

ACCUMAX - 3

Overhead Transmission Line Fault Analyser System

ECG of Transmission Lines



The Challenge to

improve reliability

& availability of **Transmission** lines

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ACCUMAX - 3 is Taurus's third generation, **one of its kind** product based on principle of multiple pulse echo co-relation technology using advanced matrix processors. With its unique features and capabilities these are ideal choice for the virtual patrolling and identifying all type of faults and inhomogeneities of entire transmission line.

ACCUMAX - 3 is an auto-calibrated portable system comprising of 3 main units: Fault Locator cum Signature Analyser unit; Adaptor unit; Simulator unit along with a Computing System loaded with Taurus Data Management Software (TADMA). The system being a portable kit can be used on any de-energised AC transmission line from 66kV to 1250kV.

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The **ACCUMAX- 3** is concept equipment that incorporates features & capabilities that contribute immensely in ensuring that all your transmission lines are maintained at optimum uptime & transmission levels. The system is highly versatile and can be used on any AC overhead transmission line from 66 kV to 1250 kV without any requirement of precalibration or data input reference. Designed for total safety of the operational personnel, it can be used very safely on a de-energised line in a highly induced multi circuit AC transmission line configuration. Operational simplicity, despite its advanced technology, has been one of its aspects of its user friendliness.

Simplicity in user operation, direct digital read out in kilometers (one tenth of) and its ability to track various categories of open & short circuit faults, places it in a unique category of its own.

Many utilities have benefitted immensely in not only in drastic reduction of line breakdown time, but also in achieving optimum transmission levels and effective maintenance transmission lines. As initial placement of one system in each of your major zones would derive the benefits & advantages that would prelude every major station being equipped and thereby benefitted to their advantage.

This initial minimal investment is easily recovered within locating one fault. Being an auto calibrated system, it can be used without difficulty by even a non technical support staff.

Some of the major applications of the system are:

Application of the ACCUMAX-3 in fault location: The ACCUMAX-3 precisely detects any or all types of open & short circuit faults that causes line breakdown. A direct reading digital display in kilometers with an accuracy of ± 100 meters linearly upto a range of 1000kms without any pre-calibration categories it is the simplest & most accurate fault locating device. Faults that may be of high resistance category (HIF) are to be tracked in the signature printouts. Furthermore, faults occurring on spur lines are easily located from the base testing location itself.

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Application of the ACCUMAX-3 in line diagnostic study: This unique line signature analysis taken on regular intervals serves as a trend & condition monitoring transmission lines. The trend comparative data that is automatically tabulated and stored in the laptop attachment integrated with the TADMA 16.3 data management software serves as a permanent record file of all the lines tested. Line diagnostic analysis has vital applications in troubleshooting well in advance inherently present lurking fault points. This apart, coherent jungle growth has been successfully deciphered from signature printouts & remedial action effected. This is particularly pre-dominant problem in transmission lines aligned in forest area/hilly terrain.

Application of the ACCUMAX-3 before charging a line: With the ACCUMAX-3 you can arrive at a correct decision as to whether a line is to be energized post fault rectification or in the event of a transient tripping. In perplexing situations, serial comparison of the line's previous signature with the present one would serve as a reference guide whether to energize the line or not. Thus, safe & sure charging can be successfully effected. Many a times, the presence of a secondary fault is detected & remedial action initiated prior to charging when you study the LSA data closely.

Application of the ACCUMAX-3 in line pre-commissioning check: The ACCUMAX-3 serves as a key applicational tool in documenting line pre-commissioning tests like

- (i) Exact length of the line - digitally monitored & hence provides the most accurate distance in fractions of kilometers.
- (ii) Continuity test.
- (iii) Phase sequence tests.
- (iv) Line Signature Analysis study for the entire length of line etc., and all this without the necessity for any complimentary & supporting equipments at the far end of the line.

This would immediately contribute in:

- Maximizing availability of transmission line.
- Attaining optimum transmission levels
- Effective maintenance of transmission system.
- Mega Watts saved = Revenue saved
- e.g: If a 230 kV line carrying 100 MW power is retrieved from breakdown in 6 hours by using our equipment rather than 18 hrs (average) using conventional methods, revenue earning of utility would approx: US \$ 1,20,000 in one day on one line for one fault with one equipment.

This derivation is based on considering that cost per 1 Kwh = US \$ 0.1. It is now evident that this minimal investment is a rewarding investment, which is not only recovered in a short time but continuously helps in monitoring & managing the line efficiently.

