PRODUCT/TEST MANUAL

2SY112K3

CHECK SYNC RELAY

Order Number

Serial Number

Issue	Date	Summary of changes
A	4/09/01	Initial issue.

Author	Checked & Registered	.pdf file created	Released
ERL	MW	MW	Digitally signed by Michael Williams cn=Michael Williams, ou=Test Room, o=Relay Monitoring Systems, c=AU Date: 2001.12.07 13:12:11 +11'00' Reason: Document is released

1. BROAD DESCRIPTION

The 2SY112 is a synchronism check relay which gives a continuous output contact closure when the two input voltages have remained with preset phase angle limits for a preset time and the voltage magnitudes are both above a minimum level of 80% of nominal, or less than 80% if the appropriate Min Bus or Min Line switches are selected. Phase angle is not considered for input voltages below the 15% level, but the unit will give an output contact closure if the Dead Line and/or Dead Bus select relays are operated and the relevant input is below this threshold. Resetting occurs if any of the voltage conditions ceases to be true. A starting relay (pulse > 500ms) is required to connect AC sensing and auxiliary supplies to the unit and enable the unit to be de-energised by closure of the CB.

2. SPECIFICATIONS

Auxiliary Supply Voltage	40 -300 V DC & 40 - 275 V AC
Auxiliary Supply Burden	<10W @ 125V DC
AC Sensing Voltage (Bus & Line Inputs)	A110 / 63.5 50Hz
AC Sensing Voltage Burden	<1.5VA @ 110V 50Hz
Ambient Temperature Range	-5^{o}C to 55^{o}C
Status Input Voltage Range	75 - 150 VDC
Remote Flag Reset Voltage	75 - 150 VDC
Undervoltage Lockout Threshold	88V $\pm$1.5V
Dead Bus & Dead Line Select Threshold	16.5V $\pm$ 1.5V
Phase Measuring Circuitry	10 - 100^{o} $\pm$ 2.5^{o}
"Out of Phase" Response Time	100ms approx.
"In Phase" Response Time	180ms approx.
Relay Start Pulse	500ms minimum at Aux Supplies
Timer	1 - 10 sec $\pm$ 0.5 sec.
Output Contacts	2 Changeover
Remote Flag Reset	24 – 80 volts
Initiate input	75 – 150 volts

Output Relay Contact Ratings

Make & Carry Continuously
1,650 VA AC resistive with maximums of 250V & 10A
300 W DC resistive with maximums of 125V & 10A

DC Break Capacity (Sync. check output contacts only)
60 W maximum DC inductive load L/R = 40ms

Case 4M28

3. TEST EQUIPMENT REQUIRED

2 x AC 0-300V Amplifiers	50Hz Oscillator
50Hz Adjustable Phase Shifter	Digital Voltmeter
Oscilloscope Dual Trace	Frequency & Period Counter
Decade Boxes	High Voltage Test Equipment
Pickup and Dropout Time Measuring Apparatus	

4. ASSOCIATED DRAWINGS

171-112-103	2SY112K3 Wiring Diagram
660-324-203	Circuit Diagram Primary PCB
660-324-303	Loading Diagram Primary PCB
660-325-201	Circuit Diagram Secondary PCB
660-325-301	Loading Diagram Secondary PCB

5. HIGH VOLTAGE TESTING

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

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

TABLE 1

GROUP 1	GROUP 2
1,3,5,7,18,20,23,25,27,22,24,26,28	9,11,13,15,17,19,6,8,10,12,14,16
1,3,5,7,18,20,22,24,26,28,9,11,13,6,8,10	23,25,27,18,20,15,17,19,12,14,16
1,3,5,7,23,25,27,9,11,13,15,17,19	22,24,26,28,18,20,6,8,10,1214,16
All terminals	Earth

6. CALIBRATION & TEST PROCEDURE

6.1 General

The phase angle measuring circuitry in this unit is fed from a low voltage (10V 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 input pulse. The resultant integrator output waveform is a triangular waveform with a linear rising edge and exponentially decaying trailing edge. The amplitude is proportional to the phase difference between AC Input signals and a front panel variable threshold level detector is used to sense if the height of this waveform exceeds a preset 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 contains two identical “perfect” rectifier and smoothing circuits each fed from a 10V transformer secondary winding. The DC outputs are each fed into two separate comparators to give a logic level corresponding to:

V bus > 88V, V line > 88V, V bus < 16.5V, V line < 16.5V.

