#142782

ERL MAINTENANCE SUPPORT SDN BHD

(Company No. 498574-T)

E-MAS

Effective Railway Operations; Reliable System Maintenance

Signalling Department

Standard Operating Procedure (SOP) - SIG

G00.OMW.M12950.BT.1001.C

Release

Item	Name	Department	Date	Signature
Released:	Anthony Arokianathan	WSE Manager	11/03/19	
Checked:	Aziz Hashim	SIG HOD	11/03/19	
Checked:	Tengku Nadzuan	Technical Executive	08/3/19	
Checked:	Laxchumy	SIG Engineer	07/03/2019	
Checked:	Azuansyamsany	Technical Executive	06-03-2019	
Checked:	Asmawi Jusoh	SIG QEMR	5/3/2019	
Author:	Md Hasan Fahmi Miskam	SIG Engineer	4/3/2019	

Amendments or additions to this procedure must be indicated with a vertical black line in the adjacent left margin.

Change Record and Configuration Control

Revision	Date	Modification	Name
C	05 Mar 19	Update Document Version	Asmawi
B	31 May 13	Changes of E-mas Logo and update document version	Asmawi
A	08 Nov 05	New	Anthony

Planning Of Changes Reference For Revision: G00.OMW.M12950.BT.1001.C					
Issue To Consider	**Checked** *(Please Mark X)*				**Remarks**
1) Are there any negative impact?	YES		NO	X	
2) Will the integrity of QEMS be effected?	YES		NO	X	
3) Resources available:	YES	X	NO		
4) Allocation or relocation of responsibilities and authorities required?	YES		NO	X	

TABLE OF CONTENTS

Page

1.0 Purpose

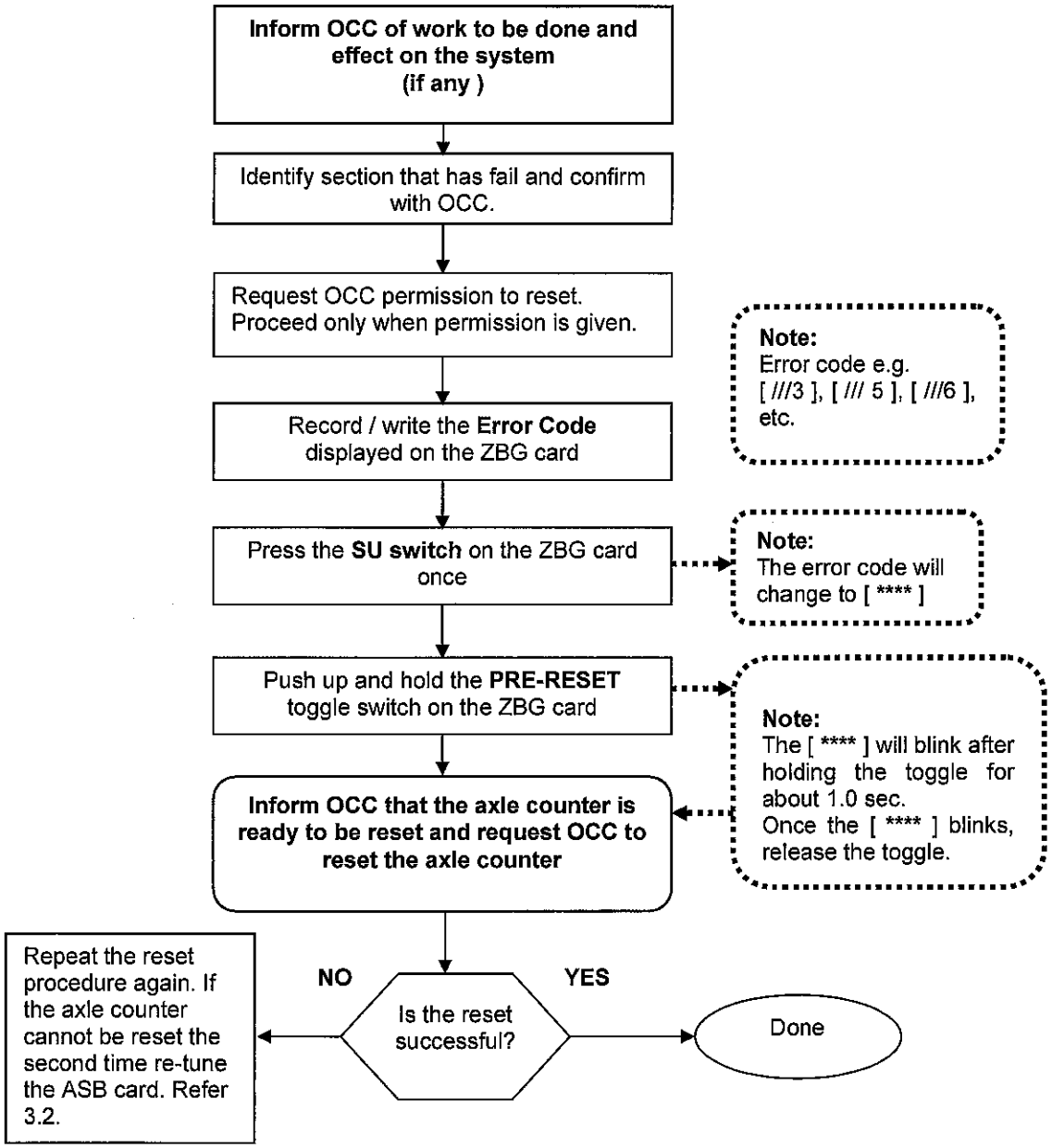
1.1 This document provides a structured guidance / process flow for the purpose of maintenance on the various Signalling sub-systems.
1.2 These guidance / process flow is extracted from the O&M Manual and also based on the experience acquired from the daily maintenance of the Signalling system.
1.3 The guidance / process flow outlined in this document shall be used by all Signalling personnel for carrying out maintenance activities as and when required.

2.0 Scope, Distribution & Access

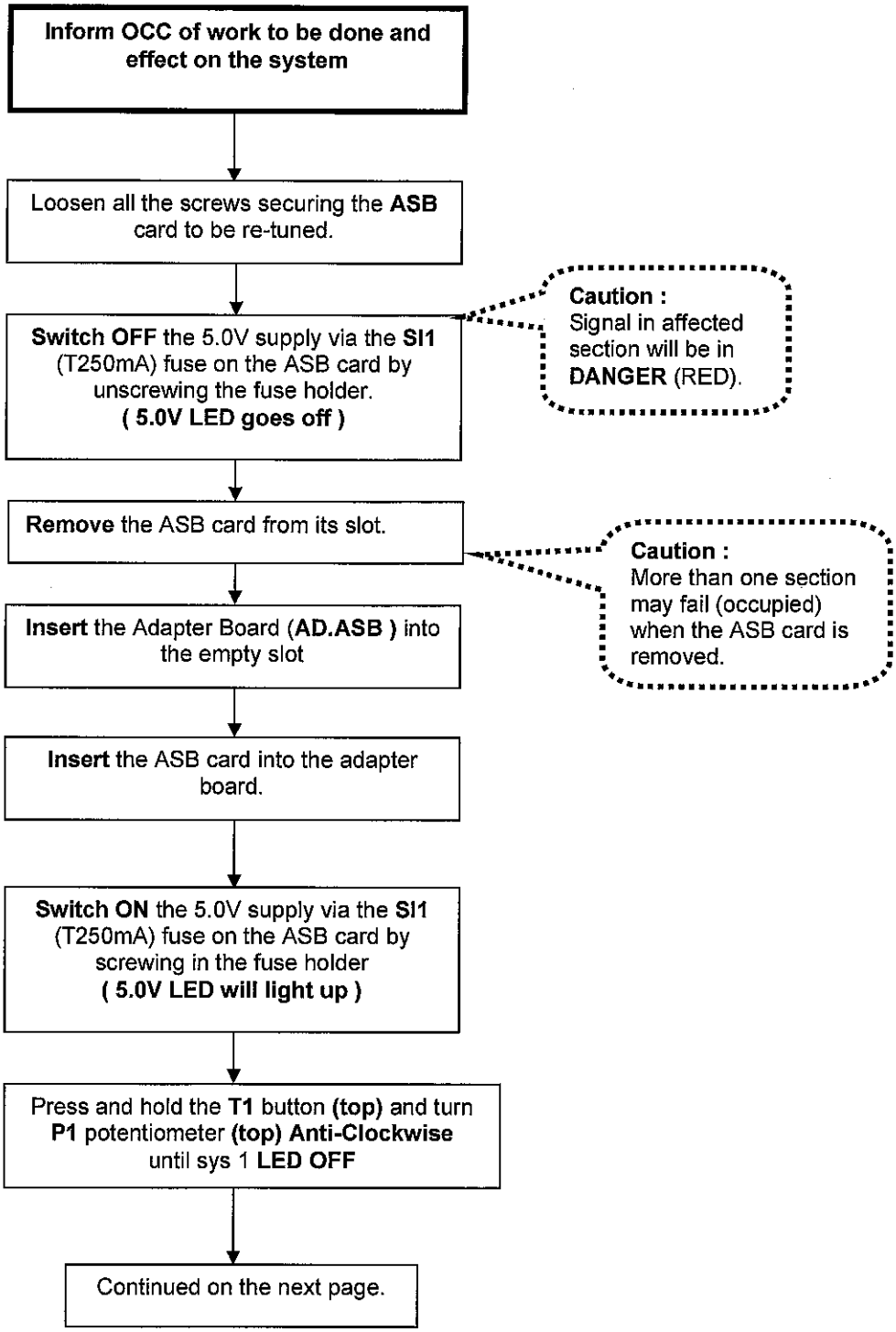
2.1 This document is specific for the various Signalling sub-systems used in the ERL system.
2.2 A hardcopy of this document shall be made available for each SIG personnel as a personal guide. This document can also be accessed electronically via the common shared folder N:/ by all SIG personnel.

3.0 Axle Counter Maintenance Guide

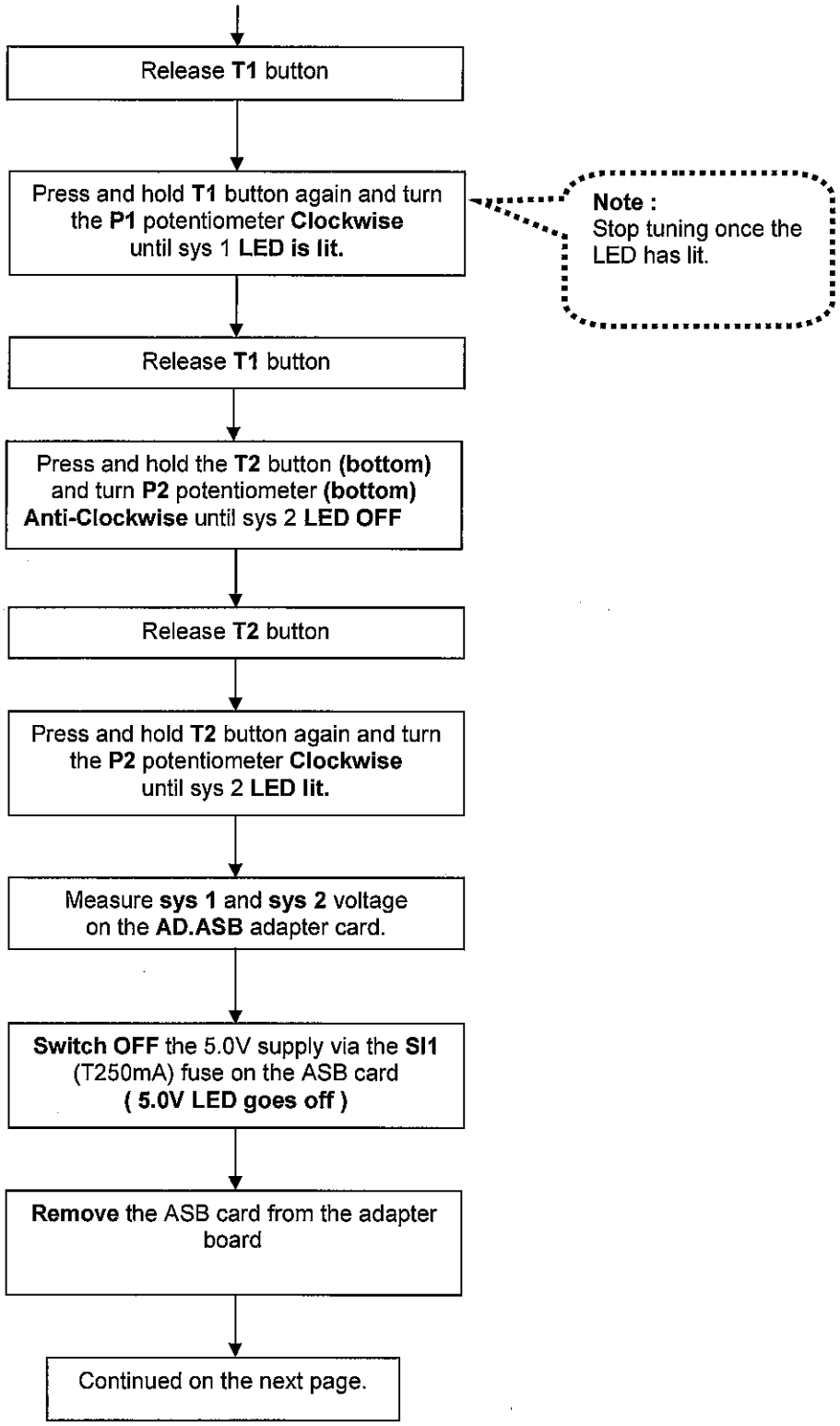
3.1 Re-setting an Axle Counter



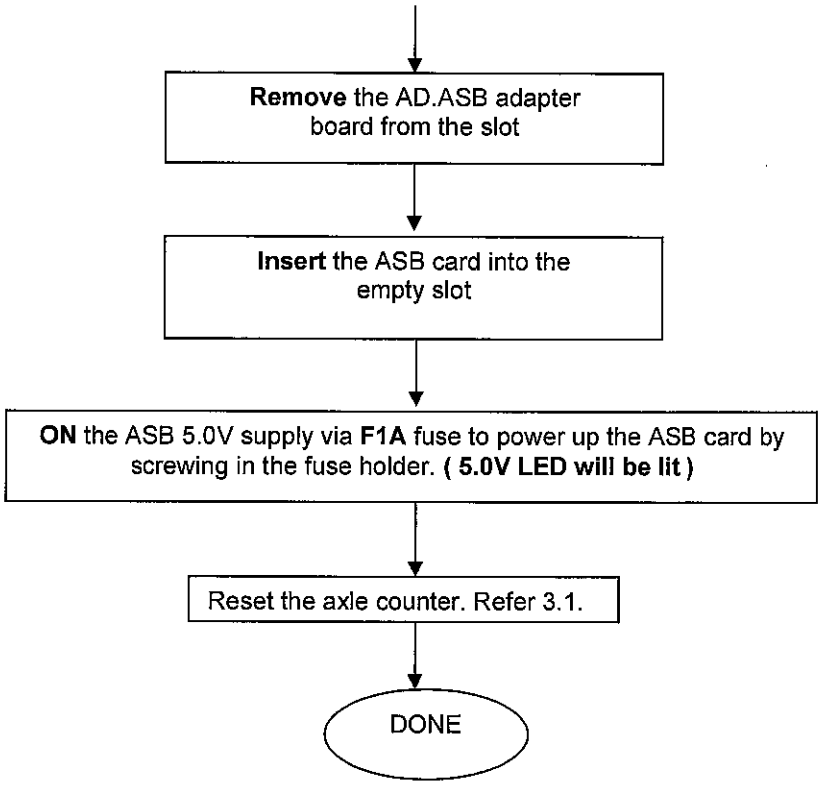
3.2 Re-Tuning ASB card



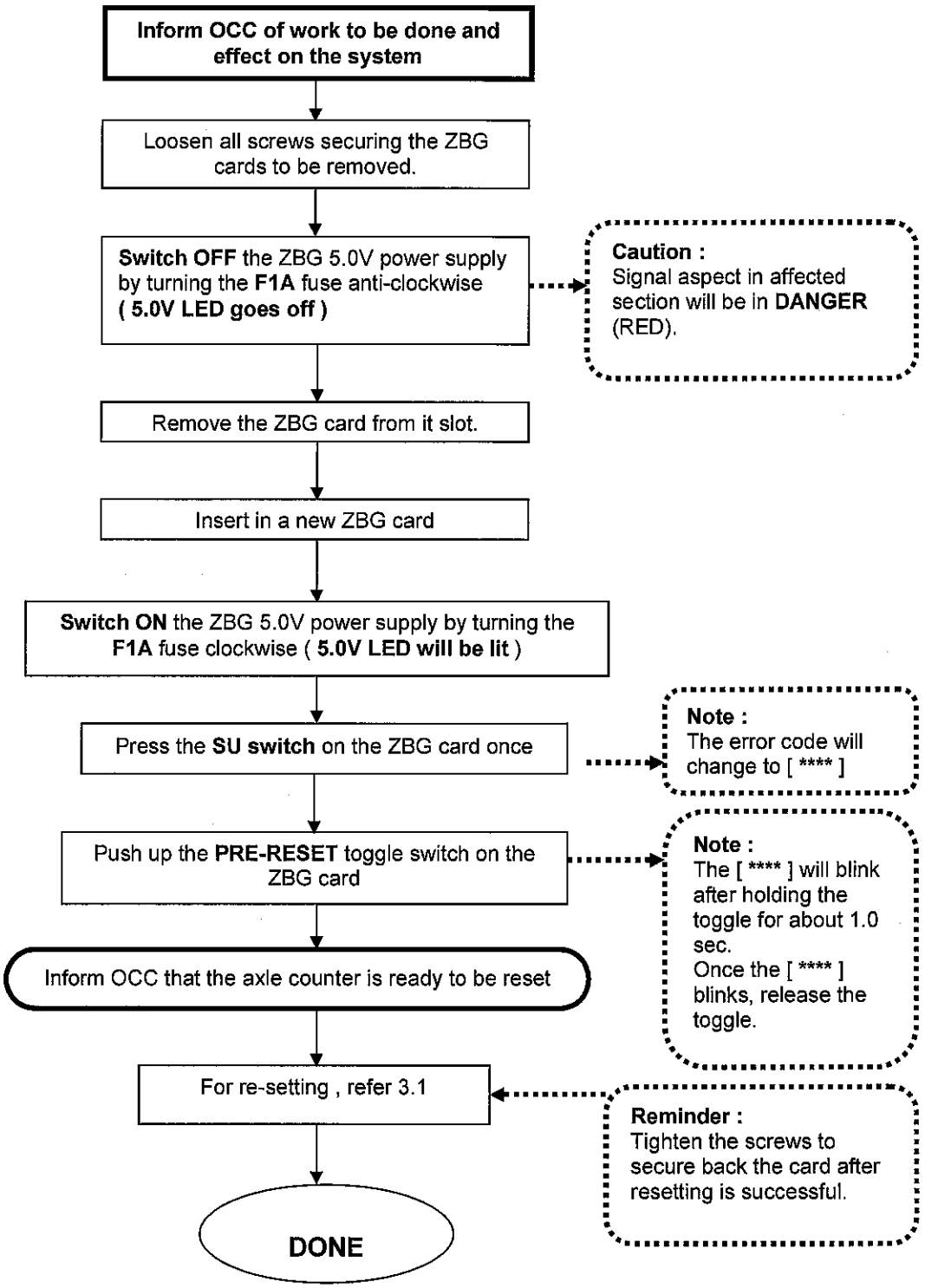
3.2 Re-Tuning ASB card (Continued)



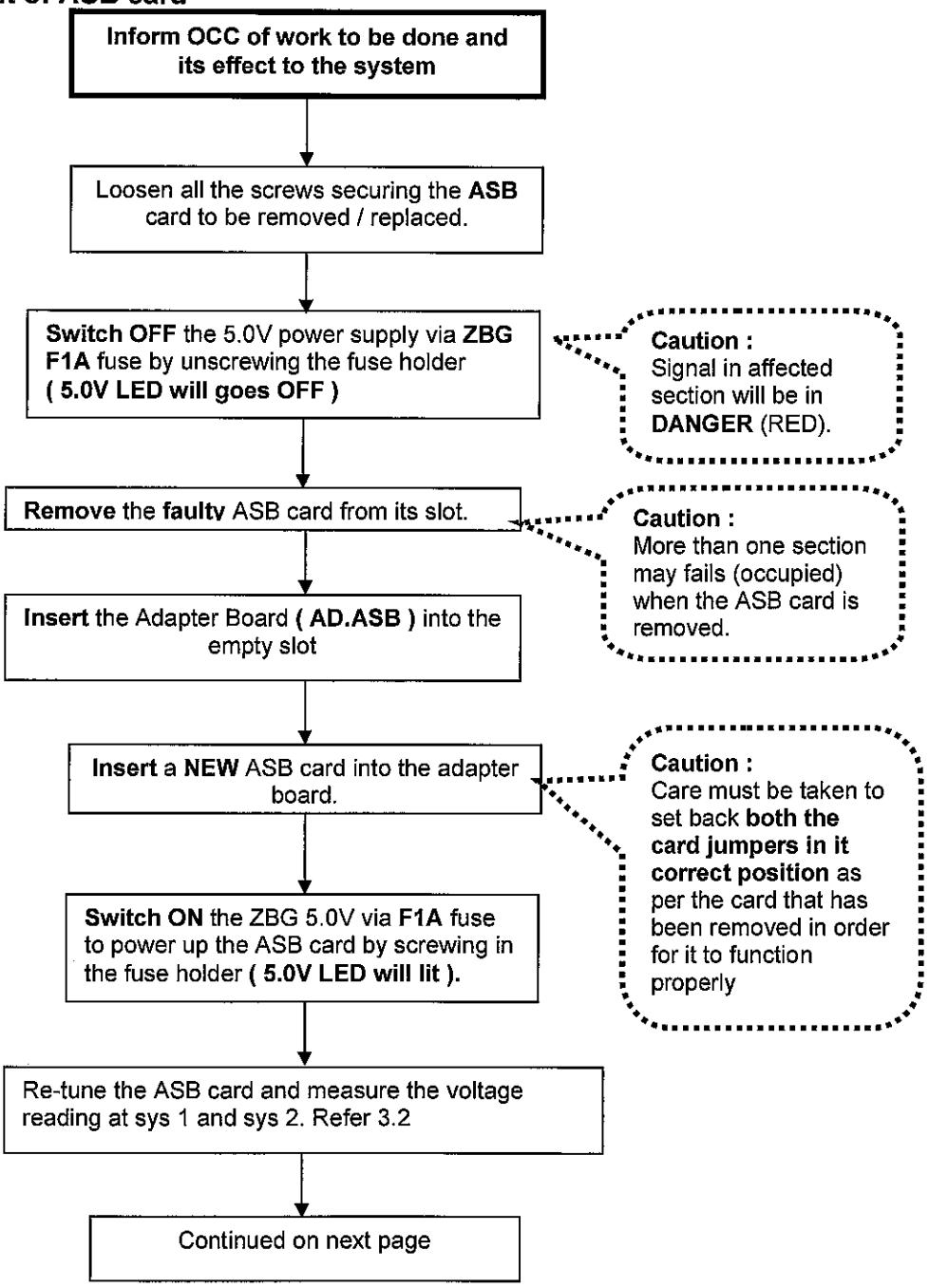
3.2 Re-Tuning ASB card (continued)



