

w.e.f 12/10.	Instruction No.TI/IN/P&S/0028	Implementation of Feeder circuit breaker backup feature of different makes/types of feeder protection modules provided in C&R panels as per old RDSO spec. No. ETI/PSI/65(1/97)	Page 1 of 20
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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS



सत्यमेव जयते

*Si. Singh
Copy to Divm.
RDSO*

TECHNICAL INSTRUCTION NO.TI/IN/P&S/0028

**Implementation of Feeder circuit breaker backup feature
in different makes/types of feeder protection modules
provided in C&R panels as per old RDSO spec. No.
ETI/PSI/65(1/97).**

December, 2010

ISSUED BY

TRACTION INSTALLATION DIRECTORATE
RESEARCH DESIGNS AND STANDARDS ORGANISATION
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1.0 Background:

In Northern Railways an incident of OHE break down occurred on 23-11-10 at Narela TSS wherein feeder CB did not clear the fault as MTR contacts were not passing feed. The traction transformers were operating in parallel condition (with extended feed conditions) without any improved protection scheme available (as per RDSO instructions TI/IN/0017) and as the fault was at the farthest end of extended feeding section (i.e. with not substantial fault current) the LVCB IDMT relays (set at 150 %) also failed to detect the same as total fault current is shared by both transformers.

The feature of Feeder breaker back up available in the modern numerical feeder protection relays was also not implemented there hence effectively no backup protection operated and extensive damage to OHE was resulted.

1.1 Introduction to Feeder breaker back up protection feature

This feature monitors the status of Feeder CB or magnitude of fault current after issue of trip command to feeder CB and issues a trip command for LVCB's after a lapse of set time delay, if either Feeder CB fails to open or fault current is not falling below the actuating value.

This feature has been defined in Para 6.1.7 of RDSO spec TI/PSI/SPC/PROTCT/5070 and Para 7.2.1.1 of RDSO spec TI/SPC/PSI/PROTCT/6070(3/09). Setting of time delay is explained in the amendment to the setting guidelines issued vide letter No. TI/PSI/PROTCT/STATIC/07 dated 23-04-07.

2.0 History of development of feeder protection modules

The different feeder protection modules developed by RDSO since 1995 along with their make & features are tabulated below.

Sl. No	Type	Year Of approval & RDSO specification	Make	Features
1.	AZ1114	1995 ETI/PSI/141(10/90)	M/s ALIND	Micro processor based design and integration of DPR, WPC, Inst. OCR & PTFE in one module.
2.	ADDR/1	2002 ETI/PSI/141(10/90)	M/s ASHIDA	• Micro processor based numerical design. • Integration of DPR, WPC, Inst OCR, PTFE, Auto reclosure, LBB (Local breaker backup) relay in one module. • Storage of 50 cycle fault

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				current and voltage of latest 10 faults in relay memory.
3.	AZ1114+	2003 ETI/PSI/141(10/90)	M/s ALIND	• Micro processor based numerical design. • Integration of DPR, WPC, Inst OCR, PTFF, Auto reclosure, LBB (Local breaker backup) relay (only one trip contact for LBB). • Storage of 50 cycle fault current and voltage of latest 10 faults in relay memory.
4.	ADR 219A	2007 TI/SPC/PSI/PROT CT/5070 (5/2007)	M/s ASHIDA	• Development as per revised RDSO specification no. TI/SPC/PSI/PROTCT/5070. • Micro processor based numerical design. • Integration of DPR, WPC, Inst OCR, PTFF, Auto reclosure, LBB (Local breaker backup), and CB trip coil monitoring relay in one module. • Storage of 50 cycle fault current and voltage of latest 10 faults in relay memory.
5.	AZM1114+	2009 TI/SPC/PSI/PROT CT/5070 (5/2007)	M/s ALIND	• Development as per revised RDSO specification no. TI/SPC/PSI/PROTCT/5070. • Micro processor based numerical design. • Integration of DPR, WPC, Inst OCR, PTFF, Auto reclosure, LBB (Local breaker backup), and CB trip coil monitoring relay in one module. • Storage of 50 cycle fault current and voltage of latest 10 faults in relay memory.
6	ADR 219 B	2008 TI/SPC/PSI/PROT CT/4050 & Parallel operation of transformers vide	M/s ASHIDA	• Development as per RDSO specification No. TI/SPC/PSI/PROTCT/4050 for Mumbai area. • Micro processor based

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		letter no. TI/PSI/PROTCT/C ONVEN/08 dated 15.07.2008.		numerical design. - Integration of DPR, WPC, Inst OCR, PTFF, Auto reclosure, LBB (Local breaker backup), and CB trip coil monitoring relay in one module. The DPR is having 3 zone and 3 stage OCR . - Storage of 50 cycle fault current and voltage of latest 10 faults in relay memory.
7.	AZM1114 + (AN SERIES)	2010 TI/SPC/PSI/PROT CT/4050 TI/SPC/PSI/PROT CT/5070 (5/2007). & Parallel operation of transformers vide TI/PSI/PROTCT/C ONVEN/08 dated 03.03.2010.	M/s ALIND	- Development as per RDSO specification No. TI/SPC/PSI/PROTCT/4050 for Mumbai area and also meets the revised RDSO specification no. TI/SPC/PSI/PROTCT/5070. - Micro processor based numerical design. - Integration of DPR, WPC, Inst OCR, PTFF, Auto reclosure, LBB (Local breaker backup), and CB trip coil monitoring relay in one module. The DPR is having 3 zone and 3 stage OCR . - Storage of 50 cycle fault current and voltage of latest 10 faults in relay memory.

3.0 Implementation of Feeder circuit breaker back up feature

- 3.1 All feeder protection modules being used in IR except S.No.1 (i.e. AZ1114 of M/s Alind) in table above are having this feature of Feeder circuit breaker back up protection.
- 3.2 Current specifications of feeder protection module (TI/SPC/PSI/PROTCT/5070(5/2007)) and control & relay panels (TI/SPC/PSI/PROTCT/6070(8/09)) are having this feature and all the panel drawings approved by RDSO includes its implementation.

