

Where showed in the one line diagram the Automatic Transfer Scheme (ATS) should be based on ABB's Relion Microprocessor Protective relays and provide the following features:

The ATS Scheme shall take advantage of IEC-61850 GOOSE messages by limiting the number of cross unit wiring between cubicles.

The ATS Scheme shall be based on three relays to provide another level of selectivity for MTTM schemes, one relay for each incoming breaker, and one relay for the two tie breakers

It shall be possible to operate all breakers via its respective control switch when ATS scheme is in manual mode.

An external lockout relay shall be used to indicate if there is a fault in the bus and to prevent automatic transfer operation

It shall be possible to adjust timers and under voltage settings through the Human Machine Interface (HMI) of the relay.

It shall be possible to adjust timers and under voltage settings through the Web HMI without the need of any external software other than a web browser

To increase the reliability of the GOOSE communications between the devices the Microprocessor relays shall support either HSR or PRP redundancy communications

The ATS shall have five selector switches as indicated in the sequence of operations

The sequence of operations for the ATS scheme would be as follows

Selector Switches

43 M/A Manual/Auto Switch

Describes manual or automatic operation for the transfer scheme

43R M/A Manual/Auto Restoration Switch

Only when 43 M/A switch is in "Auto", describes if restoration to normal condition would be done manually or automatically

43T C/O Closed or Open Transition Switch

Only when 43 M/A switch is in "Auto" and 43-R M/A is in "Auto", describes if restoration to normal condition would be through an open or closed transition

43-10 M1/T1/T2/M2 Maintenance Switch

Only when 43 M/A switch is in "Manual", used to indicate what breaker should be open when all breakers are closed at the same time to perform maintenance operations or to return system to normal when 43R M/A switch is in "Manual"

43-PT T1/T2 Preferred Tie Switch

Only when 43 M/A switch is in "Auto", used to indicate what tie breaker should be normally open when system is in "Auto" and both incoming lines are available

Normal Mode of Operation

The normal mode of operation would be with device 43 M/A switch in "Auto" mode, both incoming lines will be normally closed, and preferred tie breaker will be open as indicated by 43-PT switch. The alternate (non-preferred) tie breaker shall always be closed when 43 M/A switch is in "Auto" in order for the Automatic Transfer Scheme to work properly.

Electrical interlocks

Under manual operation there is an electrical interlock between all incoming sources to prevent paralleling unless sources are synchronized.

Incoming lines will only be paralleled momentarily as permitted by device 43/10. Please refer to maintenance operations.

Under automatic operation it would only be possible to parallel de resources momentarily if device 43T is in "Closed" and the lines are synchronized.

Manual /Maintenance Operation

It would be possible to perform maintenance to any of the incoming lines. Dev 43 shall be in "Manual". Device 43/10 will indicate what breaker will be automatically open if both Main breakers and Tie breakers are closed at the same time under manual operation.

Maintenance of Main 1

Device 43/10 shall be placed on "Main 1" and device 43 shall be placed in "Manual". To perform maintenance on Main 1, close both tie breakers subject to electrical interlock above described. Once the tie breakers close, the Main 1 will be open automatically.

Maintenance of Main 2

Device 43/10 shall be placed on "Main 2" and device 43 shall be placed in "Manual". To perform maintenance on Main 2, close both tie breaker subject to electrical interlock above described. Once the tie breakers close, the Main 2 will be open automatically.

Return to Normal

To return the system to normal conditions with both Main breakers closed and the preferred tie breaker open. With device 43 in "Manual" mode, place device 43/10 on the preferred tie breaker either "T1" or "T2", and then closed the opened incoming line subject to electrical above. As soon as the opened incoming line is closed and all four breakers are closed at the same time, the preferred tie breaker will be open automatically.

In order for any of the Automatic modes described in this section to work properly, please make sure that the preferred tie breaker is open as indicated by selector switch 43PT, and the non-preferred tie breaker is always closed.

Automatic Mode

Selector switch device 43 in “Auto”, device 43R in “Auto”, and device 43T in “Closed”

(a)

Loss of voltage (UV or NEG SEQ) on either incoming line will after a time delay cause its main breaker to open and then the preferred tie breaker will close, provided that voltage is present on the other incoming line.

When the voltage is restored, the main breaker would after a time delay automatically close and then the tie preferred breaker will open.

(b)

However, if the voltage is subsequently lost on the second line after the transfer has occurred as described in (a) above, the second line will after a time delay open and then the preferred tie would open.

Return of voltage on either line will after a time delay cause its main breaker to close, and then the preferred tie would close. When voltage returns to the other line, the main breaker will after a time delay close, and then the preferred tie breaker will open, restoring the system to normal.

(c)

Simultaneous loss (or restoration) of both sources will after a time delay cause both main breakers to open (or close), leaving the preferred tie breaker open.

Automatic Mode

Selector switch device 43 in “Auto”, device 43R in “Auto”, and device 43T in “Open”

(a)

Loss of voltage (UV or NEG SEQ) on either incoming line will after a time delay cause its main breaker to open and then the preferred tie breaker will close, provided that voltage is present on the other incoming line.

When the voltage is restored, the preferred tie breaker will open after a time delay automatically and then the opened incoming line would close.

(b)

However, if the voltage is subsequently lost on the second line after the transfer has occurred as described in (a) above, the second line will after a time delay open and then the preferred tie would open.

Return of voltage on either line will after a time delay cause its main breaker to close, and then the preferred tie would close. When voltage returns to the other line, the preferred tie breaker will after a time delay open, and then the other line breaker will close, restoring the system to normal.

(c)

Simultaneous loss (or restoration) of both sources will after a time delay cause both main breakers to open (or close), leaving the preferred tie breaker open.

Automatic Mode

Selector switch device 43 in “Auto”, and device 43R in “Manual”

(a)

Loss of voltage on either incoming line will, after a time delay, causes its main breaker to open and then the preferred tie breaker will close provided that voltage is present on the other incoming line.

When the voltage is restored, the system will be restored to normal operation manually. Refer to manual/maintenance operation.

However, if while waiting for manual restoration, the incoming line powering the load loses power, the failed incoming line will open and then the healthy incoming line will close provided that it has been healthy for the specified time

(b)

However, if the voltage is subsequently lost on the second line after the transfer has occurred as described in (a) above, the second line will stay close leaving the preferred tie breaker close.

Return of voltage to the open incoming line first will cause, the closed incoming line to open and then the open incoming line will close.

Return of voltage to the closed incoming line first will not cause any operation leaving the closed incoming line close and the open incoming line open.

Simultaneous restoration of both sources will not cause any operation leaving the closed incoming line close and the open incoming line open.

(c)

Simultaneous loss of both sources will not cause any operation, leaving both incoming lines closed and preferred tie breaker open.

(d)

Simultaneous restoration of both sources, after both sources were lost at the same time will not cause any operation, leaving both incoming lines close and preferred tie breaker open.

Bill of Material

43 M/A Manual/Auto switch

43R M/A Manual/Auto Re-transfer switch

43T C/O Close or Open Transition switch

43/10 M1/T1/T2/M2 Maintenance switch

43-PT T1/T2 Preferred Tie Switch

(3) Lockout Relays

(2) REF615 Ordering Code: HAFDDADAFHE5BBN12E for the Mains

(1) REF615 Ordering Code: HAFFFAFAFHE5BBN12E for the Ties

(1) Ethernet Switch*