Note:

* The approved updated final settings should be applied and printed out from the relay by using the software of the relay.
* The approved final setting and the printout final setting should be attached with this test format.
* The print out final setting should be signed by SEC AND Contractor.
* The following test format contains minimum required tests and some of settings are mentioned as an example and not as limitation.
* As Per The Schematic Drawing The Content In This Test Format Can Be Modified.
1. **GENERAL DATA & INFORMATION**

|  |  |  |  |
| --- | --- | --- | --- |
| Bay Unit No |  | Designation |  |
| Relay Type  |  | C.T Ratio |  |
| Manufacturer |  | No. of contacts:  |  |
| *CI* U Sr. no |  | Draw. & Sh No. : |  |
| BU – MLFB |  | Conn.Diag.No. |  |
| Software Version |  | DC. Auxiliary. Voltage  |  |
| P.T Ratio |  | Circuit Ref:  |  |
| CU- MLFB No |  | Frequency Fn  | 60 Hz |

1. **MECHANICAL CHECKS AND VISUAL INSPECTION**

 As per TCS –P–105 Rev -1, Item no 4.1& 4.12.1.1

|  |  |  |
| --- | --- | --- |
| item | Description | Remarks |
| 1 | Inspect for any physical damage or defects. | ❑ Yes | ❑ N/A |
| 2 | Verify connections and ferrules as per approved drawings | ❑ Yes | ❑ N/A |
| 3 | Check tightness of all the connections. | ❑ Yes | ❑ N/A |
| 4 | Check Apparatus List | ❑ Yes | ❑ N/A |
| 5 | Check relay version and switching elements on printed circuit board | ❑ Yes | ❑ N/A |

1. **ELECTRICAL TESTS:** (As per TCS –P–105 Rev -1, Item no 4.2& 4.12.1.2)

* 1. FUNCTION TEST

|  |  |  |
| --- | --- | --- |
| Item | Description | Remarks |
|  | Human Machine Interface (HMI) Checked. | ❑Yes  | ❑N/A  |
|  | Case Earthing checked. | ❑Yes  | ❑N/A  |
|  | LED’s Function Checked. | ❑Yes  | ❑N/A  |
|  | Trip Contacts Checked. | ❑Yes  | ❑N/A  |
|  | Reset Function Checked | ❑Yes  | ❑N/A  |
|  | Group active Functions Checked | ❑Yes  | ❑N/A  |
|  | Binary inputs checked. | ❑Yes  | ❑N/A  |
|  | Output Relays Checked | ❑Yes  | ❑N/A  |
|  | Event Display on HMI Screen Checked | ❑Yes  | ❑N/A  |
|  | Test switch / plug checked for correct function. | ❑Yes  | ❑N/A  |
|  | Watchdog contacts checked | ❑Yes  | ❑N/A  |
|  | Current shorting facility. | ❑Yes  | ❑N/A  |

* 1. **MEASUREMENTS:** CT Ratio:

|  |  |  |  |
| --- | --- | --- | --- |
| Bay No: | Phase | Iinj: (A) | Measured current (A)  |
| Bay unit (A) | Central unit (A) |
|  | L1 |  |  |  |
| L2 |  |  |  |
| L3 |  |  |  |
|  | L1 |  |  |  |
| L2 |  |  |  |
| L3 |  |  |  |

* 1. **DIFF CURRENT ALARM TEST:**

Any function (Check zone or Bus zone) to be checked should be as the set value and the others should be in high value.

Settings, Address 6306: Idiff supervision ON

Address 6307: Idiff superv. : Time delay: Sec (ref technical manual page no 276.)

Address 6308: Idiff superv. Limit value - BZ: 0.2 I / Ino (ref technical manual page no 276.)

Address 6309: Idiff superv. Limit value - CZ: 0.8 I / Ino (ref technical manual page no 276.