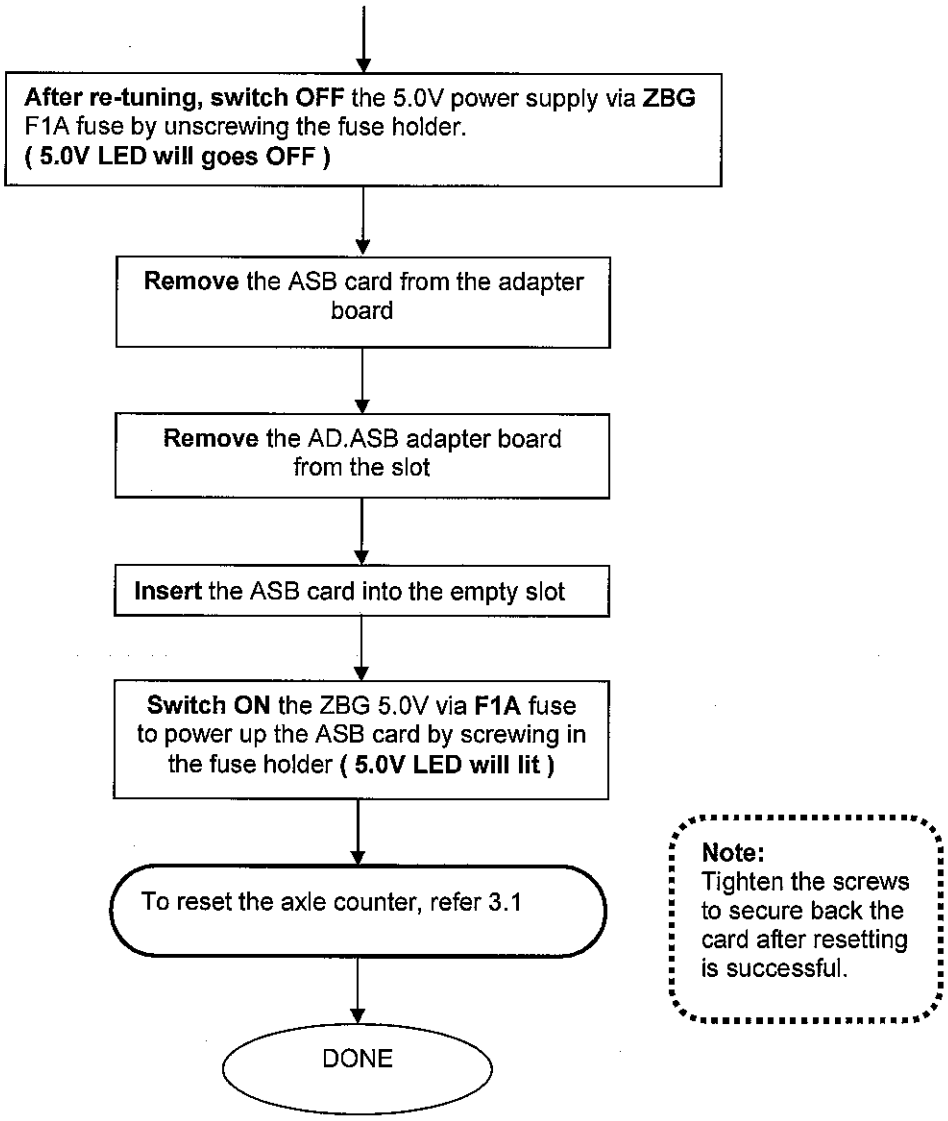
3.3 Replacement Of ZBG Card



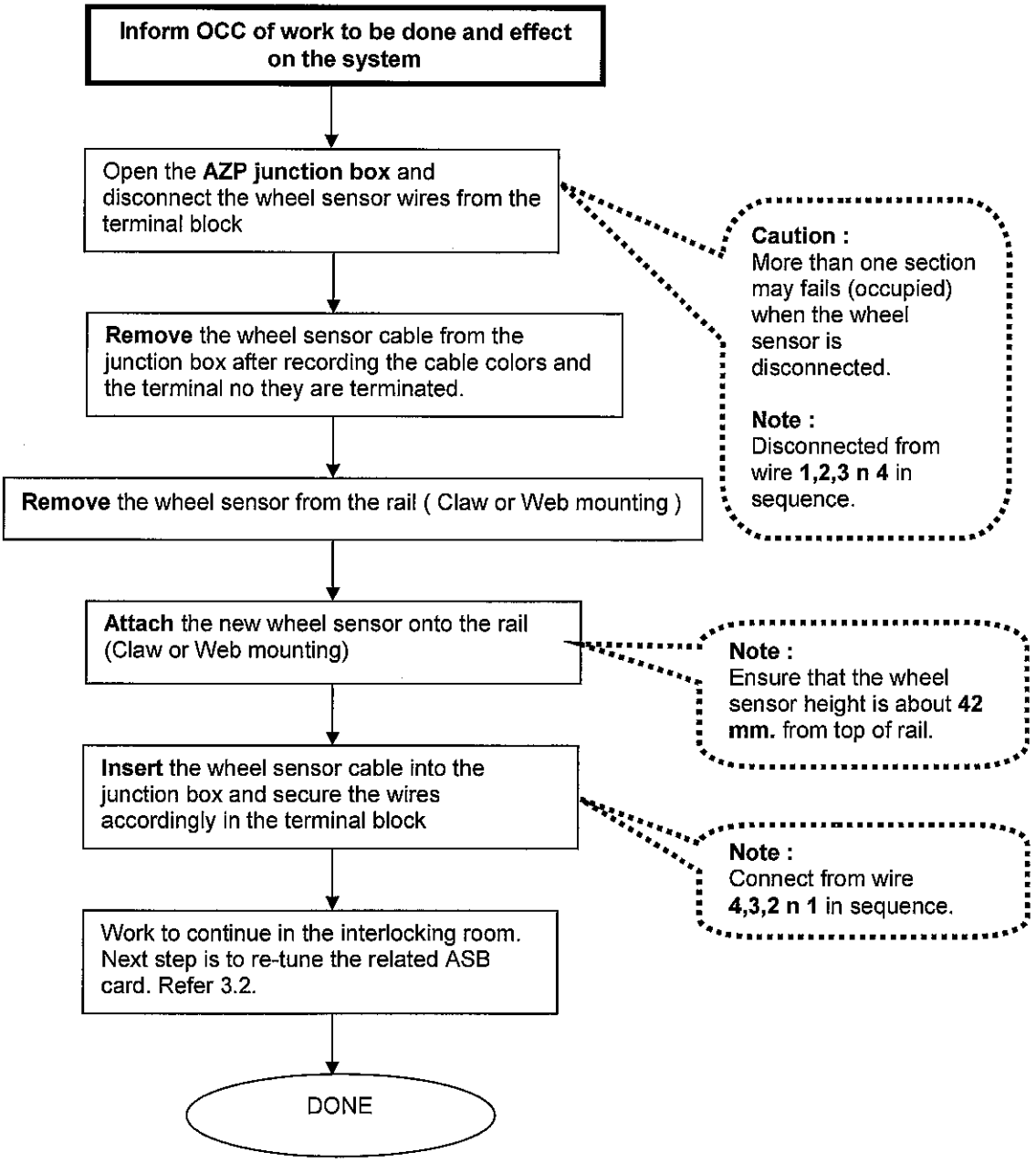
3.4 Replacement of ASB card



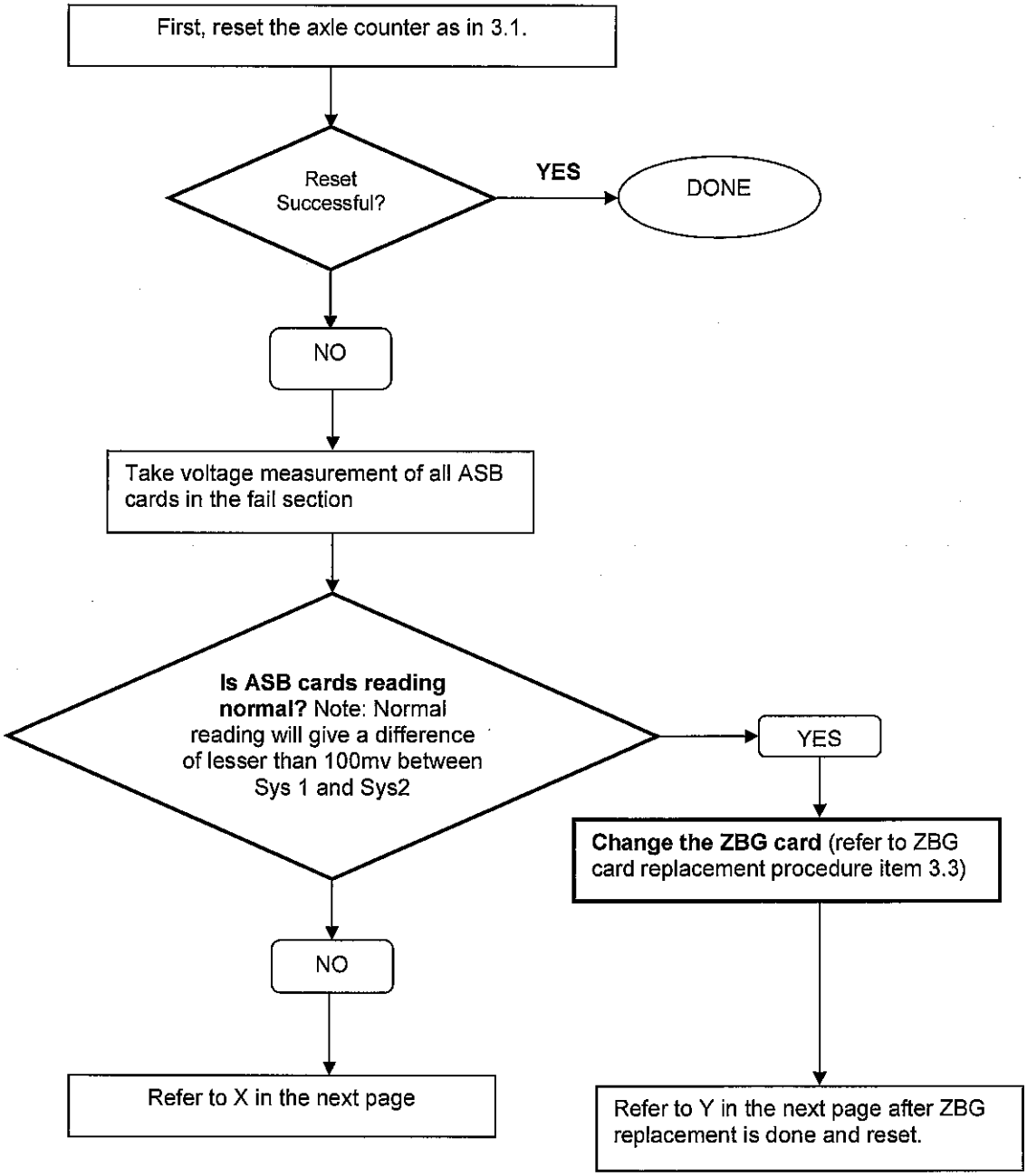
3.4 Replacement of ASB card (continued)