These signals are fed via combinational logic to the timer initiate input. The timer on the voltage measuring board is initiated from the above mentioned logic circuitry and contains a front panel variable oscillator and ripple counter to give a continuous output “high” when the count reaches 8192.

6.2 Power Supply Check

a) Component reference numbers refer to Circuit Diagram 660-325-201.

b) Apply auxiliary supply between enclosure terminals 3(+) and 1(-).

c) Check that TP01B is 10 V DC and that TP01C is 24 V DC (TP01A is 0V) for Input voltages of 40 V DC, 300 V DC, 40 V AC and 275 V AC

6.3 Calibration of Voltage Sensing Circuitry

a) Turn Dead Line and Dead Bus Select switches in and turn Min Bus and Min Line select switches out.

b) Apply AC amplitude and phase variable supplies to unit as per Wiring Diagram 171-112-101 (110 V).

6.3 Calibration of Voltage Sensing Circuitry (Cont)

c) Set Bus input to 88V and decrease trimpot VR73 ("B80") until TP01F just goes high at this input voltage. i.e. TP01F high for V bus > 88V.

Minimum	Maximum	Nominal	Actual	Unit
86	90	88		Volts

d) Set Bus input to 16.5V and increase trimpot VR74 (B"15") until TP01H just goes high at this input voltage. i.e. TP01H high for V bus < 16.5V.

Minimum	Maximum	Nominal	Actual	Unit
15	18	16.5		Volts

e) Set Line input to 88V and decrease trimpot VR75 (L"80") until TP01G just goes high at this input voltage. i.e. TP01G high for V line > 88V.

Minimum	Maximum	Nominal	Actual	Unit
86	90	88		Volts

f) Set Line input to 16.5V and increase trimpot VR76 ("L15") until TP01I just goes high at this input voltage. i.e. TP01I high for V line < 16.5V.

Minimum	Maximum	Nominal	Actual	Unit
15	18	16.5		Volts

g) Check Bus and Line 63.5 V AC connections

6.4 Calibration of Timer

a) Initiate timer by switching Synch Check Inhibit input (set link for volts high) from high volts to low.

b) Adjust trimpot VR91 to give a maximum to minimum period ratio (measured at TP01E) of exactly 10 to 1 for the dial scale end settings.

c) Pad C4b, C4c to give a waveform period of 2.441ms at TP01E at maximum time setting.

Minimum	Maximum	Nominal	Actual	Unit
.7	1.3	1		Seconds
3.7	4.3	4		Seconds
6.7	7.3	7		Seconds
9.7	10.3	10		Seconds

6.5 Calibration of Phase Angle Measuring Circuitry

a) Component reference numbers refer to Circuit Diagram 660-324-203 & 660-325-201.

b) Apply 110V 50Hz/63.5 50Hz to bus and line inputs. Set phase difference to 0^o using either a dual trace oscilloscope or phase meter.

c) Set trimpot VR44 to the middle of its range and dial pot VR43 to maximum setting (100^o).

d) Set incoming phase angle to 100^o and adjust trimpot VR52 until TP01D just goes high (i.e. the in-phase condition).

6.5 Calibration of Phase Angle Measuring Circuitry (Cont)

e) Set incoming phase angle and dial pot setting to 10^{o} and adjust VR44 until TP01D just goes high.

f) Set incoming phase angle and dial pot setting to 100^{o} and adjust VR52 until PCB pin 6 just goes high.

g) Repeat steps d, e, and f until dial pot scale is calibrated to the following accuracy.