The ACCUMAX-3 is applicable for any AC transmission line from 66kV to 1250 kV. Integrated with the advanced data management software TADMA, line study, fault finding & pre-charging checks have now been simplified with these portable user friendly fault analyzer systems.

ACCUMAX - 3

- decoding the complexities of EHT Lines

Salient Features :

- **Fault & Line Diagnostics** - Complete fault information in direct reading data display in fractions of kms and a comprehensive line diagnostic output.
- **Flexibility in utility and application** - Portable system that can be used on any line from 66kV to 1250 kV AC transmission lines.
- **Auto calibrated system** - Requires no parameter input or presetting. Extremely simple operation
- **Direct reading digital display** - No further calculations required
- **Fault resolution** of +/- 100 meters throughout the range of 1000 kilometers
- **Reliability** - Data is acquired 60 times at different sensitivities for better & reliable results
- **Zoom blanking** - Unique capability to easily detect faults on spur lines and other applications with extended range blanking facility
- **Direct PC storage**, no cumbersome interfacing modules to storage units. Review and print only selected frames / data.
- **Optimum safety** - Engineered both in design and hardware with added safety mechanisms to ensure total safety of the operating personal. Splash proof, twist lock sockets ensures firm interconnections between the system constituents.
- **Induction Suppression** - Complete suppression of stay surges, lightning impact and induction voltages from parallel feeders
- **EHT Line Simulator** - for ascertaining the system's functional aspects. Also serves as an ideal training kit.
- **TADMA**: Taurus data management software for instantaneous LSA data management - Using TADMA, Line Signature Analysis and its inhomogeneties are automatically tabulated and printed / stored. TADMA instantaneously computes, documents, initiates its diagnostic s/w, classifies and interprets LSA line study. Customised reference to each & every line including tower schedules (opt.)
- **All weather system** - Accurate reading between -20°C to 60°C
- **Portable off-line** system with in-built re-chargeable batteries - Can be used as and when required or at periodic intervals on any line in a substation.
- **Economical investment** - One single system is sufficient for the entire station and applied on any AC transmission line from 66kV onwards

ACCUMAX - 3 Constituents

Fault Locator cum Signature Analyser Unit

Housed in rugged unbreakable & water resistant portable carry cases. This unit is used in Fault Location & Line Signature Analysis

Fault Location

- Display the distance to fault in kilometers, digitally -

A non glare LCD display positioned at a comfortable viewing angle shows the distance to fault in kilometers from the point of connection upto range of 1000kms. Parallel array processors accurately compute fault distances, both open circuit and short circuit type and the phase(s) on which it has occurred are clearly recognised. Zoom blanking allows for superior fine tuned study of user selectable sections of the line. A major advantage being spur line fault diagnosis & identifying markedly severe inhomogeneous points. Hardware capsules are designed to ensure quick and easy service as well as upgradation.



Line Signature Analysis

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The Line Signature Analysis extends the utility of the system into hitherto difficult aspects of line diagnostic study. Constructed with multiplexer integrated circuits, the unit accesses broad spectrum binary controlled signals that perform multi mode data acquisition resulting in high sensitive perception and accurate LSA computation. The ACCUMAX - 3 unique capability of revealing inhomogeneities along the transmission line gives complete insight into line healthiness. Inhomogeneities detected on an EHT line can be of significance that could bring about a serious negative bearing towards the overall efficiency and stability of the line. Most of these inhomogeneities like leakage points, highly polluted sections, excessive current flow areas, improperly compressed joints etc. aren't easily deciphered by visual inspection and inevitably does need the help of LSA data. Data acquired from the system reflects the dynamic condition of the line at the moment of testing & provides you vital clues for easy inference. Automatic acquisition of line data 9 times followed by a processed and computed inhomogeneity study summarises significant inhomogeneities on a transmission line - summary highlights, signature & scan, and map data printouts. Already well proven in its utility for predictive maintenance protocols, the ACCUMAX's LSA data, reviewed and computed by the unique TADMA techno-graphics s/w brings into focus areas on your line that need immediate attention. The advanced signal processing, computation and sophisticated filter modules specially developed by our R&D ensure effective immunity from external signal & noise interference. LSA application is vital not only in predictive maintenance protocols, but also before charging a fault rectified line. LSA would ascertain whether you could safely recharge the line. Further more it serves as ideal pre-commissioning test to verify phase continuity, phase sequence, eliminate loose links and shorted points on newly constructed lines ensuring long standing optimised efficiency of the line. Many a line breakdown and grid collapse has been averted with the LSA data. True to its design concept the unit is extremely easy to operate to attain complete LSA documentation of your line.