Idiff: sup.CZ, BZ alarm appears only at C.U (Config: LED address on CZ. /10410, BZ. /104l5)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Bay No: | Phase | setting | Check Zone | setting | Bus Zone | Relay LEDs | Remarks |
| P/U (A) | D/O (A) | Time (sec) | P/U (A) | D/O (A) | Time (sec) |
|  | L1 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| L2 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| L3 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | L1 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| L2 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| L3 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

* 1. **DIFF CURRENT (TRIPPING TIME):**

Pickup Test:

(Check zone or Bus zone), the function which will be tested the other should be Set at low value

Settings,

6306: l diff supv: OFF,

6101: Stabilizing Factor (BZ):

6102: I diff: threshold (Id > BZ): Ino,

6103: Stabilizing factor (CZ):

6104: I diff: threshold (Id > CZ): Ino

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bay No: | Phase | Check Zone | Bus Zone | Relay Lead | Remarks |
| P/U (A) | Time at 4\*I (m sec) | P/U (A) | Time at 4\*I set (m sec) |
|  | L1-N |  |  |  |  |  |  |
| L2-N |  |  |  |  |  |  |
| L3-N |  |  |  |  |  |  |
|  | L1-N |  |  |  |  |  |  |
| L2-N |  |  |  |  |  |  |
| L3-N |  |  |  |  |  |  |
|  | L1-N |  |  |  |  |  |  |
| L2-N |  |  |  |  |  |  |
| L3-N |  |  |  |  |  |  |

Note: Typical tripping time: 15ms

* 1. **CURRENT SLOPE TEST: SELECTIVE ZONE (BUS ZONE)**

Settings,

Address 6306: l diff: superv, 6101: Stabilizing factor (BZ), 6102: I diff: threshold (BZ), 6103: Stabilizing factor (CZ), 6104: l diff: threshold (CZ)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Phase | K- Factor (Slop) Setting | Injected current | Bus Zone | K- Factor Slope = Id/ Is measured | Remarks |
| I1 | I2 | Id | Is |
| L1 |  |  |  |  |  |  |  |
|  |  |  |  |  |
| L2 |  |  |  |  |  |  |
|  |  |  |  |  |
| L3 |  |  |  |  |  |  |
|  |  |  |  |  |

Stop contact**:** BB Trip 3 pole

 Id= │I1- I2│ Is= │I1│ + │I2│ K= Id/ Is

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | K- Factor (Slop) Setting | Injected current | K-Factor (Slop)=I2/I1 measured | Remarks |
| I1 | I2 |
| L1 |  |  |  |  |  |
|  |  |  |
| L2 |  |  |  |  |
|  |  |  |
| *L3* |  |  |  |  |
|  |  |  |

Verify this connection Inject I1 ∟0º & 12 ∟180º with equal magnitude and a phase displacement of 180°, then decrease or increase any one for Trip.

I 2 = I 1 (1 + k) / (1 – k)



 Central unit

* 1. **CHECK ZONE:**

Settings,

Address 6306: l diff: superv:

Address 6101: Stabilizing factor (BZ)

Address 6102: I diff: threshold (BZ)

Address 6103: Stabilizing factor (CZ)

Address 6104: l diff: threshold (CZ)

 Stop contact. BB Trip 3 pole

Verify this connection.

 Inject I1 ∟0º ≥ 2.0 A; I diff: threshold (CZ) Increase I 2 ∟180° up to trip, Calculate slope I2 / I1

Bay unit 2 ****

 

Bay unit 3 ****

 L +

 TRIP

Bay unit 1 ****

 

Central unit

 Test Set

Test current I1

FO

FO

FO

Test current I2

* 1. **BREAKER FAILURE PROTECTION TESTS**

 Trip repetition current query I <

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bay No: | Phase | Circuit Breaker Failure | Relay Leads | Remarks |
| I Set (A) | P/U (A) | D/O (A) | Stg-1(m sec) | Stg-2(m sec) |
|  | L1-N |  |  |  |  |  |  |  |
| L2-N |  |  |  |  |  |  |
| L3-N |  |  |  |  |  |  |
|  | L1-N |  |  |  |  |  |  |
| L2-N |  |  |  |  |  |  |
| L3-N |  |  |  |  |  |  |
|  | L1-N |  |  |  |  |  |  |
| L2-N |  |  |  |  |  |  |
| L3-N |  |  |  |  |  |  |

* 1. **BUS SECTION INTER TRIP TEST:**

Setting:

Address: xx20: \_\_\_ Sec.

Address: xx21: \_\_\_ Sec.