Minimum	Maximum	Nominal	Actual	Unit
7.5	12.5	10		Degrees
37.5	42.5	40		Degrees
67.5	72.5	70		Degrees
97.5	102.5	100		Degrees

7. GENERAL & FUNCTIONAL

a) Check for correct operation of the Sync in progress logic by observing that the Sync In Progress LED operates in the following cases:

b) Bus voltage greater than 88V, Line voltage greater than 88V and inputs “in phase”.

c) Bus voltage greater than 88V, Line voltage less than 16.5V and Dead Line select In. Do both switch and electrical input.

d) Line voltage greater than 88V, Bus voltage less than 16.5V and Dead Bus select In. Do both switch and electrical input.

e) Bus voltage greater than 88V, Line voltage is 30V and Min Line select In

f) Line voltage greater than 88V, Bus voltage is 30V and Min Bus select In.

g) Check for correct operation of the Sync Check Inhibit logic, by observing both Sync LED’S extinguish when Sync in progress is on, Link for Sync Check Inhibit (Volts High) on and high volts are applied to the Sync Check Inhibit input and Sync in progress is on, Link for Sync Check Inhibit (Volts Low) on and low volts are applied to the Sync Check Inhibit input

h) Check for correct operation of the Start pulse by proving the unit operates with a pulse which is less than 500ms at auxiliary voltages of 40 V AC and 40 V DC.

i) Check that the flag can be reset remotely.

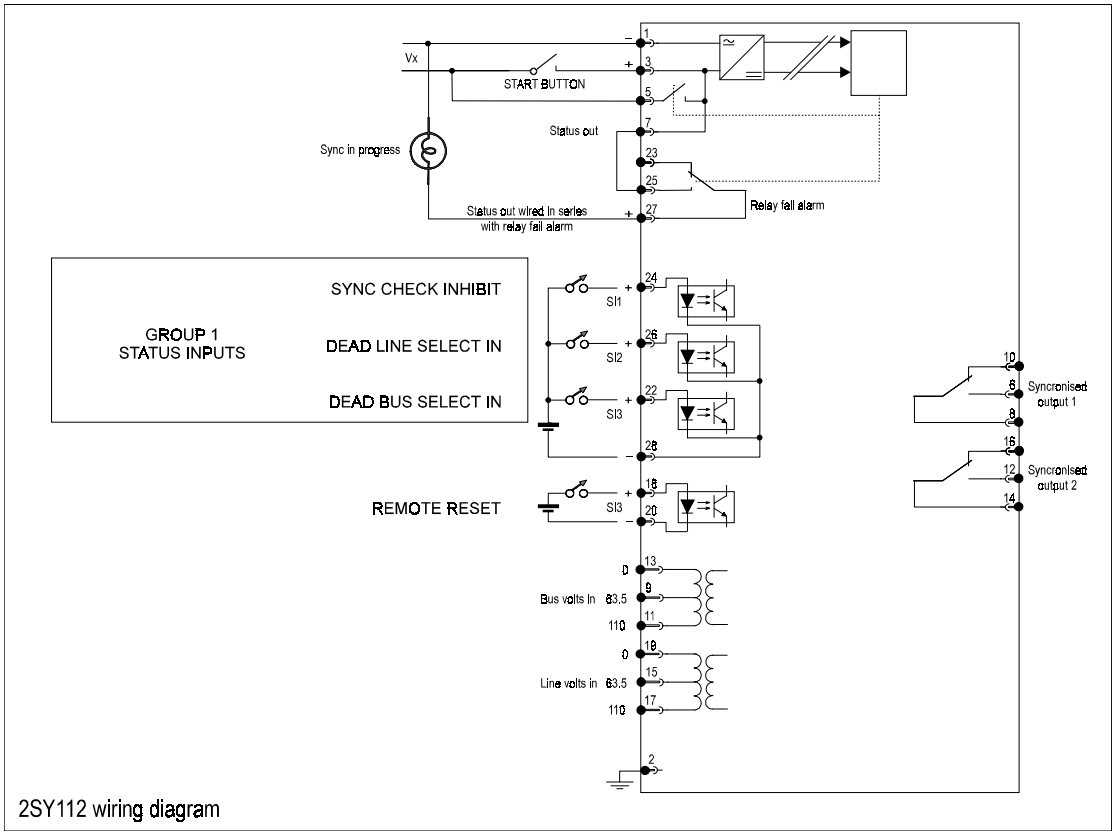
j) Remove LK02 and check for 2 second pulsed output. Replace LK02 for continuous output. Continuous Output (default).

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

PASS ☐

TESTED BY :_____DATE :_____

8. CONNECTION DIAGRAM



2SY112 wiring diagram