ACCUMAX - 3 Constituents

3 Phase Heavy Duty Adaptor unit - EHT 1250 adp

Line matching : induction & noise suppression



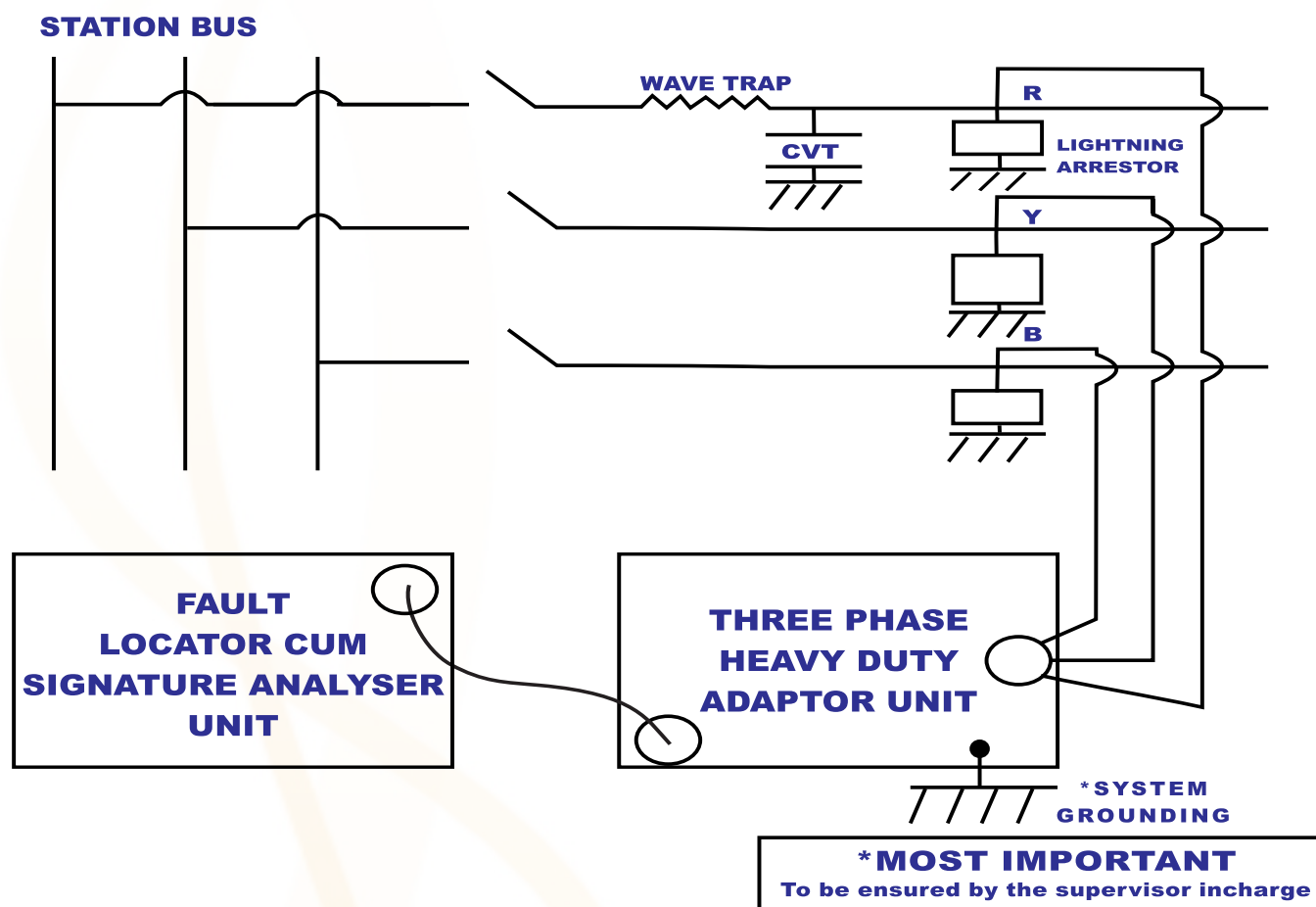
Re-engineered with maximised safety features, this 3 phase heavy duty adapter unit is the main fulcrum of the ACCUMAX's functional characteristics, bridging the 3 phases and the fault locator cum analyser unit. This unit performs the vital function of complete induction and noise separation from parallel or multi-circuit feeders and line impedance matching enabling synchronous operational sequence of the ACCUMAX-3. Earth connectors, splash proof twist locking mega socket interconnections and internal safety path ways, fortify safety aspects against accidental situations or oversight in procedural sequence. This apart, noise interference from HVDC grids and other sources are effectively filtered by hyper sensor circuits. Housed in rugged, unbreakable & water resistant portable carry cases.