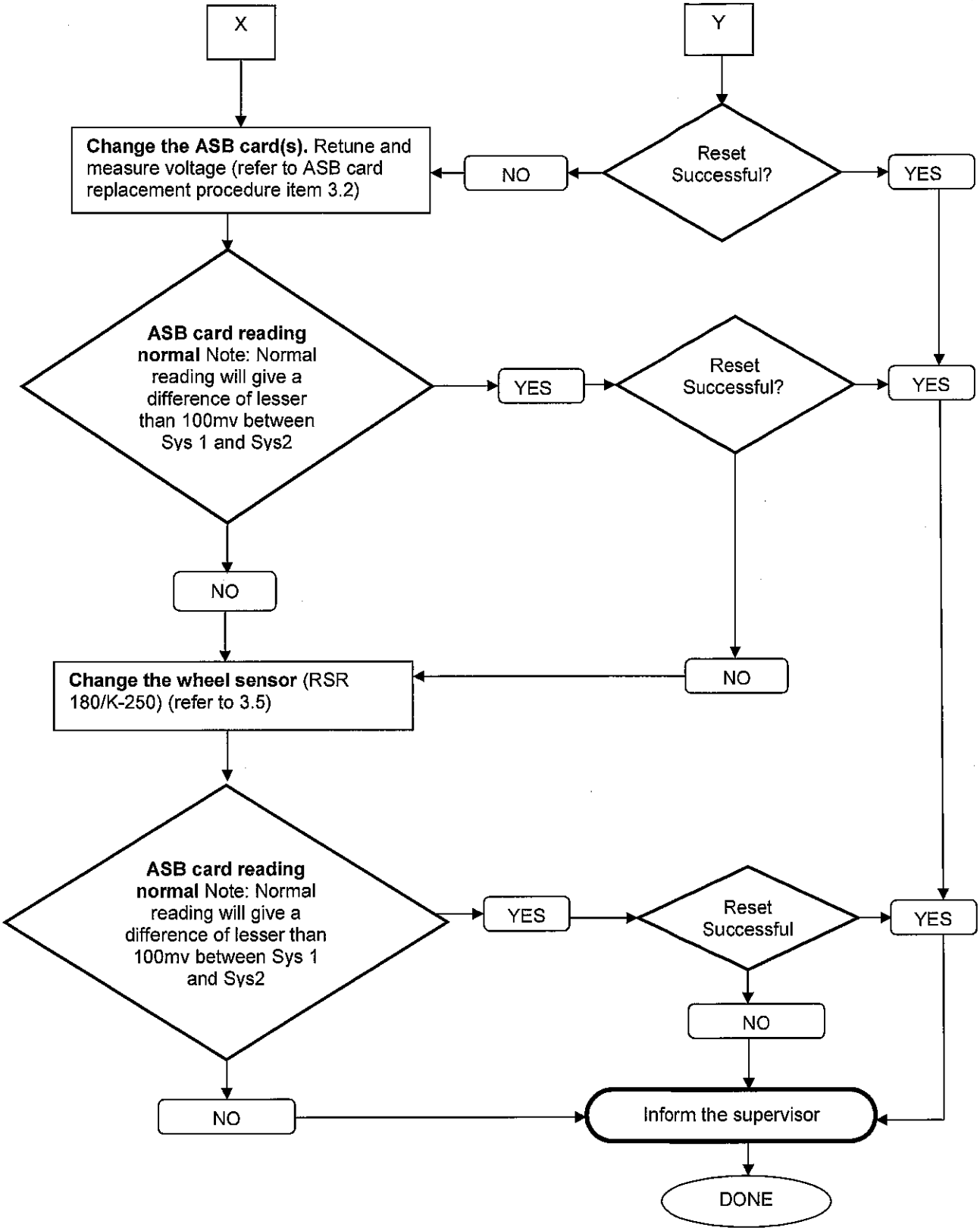
3.5 Replacement Of Wheel Sensor



3.6 Axle Counter Failure Rectification

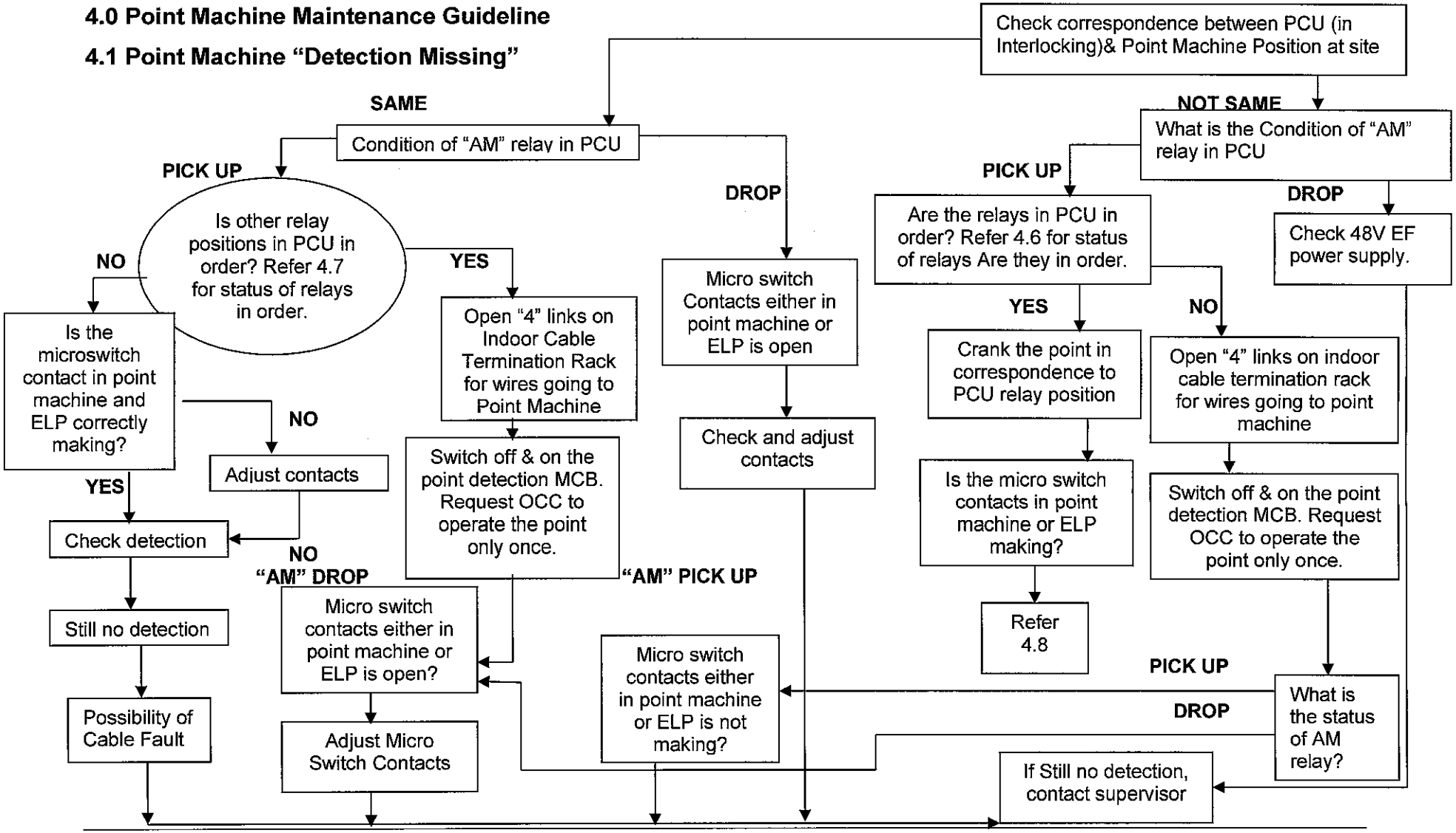


3.6 Axle Counter Failure Rectification (continued)



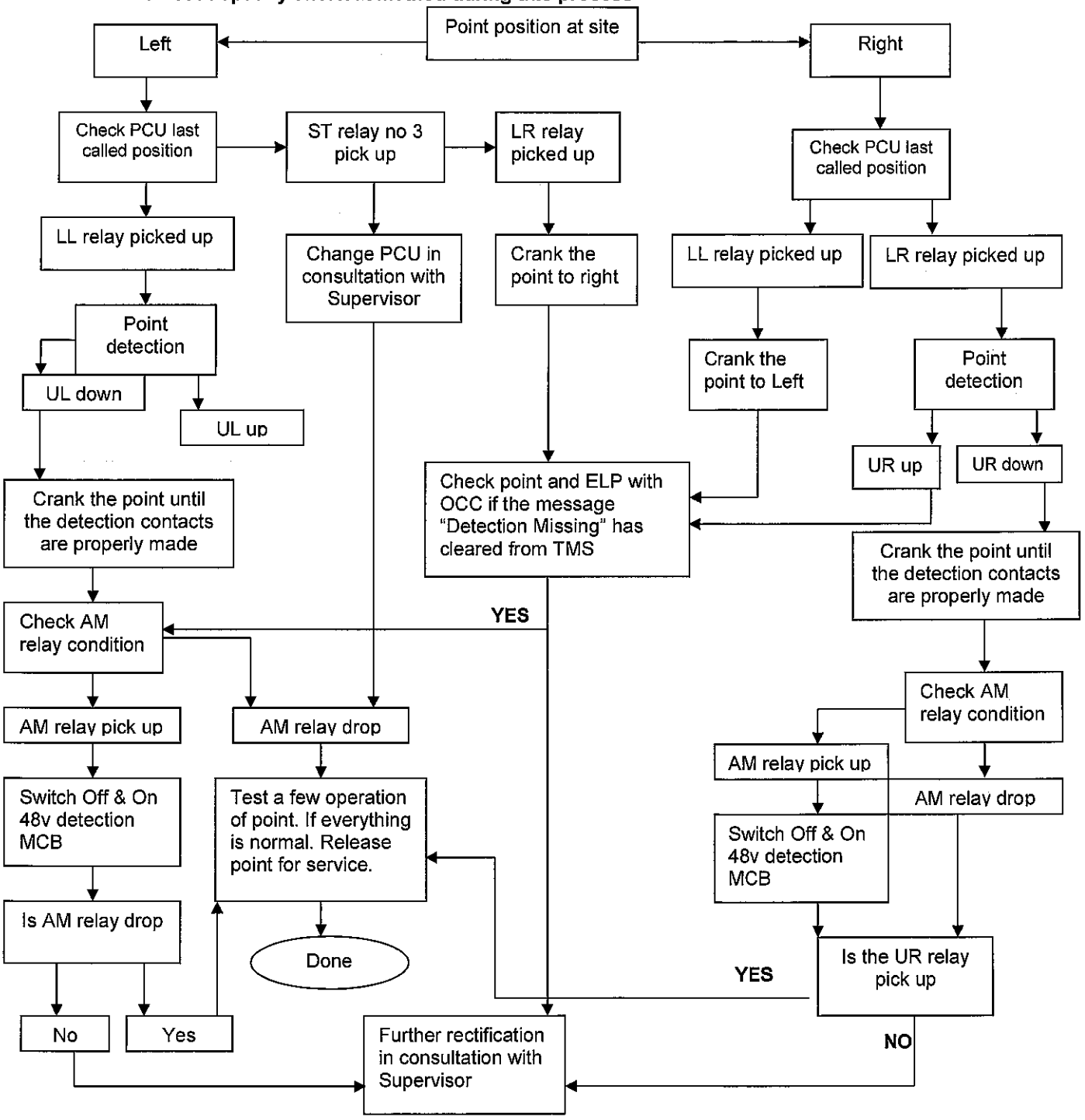
4.0 Point Machine Maintenance Guideline

4.1 Point Machine "Detection Missing"

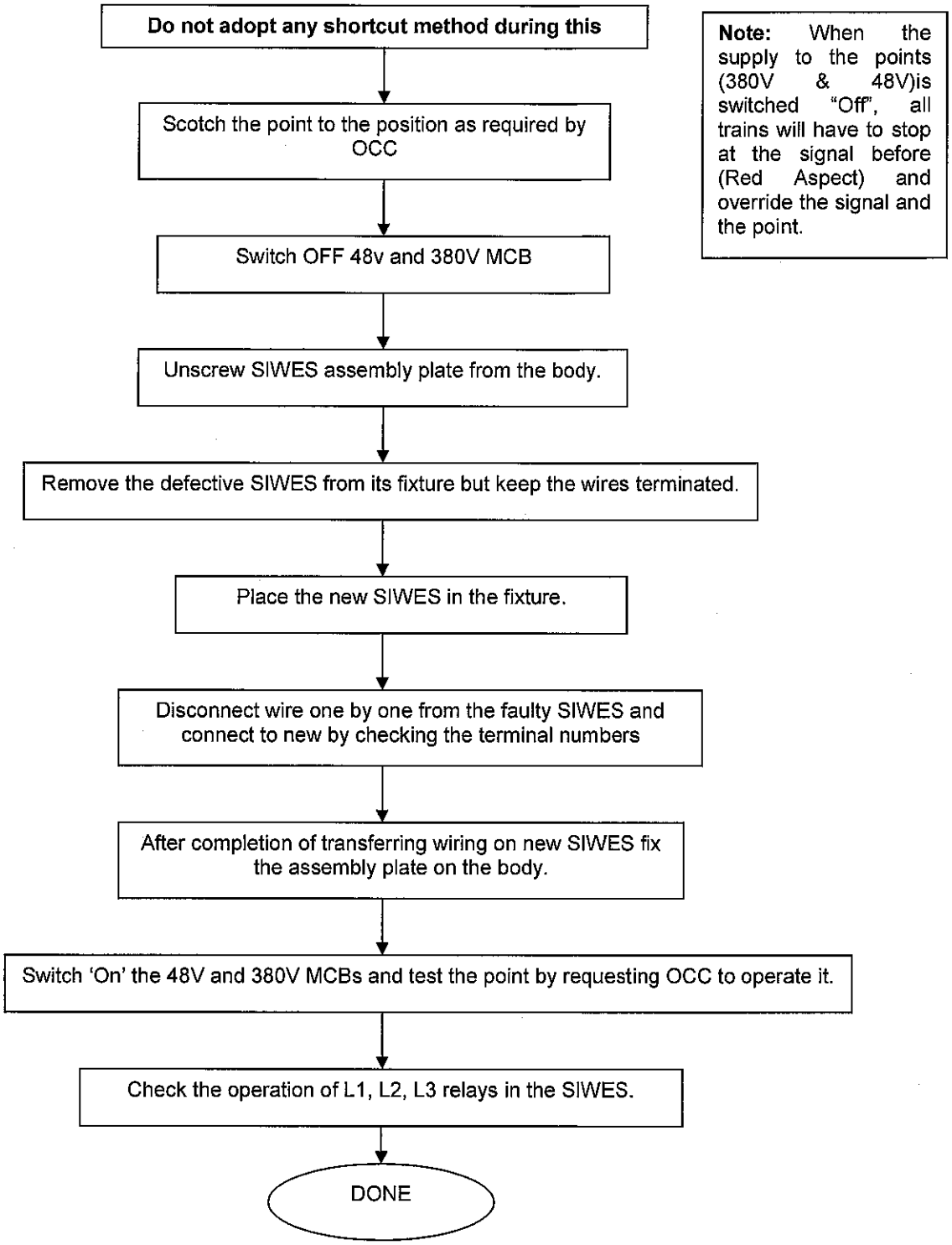


4.2 Point " Detection Missing"& " Trailed"

Do not adopt any shortcut method during this process

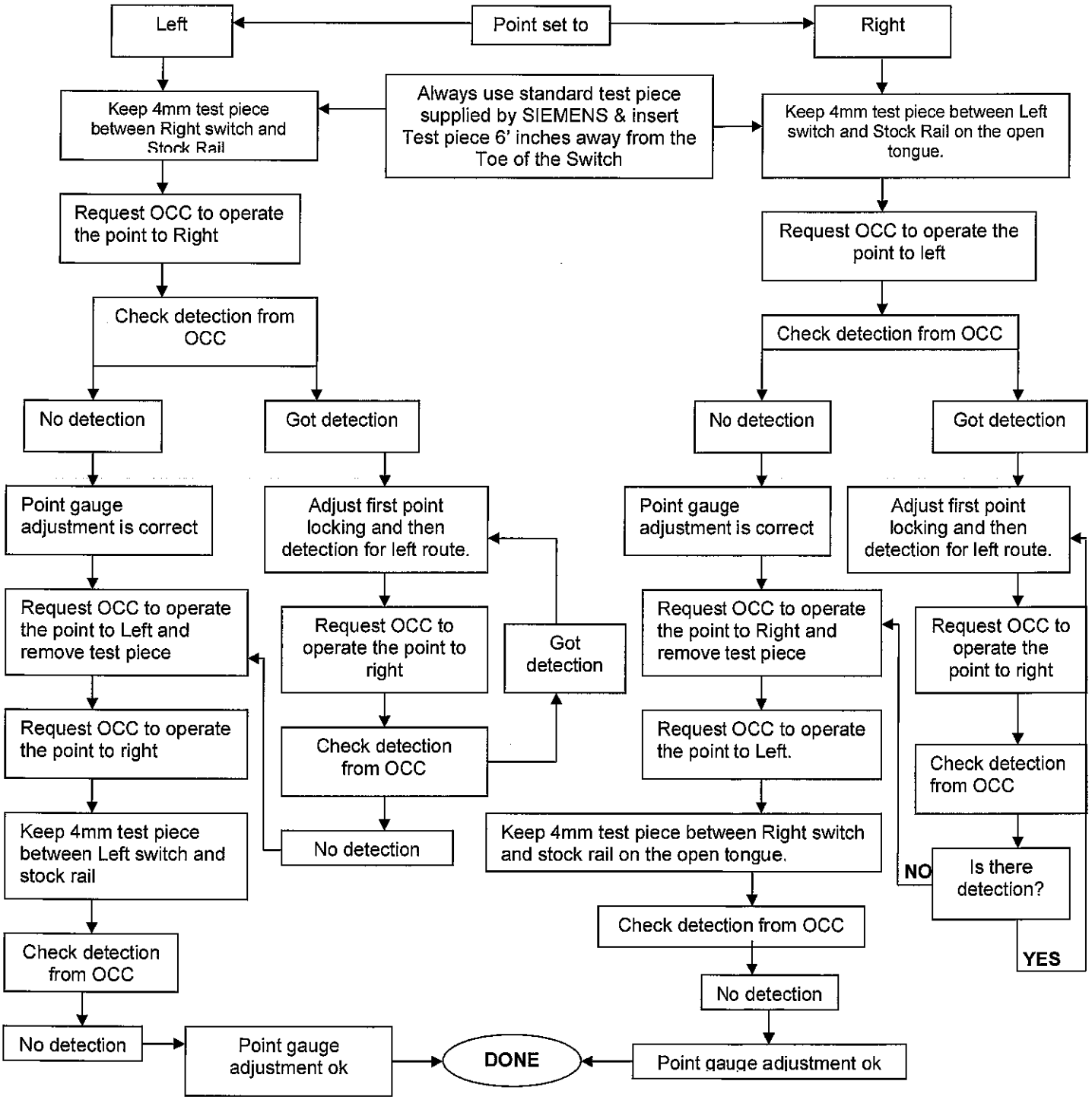


4.3 Replacement of SIWES

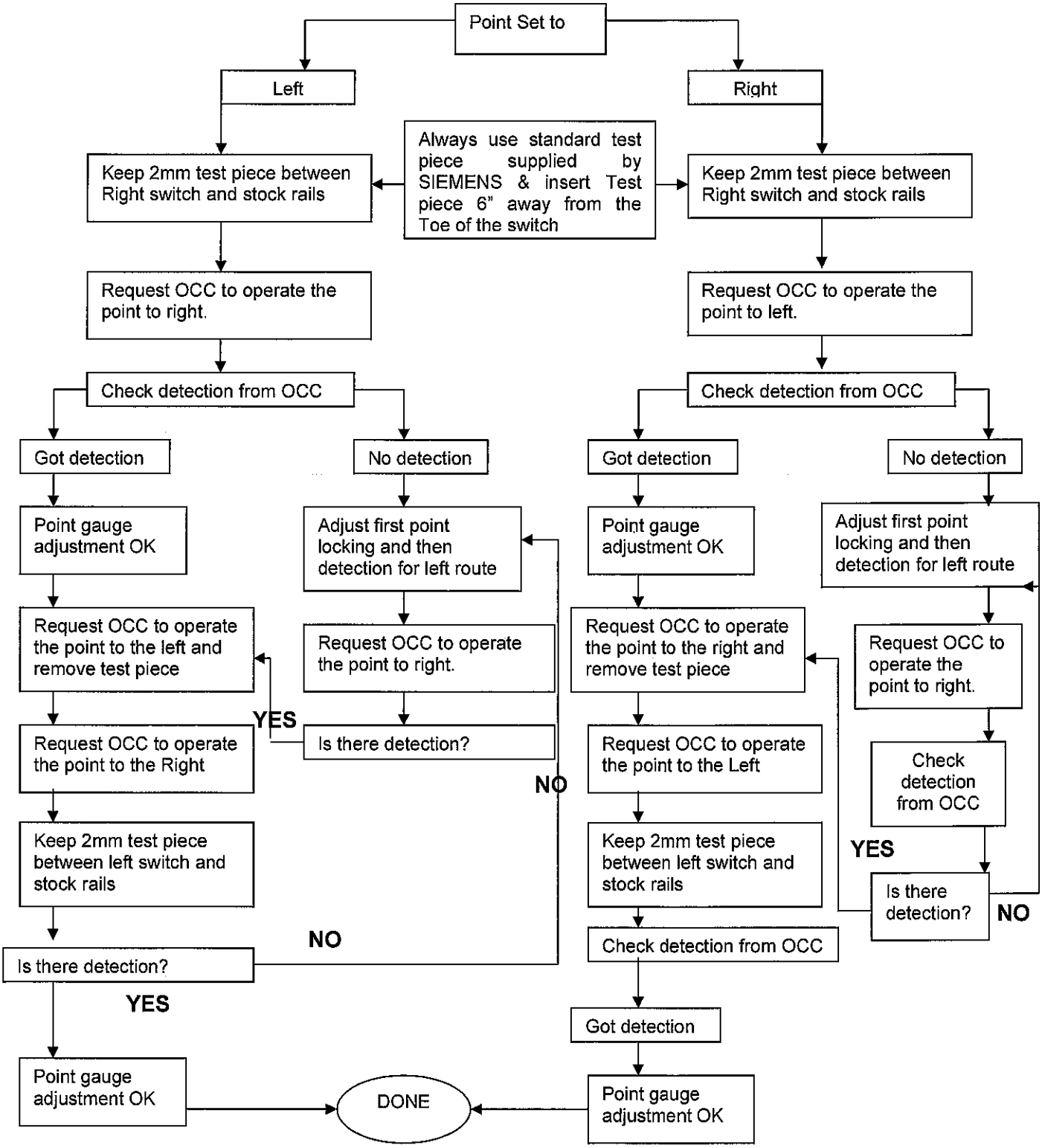


4.4 Point Machine (No Go) Test

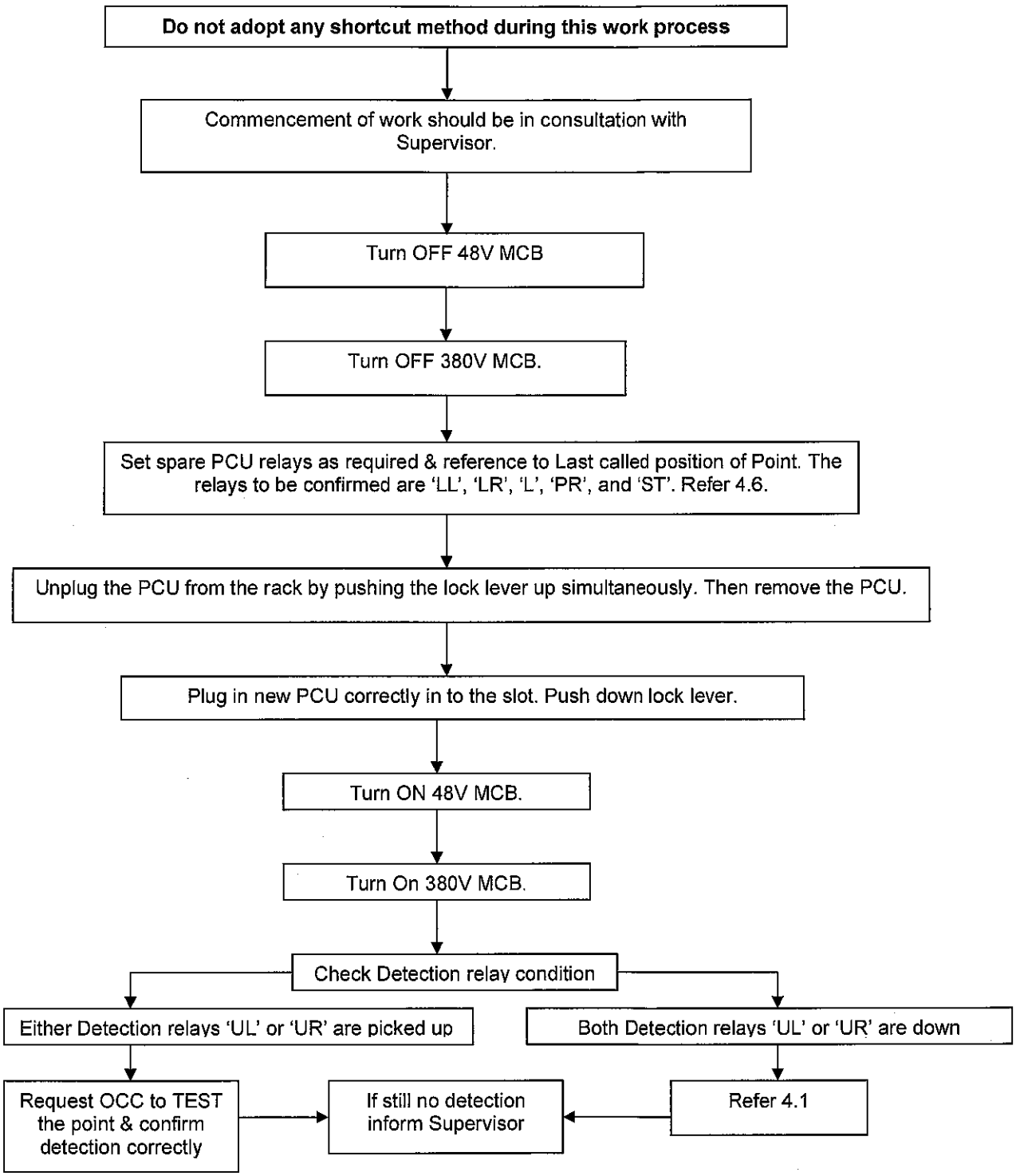
Do not adopt any shortcut method during this process



4.5 Point Machine (Go) Test



4.6 Replacement of Point Control Unit (PCU)



4.7 PCU Relay Conditions.

PCU relay condition for point set to Left

LL ↑	PR ↓	ST ↓	AN ↓	AM ↓	TIMER
LR ↓	L ↓	ST ↑	AN ↓	UL ↑	UR ↓

PCU relay condition for point set to Right

LL ↓	PR ↓	ST ↓	AN ↓	AM ↓	TIMER
LR ↑	L ↑	ST ↑	AN ↓	UL ↓	UR ↑

5.0 ATP Maintenance Guideline

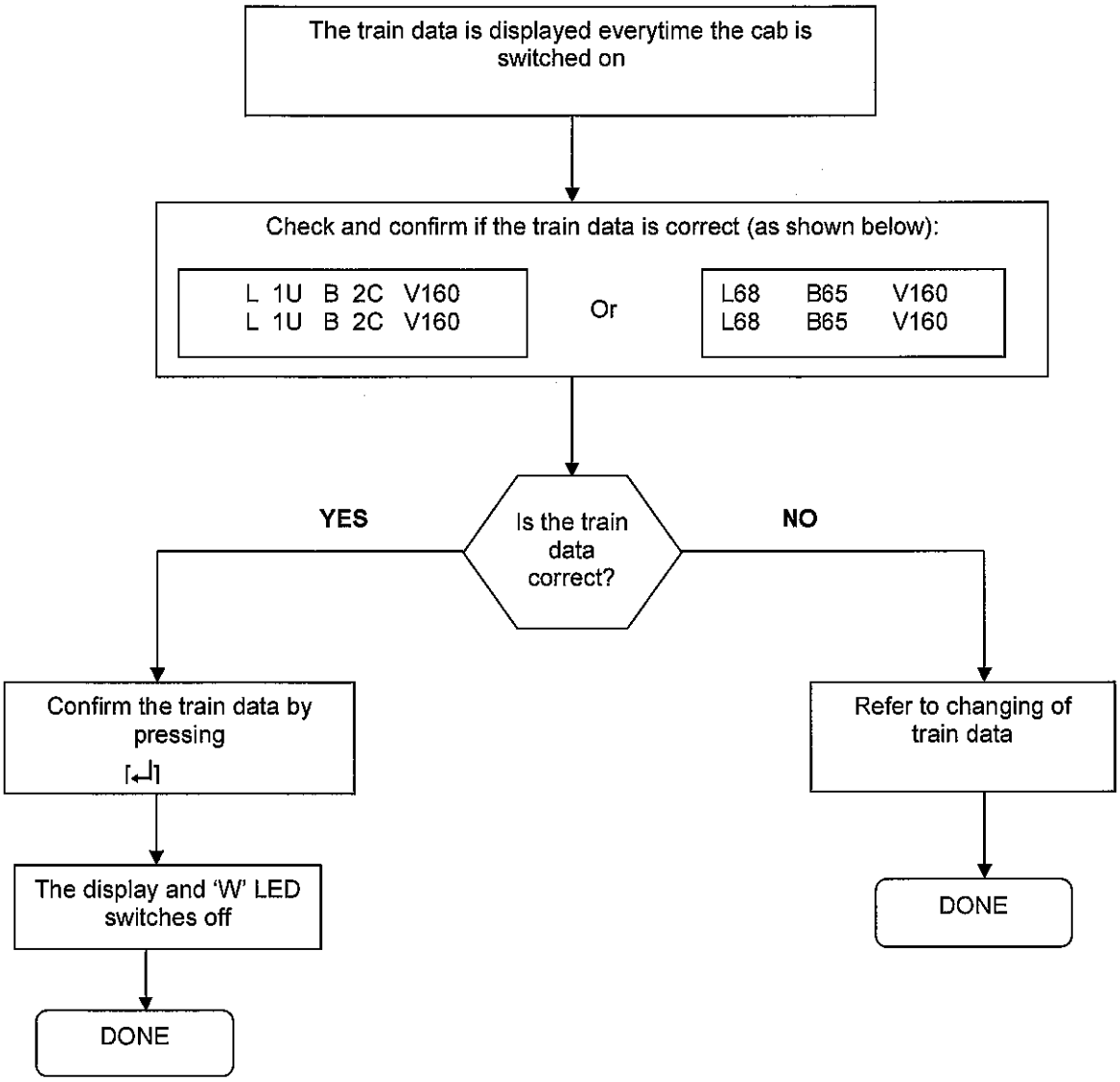
5.1 ATP Trainborne

5.1.1 Confirming The Train Data For Train

Note: the train data has to be confirmed before the train can be moved. The description of the train data is as given below:

L1U : Length of one train = 68m or 1u
B2C : Brake code 2 = 65% or 2C
V160 : Maximum running speed = 160km/h

Follow the process below to confirm train data:

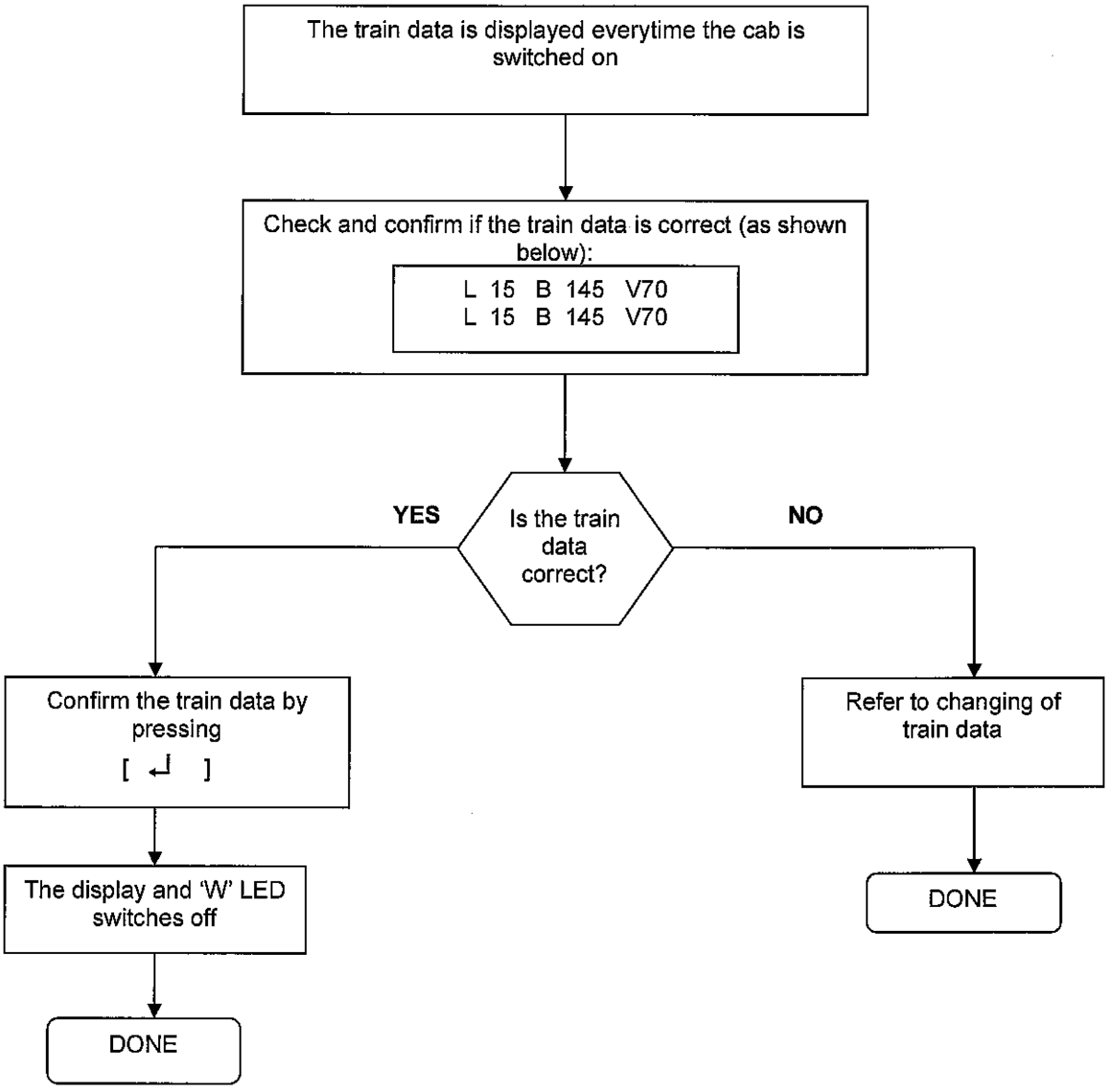


5.1.2 Confirming The Train Data For Shunting Locomotive

Note: the train data has to be confirmed before the train can be moved. The description of the train data is as given below:

L : Length of one train = 15m on 1U
B : Brake code 2 = 145% on 2C
V : Maximum running speed = 70km/h

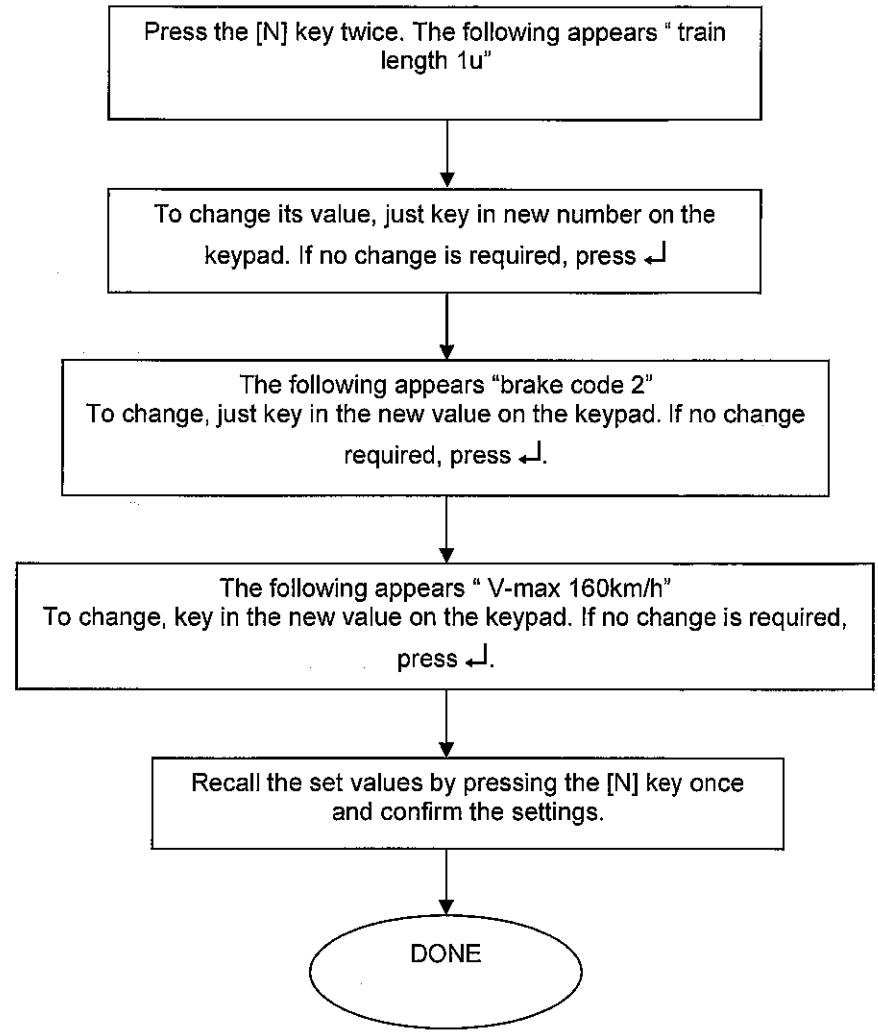
Follow the process below to confirm train data:



5.1.3 Changing Of Train Data in units

NOTE: (i) Train Units **L= 1u**
B= 2u
V= 160km/h

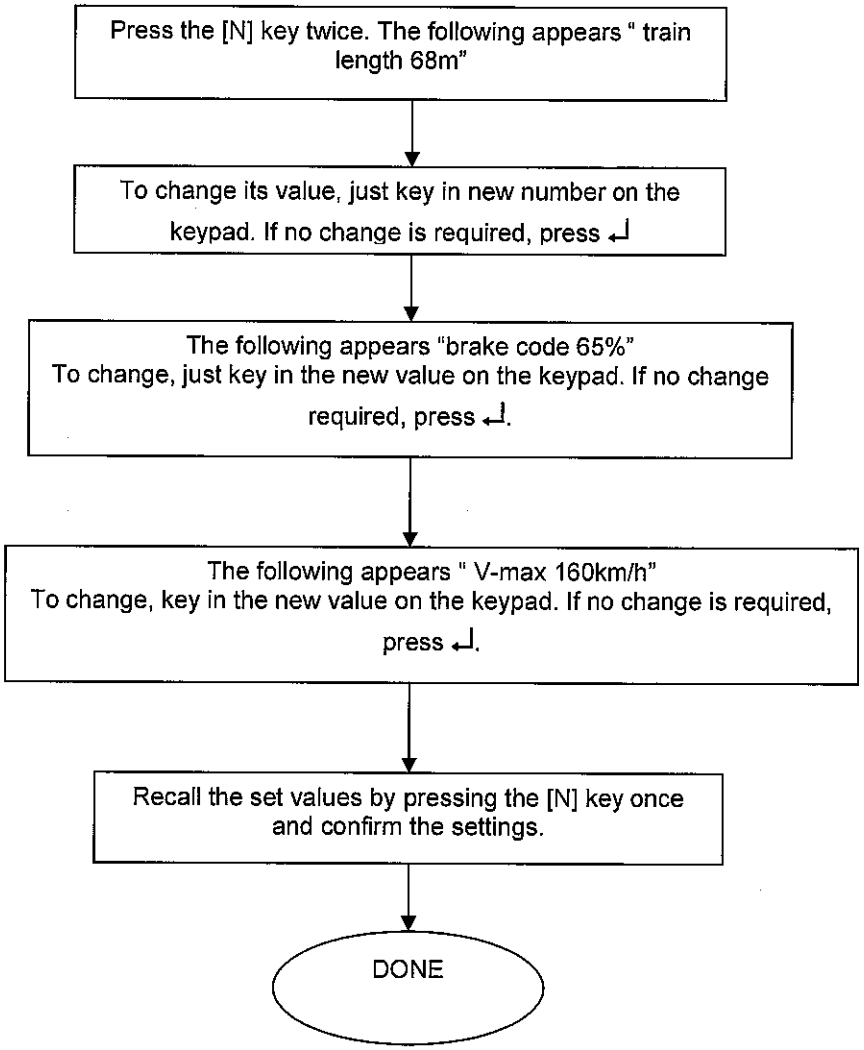
(ii) Shunting loco **L= 15m**
B= 2u
V= 70km/h



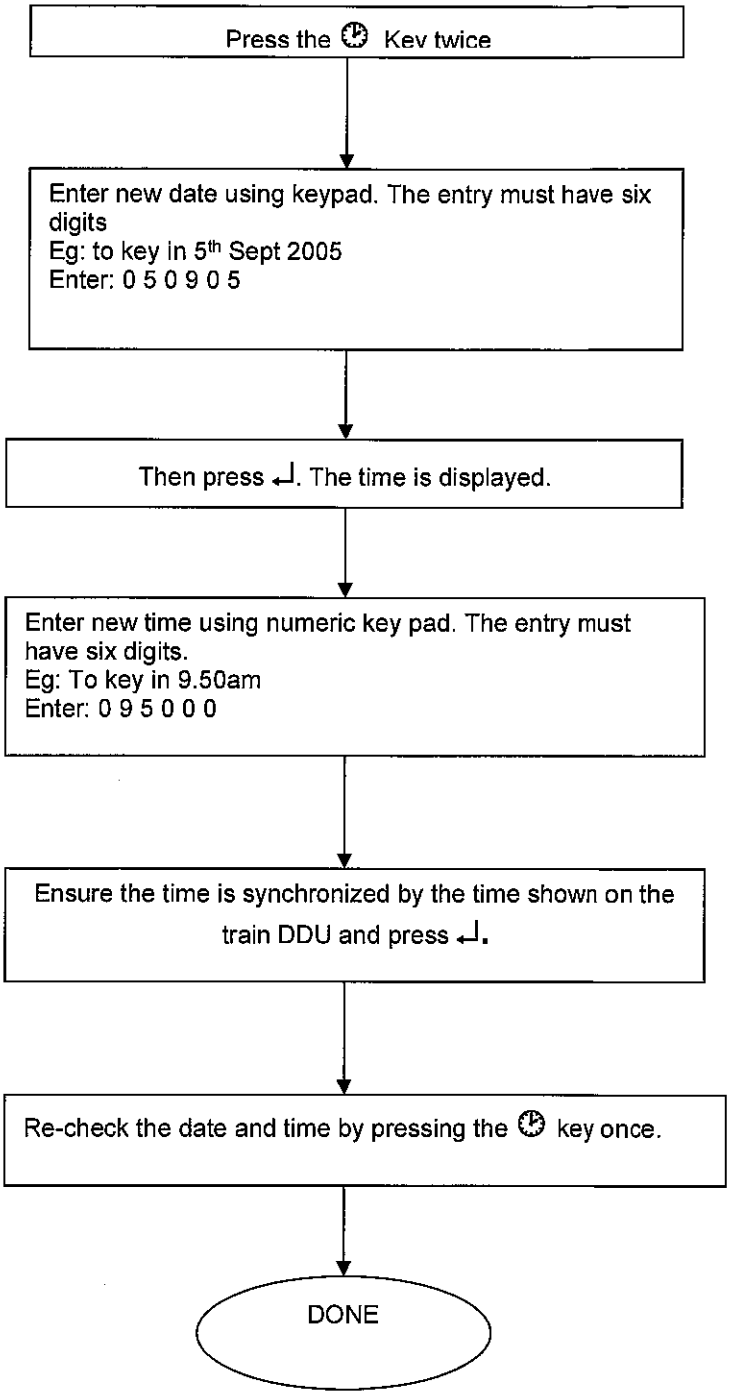
5.1.4 Changing Of Train Data In Absolute Numbers

NOTE: (i) Train Units **L= 1u**
B= 2u
V= 160km/h

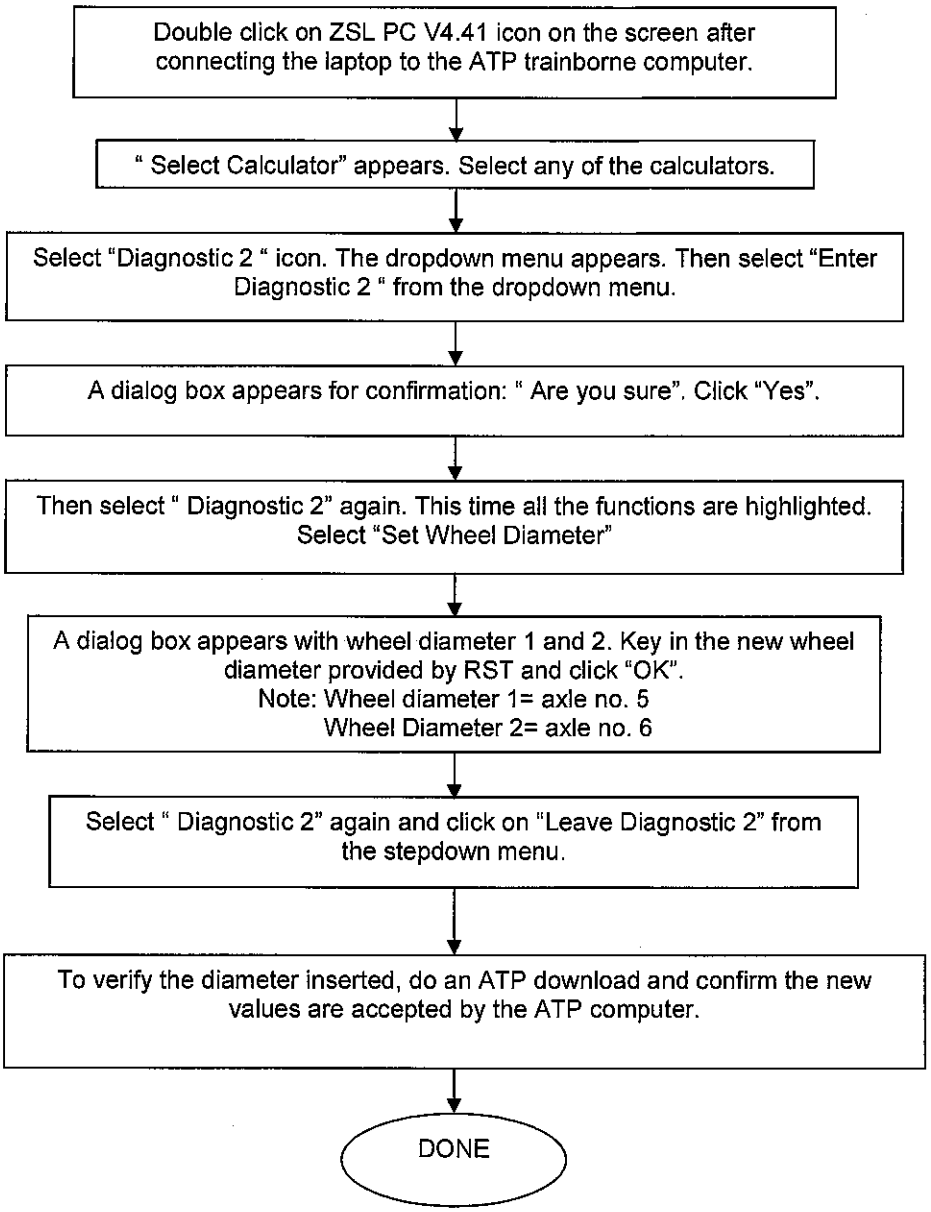
(ii) Shunting loco **L= 15m**
B= 2u
V= 70km/h