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- 3.3 Implementation of this feature was first referred by RDSO in amendment of setting guidelines issued by RDSO vide TI/PSI/PROTCT/STATIC dated 23-04-07 wherein it was suggested to carry out the wiring by taking the details from relay manufacturers.
- 3.4 It has been observed that number of Railways have still not implemented this feature in the wiring of old control & relay panels (as per old RDSO spec. ETI/PSI/65(1/97) or older specifications).
- 3.5 In view of the above it is again advised to implement this feature in different make/type of relays locally/by works using the required material only from the approved sources. If required, necessary technical assistance of relay or panel manufacturers may be taken. The wiring and other technical details are tabulated below.

Relay make/Type	Scheme of implementation
AZ1114+	-Wiring details given in Annexure-I . -Implementation shall require one additional auxiliary relay (Type: AEMS32 of M/s Alind or Type :AVAJS13 of M/s Ashida) for each feeder protection module for contact multiplication needed for trip, annunciation and telesignalling purposes.
AZM1114+	-Wiring details are given in Annexure-II .
AZM1114+ (AN series)	-Wiring details are as per the approved drawing of M/s Alind and enclosed as Annexure-III .
ADDR/1	-Wiring details are given in Annexure-IV .
ADR 219A	-Wiring details are as per the approved drawings of M/s Ashida and enclosed as Annexure-V
ADR 219B	-Wiring details are given in Annexure-VI .

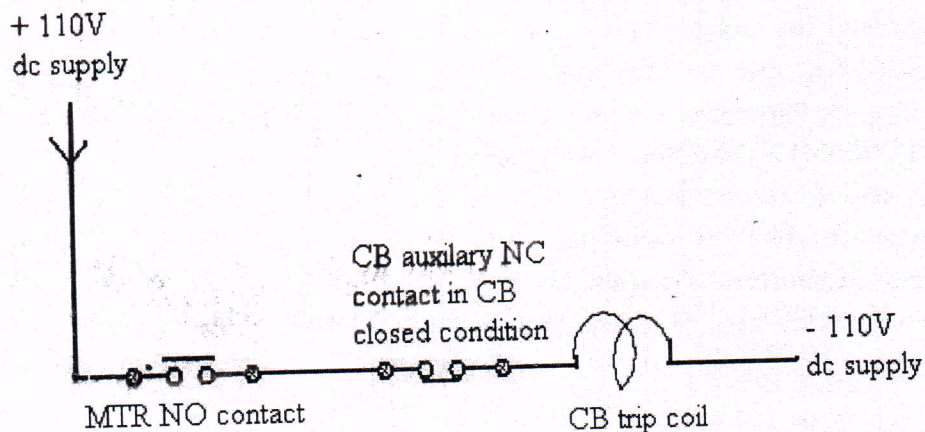
4.0 . Other important precautions for protection of 25 kV ac traction feeders

Some other important observations emerging out of the failure of the OHE at NDLS division of NR along with the actions to be taken by Railways are as under.

- 4.1 The simplified trip coil circuit is shown below. The NO contact of MTR and CB auxiliary NC contact are in series. When Feeder protection relay operates, MTR is actuated and it's NO contact closes thereby energizing the CB trip coil. As CB opens, its NC auxiliary contact should first open and break the inductive trip circuit current. If this NC interlock is sluggish and operates later then MTR NO contact (which also opens with the resetting of Feeder & MTR relays), MTR

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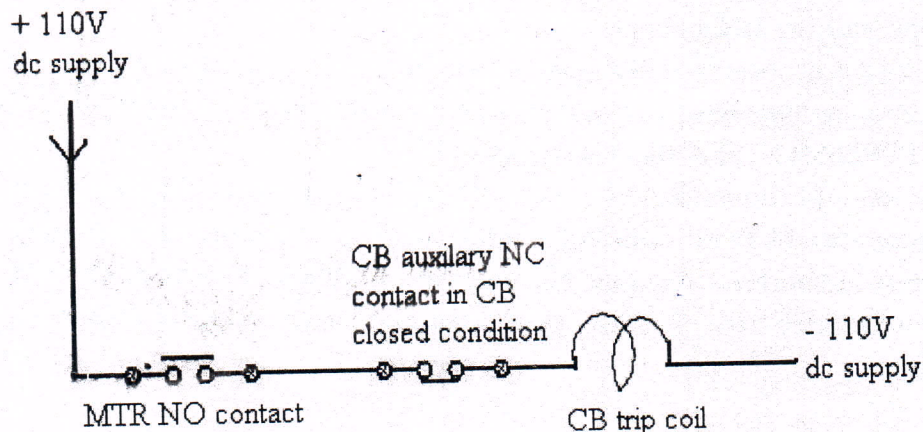
contact shall interrupt the inductive current and may get flashed as their breaking capacity is much lesser than CB contact.



