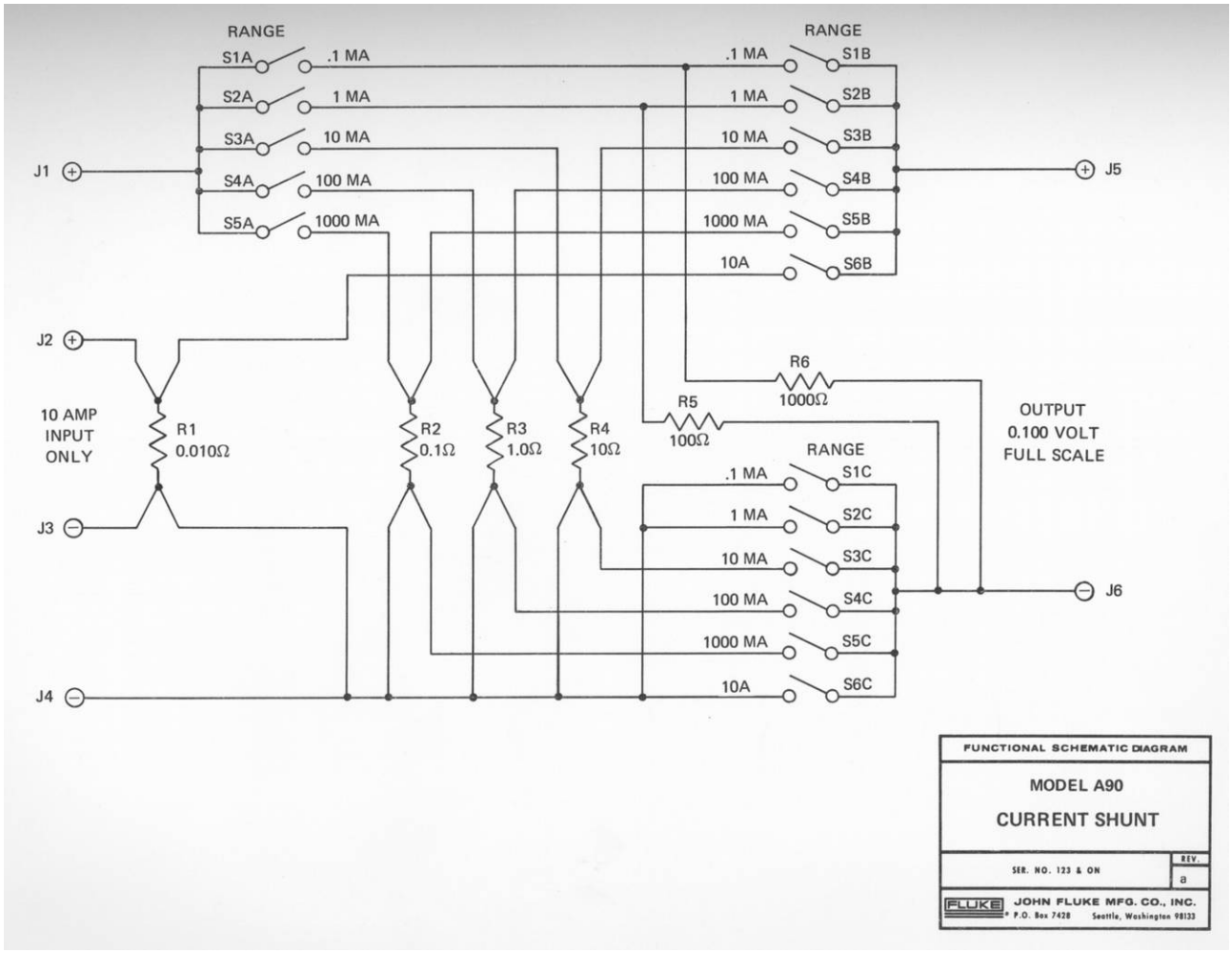
Schaltplan:



Eigene Messungen zeigten, daß die Widerstände beim eigenen Model teils um einiges besser sind, als die Spezifikation:

Die DC-Werte lagen um maximal 0,03% neben dem Nennwert.

Für die Abweichung der AC-Werte ergab sich folgendes Bild:

100µA bis 1A bis 1kHz : 0,03%
100µA bis 1A bis 3kHz : 0,1%
1mA und 10mA bis 10kHz : 0,1%
1A bis 10kHz : 0,3%
10A bis 300Hz : 0,03%
10A bis 4kHz : 0,3%
100µA und 100mA bis 10kHz : 0,2%
10A bis 1kHz : 0,1%
10A bis 10kHz : 0,7%

Unter 0,5% bei:
100µA : 20kHz ; 1mA : 70kHz ; 10mA : 25kHz ; 100mA : 25kHz ; 1A : 20kHz ; 10A : 7kHz