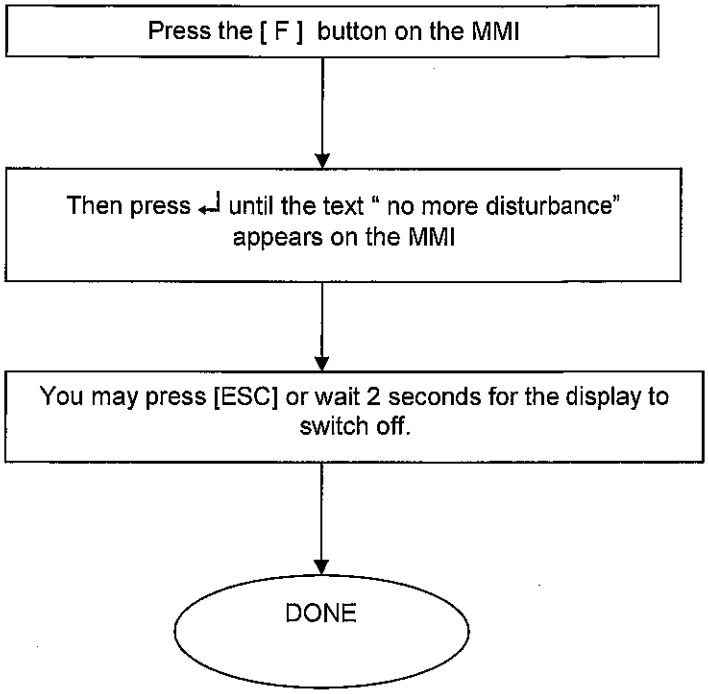
5.1.5 Input New Time And Date



5.1.6 Key-in new wheel diameter

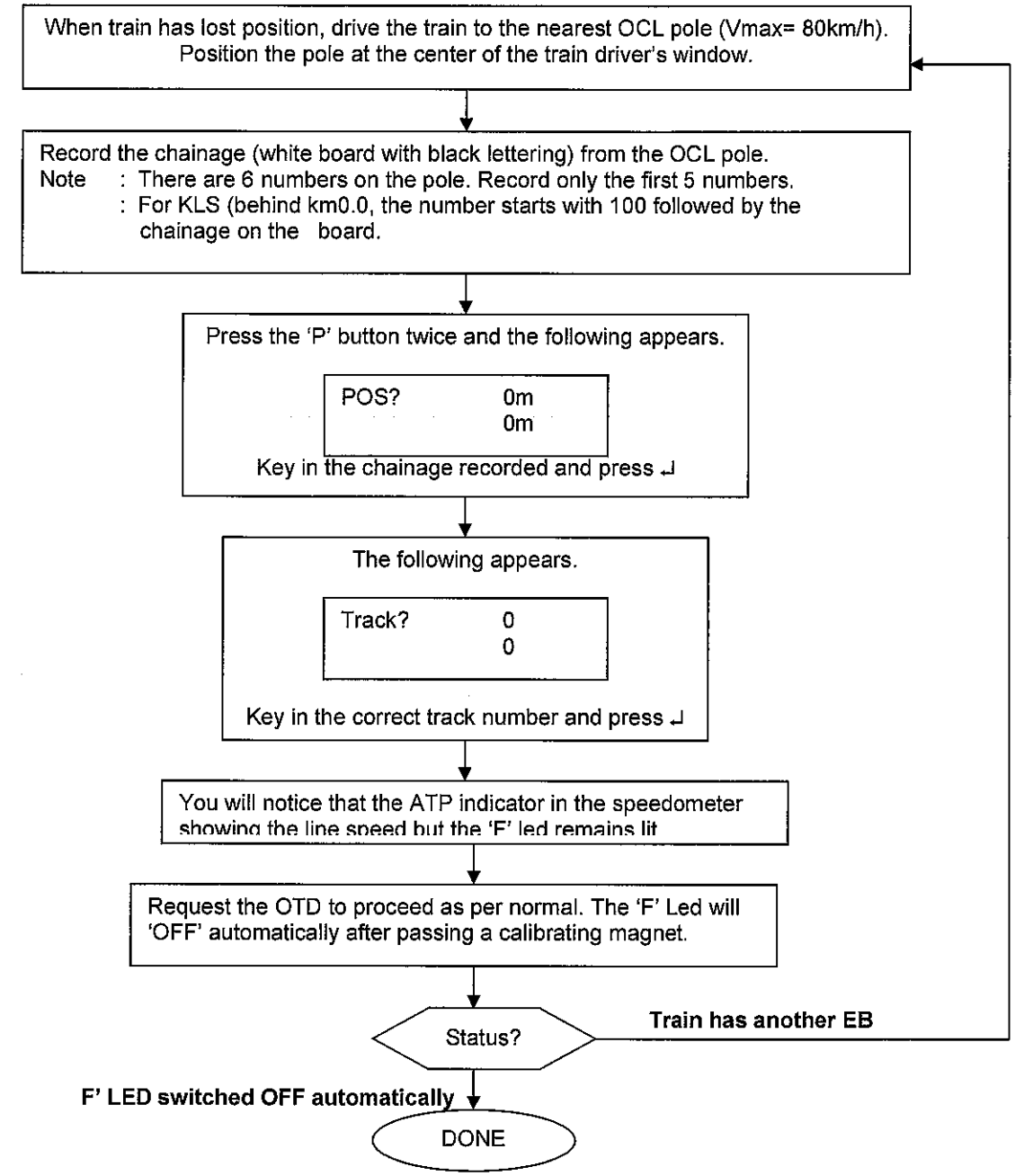


5.1.7 Checking For Faults On The MMI



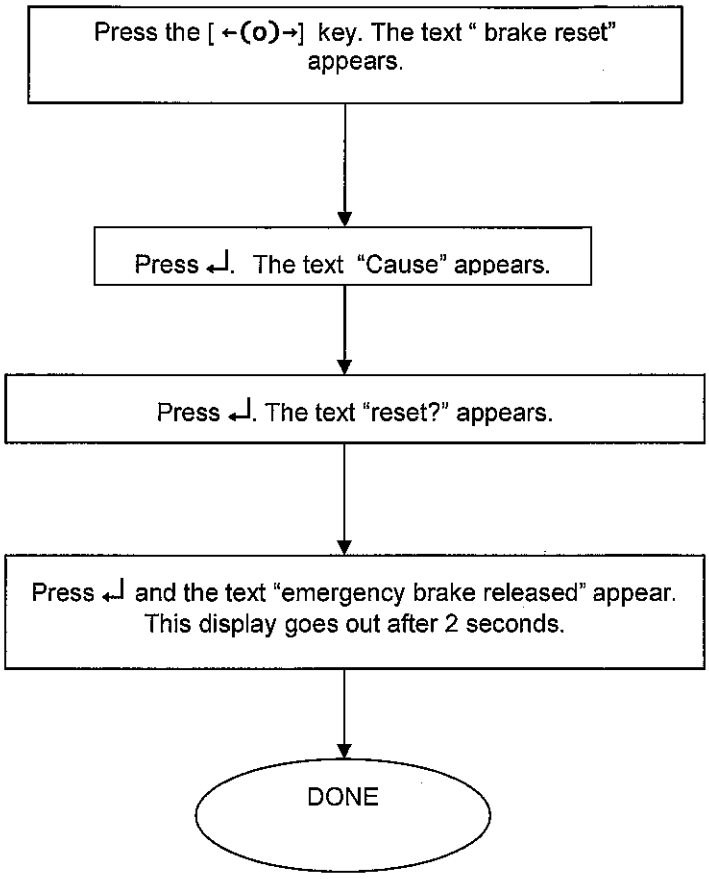
5.1.8 Keying In New Position / Track

Note: 1. For Depot, use position= 40, Track 0
2. Position cannot be entered for a vehicle (train/ shunting loco) in the loop tracks (track 1,2). Vehicle must be moved to mainline to key in new position.

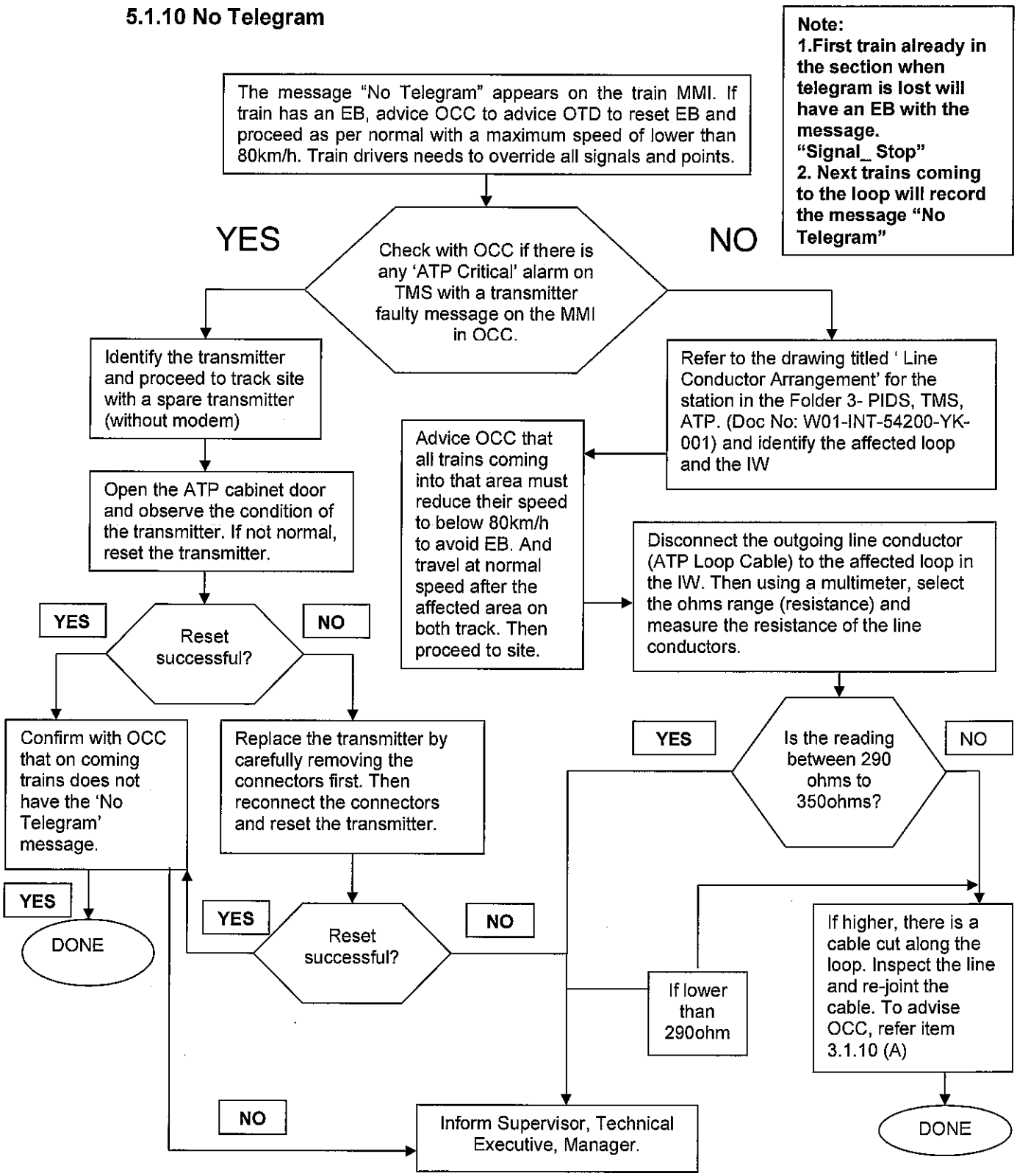


5.1.9 Clearing ATP Fault And Releasing the EB

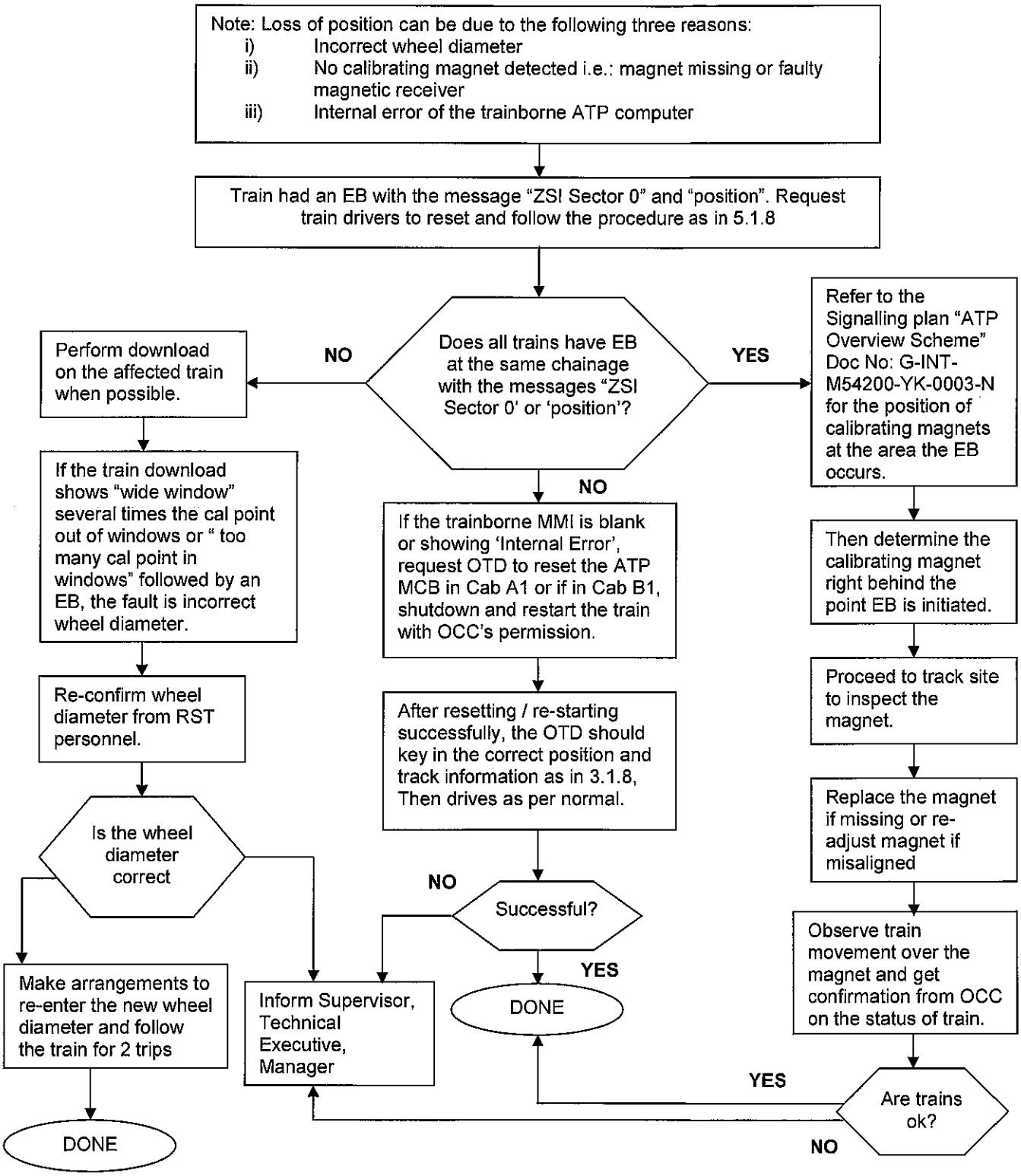
NOTE: Reset and clearing of ATP fault can be done only when the train is at complete stop.



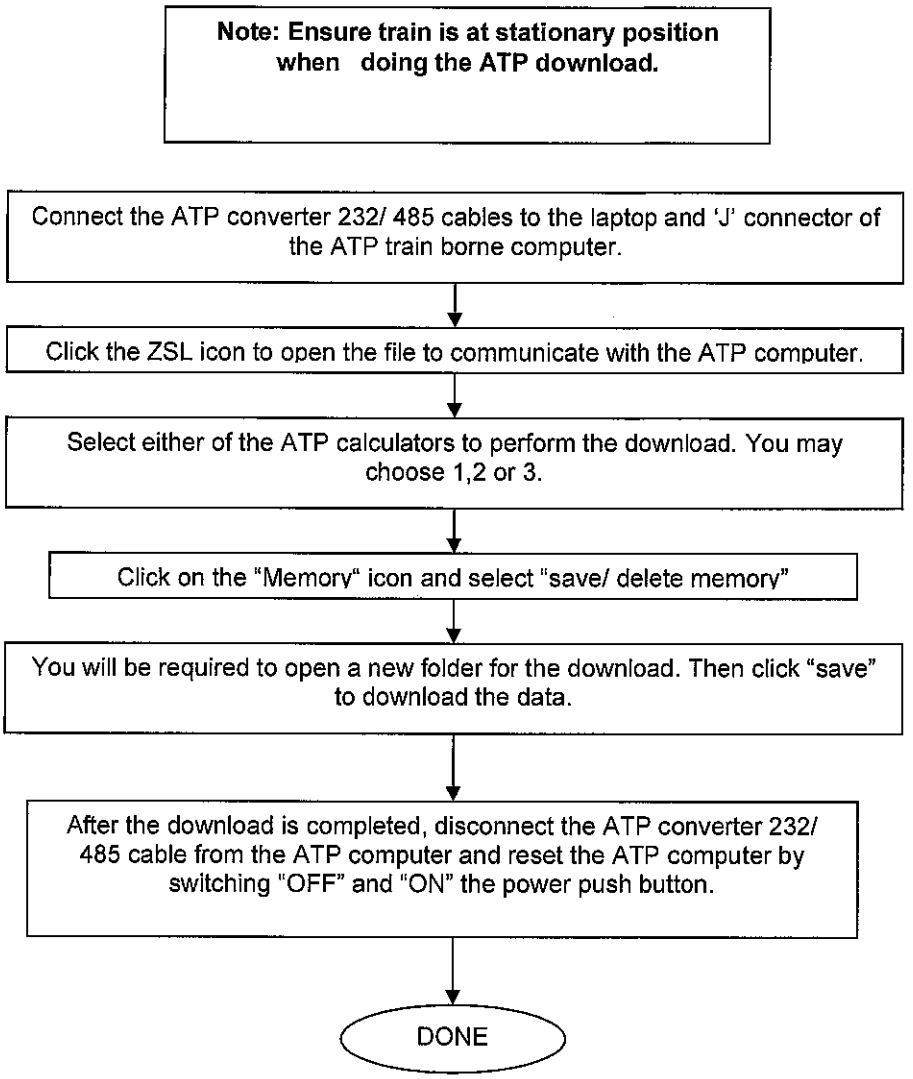
5.1.10 No Telegram



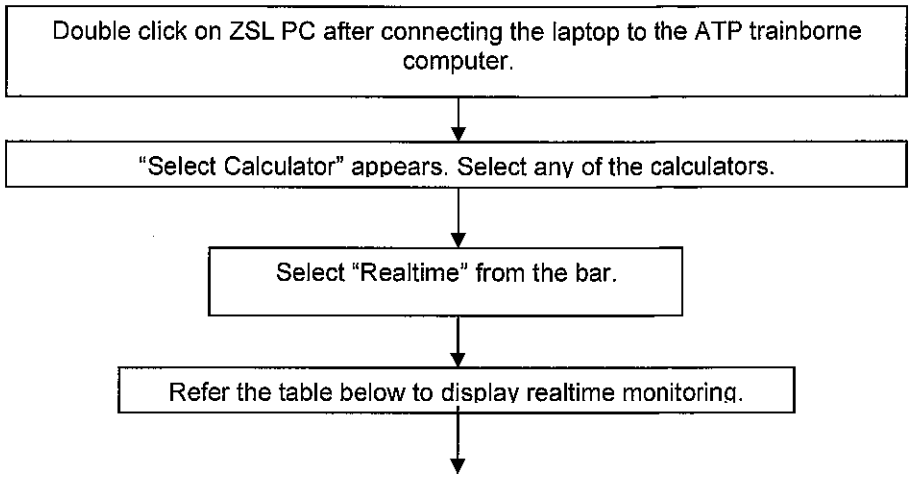
5.1.11 "Loss Position"



5.1.12 Train ATP Computer Download



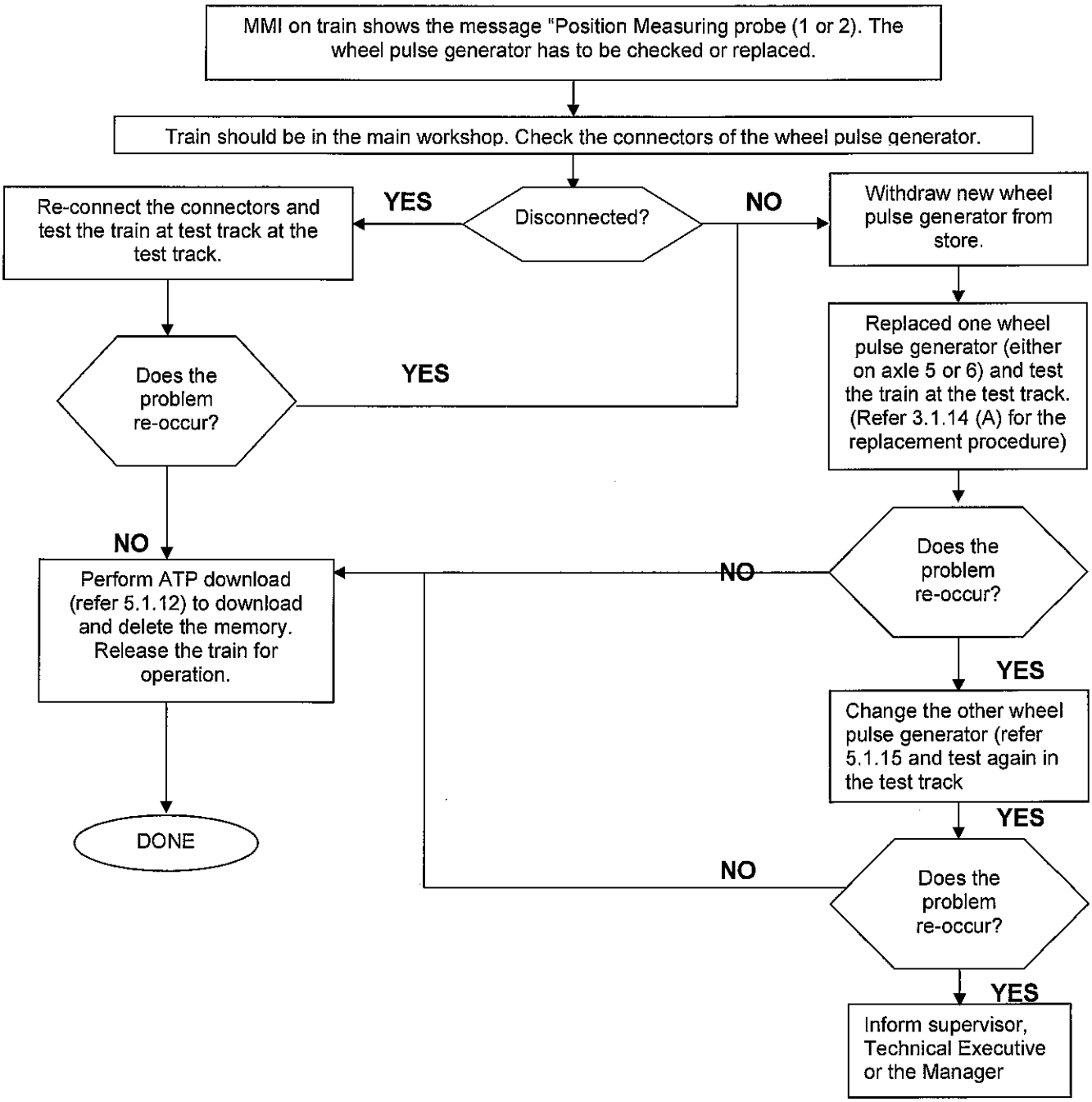
5.1.13 Real Time Monitoring on ATP diagnostic software



Decription on dropdown menu	Details
Display Speeds	Display actual speed of train (V-act) and maximum allowable speed by ATP (V-Moni)
Compare actual speeds	Compares the speed on all the calculators simultaneously. V-act (l, p, n) 0000,0000,0000
Compare positions	Compares the position of all the calculators simultaneously. Pos. (l, p, n) 0000000, 0000000,0000000
Real Odometer device	Shows the actual speed and the direction of travel. Vact: - 0000; dist + 0000000000
Receipt Cor. Tele	Measures the telegram received at both the antenna. Channel 1/ Channel 2 0005/ 0006

5.1.14 Position Measuring Probe Failure

Note: **1) Wheel Pulse generator are installed at axle no 5 and 6.**
2) They are connected to the junction box by cables, which are labeled.
3) After changing the wheel pulse generator, the new wheel pulse generator has to be commissioned



5.1.15 Replacement of Wheel Pulse Generator

Note: Once the wheel pulse generator is suspected/ identified to be faulty, the following process is to be followed.

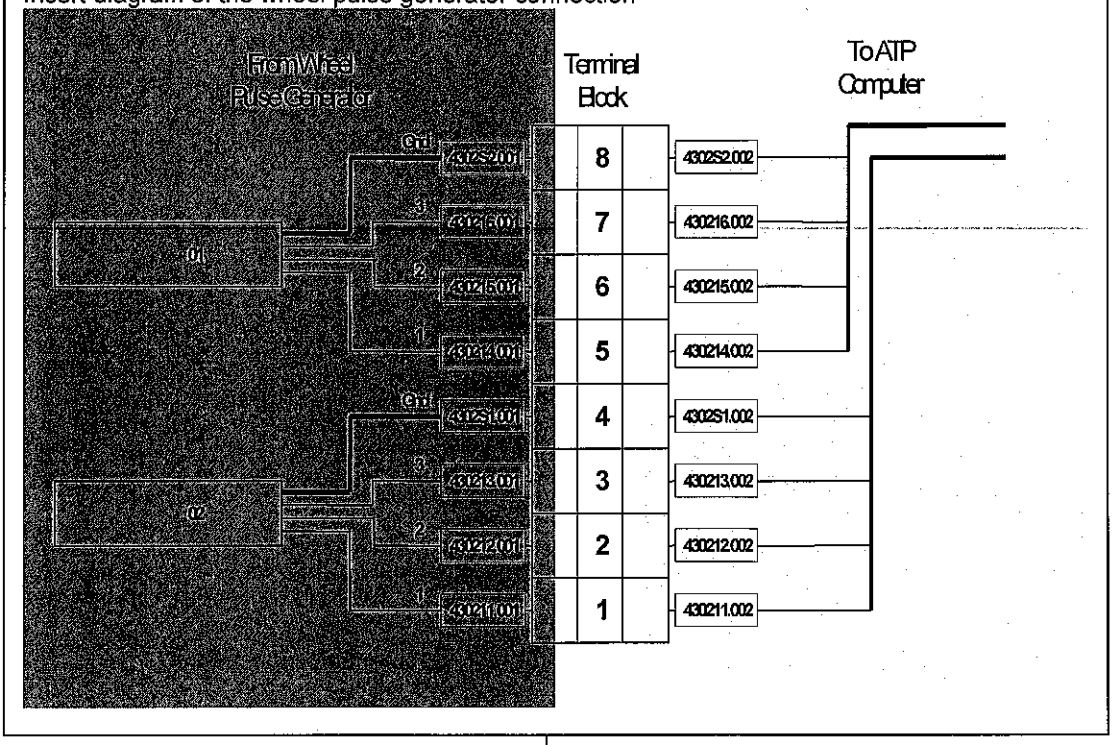
Dismount the wheel pulse generator from the wheel and disconnect the wires in the junction box.