- 4.2 The burning or flashing of Master Trip Relay contacts may be due to a short circuit in the trip coil circuit, CB trip coil failure and also due to opening of trip coil current by MTR contact instead of CB auxiliary contact as explained above.
- 4.3 The total resetting time of Feeder protection relay and MTR should be measured using a secondary relay test kit and same should be between 160-250ms. Similarly the CB NC interlock opening time should be checked for any spare interlock and same should not be more than 100 ms. In any case the time difference between the two should ideally be above 80-100 ms to avoid any possibility of opening of MTR contacts before CB auxiliary contact.
- 4.3.1 The Feeder protection relay resetting time can be adjusted by software hence if any such situation arises where the difference of 80 ms is not available then relay manufacturer should be advised to increase the relay reset time.
- 4.3.2 The condition of NC (Normally Closed) auxiliary interlock of CB provided in series with MTR (Master Trip Relay) NO (Normally Open) interlock should be checked visually for any sign of wear & tear, damage or sluggishness.
- 4.3.3 The rotary switch type auxiliary interlocks provided in Alind make CB's should be visually examined & attended/replaced on observing signs of loosening of insulated disks and holding bolts.
- 4.4 Railways replace complete control & relay panels as well as individual protection relays therefore it is recommended that before a new protection relay is provided in to the existing panel its specification should be thoroughly studied and

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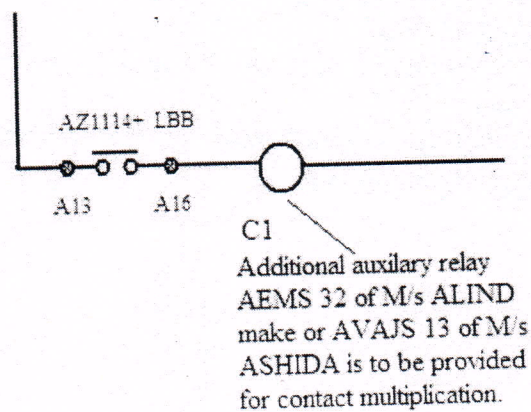
thereafter implementation of all the features should be ensured at the time of wiring of the same in panel.

- 4.5** It has been observed that Railways generally decide parallel operation of 21.6 MVA transformers based on IDMT OCR (LVCB) tripping on overloading. In this regard it is recommended that a complete load pattern recording & monitoring should be carried out as per RDSO instructions TI/IN/0019.
- 4.5.1** It is important to assess the magnitude and durations of overloading pattern because traction transformers can withstand overloads of 150% for 15 minutes & up to 200 % for 5 minutes and this feature can be utilized by adopting relays and panels for which refer new specification TI/SPC/PSI/PROTCT/6070 and setting guidelines issued vide TI/IN/0022.
- 4.5.2** Moreover traction transformers of 21.6 MVA can be continuously operated up to 30 MVA in ONAF mode.
- 4.5.3** The decision of paralleling of transformers should be taken only after above possibilities have been fully explored.

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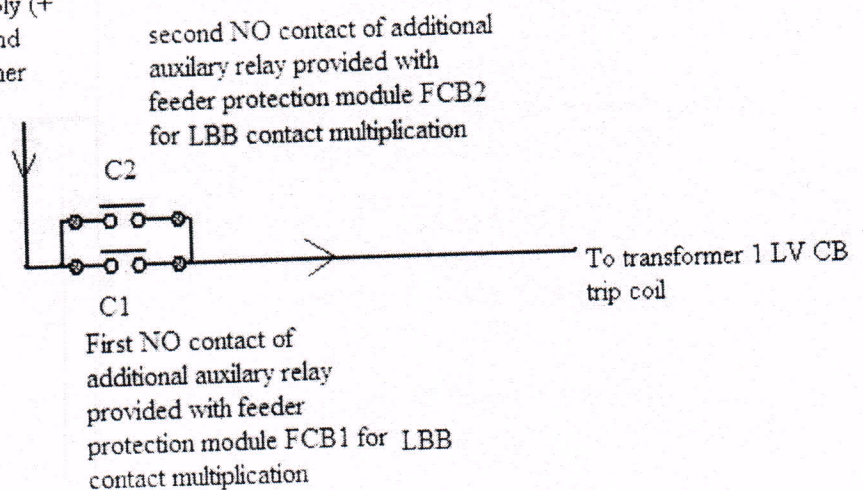
ANNEXURE-I

Loop 110V dc supply (+ psitive) from control and relay panel used for feeder relay & control circuit and connect to terminal no. A13 of feeder protection module type AZ1114-



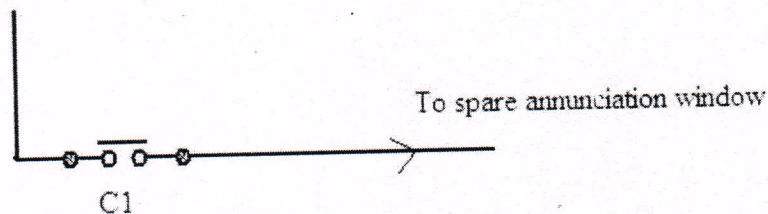
Loop 110V dc supply (- negative) from control and relay panel used for feeder relay and control circuit and connect to contact multiplication relay coil and other terminal of relay coil is to be connected to terminal number A16 of feeder protection module type AZ1114+

Loop the 110V dc supply (+ positive) from control and relay circuit of transformer LV CB



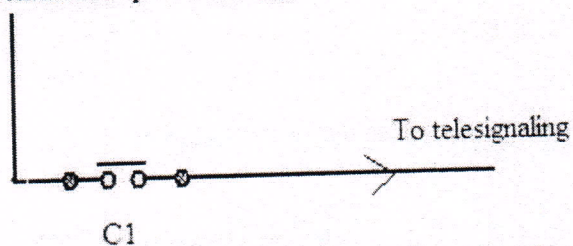
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Loop the common output supply of
annunciation window and connect to
3rd contact of multiplication relay.



3rd NO contact of additional
auxiliary relay provided with feeder
protection module FCB-1 for LBB
contact multiplication.