Set time: \_\_\_\_

1. Connect all feeders to Bus-1 with bus section A603 close.

(i.e) All feeders with 1 A and 1 C

(i). Apply fault on A603 from 1 C side. There should be no current in 1 A

(a).1C faulty bus should trip instantaneous

 Measured time:

 A607: \_\_\_\_ m.sec

A605: \_\_\_\_ m.sec

 (b).1A should not trip.

(ii) Apply fault on A603 from 1 C. There should be Balance current in1 A.

1. 1 C faulty bus should trip instantaneously.

 (b) 1A trip after breaker failure time

 Measured time:

A607: \_\_\_\_ m.sec

A605: \_\_\_\_ m.sec

A602: \_\_\_\_ sec

A604: \_\_\_\_ sec

A606: \_\_\_\_ sec

 BUS -1AA603-2 A603-1 BUS-1C Fault

 X

A 606A 602A 604A605A607

 BU-06 BU-02 BU-04 BU-05 BU -07

* 1. **BUS SECTION INTER TRIP TEST:**

Setting:

Address: xx20: \_\_\_ Sec.

Address: xx21: \_\_\_ Sec.

Set time: \_\_\_\_

1. Connect all feeders to Bus-1 with bus section A603 close.

(i.e.) All feeders with l A and 1 C

(i). Apply fault on A603 from 1 A side. There should be no current in 1 C

 (a). 1A faulty bus should trip instantaneous.

 Measured time:

A602: \_\_\_\_ m.sec

A604: \_\_\_\_ m.sec

A606: \_\_\_\_ m.sec

1. 1C should not trip.

 (ii) Apply fault on A603 from 1 A. Balance current in 1 C.

 (a) 1 C faulty bus should trip instantaneously.

 (b) 1A trip after breaker failure time

 Measured time:

A607: \_\_\_\_ m.sec

A605: \_\_\_\_ m.sec

A602: \_\_\_\_ sec

A604: \_\_\_\_ sec

A606: \_\_\_\_ sec

 Fault

 BUS -1AA603-2 A603-1 BUS-1C

Χ

 **Χ**A 606 **Χ** A 602 **Χ** A 604A603 **Χ** A605 **Χ** A607

BU-06 BU-02 BU-04 BU-05 BU-07

* 1. **BUS COUPLER INTER TRIP TEST:**

Settings:

Address: xx20: \_\_\_ Sec.

Address: xx2I: \_\_\_ Sec.

Set time: \_\_\_\_

1. Connect all feeders to Bus-1A And 2C with bus coupler A60l close.

(i. e) All feeders with 1A and 2C

(i). Apply fault on A601 from 2C side. There should be no current in 1A.

 (a). 2C faulty bus should trip instantaneous.

 Measured time:

A607: \_\_\_\_\_ m.sec

A605: \_\_\_\_\_ m.sec

 (b). 1A should not trip.

 (ii) Apply fault on A60l from 2C. Balance current in 1A

1. 2C faulty bus should trip instantaneously.
2. 1A trip after breaker failure time

Measured time

A607: \_\_\_\_ m.sec

A605: \_\_\_\_ m.sec

A602: \_\_\_\_ sec

A604: \_\_\_\_ sec

A606: \_\_\_\_ sec

 BUS -1AA601-2 A601-1 BUS-2C

 Χ

 **Χ**A 606 **Χ** A 602 **Χ** A 604A601 **Χ** A605 **Χ**A607

BU-06 BU-02 BU-04 BU-05 BU-07

* 1. **BUS COUPLER INTER TRIP TEST:**

Settings:

Address: xx 20: \_\_\_\_ Sec.

Address: xx21: \_\_\_\_ Sec.

Set time: \_\_\_\_\_

1. Connect all feeders to Bus-1A And 2C with bus coupler A601 close.

(i.e.) All feeders with l A and 2C

(i). Apply fault on A601 from l A side. There should be no current in 2C.

 (a). 1 A faulty bus should trip instantaneous.

 Measured time:

A602: \_\_\_\_ sec

A604: \_\_\_\_ Sec

A606: \_\_\_\_ Sec

 (b). 2C should not trip.

(ii). Apply fault on A601 from l A Balance current in 2C.

 (a) 1 A faulty bus should trip instantaneously.