↓

Re-connect the new wheel pulse generator as in the diagram below

↓

Insert diagram of the wheel pulse generator connection



↓

After the wheel pulse generator is connected, take the train to the test track and perform the commissioning test.

↓

Refer 4.1.16

↓

Once the commissioning test is completed, the train can be released for service. → DONE

5.1.16 Wheel Pulse Generator Commissioning

Note: Follow the following procedure and tick the provided YES or NO column. For any NO ticked, consult Supervisor.

Wheel Pulse Generator 1

	YES	NO
1. Station train at a known chainage at the test track.	☐	☐
2. Connect the ATP diagnostic laptop to the ATP computer and select to view the real time for position.		
3. Note down the current position of the train and indicate if it shows + or –.		
4. Switch off the train computer via the driver's key.	☐	☐
5. Disconnect the connection of the pulse sensor 2.	☐	☐
6. Switch on the computer.		
7. Move train in direction of KLS about 15m.		
8. Point measurement indicates positive in the real time diagnostic.	☐	☐
9. Speed indication positive in the real time diagnostic.	☐	☐
10. After ____m LEDs 3 and 4 on the position measuring interface illuminates.	☐	☐
11. The 'F' LED on the MMI is lit.	☐	☐
12. The message " Position sensor 2 defective " is displayed.	☐	☐
13. Re-connect the connection of the pulse sensor and reset the faults on the MMI.		

5.1.16 Wheel Pulse Generator Commissioning (continued)

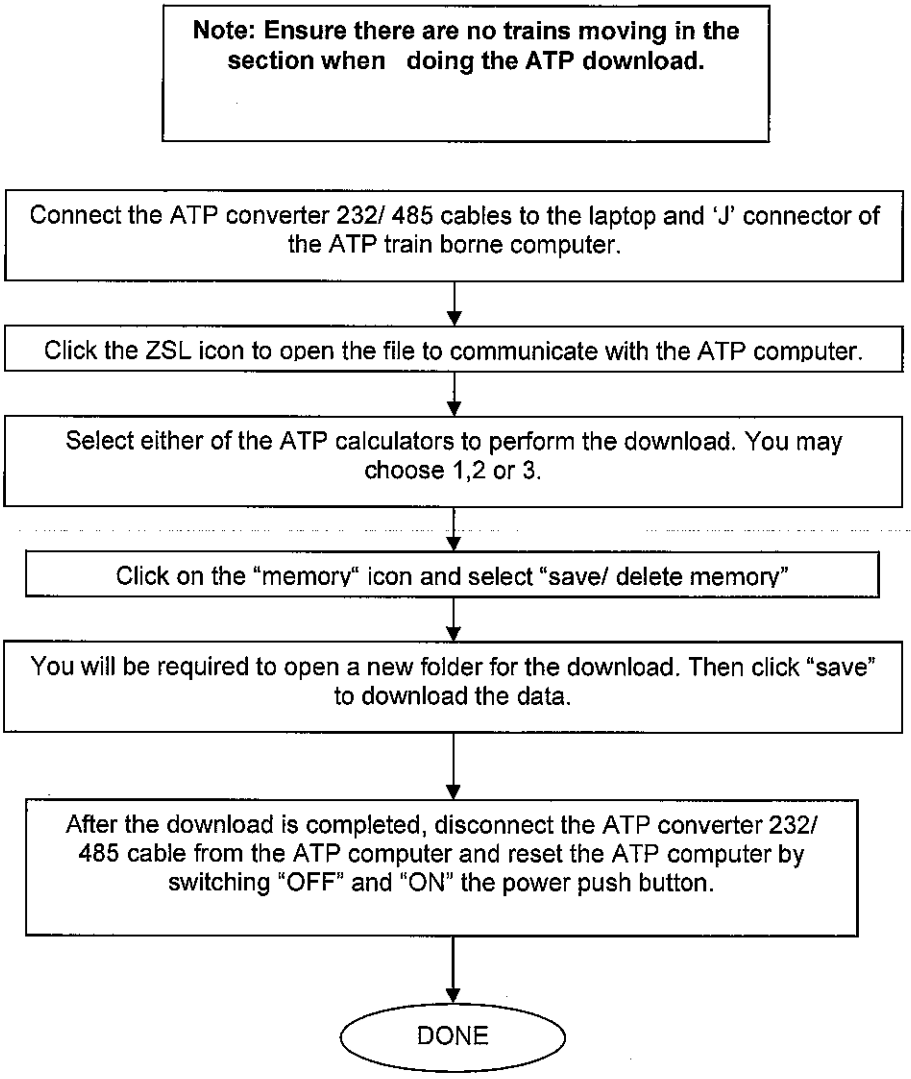
Note: Follow the following procedure and tick the provided YES or NO column. For any NO ticked, consult Supervisor.

Wheel Pulse Generator 2

	YES	NO
1. Station train at a known chainage at the test track.	☐	☐
2. Connect the ATP diagnostic laptop to the ATP computer and select to view the real time for position.		
3. Note down the current position of the train and indicate if it shows + or –.		
4. Switch off the train computer via the driver's key.	☐	☐
5. Disconnect the connection of the pulse sensor 1.	☐	☐
6. Switch on the computer.		
7. Move train in direction of KLS about 15m.		
8. Point measurement indicates positive in the real time diagnostic.	☐	☐
9. Speed indication positive in the real time diagnostic.	☐	☐
10. After ____m LEDs 3 and 4 on the position measuring interface illuminates.	☐	☐
11. The 'F' LED on the MMI is lit.	☐	☐
12. The message " Position sensor 1 defective " is displayed.	☐	☐
13. Re-connect the connection of the pulse sensor and reset the faults on the MMI.		

5.2 ATP indoor

5.2.1 Downloading ATP Computer in Interlocking



5.2.2 Inserting speed restriction from the Interlocking

Note: Under normal condition, the ATP MMI in the interlocking is inactive and has to be activated by requesting from OCC.

Request OCC to activate the MMI (local panel) in the interlocking.
Note: OCC must click on "ATP Local Panel On" command in the TMS.

Once OCC has confirmed that local panel is activated, test by pressing the Ⓛ button. The current date and time will be displayed.

Check if the speed restriction area is within an overlap section (between two section). Refer diagram on 5.2.8.

YES / YES/ NO / NO

Key in the speed restriction at both the stations' MMI. The speed restriction is entered at the station with the lower chainage border. Then key in the speed restriction at the next station starting at the beginning of the chainage border to the desired length of the speed

To key in the speed restriction, press "p" twice. The following appears.

POS	0m 0m

Key in the starting chainage where the speed restriction is to be implemented. Then press ↵. The following will be displayed

Track	0 0

Key in the starting chainage where the speed restriction is to be implemented. Then press ↵. The following will be displayed.

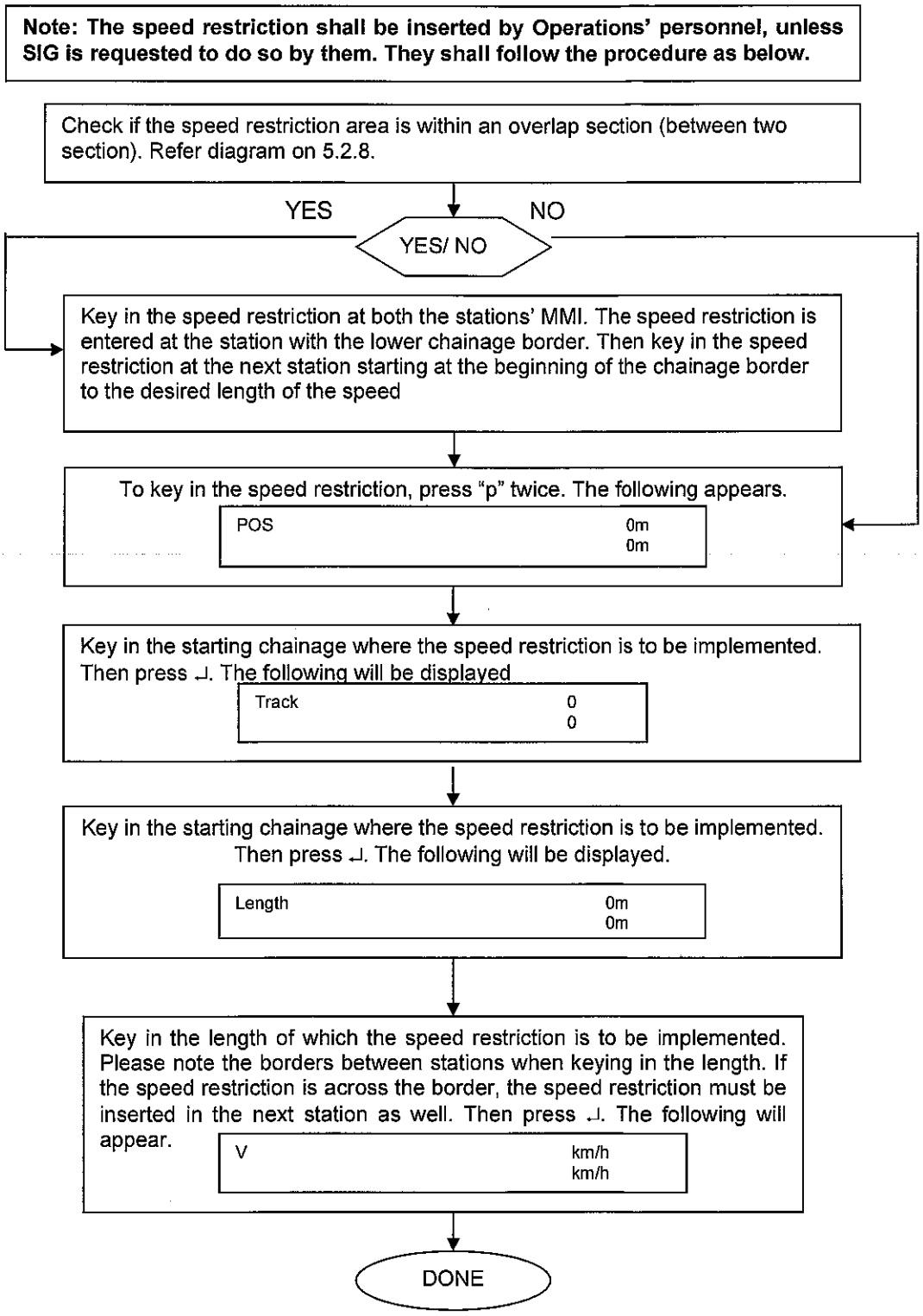
Length	0m 0m

Key in the length of which the speed restriction is to be implemented. Please note the borders between stations when keying in the length. If the speed restriction is across the border, the speed restriction must be inserted in the next station as well. Then press ↵. The following will appear.

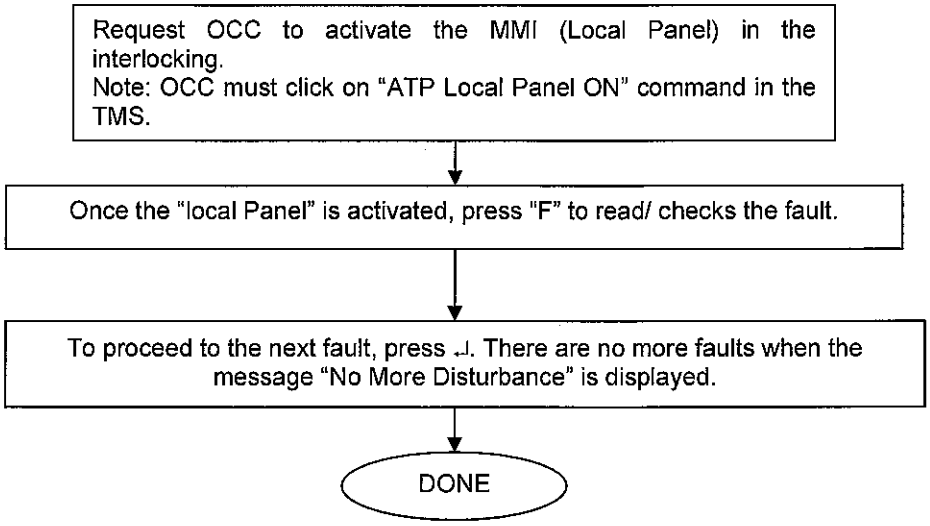
V	km/h km/h

DONE

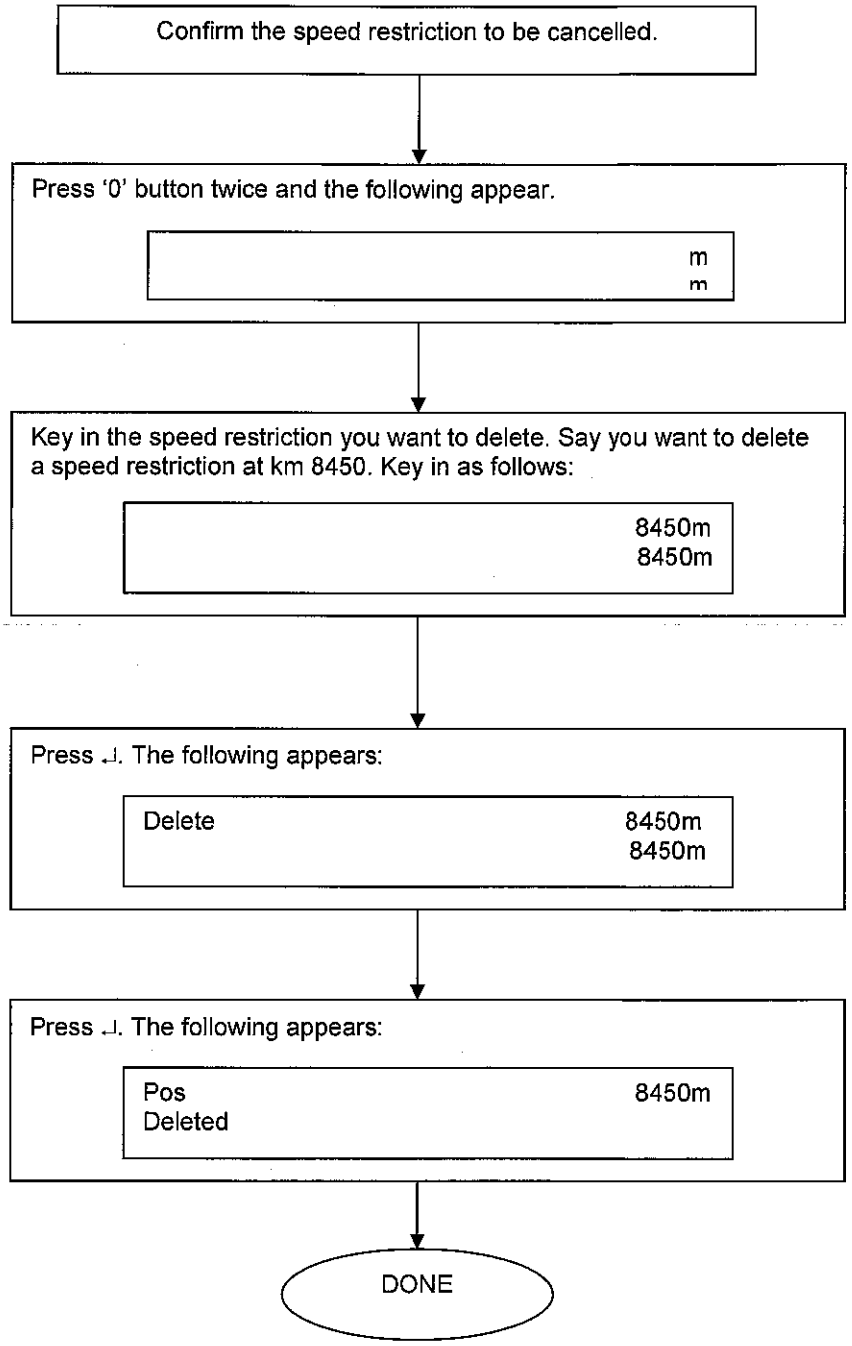
5.2.3 Inserting speed restriction from OCC



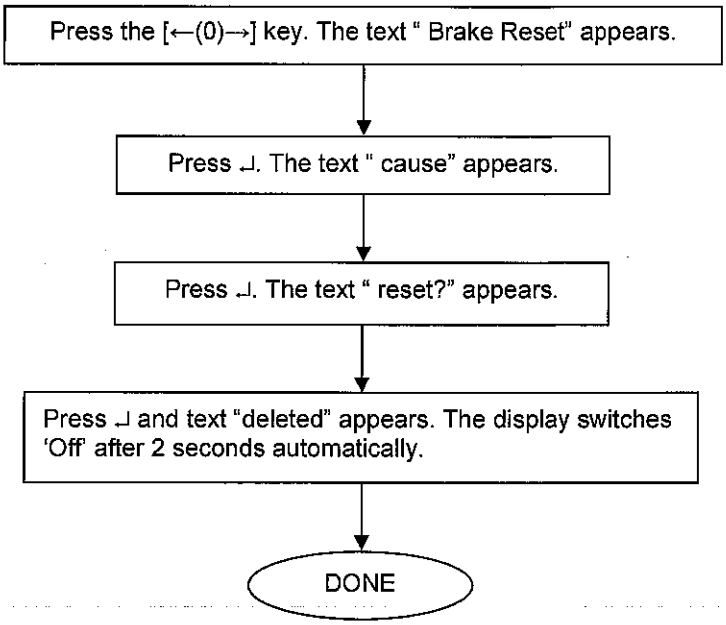
5.2.4 Checking for faults



5.2.5 Canceling Speed Restriction (Interlocking & OCC)

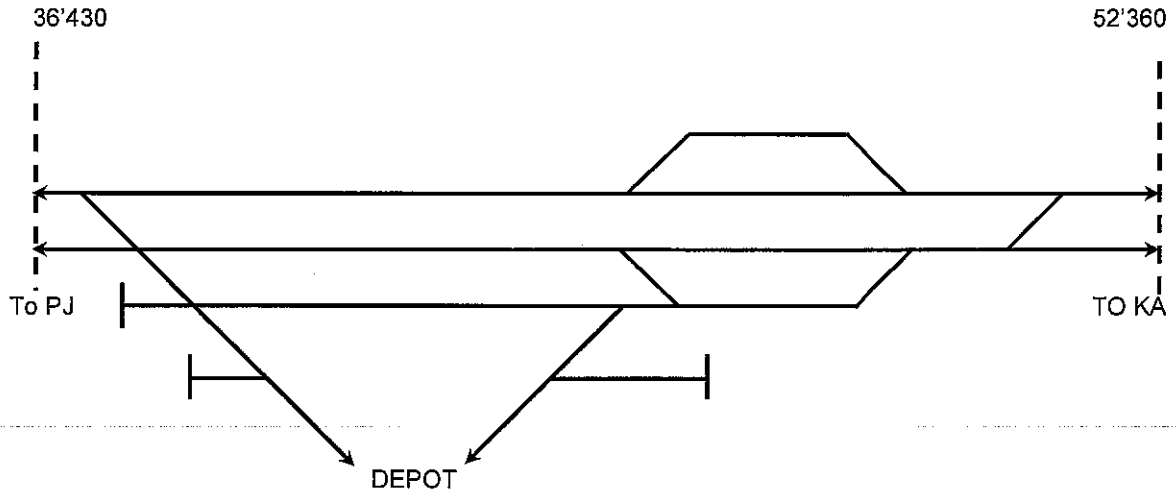


5.2.6 Clearing of ATP fault (via OCC MMI & Interlocking MMI)

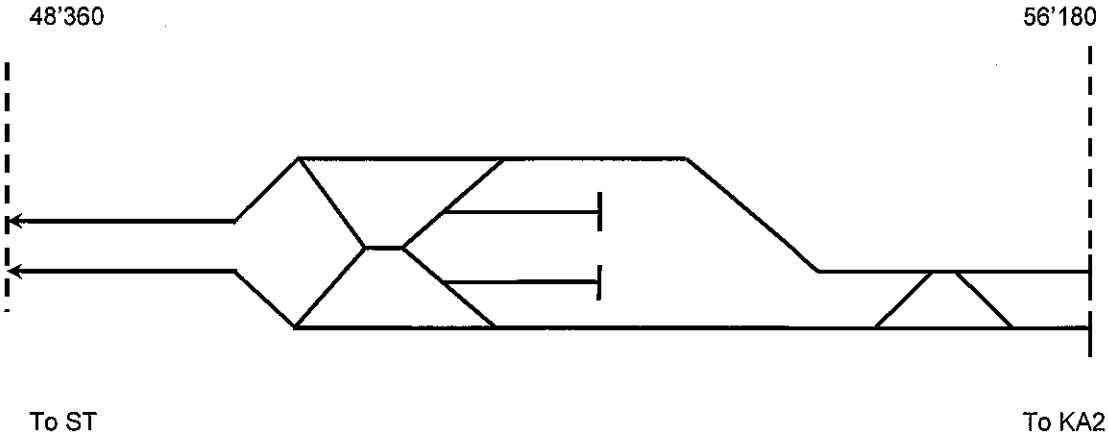


5.2.7 ATP station borders and overlaps

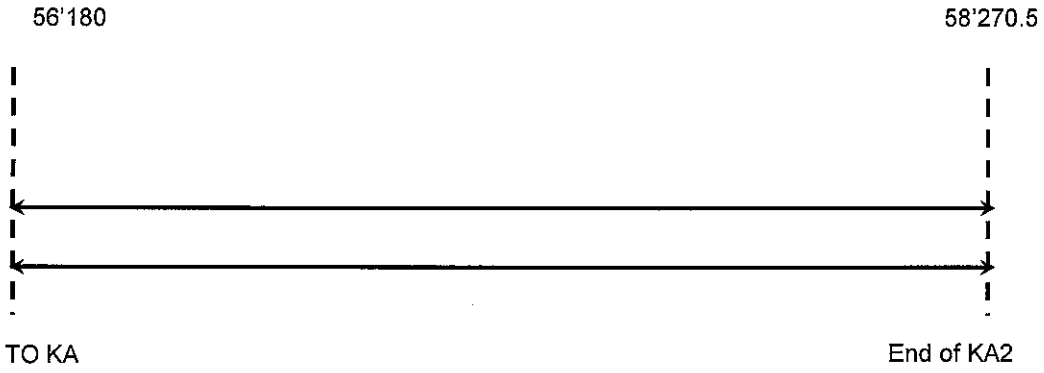
SALAK TINGGI (ST)



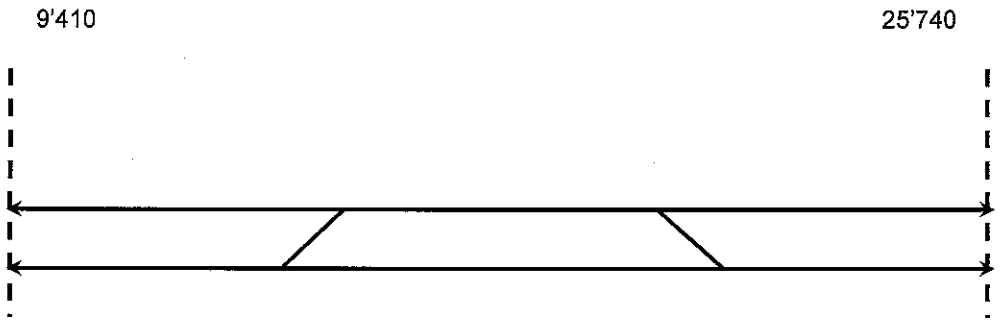
KUALA LUMPUR INTERNATIONAL AIRPORT (KA)



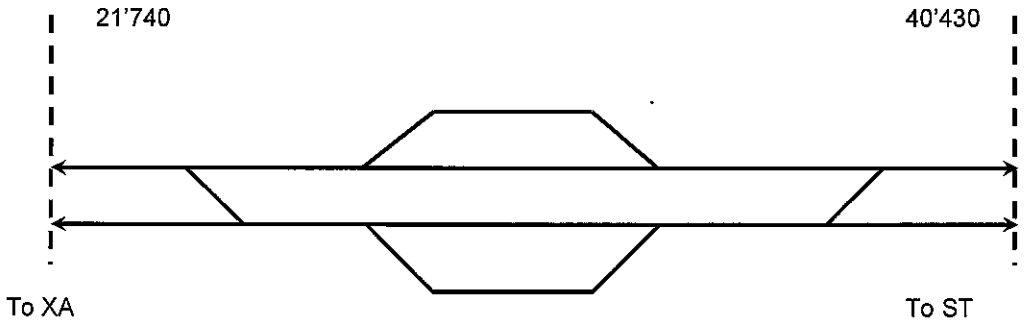
KUALA LUMPUR INTERNATIONAL AIRPORT 2 (KA 2)



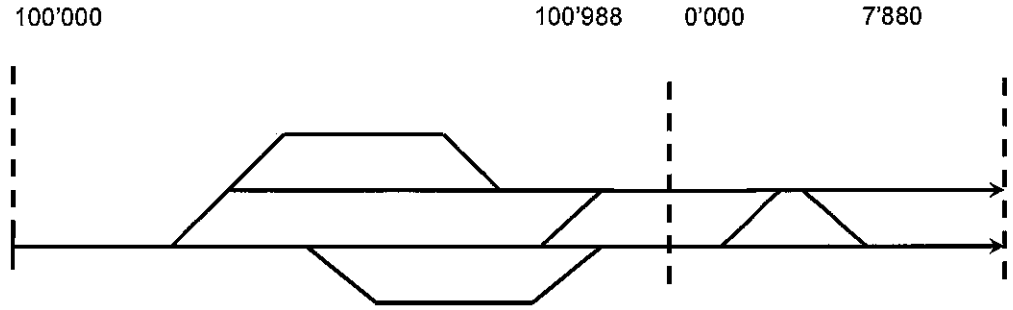
CROSSOVER A (XA)



