RTK Networks: Real-Time Data Correction Protocols

Introduction

Real-Time Kinematic (RTK) differential correction is quickly becoming standard for precision agriculture operations. This level of correction provides consistent sub-inch accuracy for planting, fertilizing, spraying and other field operations. RTK guidance keeps a farm vehicle and/or implement on the intended path during an operation, thereby minimizing skipped or double covered areas. A Differential GPS (DGPS) correction signal such as

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RTK can be broadcast via radio transmission or over the internet to your tractor's guidance system. Two, publically available, correction protocols on which the correction signal can be transmitted will be discussed in this publication. For comprehensive definitions of terms and acronyms used in this document see *GPS/GNSS Related Terminology* at www.AlabamaPrecisionAgOnline.com.

Correction Format Overview

Two common, publically available real-time data correction protocols are CMR and RTCM. Others do exist, such as NCT (NavCom), but are usually specific to the signal proprietor's equipment, such as John Deere in this example. Compact Measurement Record (CMR) is a correction protocol proprietary to Trimble™ with three formats (CMR, CMR+, and CMRx) to date. The difference among the formats is the amount of correction data that can be transmitted to a guidance device from an increasing number of satellite sources. CMR+ improves performance with a correction stream of more consistent length than the traditional CMR format, which facilitates better operation on radio networks. CMRx was developed to support GNSS operations, which utilize other countries satellite positioning systems (e.g. GLONASS), and will allow the user to employ more constellations, satellites, and signals as they come available. With faster initializations and improved performance near obstructions, CMRx offers significant compression (about 40%) over the already compact CMR/CMR+ format to help users receive more correction on less bandwidth.

Radio Technical Commission for Maritime Services (RTCM) refers to an international communication / corrections format that is not manufacturer specific. Since RTCM is an international standard, most if not all guidance devices should be able to interpret correction data broadcast on this protocol. However, it is important to realize that your GPS/GNSS receiver may only be able to interpret certain formats of this protocol. RTCM v.2 was the first version to offer data streaming for RTK correction. The current version is RTCM 3.1 with expected advancements in the future. Newer GPS/GNSS receivers would most likely use RTCM 3.0 or RTCM 3.1, while older receivers may only be able to use RTCM 2.x. If RTCM 3.x is available, it is most beneficial to use the newest format because of its ability to carry more data on less bandwidth and efficiency with GNSS data. Fortunately for RTCM users in Alabama, ALDOT broadcasts both RTCM 2.x and 3.x via the internet. However, check with the administrator of your Real-Time Network (RTN) to ensure a format compatible with your system is available.

Because the CMR protocol is proprietary to Trimble, some guidance manufacturers do not design their systems to be compatible with it. On the other hand, manufacturers such as AgLeader and Topcon support certain formats of both RTCM and CMR protocols. However, the only format of CMR that ALDOT currently offers is CMR+.

Accessing Real-Time Data Correction Protocols

For single base-line CORS users in Alabama, ALDOT provides a free service in which only an IP address and port number are required to utilize RTK correction. To access the necessary information on ALDOT offered protocols and formats, visit http://aldotcors.dot.state.al.us and click on **RTK Network Connections**. Once the nearest CORS station with respect to their field is identified, one can look up the associated port number for the desired real-time correction protocol. Using this information, the guidance system operator will have access to sub-inch accurate GPS/GNSS correction.

Table 1 depicts port numbers for Auburn's CORS station as outlined by ALDOT. For example, the user would input the ALDOT server's IP address, 205.172.52.26, and if RTCM 3.x was required, enter 14305 as the port number. On the other hand, if the closest CORS station is unknown, users can input the IP address above with a **Nearest** port number for the desired correction protocol. This feature uses an autonomous spatial location of the guidance device to automatically determine the closest CORS station and begin streaming correction data. The necessary port number for the **Nearest** feature can be accessed at the link above as well.

Table 1. ALDOT real-time data correction protocol options for Auburn CORS (ALA1).

Protocol	Site Name	Message Type	Satellite System	Port
Leica GG	ALA1 - Auburn	Leica	GPS and GLONASS	14301
CMR+	ALA1 - Auburn	CMR+	GPS Only	14302
RTCM v2.3 GG	ALA1 - Auburn	RTCM 2.x (Type 1;2;18;19)	GPS and GLONASS	14303
RAW LB2	ALA1 - Auburn	Original raw data	GPS Only	14304
RTCM v3 GG	ALA1 - Auburn	RTCM 3.x (Extended)	GPS and GLONASS	14305
RTCM v2.2	ALA1 - Auburn	RTCM 2.x (Type 1;2;18;19)	GPS Only	14307

Some guidance devices and especially third party cellular modems (e.g. Raven Airlink or Intuicom RTK Bridge) may require special cabling and/or software to program the necessary IP address and port number. RTNs are also available in Alabama with ALDOT providing Leica's MAX solution and Trimble™ offering VRS Now. However, these services require a username and password while VRS Now requires a subscription fee. Contact your guidance device sales representative or technical support for additional information.

Please visit www.AlabamaPrecisionAgOnline.com for additional information or contact an Alabama Precision Ag team member.

Disclaimer

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