Loop the common supply of telesignaling and connect
to 4th contact of contact multiplication relay



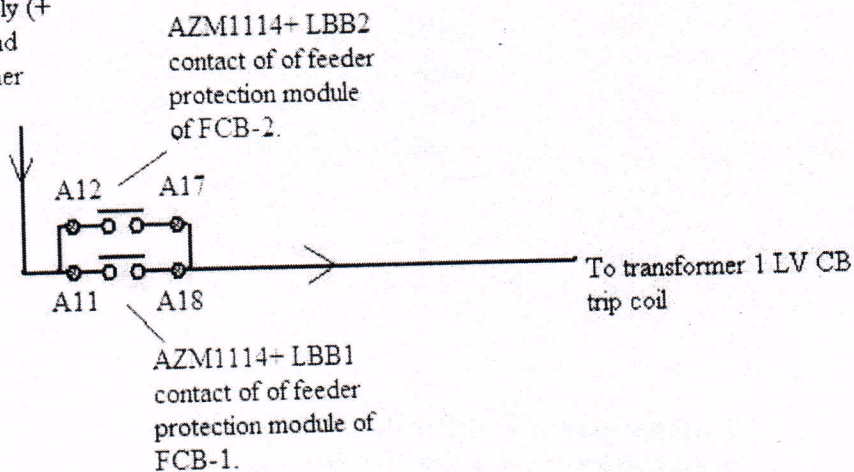
4th NO contact of additional auxiliary
relay provided with feeder protection
module FCB-1 for LBB contact
multiplication.

Note : Similar arrangement to be made for tripping, annunciation and telesignaling for feeder
CB- 2 also.

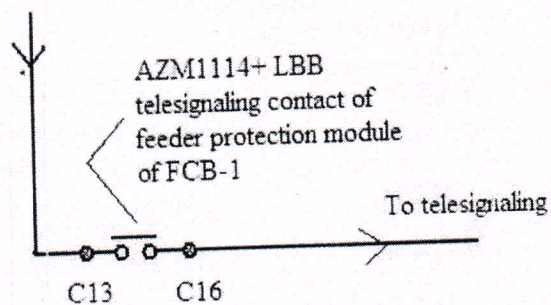
w.e.f 12/10.	Instruction No.TI/IN/P&S/0028	Implementation of Feeder circuit breaker backup feature of different makes/types of feeder protection modules provided in C&R panels as per old RDSO spec. No. ETI/PSI/65(1/97)	Page 10 of 20
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ANNEXURE- II

Loop the 110V dc supply (+
positive) from control and
relay circuit of transformer
LV CB