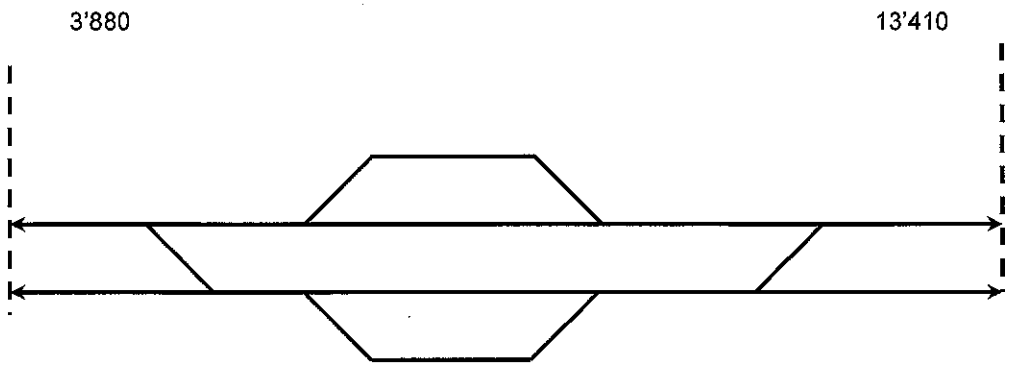
PUTRAJAYA (PCS)



KUALA LUMPUR SENTRAL (KS)



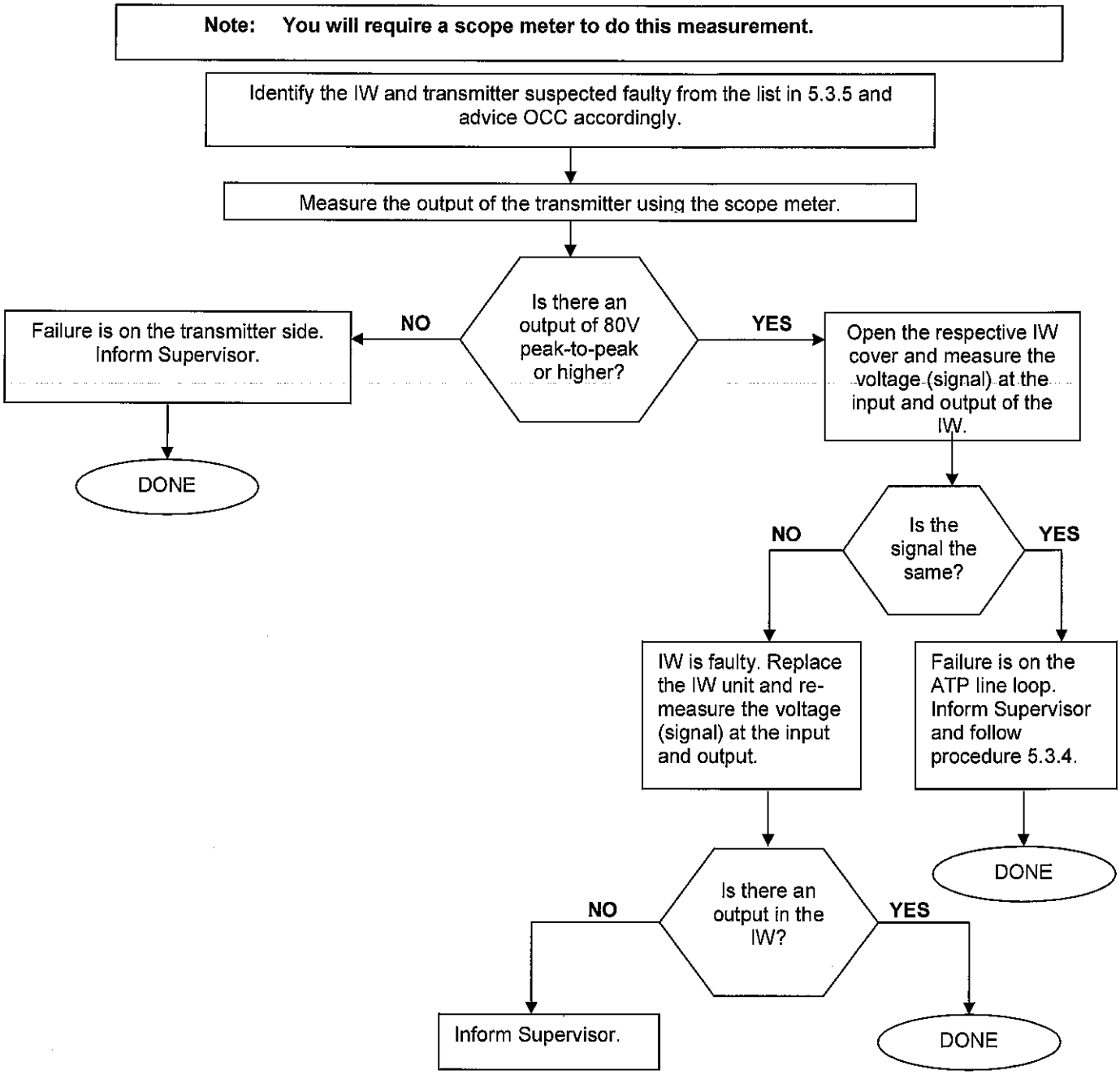
BANDAR TASIK SELATAN (BS)



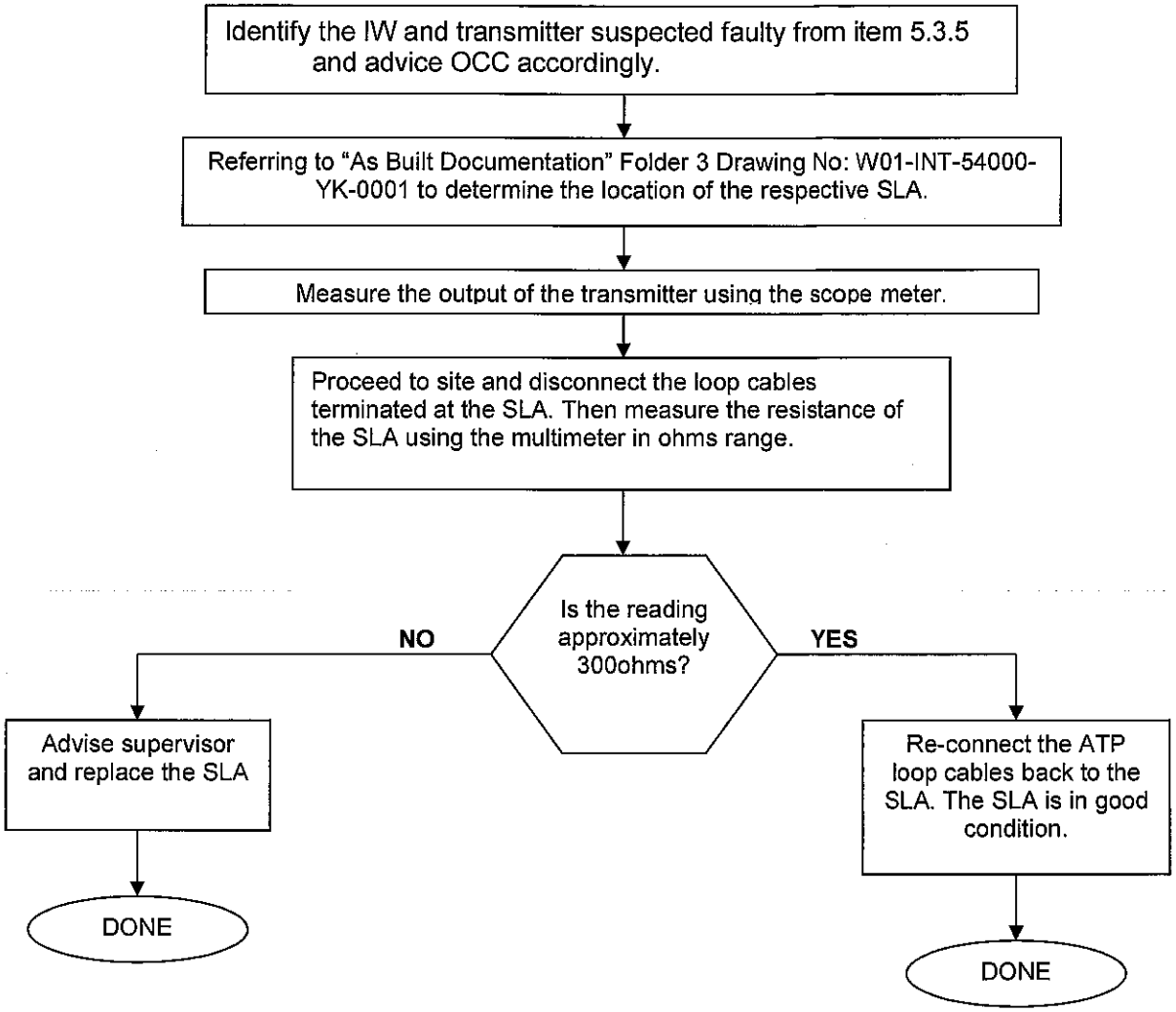
TO KLS TO XA

5.3 ATP outdoor

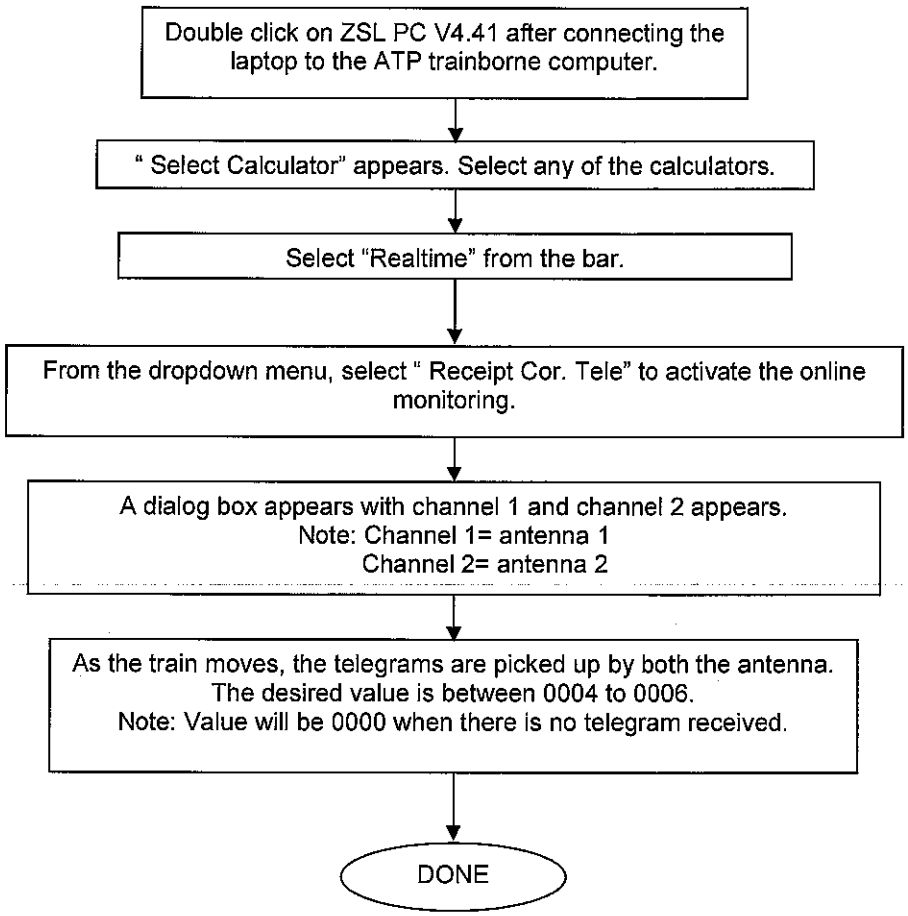
5.3.1 Measurement Of Impedance Transformer



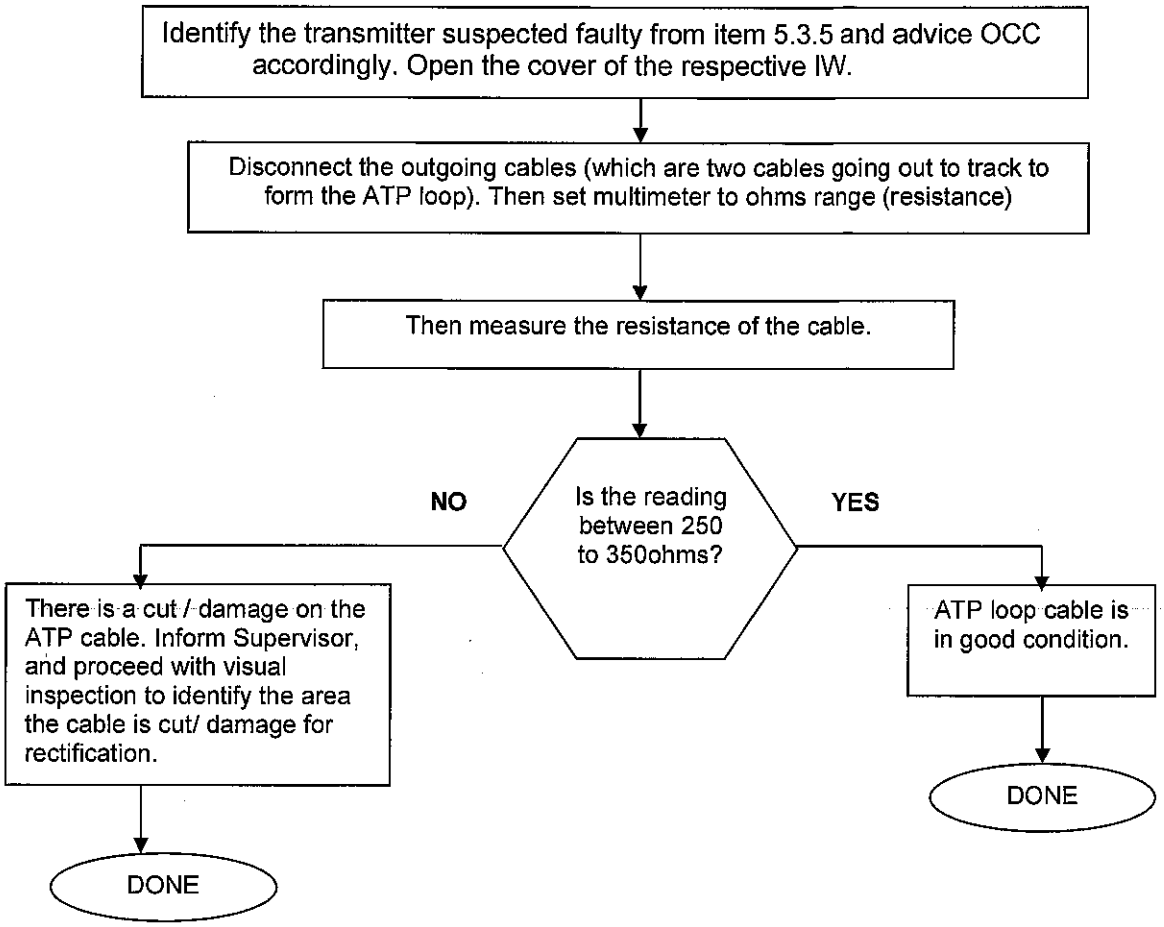
5.3.2 Measurement Of SLA



5.3.3 Reading the ATP Telegram Using Train



5.3.4 Measurement Of ATP loop cable resistance



5.3.5 IW, Transmitter and ATP loop configuration

Station	Suspected fault at transmitter no:	IW	Signals and point affected	Advise to OCC
KLS	1	IW 01/01	Signals: N34, T34, N33, T33, T32, N32, T31, N31, S27, N42 Points: 201,202,302,223,322,323,221	-Override all signal and points. - All trains shall proceed with max speed lower than 80km/h from KM 0-979 to KM 0-270.
	2	IW 01/ 02	Signal: N23, 22,T42, T43, N13, N12, T3011, RN13, N2013 Points: 325,326,225,226	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 0-270 to KM1.400
	3	IW 01/03 (KM 3.400)	Signal: T3021, N2023, T3023, N2029 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 1.400 to KM 3.700
	4	IW 01/04 (KM 3.700)	Signals: T3039, N2039, T3051, N2049 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 3.700 to KM 6.000

BTS	1	IW 08/01	Signals: N2059, T3063, N2069, T3073, R T22 N2077, T23, T22 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 5.900 to KM 8.300
	2	IW 08/02	Signals; N31, N32, T31, T32, T33, T34, N33, N34 Points: 302,202,305.206,322,221,325,225	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 8.200 to KM 9.500
	3	IW 08/02	Signals: N23, N22, T3097, RN 23,N2015, T3113 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 9.100 to KM 11.400
	1	IW 16/01 (KM 13.700)	Signals: N2115, T3125, N2125 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 11.400 to KM 13.700

XA	2	IW 16/02 (KM 13.700)	Signal: T3135, N2135, T3145, RT 22, N2151 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 13.7 to KM 15.8
	3	IW 16/03 (KM 17.00)	Signal: T23, T22, N33, N32 Points: 302,202	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 15.800 to KM 17.100
	4	IW 16/04 (KM 19.200)	Signal: T33, N23 , T32 , N22 , T3193 Points: 225, 325	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 17.1 to KM 19.200
	5	IW 16/04 (KM 21.300)	Signal: RN 23, N 2195, T 3201,N 2207 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 19.200 to KM 21.300
	6	IW 16/04 (KM 21.300)	Signal: N 2221. T 3227 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 21.300 to KM 23.500

PJS	1	IW 31/01 (KM26.050)	Signals: N2235, T 3247, N2251 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 23.500 to KM 26.100
PJS	2	IW 31/02 (KM26.050)	Signals: T 3267, N 2267, RT 12, N 2281 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 26.000 to KM 28.500
	3	IW 31/03 (KM 30.600)	Signal: T13, T12, N43, N42, T23, T22 Points: 302,202	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 28.500 to KM 30.600
	4	IW 31/04	Signals: N34, N33, N32, N31, T34, T33, T32, T31 Points: 305,206,322,221,325,225	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 30.600 to KM 31.700

PJS	5	IW 31/05	Signals: N 23, N 22, T 3325 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 31.300 to KM 33.600
	6	IW 31/06 (KM 36.000)	Signals: RN 23, T 3345, N 2341, N 2359 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 33.600 to KM 36.00
	7	IW 31/07 (KM 36.000)	Signals: T 3361, T3377, N 2377 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 36.000 to KM 38.400
STS	1	IW 46/01 (KM 40.500)	Signals: T3397, N2397 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 38.400 to KM 40.500

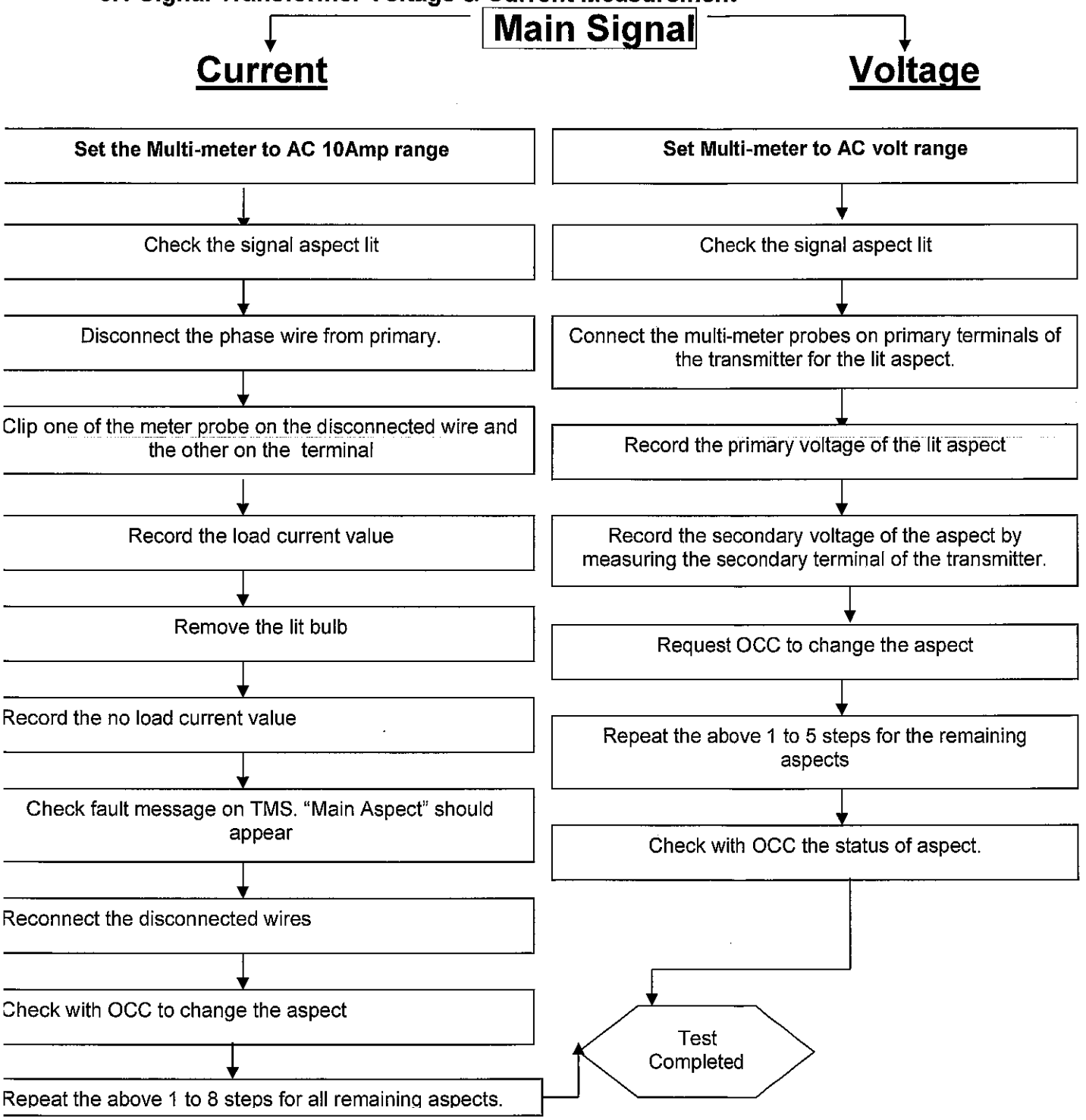
STS	2	IW 46/02 (KM 40.500)	Signals: T3415, RT 12, N 2417 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 40.500 to KM 42.600
	3	IW 46/03 (KM 44.100)	Signals: N53, T13, N52, T12, T15 Points: 302,202,206,106	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 42.600 to KM 44.100
	4	IW 46/04 (KM 45.999)	Signals: N43, T23, N42, T22 Points: 325	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 44.000 to KM 46.000
	5	IW 46/05 (KM 45.600)	Signals: T35, N45, N46 Points: 106, 108, 508, 901	-Override all signal and points. -Speed restriction not required.

	6	IW 46/06	Signals: N31, T32, T31, T36 Points: 114,115,216,221	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 45.800 to KM 46.500
	7	IW 46/07 (KM 46.000)	Signals: N34, N33, T34, T33, N23, T 3476, N22 Points: 322, 325, 225	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 46.000 to KM 48.000
	8	IW 46/08 (KM 48.000)	Signals: RN 23, T 3491, N2487, T3503, N2503 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 48.000 to KM 50.400
	1	IW 55/01 (KM 52.500)	Signals: T3517, N2517, N2503 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 50.200 to KM 52.500

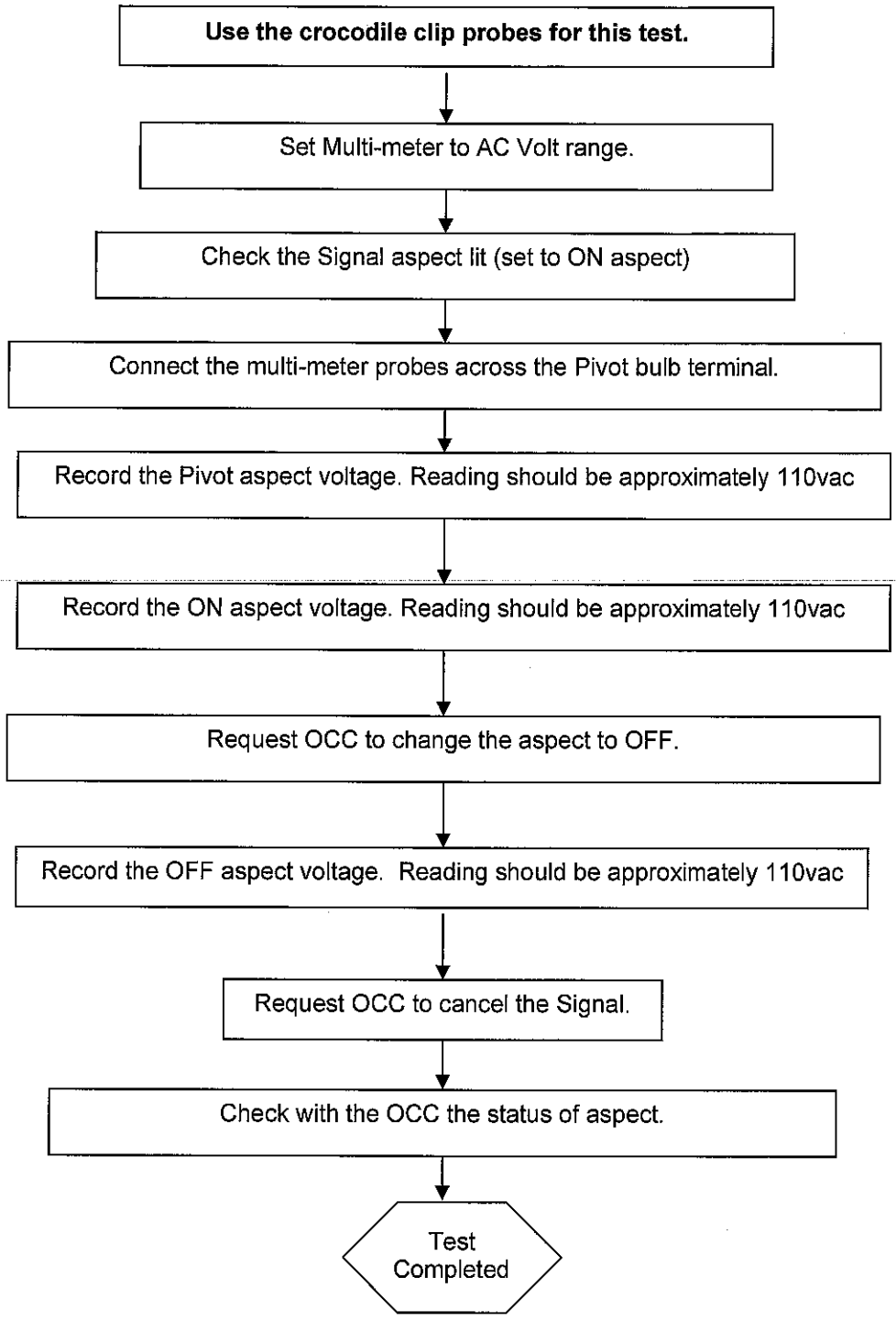
KLIA	2	IW 55/02 (KM 52.500)	Signals: T3533, N2533, RT12, T13, T12, N2541 Points: Nil	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 52.500 to KM 54.7
	3	IW 55/03 (KM 54.700)	Signals: N43, N42, T23, N33, T33, N34, T34, S24, T44 Points: 302,203,303,322,421,425,426	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 54.700 to KM 56.1
	4	IW 55/04 (KM 54.700)	Signals: N32, T32, T31, S21, T41 Points: 201203,303,221,122,125,126,425,426	-Override all signal and points. -All trains shall proceed with max speed lower than 80km/h from KM 55.000 to KM 56.1

