Technical Bulletin

NO. 9904

TOPIC: ACCURACY DIAGNOSTICS

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INTRODUCTION

Some of DynAmp's high current metering systems are equipped with "ACCURACY DIAGNOSTICS". Similar monitoring and diagnostic circuits were not available in the previous CXM, CM or FM families of products but the LKC products had a similar feature that was referred to as "alarms." In standard, unidirectional LKP Models the Accuracy Diagnostics system is available as an option, while in Models LKB, LKP-5000 and LKP-8000 the AD feature is always included. This Technical Bulletin explains "Accuracy Diagnostics", how the "AD" performs, the recommended uses of the outputs and the resulting benefits.

With unidirectional measurement systems of type LKP, LKP-5000 and LKP-8000, it is possible that the AD circuits will give a warning indication when the system is operated at low rectifier current levels even though all circuits and components are healthy. This warning at low levels is most likely to occur if the metering system is associated with only one of several rectifiers in the area. This technical bulletin also explains why the AD gives these warnings and recommends how to deal with them.

WHAT IS "ACCURACY DIAGNOSTICS" ?

"ACCURACY DIAGNOSTICS" is a system that assures the user that most internal circuits are operating properly and is also a diagnostic tool. It is made up of a number of circuits, monitoring conditions of many of the critical components, and connections within the current monitoring system. The AD subsystem provides relay contacts for the user to connect to his remote warning indicator. The AD diagnostic light emitting diodes on each meter unit module indicates proper operation of associated circuits.

HOW DOES IT WORK?

The AD indicates the feedback circuits are functioning properly and the system's power supplies are within specifications. More specifically, this indicates the following conditions exist:

1. All channels have a core magnetic flux null:
   - All components in the circuits appear to be operating normally.
   - Input fields are of the expected polarity.
   - Input magnetic flux appears balanced by feedback flux.
2. Power supplies are operating within acceptable ranges.
   - Mains input power is on.
   - Hall plate sensor power supply output is correct (not monitored in LKP-8000).

The signals show the present condition, having only a short time delay from an instantaneous condition.

Although the AD does not monitor absolutely every possible error condition, it effectively provides the user with continual assurance of signal reliability. Additional information about Accuracy Diagnostics can be found in the appropriate instruction manual.

AD WARNINGS AT LOW RECTIFIER CURRENT LEVELS IN UNIDIRECTIONAL SYSTEMS

The AD feature works well with bi-directional systems and with unidirectional systems operating either at high levels or when associated with the total line current. However, in unidirectional systems LKP-XXXX, LKP-5000 or LKP-8000, an AD warning may occur, particularly at low operating levels, due to either of the following conditions:

#1. If the primary current is too low to activate all of the AD channel circuits properly: This often occurs in most units at zero primary current. In this case the AD circuit is in an unstable condition and warnings, as indicated by the channel LEDs, should be ignored. In single rectifier applications, the AD indicator will likely turn green when the primary current is above approximately 5% of full scale operation. In a properly operating LKP-XXXX system the AD warning should certainly disappear when the affected channel dc voltage(s) is above 2 Volts.

#2. At low primary currents, the presence of magnetic fields due to high currents from other rectifiers may cause a reversal of the magnetic flux for one or more channels of a sensor. In this case, the LKP system will read high. Additional information on dealing with the effects of reversed magnetic fields can be found in Technical Bulletin #9908.

Once the rectifier current is raised so the lowest channel voltage rises above +2 Volts, all the channels are in a positive flux condition and the AD system can operate correctly. This is the lower limit of high accuracy operation. Above this level, the AD warning should disappear. In some installations, the low end of the accurate operating range may be considerably higher than a few hundred amps.

HOW DYNAMP RECOMMENDS USING THE SIGNAL

A. *If the "Diagnostics Relay" is O.K. and the green LED indicators are all on:* Continue operating normally.

B. *If the "Diagnostics Relay" indicates a warning and one or more green indicators are off:* This indicates there may be measurement errors and the metering system should not be in full, automatic control of the rectifier. The AD relay contact output is not intended to be the only monitor protecting the power rectifiers. Primarily, it is expected that the customer wants to take immediate action to prevent unsafe operation. Unsafe operation could result if the metering system is in the rectifier control loop and it erroneously produces a significantly lower output than is true. This might cause the rectifier control circuit to inappropriately increase the power output, perhaps to overload levels for either the power supply or the process. So, if the metering system is in the control loop and the "Accuracy Diagnostics" indicates a potential problem, the following actions are recommended: ***FIRST- If operating at high rectifier currents, lock out control actions that could drive the rectifier output higher and SECOND-alert the operator.***

The green LED indicators allow a maintenance person to ignore properly operating parts of the system and more quickly focus attention upon the portion needing attention. Quicker return to normal operation is the result.

WHAT ARE THE BENEFITS OF THE "ACCURACY DIAGNOSTICS?"

The user is continuously assured that the metering system is working properly. Immediate notification occurs if the system condition has become questionable.

It is possible to avoid problems that might be caused by metering errors. By appropriately connecting the relay output, it is possible to prevent wrongfully raising the power rectifier output due to some failures in the metering system. This prevents damage to the rectifier. It is also important that this avoids inadvertently running the process at the wrong load level. This allows the user to maintain smooth production flow and not upset the process. This might also prevent accidentally setting a new demand level.

The diagnostic indicators enable one to more quickly get back on track because they pinpoint the location of a fault. This clarifies the trouble shooting process and enables quick repairs.