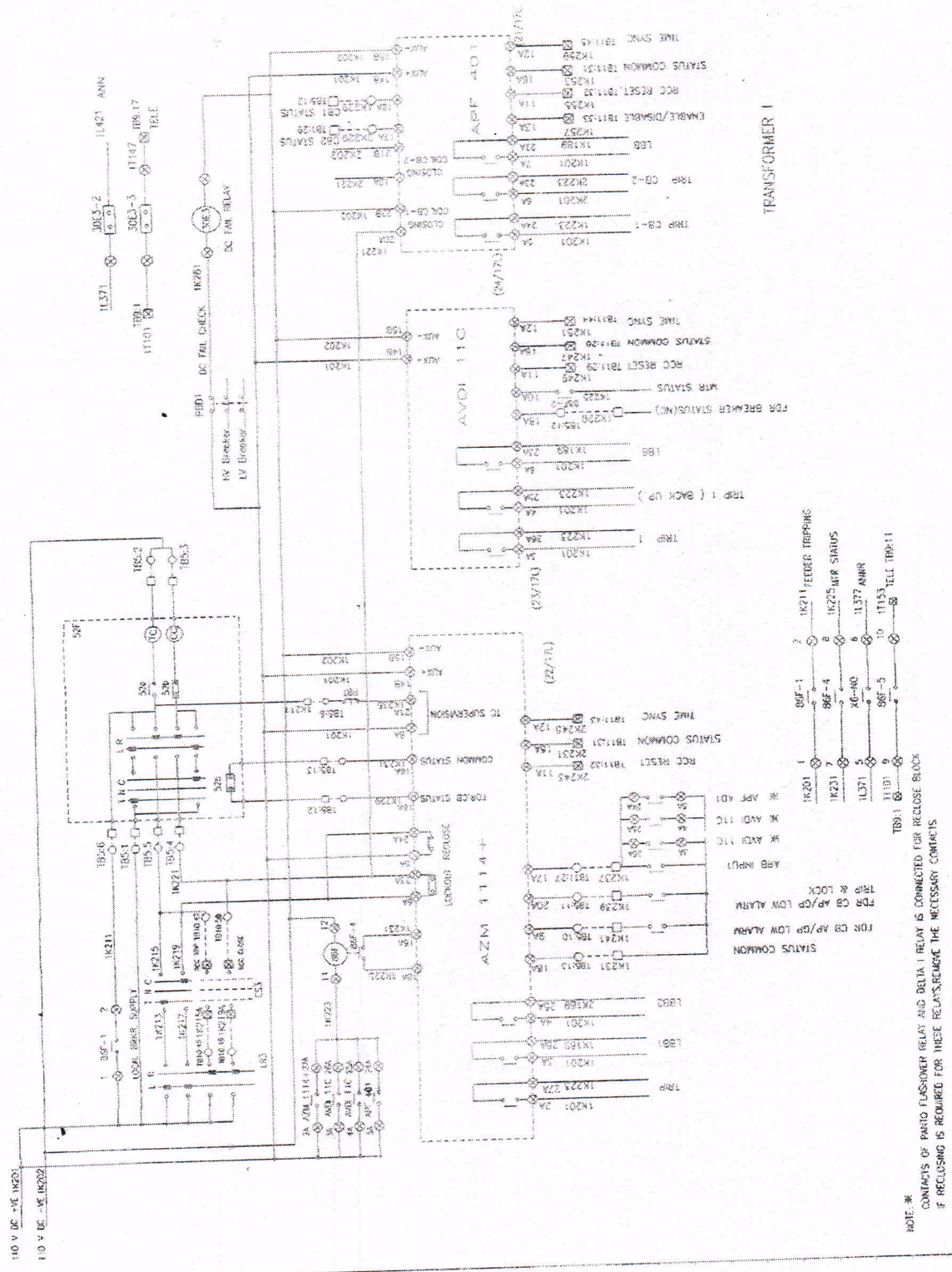


Loop the common supply of telesignaling



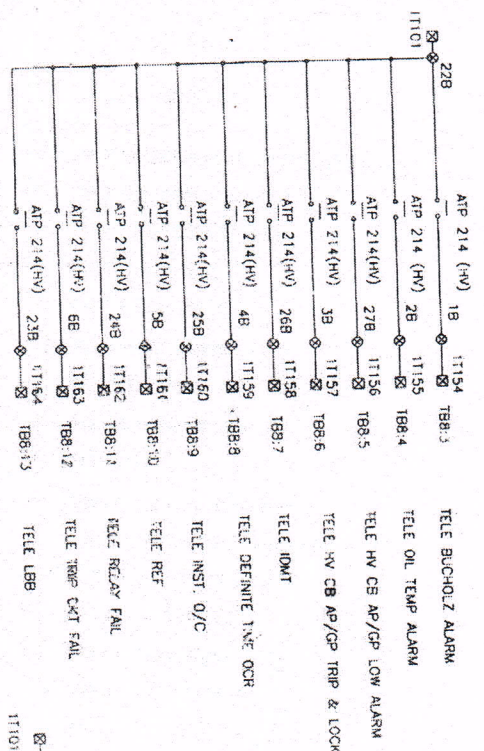
Note : 1 Similar arrangement to be made for tripping and telesignaling for feeder
CB- 2 also.

2. AZM1114+ : contact for annunciation is not provided, if any other spare
auxiliary relay is available in the control and relay panel can be used for
annunciation by contact multiplication of telesignaling contact of AZM1114+.

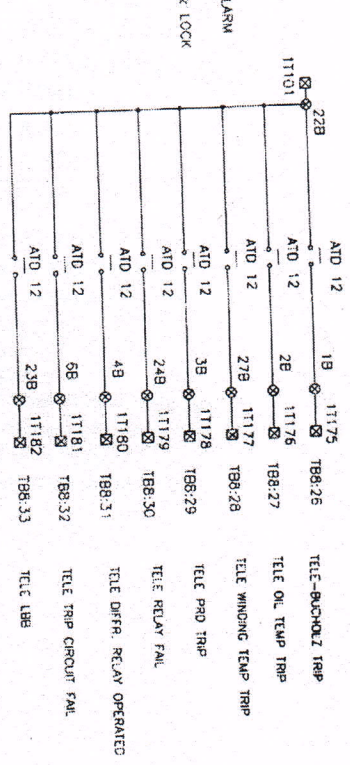


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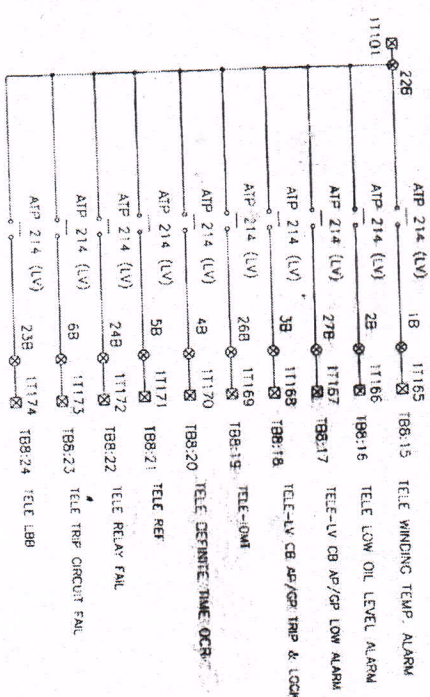
TELE ATP 214 (HV)



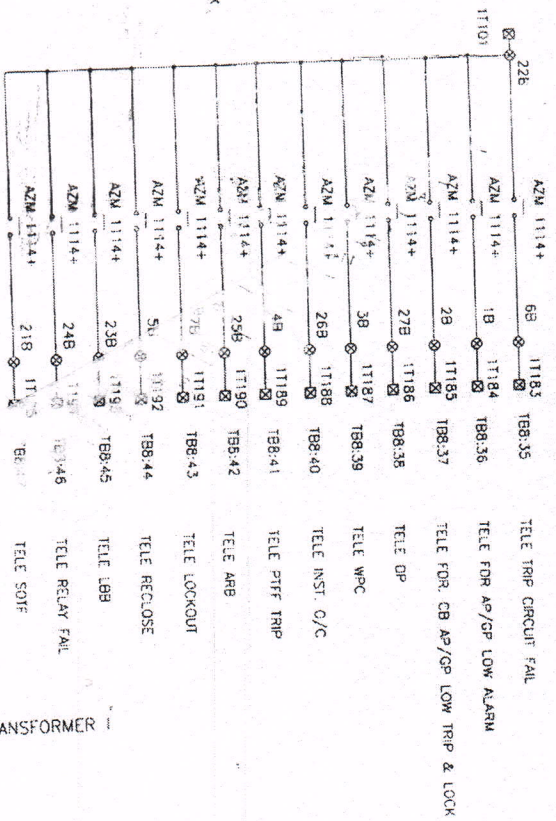
TELE AID 12



TELE ATP 214 (LV)



