Transparent Serial Communication Integration Manual

Cellocator Division
Pointer Telocation Ltd.

Proprietary and Confidential

Version 31.0

Revised and Updated: August 10, 2011

POINTER

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1 Introduction

This document describes the integration of any third party device equipped with a serial port, and connected, via the Cellocator device (deployed as a transparent modem), to applications and services of an operator's CCC (Command and Control Center). The integration provides remote monitoring and control of any third party device via the Cellocator unit.

1.1 References

No.	Document Name	Version	Date	Remark
1	Cellocator Wireless Protocol	V28	01/02/09	Or newer
2	Serial Interface	V28	05/02/09	Or newer
3	Programming Manual	V28	23/04/09	Or newer

1.2 Revisions

Version	Date	Description
28.0	30/04/09	Original version.
28.1	05/05/09	Fixed and approved.
28.2	05/07/09	Corrected wrong description of the Acknowledge control. Communication flow diagram replaced.
28.3	11/10/09	Minor correction of section 3.4.4: the ACK from CCC is unconditional.
28.4	06/03/11	Edited and converted to new documentation template.
30.1	04/05/11	Updated for the Cello unit
31.0	10/08/11	Add X-on X-off flow control for cello

1.3 Abbreviations

Abbreviation	Definition
ACK	Acknowledge
CCC	Command and Control Center
CU	Cellocator unit
ETA	Estimated time of arrival
OTA	Over the air

PNA	Personal Navigation Assistant
PND	Personal Navigation Device

2 General Description

2.1 General Overview

Utilization of the Transparent mode via the Serial Port in the Cellocator Unit enables communication with any device equipped with a serial port, without the need for protocol adaptation, on the Cellocator side, or from the perspective of the third party devices. This permits the Cellocator Unit to serve as a communication transport or a cellular modem for third party devices.

The following sections provide an overview of the communication layer and existing limitations of the Transparent Mode of the Cellocator devices' Serial Port.

2.2 Integration Overview

Once Transparent Wire mode is enabled in the PL, it can be activated/deactivated using the trigger on the "Door" input (pin 14 on the main connector). When this input is in "active" state, Transparent mode is activated. Otherwise, it is in a deactivated state and a legacy Cellocator Wire Protocol is activated instead.

NOTES:

- The "active" state may be controlled using programmable input inversion masks in the unit's configuration.
- Any enabled events for the "Door" input are generated as usual.

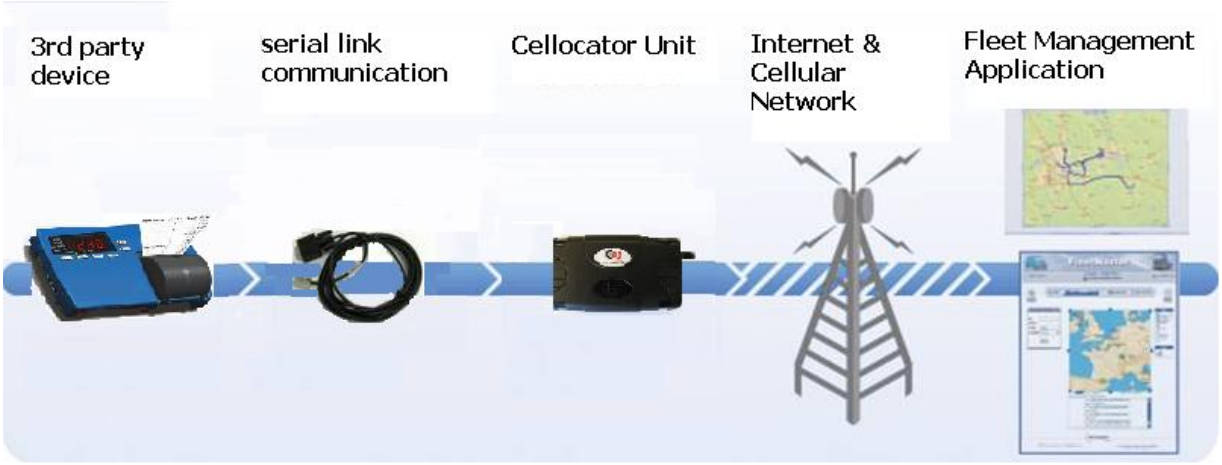
When Transparent Wire mode is active:

- All Cellocator wire protocol processing (as well as PSP and Garmin protocols) is terminated. This means wire commands, such as EEPROM programming, mode change, etc, are ignored.
- Any data received in the port is accumulated and forwarded to the wireless channel as Cellocator protocol data forwarding packets (type 8), containing the data as it was received, without further processing or filtering.
- When inbound data forwarding (type 8) packets are received in the wireless channel, the data contained in these packets is extracted and forwarded, as is, to the serial interface, without any enveloping headers or trailers.
- NMEA output is automatically disabled irrespective of the programming status.

3 Communication

This section describes the end-to-end communication stream.

3.1 System Chart



3.2 Data Flow Description

CCC	GSM/GPRS	Cellocator	3rd party unit
Cellocator inbound packet (type 5), forwarding a command to a 3rd party device. →			
When enabled in a configuration of the unit, the unit will send an acknowledgement for every valid inbound packet type 5 (message type 0, TR31). ←			
Cellocator outbound packet (type 8), forwarding a reply of the 3rd party device. ←			
The Central control has to acknowledge every incoming GPRS message type 8 by generic ACK message type 4. →			

3.3 Communication Session description

3.3.1 *Overview*

Once Transparent Wire mode is enabled in the PL and activated by triggering the "Door input", any data packet sent by a third party device is queued for transmission over the air as described below.

Any packet received from the server and encapsulated into a data forwarding frame of the Cellocator protocol – is forwarded to the third party interface without the encapsulation.

The ACK (Msg type 0, TR31) can be sent from the Cellocator unit to the CCC upon reception of the Data forwarding frame. It can be cancelled in the configuration (byte 1348, bit 0, value of 0 disables the ACK).

The maximal data burst from the third party device to the serial port of the Cellocator unit is 288 bytes (the burst of 288 bytes fulfils 300 bytes in a queue because of internal headers – 3 bytes for each forwarded frame).

As data is received from the serial port, it is accumulated in the unit's buffer. The buffer's content is "closed" and queued for transmission over the air once any of the following occurs:

- 82 bytes are accumulated (this is the maximal number of bytes per transmitted packet).
- 500 msec elapse from reception of the first byte in the packet.
- 300 msec elapse from receipt of the last received byte.

Once a packet is queued for transmission, the unit attempts to reliably forward the packet via the wireless channel, meaning that an acknowledgment must be received for the forwarded data. If the packet was forwarded through SMS the "SMS sent" of the GSM network is considered as valid acknowledge.

3.3.2 *Cello unit specifications*

The Cellocator Cello Serial port supports the following communication properties: baud rate of 9600bps, 1 start bit, no stop bit, and no parity.

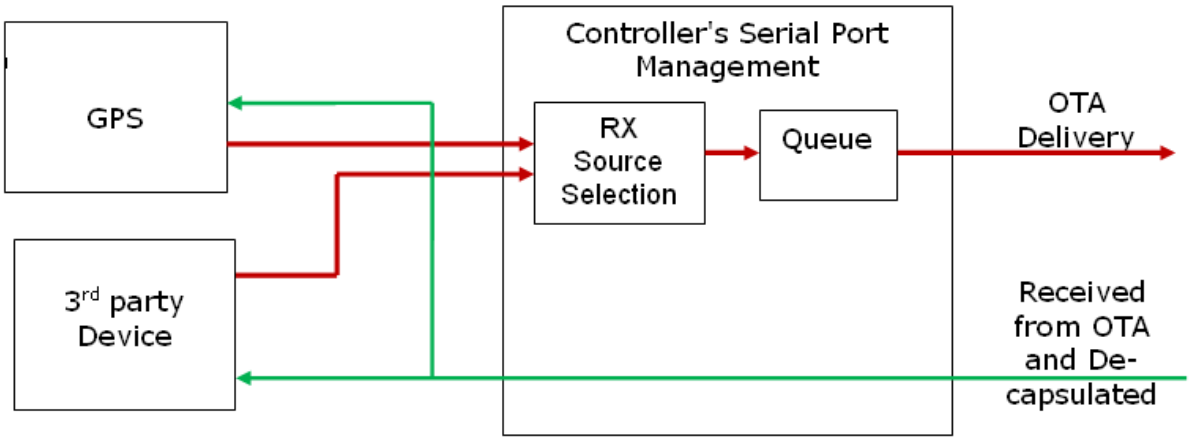
The Cello unit provides a 1K bytes queue for packets received from the serial port for transmission to the CCC application.

