Order Number | | Serial Number | |

2SY110K26 TEST PROCEDURE

SYNCHRONOUS CHECK RELAY

1. TEST EQUIPMENT REQUIRED

2 x AC 0-300 Amplifiers
50 Hz Oscillator
50 Hz Adjustable Phase Shifter
Digital Voltmeter
Oscilloscope, Dual Trace
Frequency & Period Counter
PU/DO Measuring Instrument
Decade Boxes
High Voltage Test Equipment

2. ASSOCIATED DRAWINGS

171-110-126	2SY110K26 Wiring Diagram
660-116-205	Circuit Diagram, PCB Phase Angle Measuring
660-116-305	Loading Diagram, PCB Phase Angle Measuring
660-128-201	Circuit Diagram, PCB Quad Voltage Sensing and Timer
660-128-301	Loading Diagram, PCB Quad Voltage Sensing and Timer

3. HIGH VOLTAGE TESTING CALIBRATION PROCEDURE

a) Apply 2KV RMS 50Hz between terminal groups 1 and 2 in Table 1 for 1 minute.

b) Apply 3 5KV 1/50us pulses of each polarity between terminal groups 1 and 2 in Table 1.

TABLE 1

Group 1	Group 2
1,2,3,5,6,7,8,9,10,15	12,13,17,18,19,20 + earth
4,5,6,9,10,17,18 + earth	1,2,3,7,8,11,12,13,15,19,20
7,8,9,10,11,12,13,17,18	1,2,3,4,5,6,15,19,20 + earth

4. CALIBRATION & TEST PROCEDURE

4.1 General

The phase angle measuring circuitry in this unit is fed from a low voltage (10 volt nominal) winding on each of the two input interfacing transformers. The two input signals are fed into separate squaring amplifiers and the output square waves mixed to generate a rectangular wave with the negative going pulse length proportional to the incoming phase angle difference. This waveform controls the up integration time of a linear integrator and when the negative going pulse has passed, the integrator resets to zero, ready for the next pulse. The resultant output waveform is triangular with a linear rising edge and exponentially decaying trailing edge. The amplitude is proportional to the phase difference between the AC input signals. A front panel variable threshold level detector is used to sense if the height of this waveform exceeds a pre-set value (representing the phase angle setting). The resultant output pulses edge clock a 3 stage binary counter to give a continuous “out of phase” signal if this condition exists. A second binary counter (4 stage) is clocked by the integrator control waveform and is reset by any “out of phase” pulses. If this counter times out it resets the 3 stage counter, thus signalling the “in phase“ condition.

The voltage sensing circuitry used on the 660/128-1 PCB contains two identical “perfect” rectifier and smoothing circuits each fed from a 10 volt transformer secondary winding. The DC outputs are each fed into two separate comparators to give a logic level corresponding to the following:

V Bus > 80% V Line > 80% V Bus > 15% V line > 15%

These signals are fed via combinational logic on the 660/128-1 PCB back to the timer initiate input on the 660/116-5.

The timer on the voltage measuring board is initiated from the abovementioned logic circuitry and contains a front panel variable oscillator and ripple counter to give a continuous output “high” when the count reaches 8192.

4.2 Calibration of 660/128-1 Voltage Sensing Circuit

a) Component reference numbers refer to circuit diagram 660-128-201.

b) Cut links A, B, C on the MC14541 to set it to delay pickup 1-10 sec operation.

c) Apply 32 Volt auxiliary supply between enclosure terminals 3 (positive) and 2 (negative)

d) Energise Dead Bus and Dead Line relays.

e) Apply AC amplitude and phase variable supplies to the unit as per wiring diagram 171-110-114.

f) Set Bus input to 88 volts and adjust trimpot R25 (“B80”) until PCB pin 23 just goes high at this input voltage. (V Bus > 88V).

Minimum	Nominal	Maximum	Actual	Units
86	88	90		Volts

g) Set Bus input to 16.5 volts and adjust trimpot R27 (“B15”) until PCB pin 22 just goes high at this input voltage. (V Bus < 16.5V)

Minimum	Nominal	Maximum	Actual	Units
15	16.5	18		Volts

h) Set line input to 88 volts and adjust R29 (“L80”) until PCB pin 13 just g goes high at this input voltage. (V Line > 88V).

Minimum	Nominal	Maximum	Actual	Units
86	88	90		Volts

i) Set Line input to 16.5 volts and adjust trimpot R31 (“L15”) until PCB pin 12 just goes high at this input voltage. (V Line < 16.5V)

Minimum	Nominal	Maximum	Actual	Units
15	16.5	18		Volts

4.3 Calibration of 660/128 - 1 Timer

a) Initiate timer by taking PCB pin 8 to zero volts (connect pin 17 to pin 8).

b) Adjust trimpot R18 to give a scale ends minimum ratio of 10 : 1 as measured at PCB pin 11 irrespective of actual values.

c) Check the following accuracy initiating the timer via pin 8. Note that waveform period at PCB pin 11 at maximum time setting is approximately 2.441 ms.

Minimum	Nominal	Maximum	Actual	Unit
.5	1	1.5		Seconds
3.5	4.0	4.5		
6.5	7.0	7.5		
9.5	10.0	10.5		

4.4 Calibration of 660/116-5 Phase Angle Measuring Circuitry

a) Component reference numbers refer to circuit diagram 660-116-205.

b) Apply 110 volts 50 Hz to Bus and Line inputs. Set phase difference to zero. Measure by using a Dual Beam Oscilloscope or Phase Angle meter.

c) Check that IC1 pin 8 is high. If a small phase difference exists between the Bus and Line inputs a small negative going pulse of width equal to the phase difference will appear at pin 8. If either of the input transformers is incorrectly wired IC1 pin 8 waveform will be a square wave for the “in phase” condition.

d) Set trimpot to R22 to the middle of its range, and the dial setting pot R21 to 50^0.

e) Set incoming phase angle to 50^0, and adjust trimpot R15 until PCB pin 6 just goes high (in phase condition).

f) Set incoming phase angle and dial pot setting to 10^0.

g) Adjust R22 until PCB pin 6 just goes high.

h) Repeat the above steps until the dial scale is calibrated.

4.4 Calibration of 660/116-5 Phase Angle Measuring Circuitry (Cont)

h) Check setting accuracy as per table below.

Minimum	Nominal	Maximum	Actual	Unit
8	10	12		Degrees
18	20	22		
28	30	32		
38	40	42		
48	50	52		

5. GENERAL & FUNCTIONAL

a) Check for correct operation of the timer logic by observing that PCB pin 8 (motherboard avlug L1) goes low in the following cases.

b) Bus voltage greater than 88 volts and line voltage greater that 88 volts and inputs "in phase".

c) Bus voltage greater than 88 volts and line voltage less than 16.5 volts and Dead Line switch "in".

d) Line voltage greater than 88 volts, bus voltage less than 16.5 volts and Dead Bus switch "in".

e) Check that the relay is electrically and mechanically robust as per Standard Inspection and Test Schedule 903-000-026.

PASS ☐

TESTED BY :_____ DATE :_____