TELE AZM 1114+



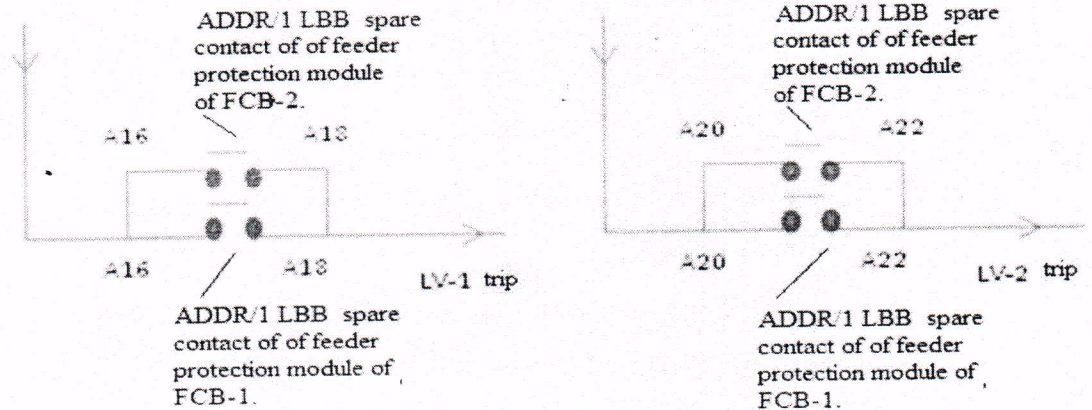
TRANSFORMER



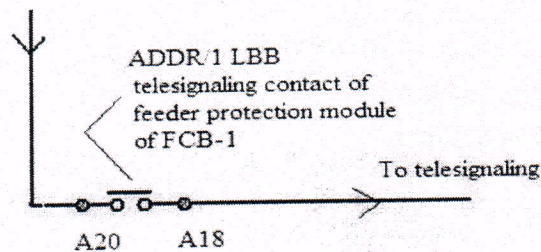
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ANNEXURE-IV

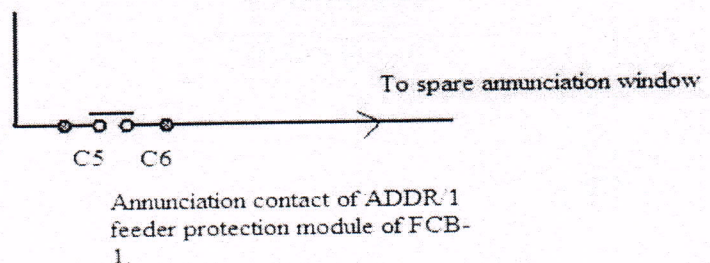
Loop the 110V dc supply (+
positive) from control and
relay circuit of transformer
LV CB



Loop the common supply of telesignaling



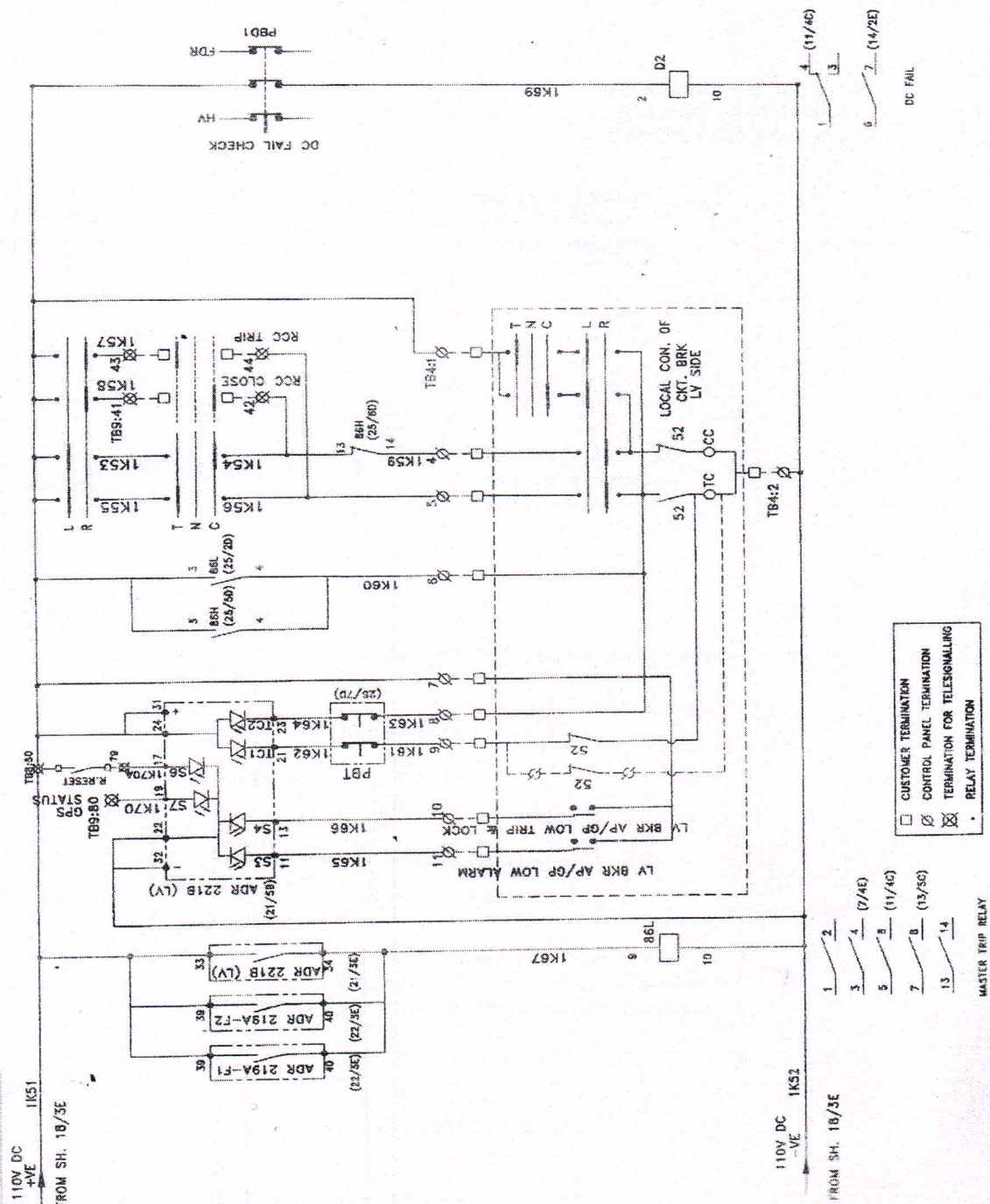
Loop the common output supply of
annunciation window and connect to
annunciation terminal C5 of feeder protection module