The Cellocator Cello unit utilizes X-on X-off flow control. When receiving buffer is full the unit sends X-off message to the serial port and the device is expected to suspend communication. When receiving buffer is ready for more messages the unit sends X-on messages to the serial port and the device is expected to resume communication. Flow control is important especially on areas where cellular network is not always available, preventing loss of messages from the device to the unit.

3.3.3 *Compact unit specifications*

The Cellocator Compact Serial port supports the following communication properties: baud rate of 9600bps, 1 start bit, no stop bit, and no parity.

The Compact unit provides a queue of up to 300 bytes (in non-CAN 25 sensors Fleet builds) for packets bound for transmission. In CAN 25 Sensor builds, the queue is smaller: 250 bytes long.



The serial port of the Compact unit shares its RX line with that of the GPS as shown in the scheme above. When a GPS TX uses the RX line of the serial port, it may cause a temporary "blackout" for the application using a transparent mode:

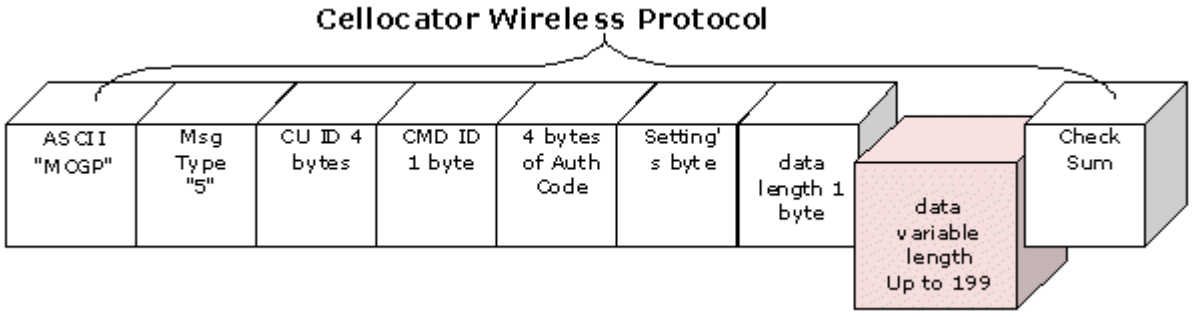
- If the GPS module is connected – the 60 ms "blackout" can occur once a second.
- If the GPS module is not connected – the 60 ms "blackout" can occur every 4 seconds.

NOTE: The communication blackout occurs only if the GPS has occupied the RX line of the serial port before the start of third party packet transmission.

Note: The serial port of the Cello has dedicated lines and it is not shared with the GPS one.