 (b) 2C trip after breaker failure time

Measured time:

 A607: \_\_\_\_ m.sec

A605: \_\_\_\_ m.sec

A602:\_\_\_\_ sec

A604: \_\_\_\_ sec

A606: \_\_\_\_sec

 BUS -1AFault A601-2 A601-1 BUS-2C

Χ

 **Χ**A 606 **Χ** A 602 **Χ** A 604A601 **Χ** A605 **Χ** A607

BU-06 BU-02 BU-04 BU-05 BU-07

* 1. **ISOLATOR POSITION STATUS FAILURE**

Settings during test:

Id>BZ =

Id>CZ =

Max. Isolator operating time (6031/cu) =

Treatment isolator status on DC Fail (6303/cu) =

Treatment isolator status not plausible (6304/cu) =

Isolator fault simulated on "Bay Unit under Test"

* + 1. Reaction on Isolator Malfunction (6302)=Blocking during the fault

Case 1: Current = \_\_\_\_ A injected in "Bay Unit under Test" (i.e.) in Zone l A

Case 2: Current = \_\_\_\_ A injected in '''Reference Bay"(i e) in Zone 2 A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bay unit under Test (1) | Ref: Bay (2)  | Position Bay unit under test (1) | Position Ref: Bay unit (2) | phase | Case 1- Trip/Block on zone | Case 2- Trip/Block on zone |
| A604 | A606 |  |  | L1-N |  |  |
| L2-N |  |  |
| L3-N |  |  |
| A606 | A604 |  |  | L1-N |  |  |
| L2-N |  |  |
| L3-N |  |  |

* + 1. Reaction on Isolator Malfunction (6302) = Alarm only without Blocking

Case 1: Current = \_\_\_\_\_ A injected in "'Bay Unit under Test" i.e. in Zone IA

Case 2: Current = \_\_\_\_\_ A injected in "Reference Bay" i.e. in Zone 2A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bay unit under Test (1) | Ref: Bay (2) | Position A 713 (1) | Position A711 (2) | Phase | Case 1- Trip/ Block on zone | Case 2- Trip/ Block on zone |
| A604 | A606 |  |  | L1-N |  |  |
| L2-N |  |  |
| L3-N |  |  |

* + 1. Blocking until Acknowledge checked =

* + 1. Blocking until release checked =
		2. Isolator DC failure (0+0 condition)- system is stable No Trip verified =
		3. Isolator not plausible (1 + 1 Condition) - system is stable No Trip verified =
		4. Isolator running time: \_\_\_\_\_ sec (tested with loss of image)

* 1. **ISOLATOR POSITION STATUS FAILURE**

 Settings during test:

Id>BZ =

Id>CZ =

Max. Isolator operating time (6301/CU) =

Treatment isolator status on DC Fail (6303/

Treatment isolator status not plausible (6304/CU) =

Isolator t1mlt simulated on "Bay Unit under Test"

* + 1. Reaction on Isolator Malfunction (6302) = Blocking During the Fault

Case 1: Current = A injected in "Bay Unit under Test" i.e. in Zone 1C

Case 2: Current = A injected in "Reference Bay" ie in zone 2C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bay unit under Test (1) | Ref: Bay (2)  | Position Bay unit under test (1) | Position Ref: Bay unit (2) | phase | Case 1- Trip/Block on zone | Case 2- Trip/Block on zone |
| A605 | A607 |  |  | L1-N |  |  |
| L2-N |  |  |
| L3-N |  |  |
| A607 | A605 |  |  | L1-N |  |  |
| L2-N |  |  |
| L3-N |  |  |

* + 1. Reaction on Isolator Malfunction (6302) =Alarm only without Blocking

Case 1: Current = A injected in '''Bay Unit under Test" i.e. in Zone IC

Case 2: Current = \_\_\_\_\_ A injected in "'Reference Bay" i.e. in Zone 2C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bay unit under Test (1) | Ref: Bay (2) | Position A 713 (1) | Position A711 (2) | Phase | Case 1- Trip/ Block on zone | Case 2- Trip/ Block on zone |
| A605 | A607 |  |  | L1-N |  |  |
| L2-N |  |  |
| L3-N |  |  |

* + 1. Blocking until Acknowledge checked =
		2. Blocking until release checked =
		3. Isolator DC failure (0+0 condition) - system is stable No Trip verified =
		4. Isolator not plausible (1 + 1 Condition) - system is stable No Trip verified =
		5. Isolator running time: sec (tested with loss of image)