6.0 Signal Maintenance guideline

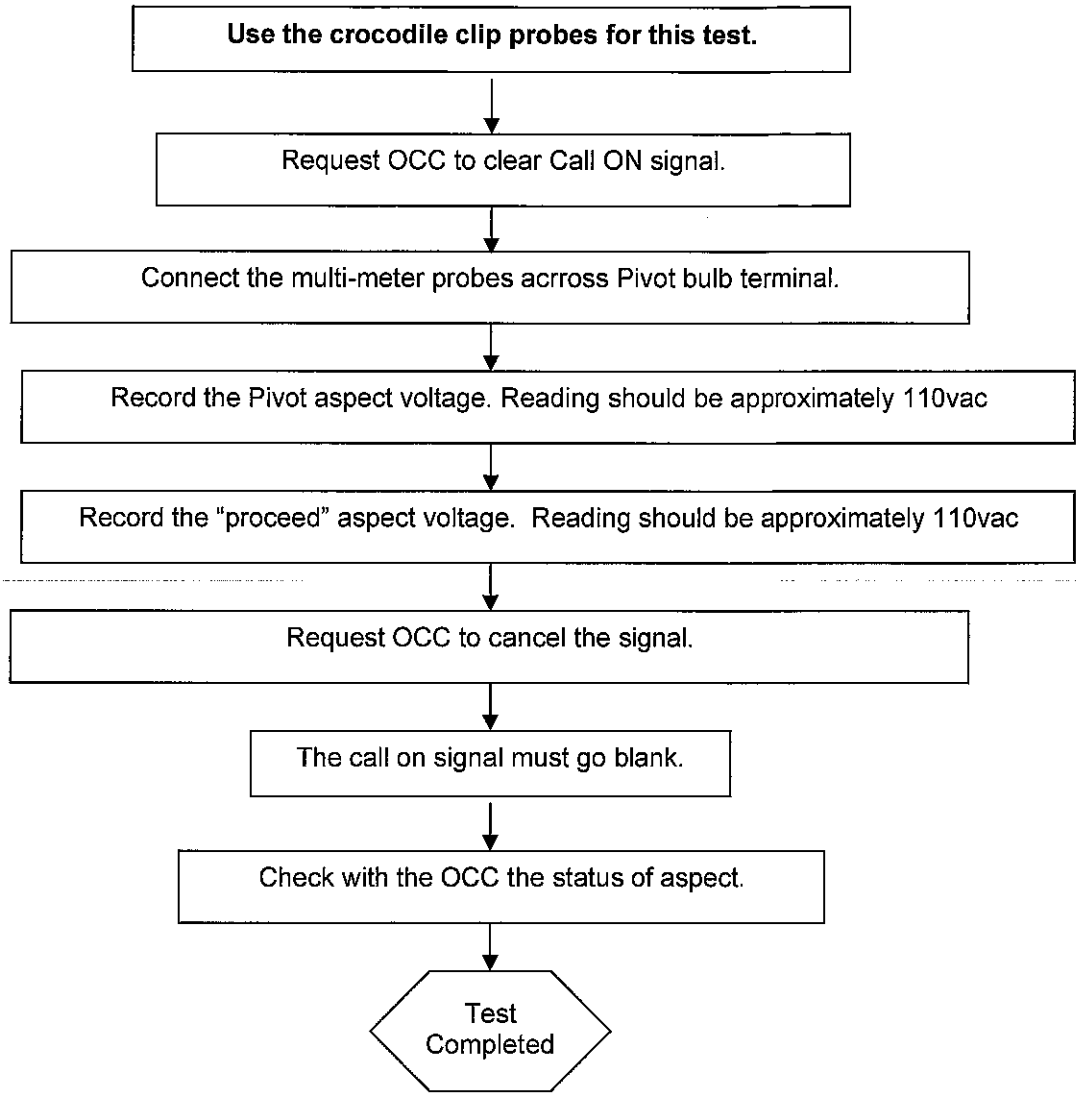
6.1 Signal Transformer Voltage & Current Measurement



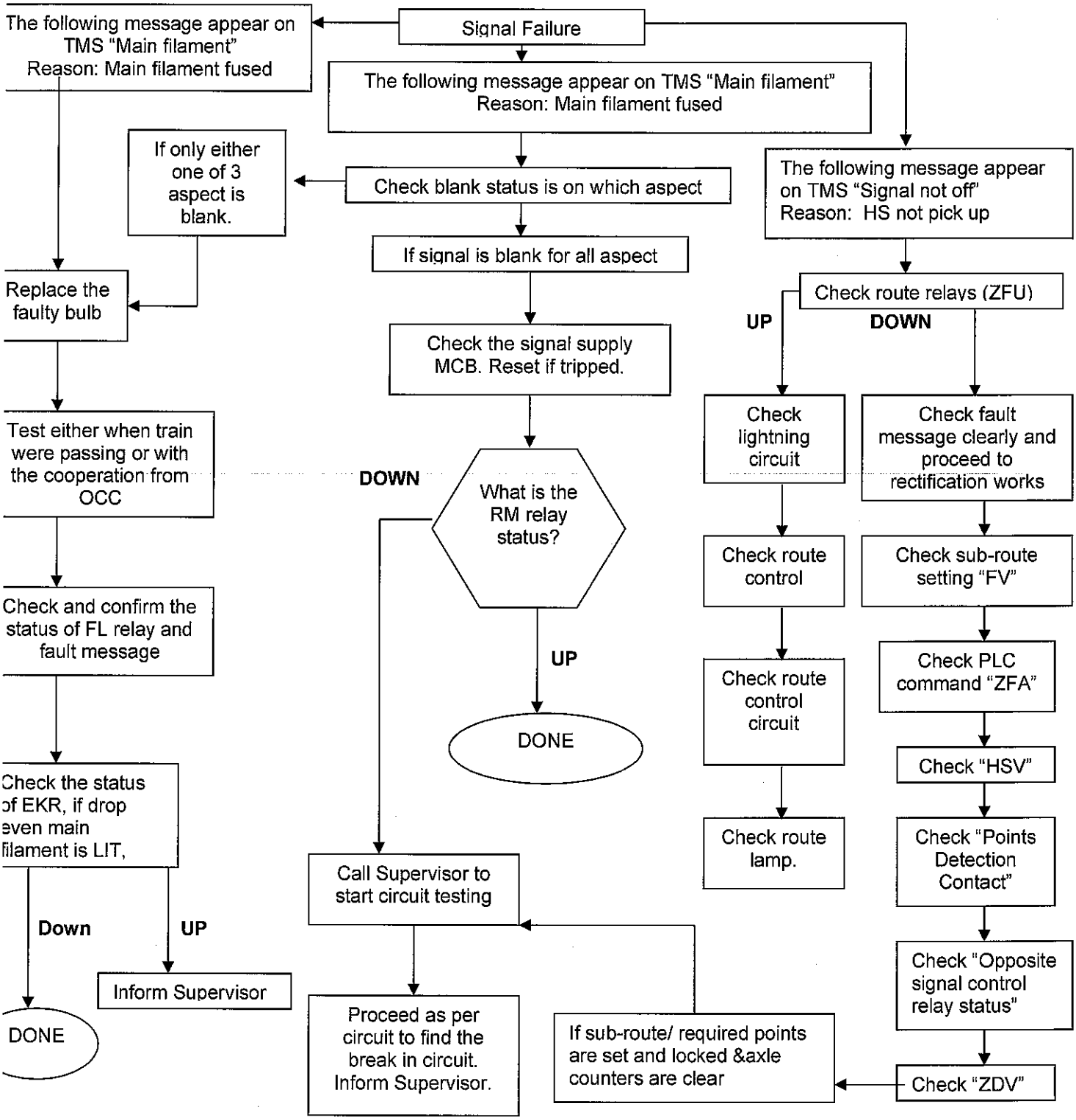
6.2 Signal Transformer Voltage Measurement – Shunt Signal



6.3 Call ON Signal Voltage Measurement

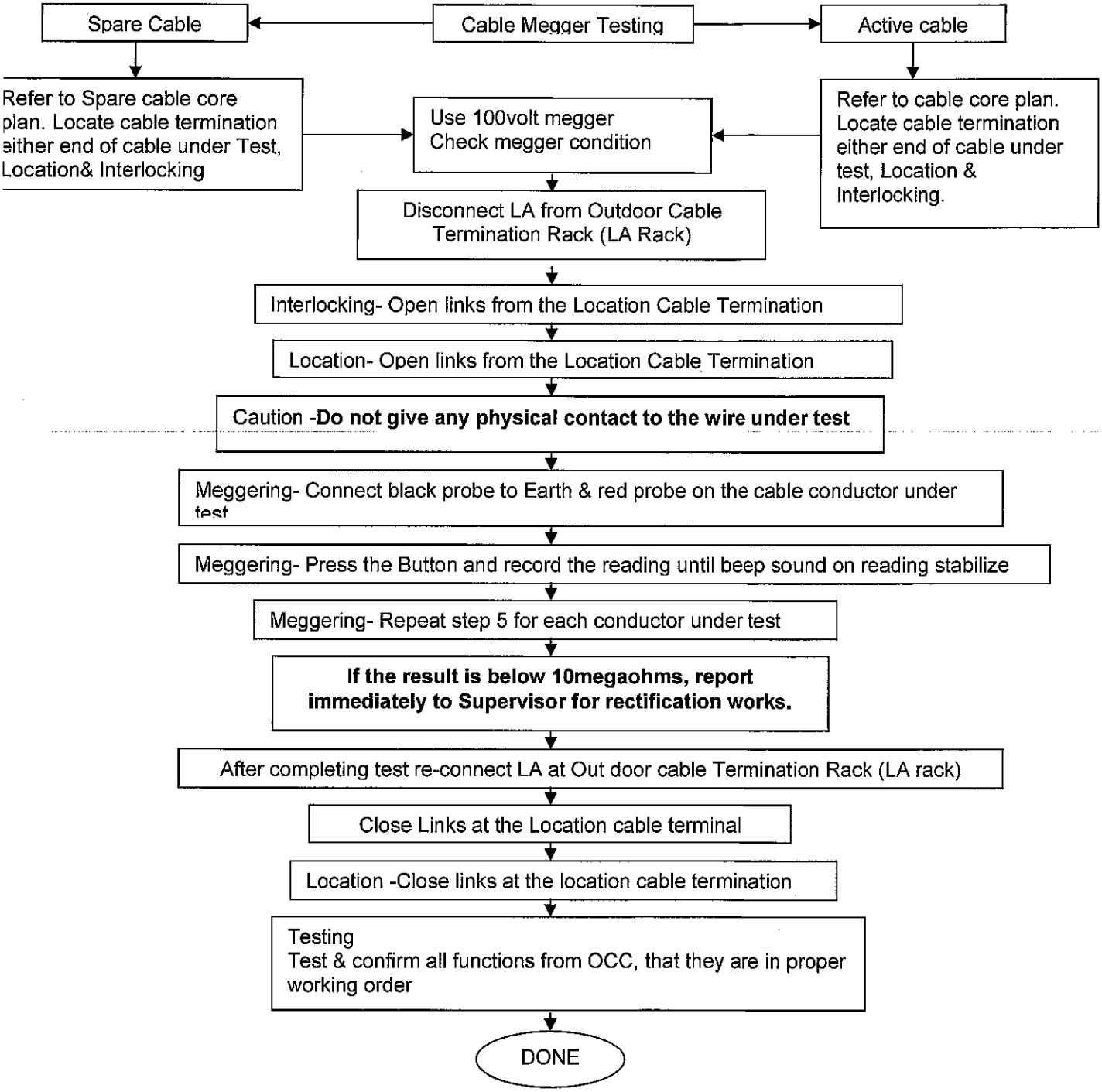


6.4 Signal Failure



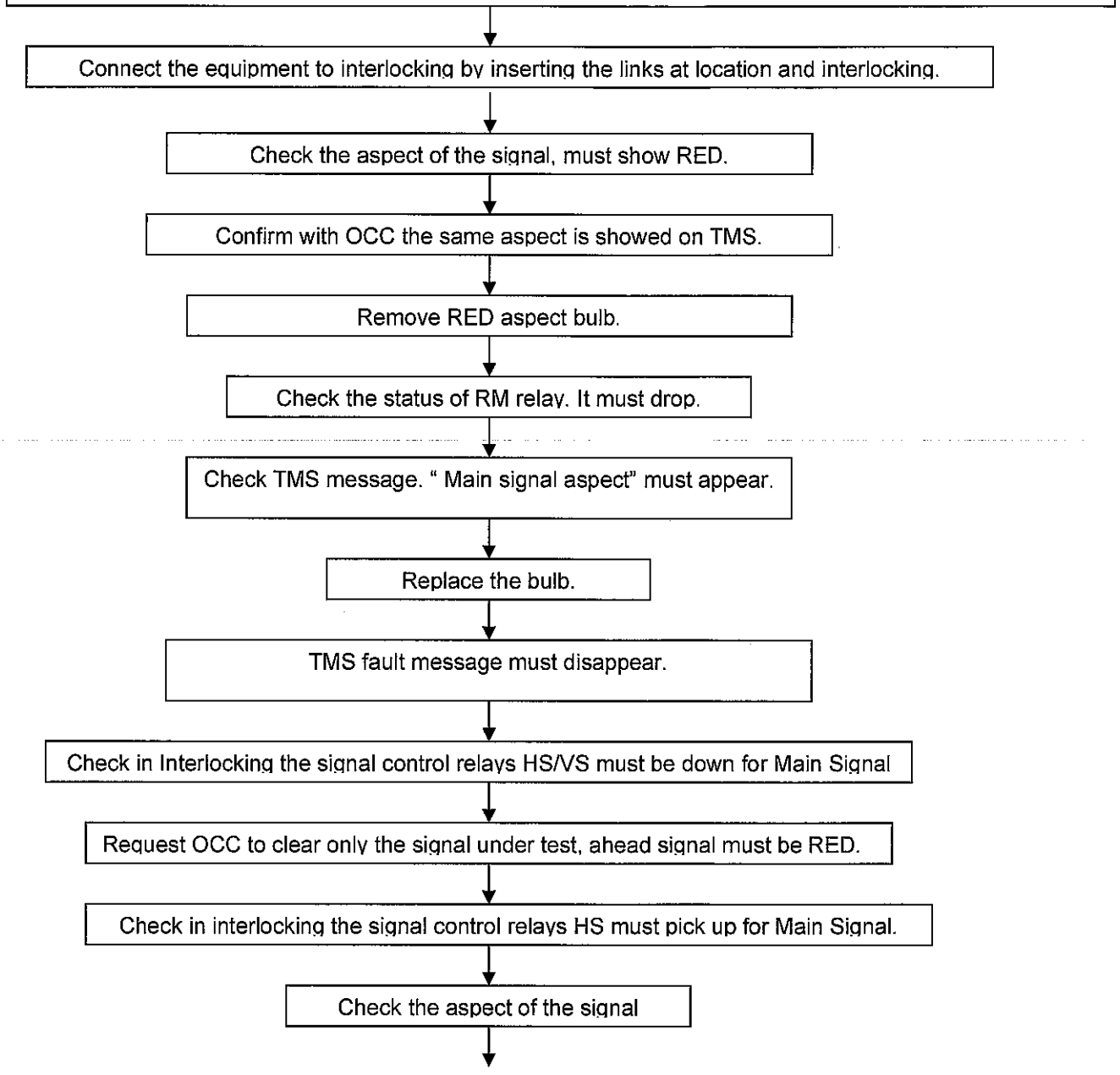
7.0 Cable Maintenance Guideline

7.1 Cable Megger Testing

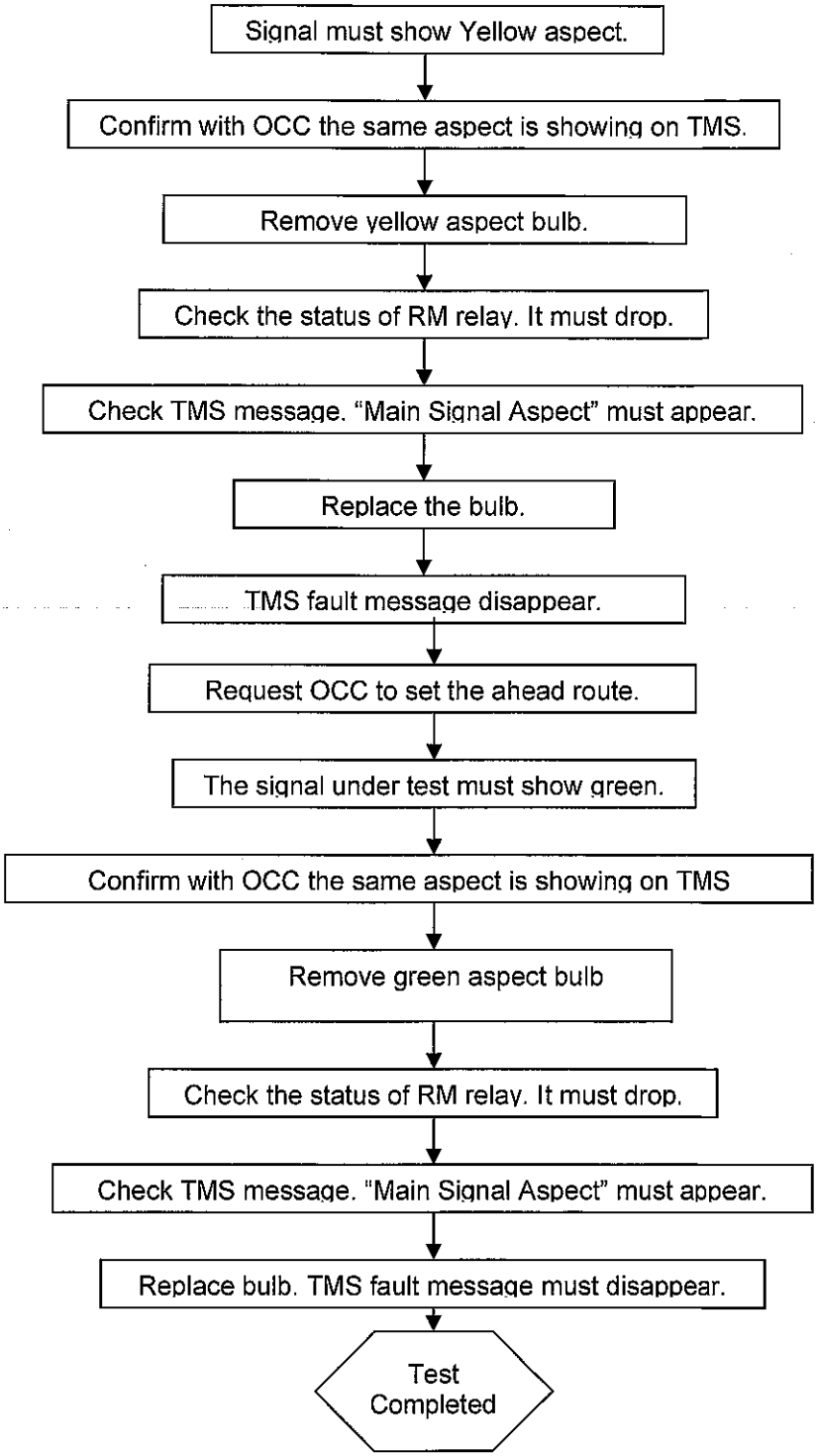


7.2 Correspondence Test- Main Signal

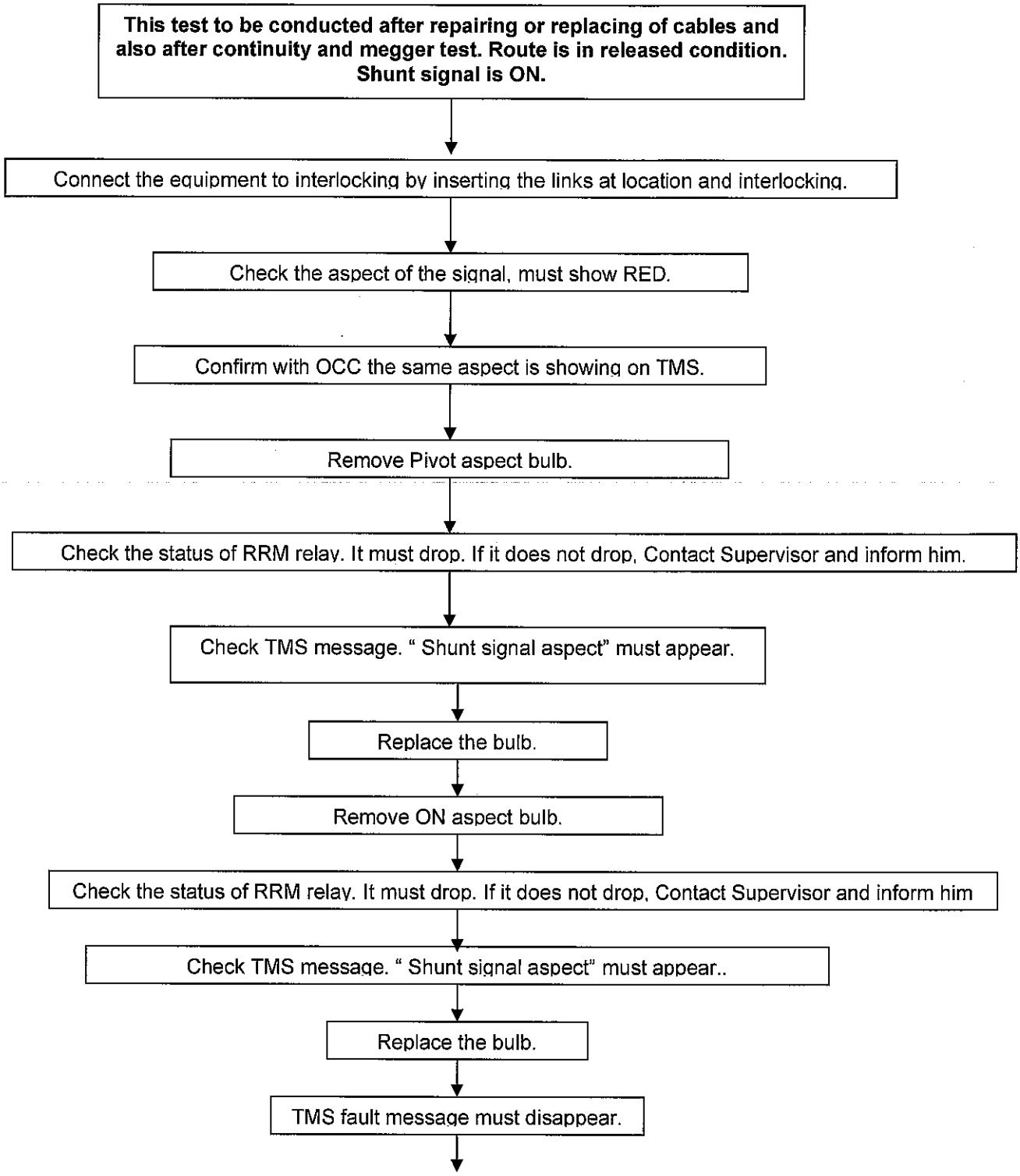
This test to be conducted after repairing or replacing of cables and also after continuity and megger test. Route is in released condition. Main and shunt signal is at "stop" aspect, Call ON signal is blank.



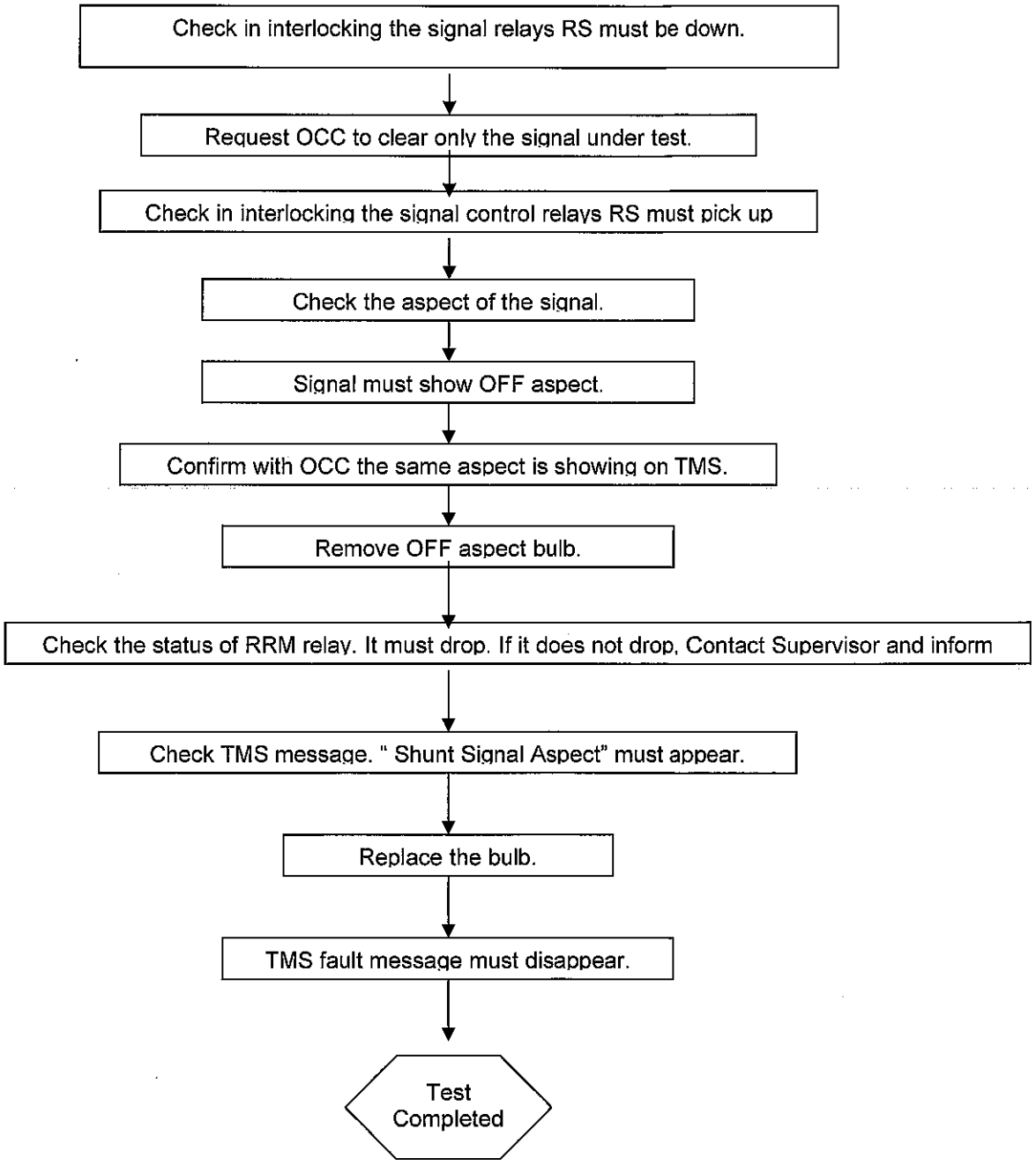
7.2 Correspondence Test- Main Signal (continued)



7.3 Correspondence Test- Shunt Signal



7.3 Correspondence Test- Shunt Signal (continued)



7.4 Correspondence Test- C-ON signal

This test to be conducted after repairing or replacing of cables and also after continuity and megger test. Route is in released condition. Call ON signal is Blank.