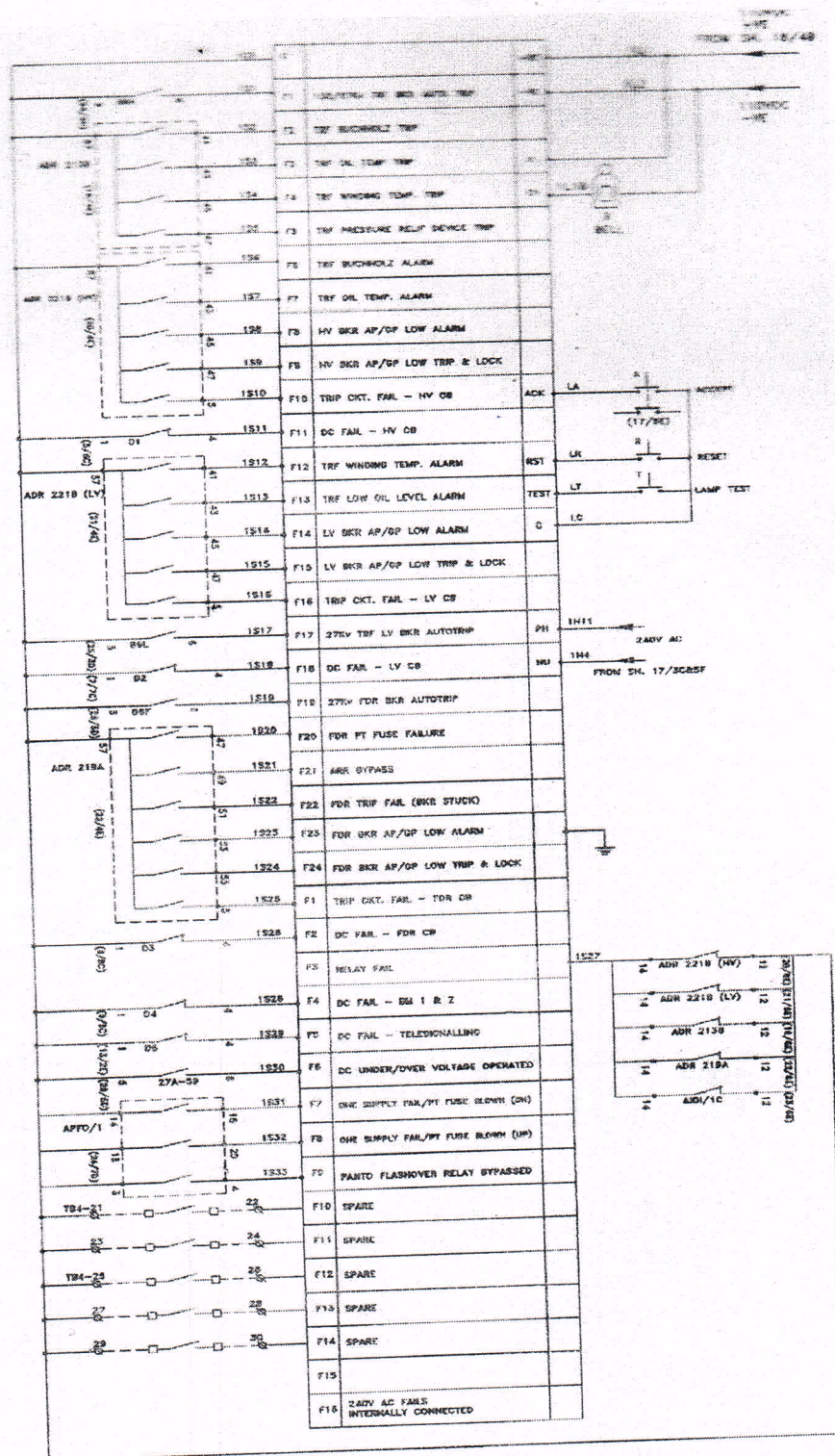
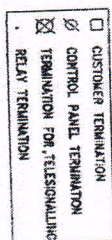
Note : Similar arrangement to be made for annunciation and telesignaling for feeder
CB- 2 also.

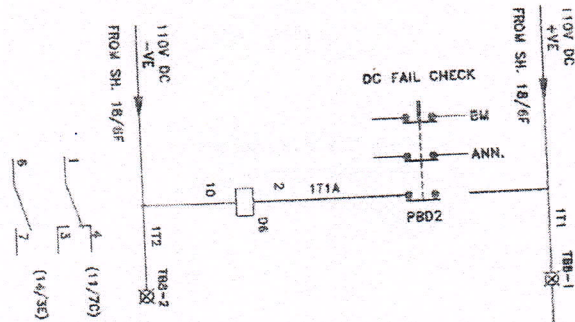
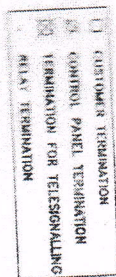
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ANNEXURE-V

