

APPLICATION NOTE



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Audience: Irrigation Specialists	Author: Ian Tite – External Consultant to UNIDATA
Subject: Using UNIDATA Instruments for Monitoring Irrigation Schemes	

UNIDATA has been manufacturing water and weather monitoring instruments for more than 25 years. We supply the complete range of data collection products and services required to monitor a modern irrigation scheme. Our worldwide clients include Government agencies, mining and resource companies, engineering and environmental consultants, schools and universities, water supply, drainage, irrigation and wastewater projects, weather and flood forecasters, agricultural producers, marine scientists and many others.

UNIDATA equipment features low initial cost, high reliability data, simple operating systems, full user support and all required technical services. This integrated system from a single supplier minimises operating costs, staff training and support overheads. If required UNIDATA can supply complete systems to suit the project with all instruments, housings, power supplies, spares and consumables, computers, software and staff training.

The benefits of using UNIDATA instruments include:

- Instruments that provide the highest accuracy and reliability, for the lowest cost,
- A well proven system with many thousand instruments in use, worldwide,
- A wide selection of instruments, ranging from general purpose data loggers that can measure up to 20 different variables, to specialised and highly accurate instruments measuring a single feature,
- Each instrument is designed for a long service life at remote sites and harsh conditions,
- All instruments are small, battery powered and easy to install, service and use,
- The same operating software is used for all instruments. This is simple to use and well proven,
- A large data capacity with many months of data stored at the site. An operator can unload all the data whenever required. Data such as flow rates and totals can be displayed at the site,
- All systems can be used to control other equipment, for example to adjust flow rates, issue high or low water alarms, or take water samples,
- All instruments can be linked by telemetry, using telephone, radio or satellite communications. The data can then be collected automatically with UNIDATA software, and
- All data produced is suitable for use by a wide range of third party computer software packages.

Monitoring Irrigation Schemes with UNIDATA Instruments

This section summarises the types of measurements that may be required. In practice, each site may monitor several different features. For example, a flow-measuring site can also be used to monitor water quality and weather conditions. Full details of the instruments mentioned can be found at the UNIDATA web site, www.unidata.com.au. Further information can be obtained from UNIDATA Australia, Telephone +618 9331 8600.

Accurate water measurement is essential for managing irrigation schemes. However, flow monitoring can be difficult because the land is flat, flows are slow and channel conditions can change as the scheme is operated and maintained. Channels range in size, from the very large supply and distribution canals to the very small channels supplying individual fields. Some measuring sites will be permanent. Other sites will be temporary to investigate special issues. UNIDATA manufactures water level and water flow instruments to suit this wide range of applications.

- Model 6541 Precision Water Level Instrument, float operated.
- Model 6508 Depth probes. Up to 8 can be connected to loggers
- Model 8007 Water Depth Logger. High precision pressure depth logger.
- Model 6526 Starflow Ultrasonic Doppler Flow system. Measures flow.

Water quality may vary as the water supply passes through the scheme or as heavy rainfall drains from the fields. The water leaving the scheme may be more saline and turbid and contain traces of agricultural chemicals. UNIDATA instruments can monitor the water salinity, turbidity, temperature, pH, and dissolved oxygen, and control automatic water samplers to collect any required special samples for laboratory analysis.

- Model 6536 4-Electrode Conductivity and temperature instrument, with
- Option: Model 6528 pH Probe
- Option: Model 7422A Dissolved oxygen Probe.
- Model 6538 Optical backscatter Turbidity instrument.

Groundwater levels may be influenced by infiltration from the irrigated fields. UNIDATA instruments can be used to monitor the water level and quality in boreholes.

- Model 8007 Water Depth Logger for boreholes.
- Model 6536 4-Electrode Conductivity instrument, with pH option.

Crop water requirements depend on the soil moisture in the root zone of the plants. This moisture level depends on the weather, soil conditions and crop maturity. Water delivery is only required when the soil moisture is about to become inadequate. Sensors buried at various depths can measure a profile of soil moisture and many sensors can be connected to any data logger.

- Model 6513 Soil Moisture Transducer. Gypsum blocks used in series.

Rainfall, evaporation and weather conditions are important for the management of an irrigation scheme. UNIDATA weather systems can be added to any suitable site and they will measure and record the required information.

- Model 6501+ Weather System. Select options including, rain, wind, solar radiation, air temperature, pressure and humidity as required.
- Model 6529 Automatic Evaporation Pan System.

Data telemetry is an option that can assist in effective project management. Any irrigation scheme will have a number of measuring sites and the instruments store the data at the site. An operator will need to travel to the site to observe and collect the data before it can be analysed and used for management.

All UNIDATA instruments can be connected to a suitable telephone or radio system, and the standard UNIDATA software allows operators to contact each site and recover the latest information.

- Model 6807C GSM Telemetry system. Landline, satellite and radio systems are also supplied, with all accessories.

More complex UNIDATA software uses a dedicated computer to automatically recover and present all information.

Flow Measurement Options.

The most difficult task is to accurately measure the flow in an irrigation system. Older schemes relied on water level measurements at measuring structures, manual flow measurements and operator experience. Modern systems make increased use of flow measuring instruments. All systems require good design, expert management and regular maintenance.

The traditional method of flow measurement is to construct a concrete or metal measuring structure such as a weir or flume and allow the flow to pass over or through this constriction. If the structure is correctly designed and built there will be a theoretical relationship between the upstream waterlevel and the flow rate. This waterlevel can be monitored by a UNIDATA model 6541/C instrument that uses a float system to measure and record the water level to an accuracy of 2mm. The instrument can be programmed to report the theoretical flow rate.

The flow through such a structure must be unhindered or the reported flow rate will be incorrect. Common problems in irrigation systems are weir blockages and constrictions by aquatic growth and channel siltation. These can be minimised by routine maintenance. In some channels the downstream waterlevel may be too high under some conditions and prevent free discharge through the structure. The reported flow rate will be incorrect. Measuring structures are expensive to construct and maintain.

Modern irrigation schemes measure flow using acoustic instruments that continuously measure the water velocity and depth from a location on the bed or banks of the channel. No special channel structures are required. The UNIDATA Model 6526C Starflow measures depth, velocity and temperature from the channel bed. This information and the channel dimensions are used to compute a continuous record of the flow rate. The Starflow is inexpensive, simple to install and can be used at suitable locations in all channels, pipes and culverts.