EHT LINE SIMULATOR MK-5

Specifically designed to conduct functional checks of the instruments & for training purposes. This line simulator is modeled to behave as a EHT line. Its utility is important before connecting the equipment to a EHT line in order to ascertain safe usage of the kit at site.



OPERATIONAL PROCEDURE - SEQUENCE FOR CONNECTING THE TAURUS ACCUMAX-30 OVERHEAD TRANSMISSION LINE FAULT ANALYSER SYSTEM TO THE LINE (IMP: PLEASE READ MANUAL BEFORE INITIATING PROCEDURE)



- STEP 1 : UNPACK EQUIPMENTS AND KEEP THEM (R-L)--> (A) ADAPTOR (B) FAULT LOCATOR CUM SIGNATURE ANALYSER
- STEP 2 : CONNECT EQUIPMENT EARTH TO STATION EARTH FIRMLY. DOUBLY RE-ENSURE
- STEP 3 : CONNECT THE SPLASH PROOF CONNECTER AT THE END OF THE THREE HOOK RODS TO THE ADAPTOR AND KEEP THE RODS READY FOR CONNECTION (DO NOT CONNECT TO THE HOOK ROD. CONNECT ONLY AFTER STEP NO. 7. See Pt. 8)
- STEP 4 : WAIT FOR LINE CLEARANCE
- STEP 5 : TESTING END OF LINE TO BE GROUNDED
- STEP 6 : FAR END OF LINE TO BE KEPT OPEN
- STEP 7 : PLCC KNIFE SWITCH TO BE CLOSED
- STEP 8 : CONNECT THE HOOK RODS TO LINE
- STEP 9 : INTERCONNECT ADAPTOR TO FAULT LOCATOR CUM SIGNATURE ANALYSER
- STEP 10 : REMOVE LINE GROUNDING AT TESTING END
- STEP 11 : SYSTEM IS READY FOR TAKING READINGS/ANALYSIS
- STEP 12 : AFTER TAKING READINGS SWITCH OFF SYSTEM.
- STEP 13 : REMOVAL OF SYSTEM FROM LINE IS EQUALLY IMPORTANT. START PROCEDURE BY GROUNDING THE LINE AT TESTING END
- STEP 14 : REMOVE PLCC KNIFE SWITCH
- STEP 15 : REMOVE HOOK STICKS FROM LINE
- STEP 16 : REMOVE EQUIPMENT'S INTERCONNECTING CABLES
- STEP 17 : REMOVE GROUND- THIS SHOULD BE THE FINAL STEP
- STEP 18 : PACK EQUIPMENTS
- STEP 19 : STORE/TRANSPORT VERTICALLY

ACCUMAX - 3 Digital Eye system comprising of:

1. Fault Locator cum Signature Analyser Unit
2. 3Phase Heavy Duty Adaptor Unit
3. Line Simulator
4. Laptop & Tadm s/w. - Taurus Data Management Software Version 16.3 integrated in laptop

Accessories :

1. Interconnecting cables with multi pin heavy duty splash proof twist lock pig tail plugs at both ends
2. Line connecting cables (Red, Yellow & Blue)
3. Flexible equipment earthing cable with vice clamp

Additionally : Log book for data entry, instruction manual

Technical Brief

Feature	Fault Location	Line Signature Analysis
Range	0-1000 kms	0-400/600 kms
Resolution	100 mts	100 mts
Fault Type	All types of absolute faults	Line Signature Analysis
Display	High resolution illuminated LCD	High resolution backlit LCD
Operation	Mains or in-built rechargeable batteries	Mains or in - built rechargeable batteries
Application	On all 66 kV to 1250 kV lines	On all 66 kV to 1250 kV lines

TADMA - Laptop loaded with TADMA version 16.3 : 9 raw signal data & processed info., Various formats

Dimensions

ACCUMAX constituents	Dimensions in mm			Weight in kgs (approx.)
	L	B	H	
Fault Locator cum Signature Analyser unit	468	355	193	23
3 Phase Heavy Duty Adaptor unit	434	190	406	26
Line Simulator	300	225	132	6