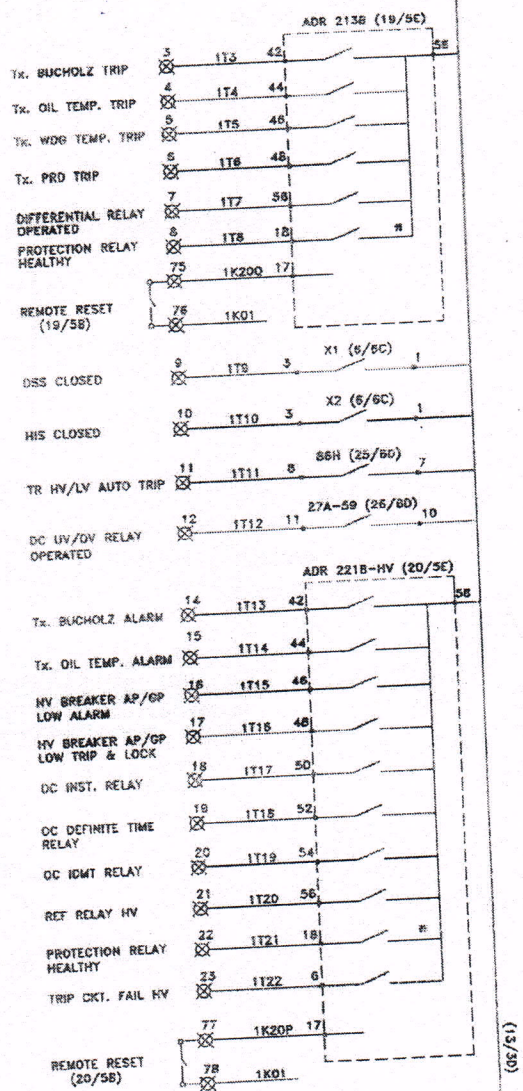
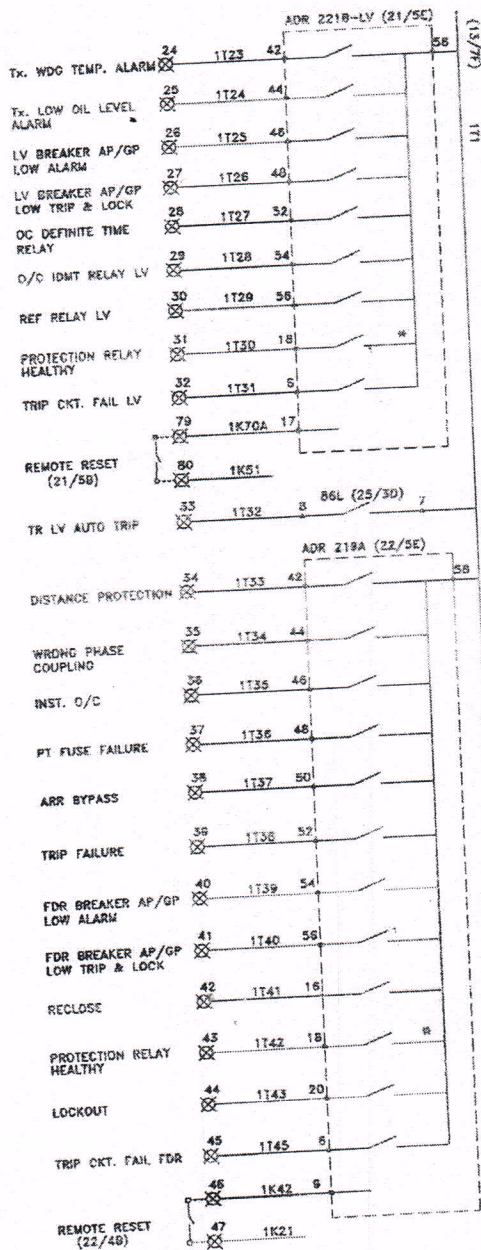


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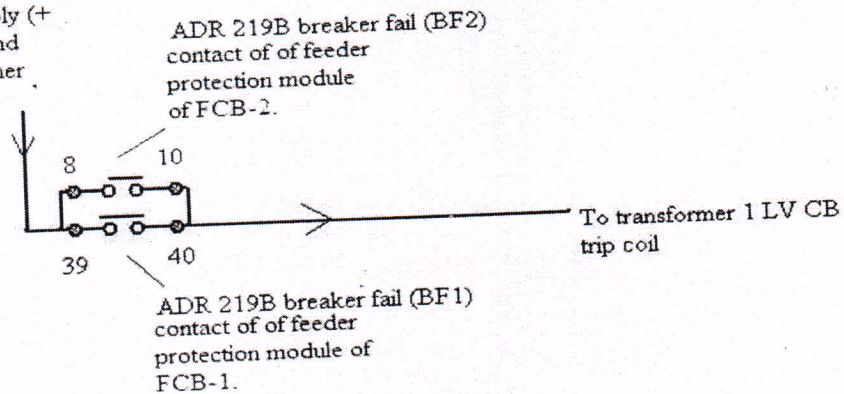
* NORMALLY CONTACT IS CLOSED, OPEN WHEN RELAY UNHEALTHY



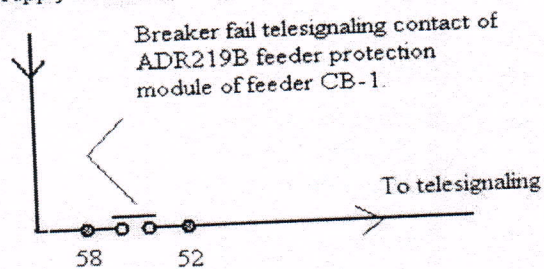
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ANNEXURE- VI

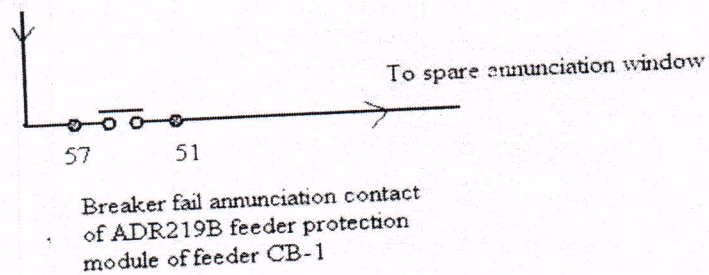
Loop the 110V dc supply (+
positive) from control and
relay circuit of transformer
LV CB



Loop the common supply of telesignaling



Loop the common output supply of
annunciation window and connect to
TB 57 of ADR219B relay



Note : Similar arrangement to be made for tripping, annunciation and telesignaling for feeder
CB- 2 also.