3.4 Encapsulation into Cellocator Wireless Protocol

3.4.1 *Packet from CCC to the Third Party Device (Type 5)*

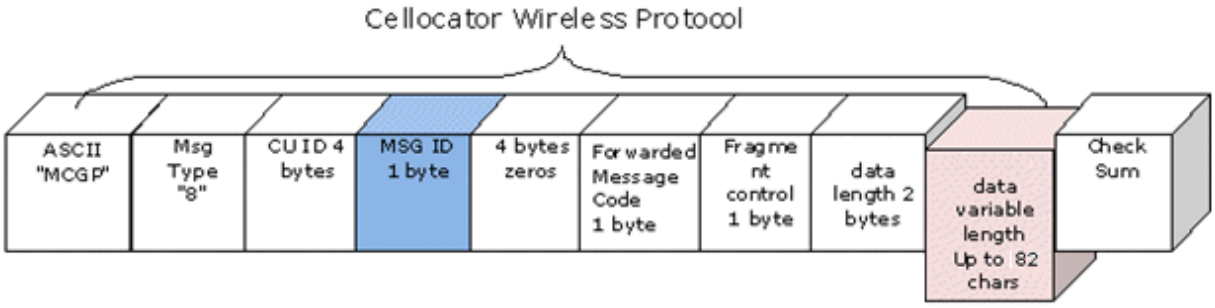


The data part is sent from the COM port of the Cellocator unit in an unsolicited fashion, without any buffering, upon reception of the OTA packet type 5.

3.4.2 *The Setting Byte*

This feature is not used in Transparent mode implementation and is sent as zero.

3.4.3 *Packet from Third Party Device to CCC (Type 8)*

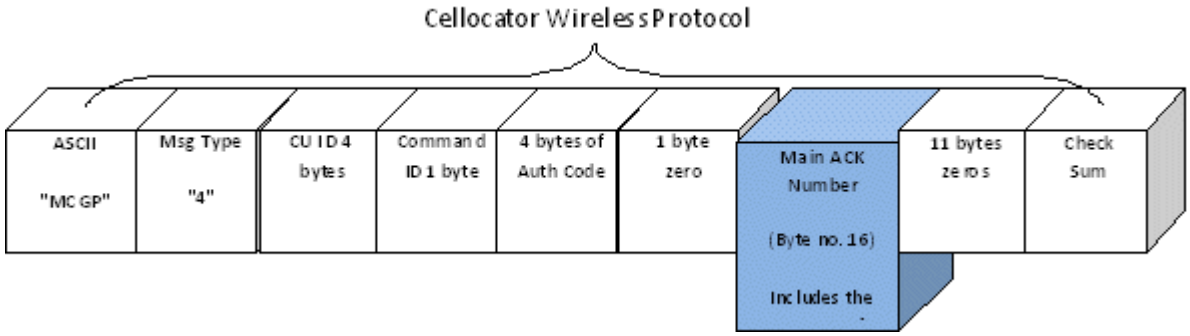


- Forwarded Message Code: Not applicable for Transparent mode and always sent as "1".
- Fragment Control Byte: Not applicable for Transparent mode and always sent as "0".
- Data part: Contains the string (or fragment of the string, as described previously) received from the third party device.

3.4.4 *Generic ACK (Type 4) from CCC to CU– Cellocator Protocol Level*

This packet is sent to the Cellocator unit as a reception confirmation for message type 8 (as well as the other types of messages).

It is always sent to the Cellocator unit when a message of type 8 is received in the CCC over GPRS. A type 8 message received via SMS does not require an ACK.



4 Summary

The Transparent mode of the serial port in the Cellocator unit is designed for scenarios where there is no justification to develop dedicated protocol support by one of the sides.

The receiving channel does not provide any buffering. The data is forwarded to the third party device upon reception from the server. The transmitting channel provides a small buffer in RAM. Note that this buffer is erased upon reset.

The Transparent mode in Compact units is not equipped with its own flow control, and therefore the third party device is required to utilize an acknowledgment management and retransmission capability with the monitoring and control application on the CCC side. The Transparent mode in Cello units is equipped with its own flow control and the device is required to support it for eliminating loss of messages from the device to the unit.

Cellocator recommends disabling the Cellocator unit ACK in order to enhance communication speed. Furthermore, it is also recommended to disable forwarding data by SMS (if GPRS is disabled), which will also speed up communications.