↓

Connect the equipment to Interlocking by inserting the links at location and interlocking.

↓

Check the aspect of the signal must show blank.

↓

Confirm with OCC the same aspect is showing on TMS.

↓

Check in interlocking the signal control relays BS must be down.

↓

Request OCC to clear only the C-ON signal under test.

↓

Check in interlocking the signal control relays BS must pick up.

↓

Check the aspect of the signal.

↓

Signal must show OFF aspect.

↓

Confirm with OCC the same aspect is showing on TMS.

↓

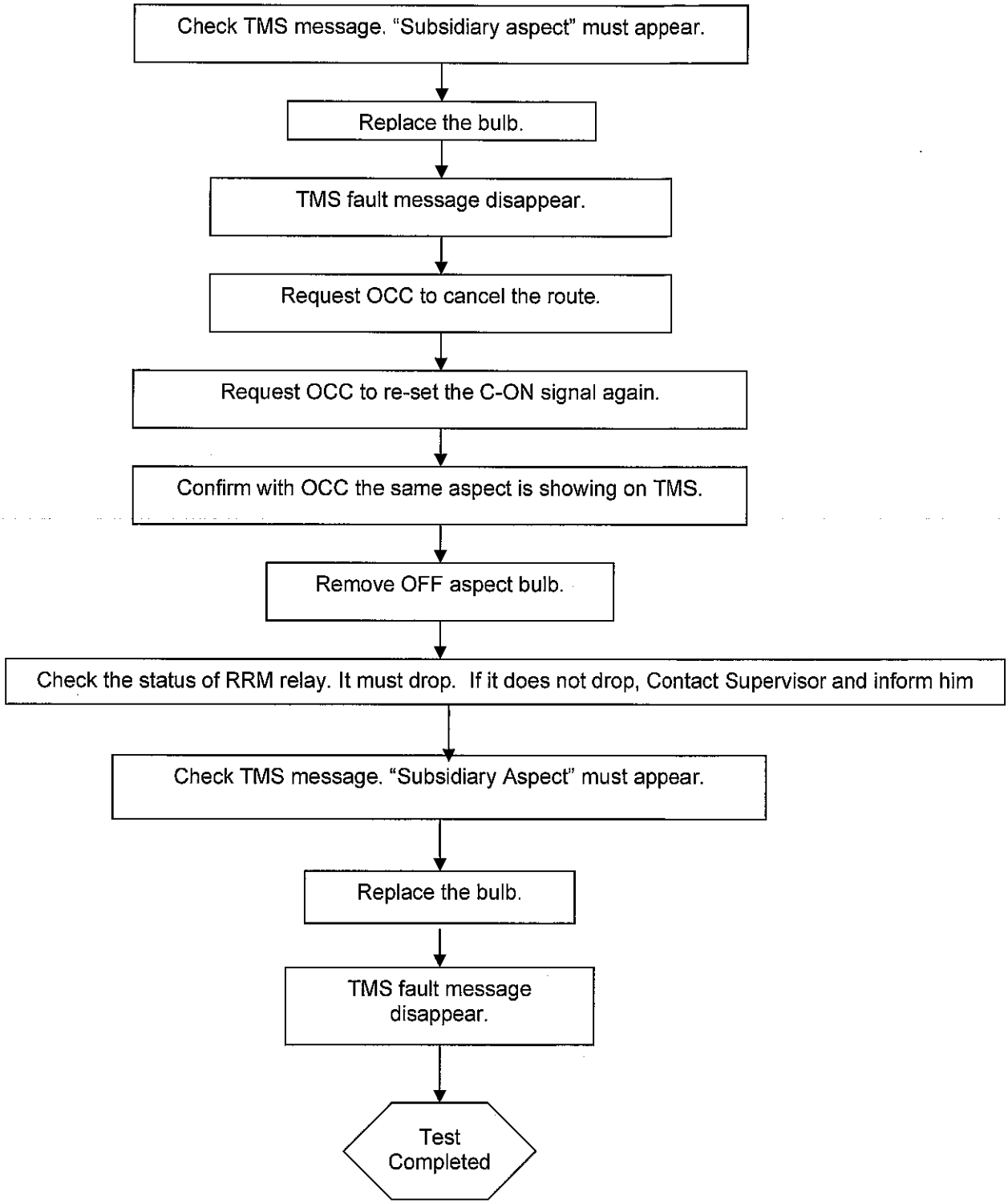
Remove the Pivot aspect bulb.

↓

Check the status of the BRM relay. It must drop. If it does not drop, Contact Supervisor and inform him

↓

7.4 Correspondence Test- C-ON signal (continued)



7.5 Correspondence Test- Point Machine

This test to be conducted after repairing or replacing of cables or point machine and also after continuity and megger test. Route is in released condition. Point is unlocked. MCB for 380v &48v is OFF. Point is clipped to the same position as the PCU last operated position.

↓

Confirm with OCC that no movement of vehicles over the point under test.

↓

Check the point position is in correspondence with the PCU UL/ UR relay position.

↓

In case the point is moved manually for traffic movements, it must be brought to the same position as the PCU last called position.

↓

Connect the equipment to interlocking by inserting the links at location and interlocking.

↓

Switch ON the 380v and 48v MCBs.

↓

Check the detection relays. Either UL/ UR relay must pick up depending on the point position and proceed. If not follow the point detection procedure in item 4.1.

↓

Consider the UL relay is picked up and point is left position.

↓

Check with OCC that the point under test must indicate left on TMS

↓

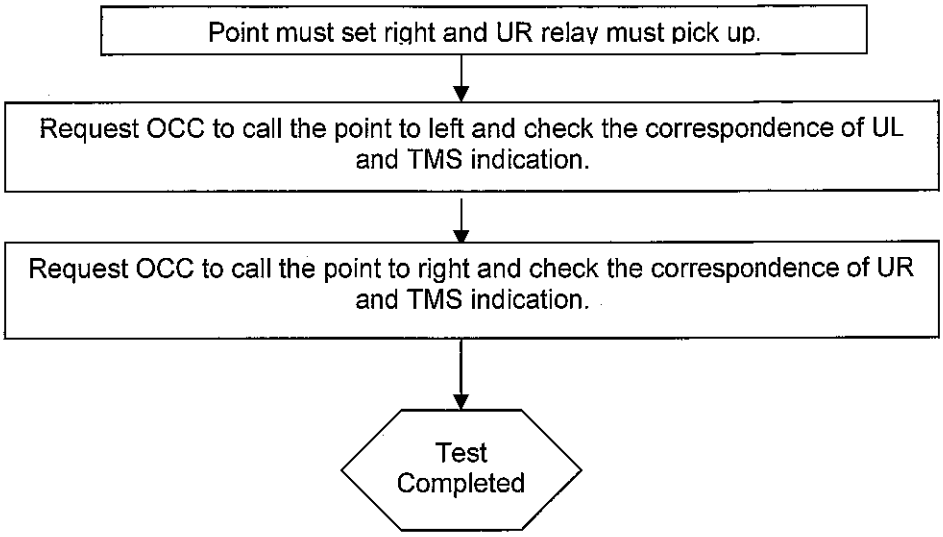
Remove the point clip.

↓

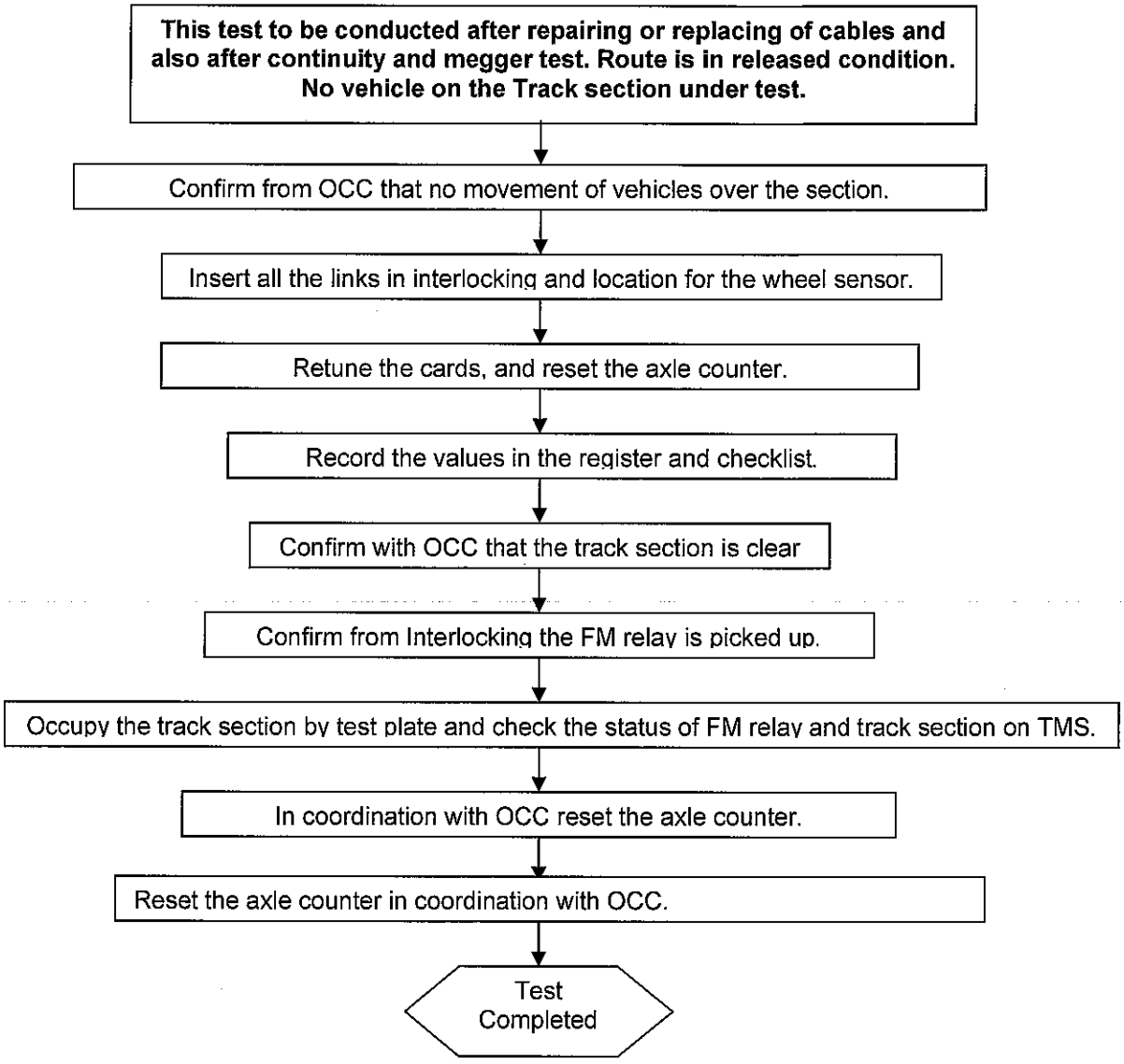
Request OCC to move the point from left to right.

↓

7.5 Correspondence Test- Point Machine (continued)

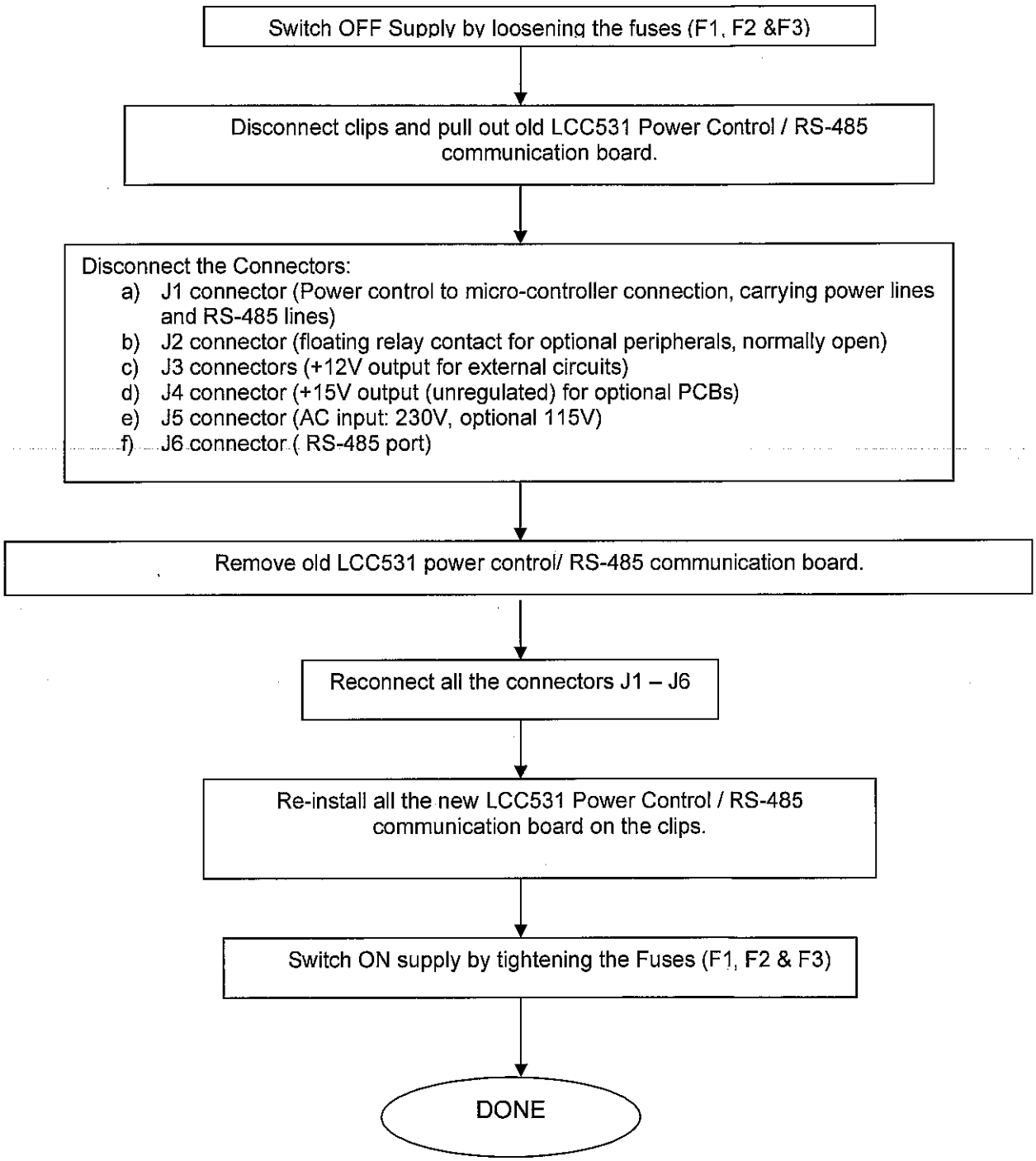


7.6 Correspondence Test- Wheel Sensor

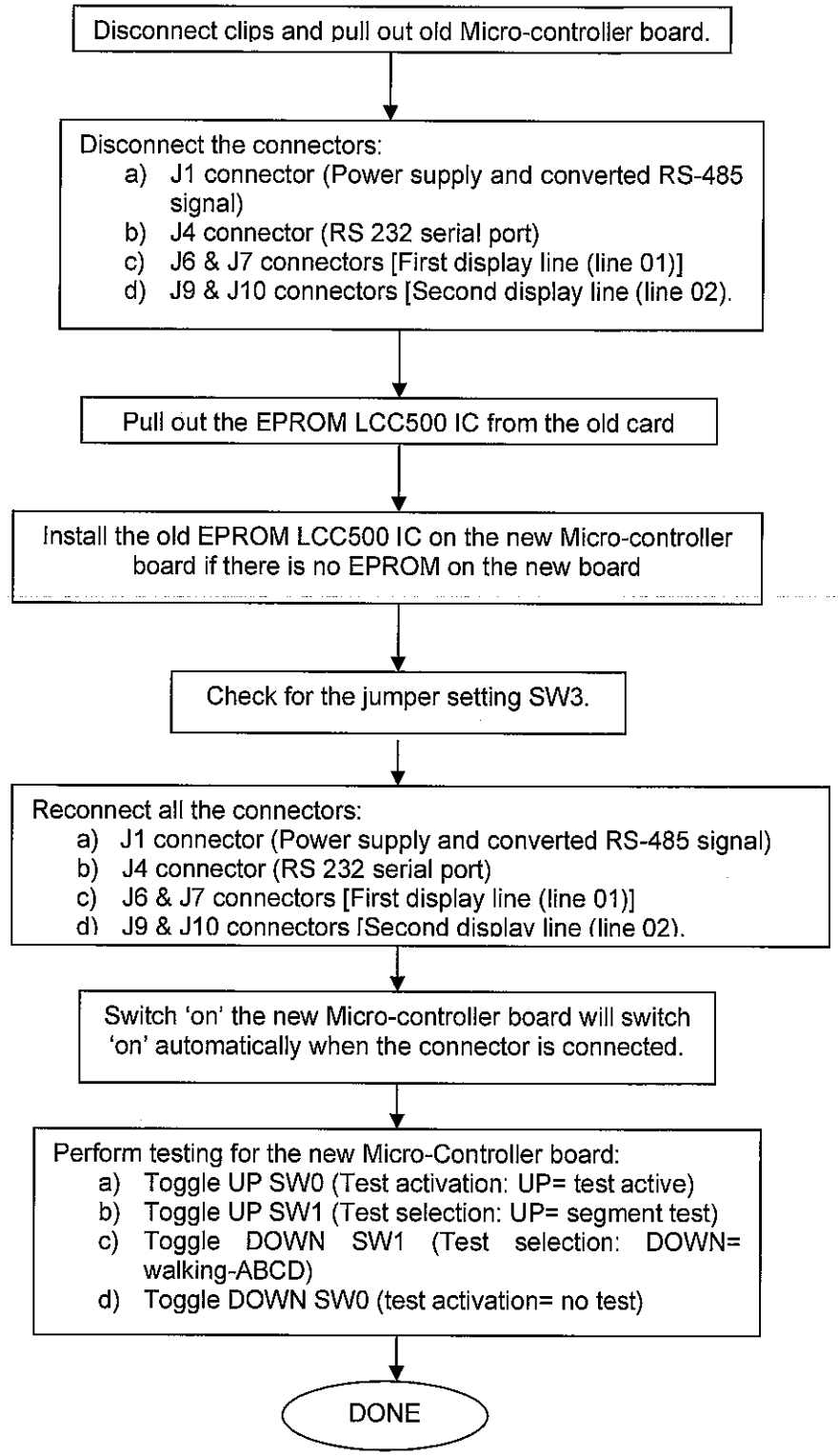


8.0 PIDS Maintenance Guideline

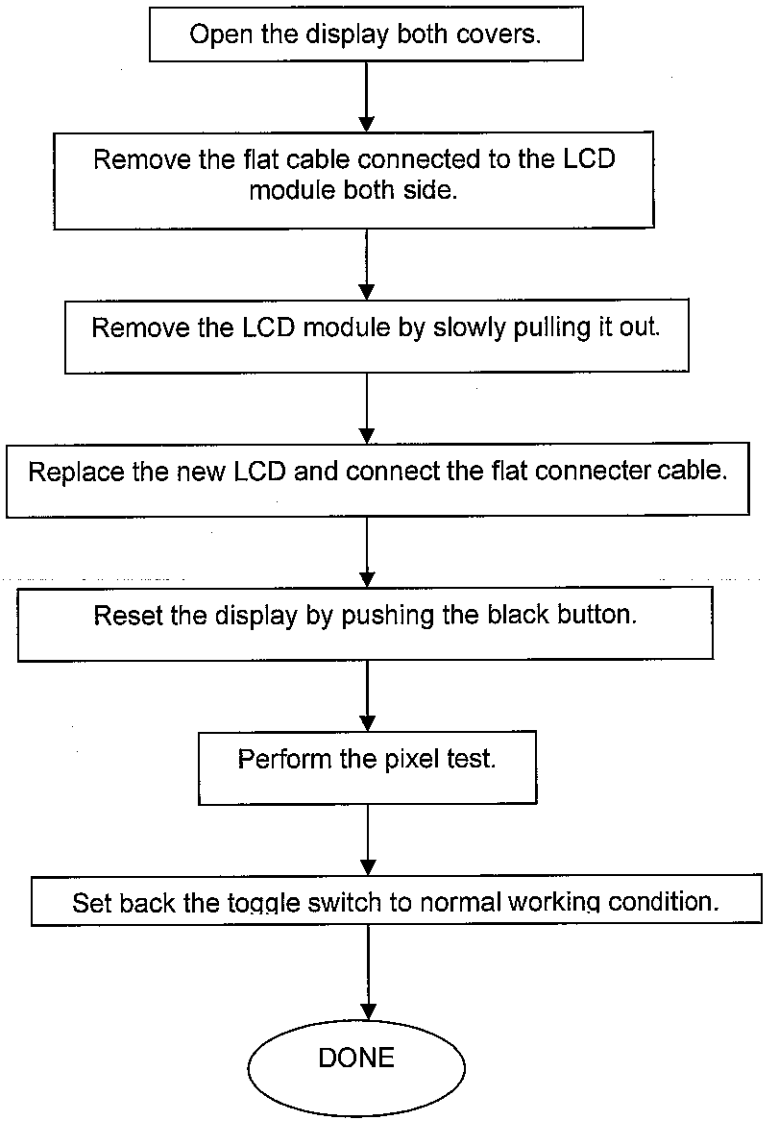
8.1 Replace LCC531 Power Control / RS–485 Communication Board



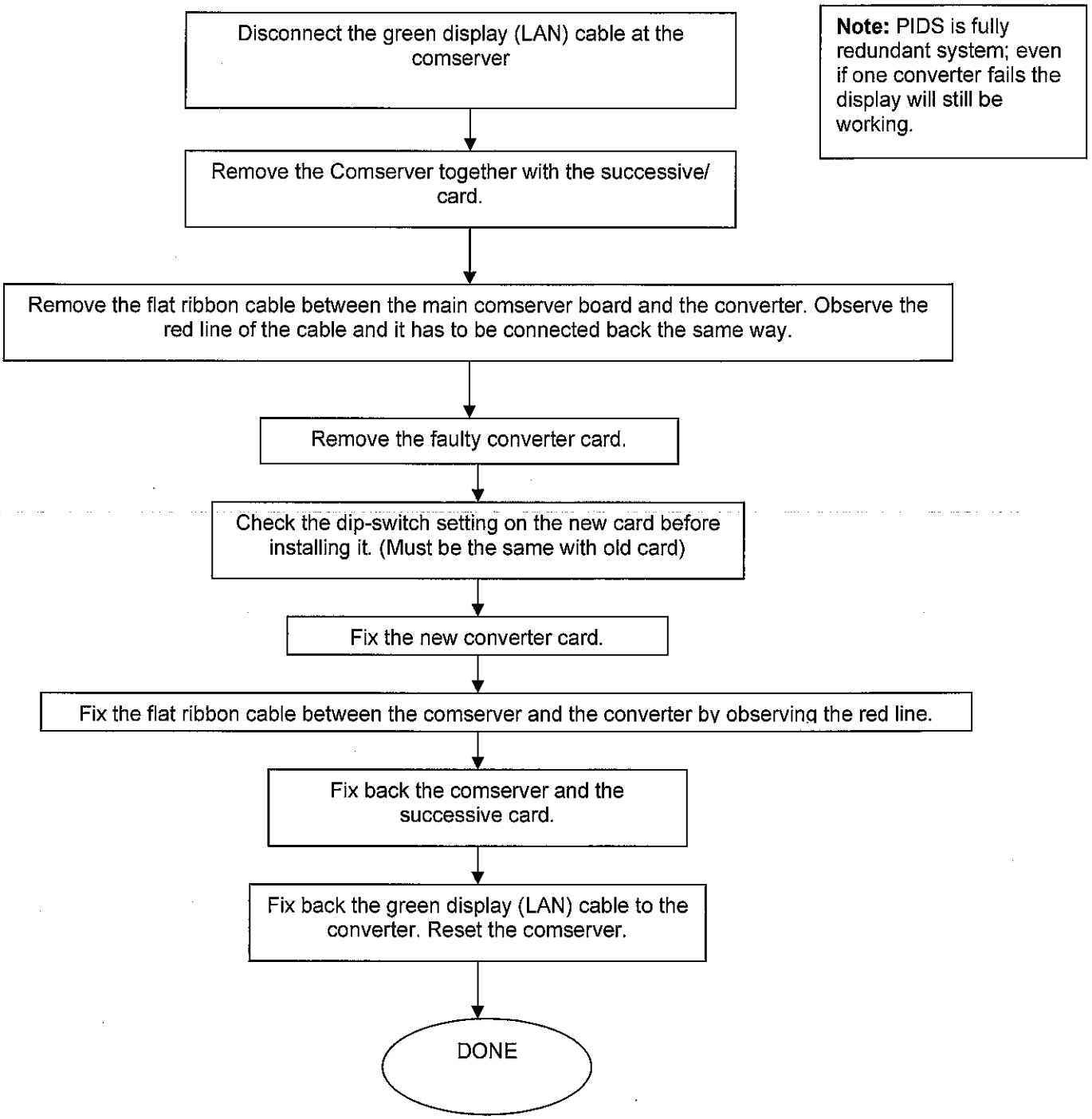
8.2 Replace LCC500 Micro-Controller Board



8.3 To Change LCD module



8.4 To Change Converter Card



9.0 TMS Maintenance Guideline

9.1 Functions of abbreviation in timetable planning

D- Availability stop
Causes the next set point to not setting automatically. As the train approaches, 'Operate signals' request will be activated.

H- Absolute stop
Same as D, except without an 'Operate Signals' request.

A (K)- Waiting for connection
Next set point is not set until the reference train has reached the programmed place and the connection time programmed in the system has elapsed.

B (K)- Waiting for delay
The next set point is not set until the reference train has reached the programmed place.

T (K)- Departure time
The next set point is not set until the departure time is reached.

S- Setting-back train
Drive train in the opposite direction with the same train number.

W- Push and Pull train
Travels in the opposite direction with a new train number.

N- New train number during stop
The new train number can be changed during a stop,

M- New train number on a moving train
Train number is changed when the train passes the station.

9.1 Functions of abbreviation in timetable planning (continued)

Z- Stop at the block signal
If a train has to stop at a block signal lying along the routes, a Z is programmed. Without a Z, the corresponding track is used as a diversion point for trains passing through.

F- Train number stepping
This function is used to step a train number to any routing track.

X- Interruption in the route
Set at the place where the train left the train guidance zone. The routing track where the train re-enters the train guidance zone is programmed as the next routing track.

V- Delayed start
The driving position for a signal may be delayed in order to put back the start of barrier procedure in case of trains that stop or in order to prevent the premature blocking of the other routes.

9.2 Activation of particular timetable

2 Log on as:

User name- Signalling
Password- EMAS

↓

At the train data editor menu choose the timetable version that you want to activate. Double click the timetable version that you required.

↓

At the menu select 'Timetable'. Drop down button will appear. Then select the 'Activate Timetable' button.

↓

A box will then appear. Then once again choose the timetable version that need to be activated. Click the 'Activate' button.

↓

The first half of the timetable can be viewed after the activation.

Note: Only an authorized personnel is advised to do this operation because wrong timetable activation can lead to unforeseen incidents.

9.3 Checking trip details