* 1. Remarks:
		1. Diff. Current Supervision function Checks:

Blocking during fault. =

Blocking till release. =

Alarm without blocking. =

* DC Fail checks (the relay save the old status, and the bus zone concerned to this bay unit is blocked =
* Comm. Fail checks (the bus zone concerned to this bay unit is blocked) =
* Out Of Service (measuring of the bay unit is stopped for that BZ, but CZ is still running) =
* Fault Recorder checked: =
	1. **WATCH DOG CONTACT CHECKED.**
	2. **BINARY INPUT ASSIGNMENT:**

|  |  |  |  |
| --- | --- | --- | --- |
| B.I No: | DESCRIPTION | STATUS CONFIG | REMARKS |
| 1 | SPARE |  |  |
| 2 | SPARE |  |  |
| 3 | SPARE |  |  |
| 4 | SPARE |  |  |
| 5 | SPARE |  |  |
| 6 | SPARE |  |  |
| 7 | SPARE |  |  |
| 8 | SPARE |  |  |
| 9 | SPARE |  |  |
| 10 | SPARE |  |  |
| 11 | SPARE |  |  |
| 12 | SPARE |  |  |
| 13 | SPARE |  |  |
| 14 | SPARE |  |  |

* 1. **BINARY OUTPUT ASSIGNMENT:**

|  |  |  |  |
| --- | --- | --- | --- |
| B.O No: | DESCRIPTION | STATUS CONFIG | REMARKS |
| 1 | BUS BAR BLOCK |  |  |
| 2 | CHECK ZONE OPTD |  |  |
| 3 | DIFF:PROTN: OPTD |  |  |
| 4 | SPARE |  |  |
| 5 | BUS- 1A OPERATED |  |  |
| 6 | BUS -1C OPERATED  |  |  |
| 7 | BUS-2A OPERATED |  |  |
| 8 | BUS-2C OPERATED |  |  |
| 9 | SPARE |  |  |
| 10 | SPARE |  |  |
| 11 | SPARE |  |  |
| 12 | SPARE |  |  |
| 13 | SPARE |  |  |
| 14 | SPARE |  |  |
| 15 | SPARE |  |  |
| 16 | SPARE |  |  |

* 1. **LED ASSIGNMENT:**

|  |  |  |  |
| --- | --- | --- | --- |
| LED No: | DESCRIPTION | STATUS CONFIG | REMARKS |
| 1 | BB1A TRIP |  |  |
| 2 | BB1B TRIP |  |  |
| 3 | BB1C TRIP |  |  |
| 4 | BB2A TRIP |  |  |
| 5 | BB2B TRIP |  |  |
| 6 | BB2C TRIP |  |  |
| 7 | L1 TRIP |  |  |
| 8 | L2 TRIP |  |  |
| 9 | L3 TRIP |  |  |
| 10 | TRANSFER TRIP |  |  |
| 11 | DEVICE TRIP |  |  |
| 12 | I DIFF: TRIP |  |  |
| 13 | TRANSFER TRIP 1A |  |  |
| 14 | TRANSFER TRIP 1B |  |  |
| 15 | TRANSFER TRIP 1C |  |  |
| 16 | Id SUP: CZ |  |  |
| 17 | BEAKER FAILURE PICKUP |  |  |
| 18 | Id SUP:BZ  |  |  |
| 19 | BAY UNIT FAIL |  |  |
| 20 | MEAS:SUP: ALARM  |  |  |
| 21 | ISOLATOR FAULTY |  |  |
| 22 | CB FAULT |  |  |
| 23 | BATTERY ALARM |  |  |
| 24 | TRIP BLOCKED |  |  |
| 25 | TRANSFER TRIP 2A |  |  |
| 26 | TRANSFER TRIP 2B |  |  |
| 27 | TRANSFER TRIP 2C |  |  |
| 28 | TRIP L1 CZ |  |  |
| 29 | TRIP L2 CZ |  |  |
| 30 | TRIP L3 CZ |  |  |
| 31 | ERROR PROTN: ACTIVE |  |  |
| 32 | ERROR PROTN: BLOCKED |  |  |