CTM-200 Gateway Vehicle Installation Guide

Model	CTM-200
Revision	Rev 1.3

3066 Beta Avenue | Burnaby, B.C. | V5G 4K4

Revision Control

Description	Revision	Date
New layout	Rev 1.0	17-Oct-2011
Updated documentation	Rev 1.1	21-Oct-2011
Updated with inputs from CoC Fleet	Rev 1.2	28-Oct-2011
Updated with inputs from CoC Fleet	Rev 1.3	10 Nov-2011

Contents

IMPORTANT: MAKE SURE TO PROTECT THE DEVICE AGAINST STATIC DISCHARGE. ENSURE YOU ARE ADEQUATELY GROUNDED TO PREVENT DAMAGE TO THE DEVICE

1. Overview

This document describes the installation steps/procedure for the installation of Cypress Solutions Chameleon Gateways into vehicles. This installation guide serves as a general guideline for wiring practice and installation procedure. The CTM-200 is an industrial wireless gateway designed for fleet applications. It has several mechanisms for interfacing with a variety of devices such as in-vehicle computers, laptops and mobile data terminals. In addition the CTM gateway can interface with the vehicle ECU via a direct wired connection (CanBus) or via the Cypress E-VDT (Engine-Vehicle Diagnostics transmitter). The GPIO (general purpose inputs and outputs) on the CTM gateway allow interfacing with other IO devices such as switches, analog gauges etc.

There are 3 essential components of the CTM installation:

1.1 CTM Gateway (CTM-200 shown)

1.2 Power Cable

1.3 Antenna






1.4 Optional Accessories

1.4.1 OBDII/J1939 interface

1.4.2 General purpose Inputs and Outputs (GPIO)

2. Before you Begin

Ensure the CTM Gateway is ready to install. Each CTM-200 needs to have a radio module installed with an active SIM embedded in the device. If the radio module or SIM is not installed this will need to be done before installation.

Determine a safe, dry location for the CTM-200 Gateway. The CTM-200 gateway is able to withstand harsh environments such as vibration and temperature extremes, but it must be mounted in areas that are moisture and dust free. Typical installation locations are vehicle trunk, behind or under the driver or passenger seat, steering column area, glove compartment.

Before positively mounting the CTM-200 gateway, ensure the cable lengths for power, antenna and any accessories reach the CTM-200.

3. Installing the CTM-200 Gateway

The CTM-200 can be mounted in any orientation, but to obtain the best results from the embedded accelerometer the CTM-200 should be mounted so at least one face of the CTM-200 gateway is parallel to the road surface.

The CTM-200 gateway has a removable Elastomer bracket. Unclip the bracket from the CTM-200 gateway secure the bracket and clip the CTM into position. The bracket allows for easy removal of the CTM-200 gateway if required.

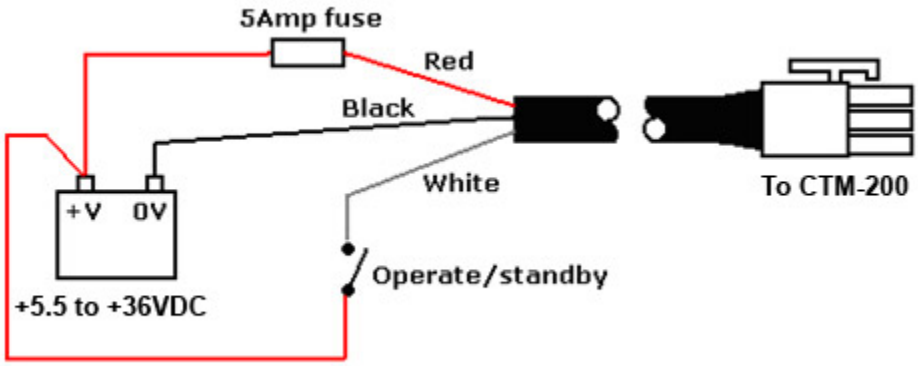
The mounting bracket has 8 holes for mounting.

4 holes are placed at 3.75” x 1.5” centers
4 holes are placed at 5.5” x 2” centers

Each hole is designed for a #10 size pan head screw

4. Power

The CTM-200 gateway uses a locking power connector and is designed for vehicle power systems



The power cable has three wires:

- **Red** +V supply (+5.5 to +36VDC)
- **Black** 0V return
- **White** Standby (+V for operation, Off for standby)

A 5 Amp “slow-blow” fuse is recommended in the +V supply line.

5. Antenna

The CTM-200 has at least two antenna ports.

The antenna port marked PRI-RF is the cellular antenna port it is an SMA Jack (External threads)
The antenna port marked GPS is the GPS antenna port and it is an SMA jack (External threads)
The antenna port marked WPAN is a 2.4 Ghz antenna port and it is an RP-SMA (External threads)
The antenna port marked Wi-Fi is a 2.4 Ghz antenna port and it is an RP-SMA (External threads)

As a general rule antennas should be mounted in areas as high and as unobstructed as possible on the vehicle. In many cases there are limitations imposed by the customer that limit antenna placement. In some cases multi-band antennas can be used to supply Cellular/GPS/WIFI feeds to the CTM-200 gateway, but in other cases a separate antenna is used for each band. GPS antennas should be mounted in areas that provide an un-obstructed view of the sky. WPAN antennas should be mounted in the top corner of the windshield.

6. CAN2.0Bus

CanBus is used to interface with the vehicle ECU (Engine Control Unit). The connection to the ECU consists of two cable assemblies a OBDII Y-cable or J1939 Y-cable depending on the type of vehicle

The Y-Cable is meant to take the place of the factory connection located in the steering column area of the vehicle. Remove the bulkhead connector from the vehicle and connect it to the mating end of the Y-cable. Replace the bulkhead connector with the other end of the Y-cable in the same place as the original connector and tuck wiring harness in behind dash.

Connect the CAN cable to the DB-9 end of the OBDII/J1939 Y-cable and connect the other end to the CAN port on the CTM-200

CAN2.0B Bus
Plug Wieland part #: 27.631.3253.0

PIN1 CAN HIGH	PIN3 CAN LOW
PIN2 COMMON GND(OPT)	PIN4 CHASSIS GND(OPT)

7. GPIO

TERMINAL BLOCK LAYOUT:

OUTPUT1	OUTPUT3	POWER GND	DIFF INPUT 1 POSITIVE	DIFF INPUT 1 NEGATIVE	SINGLE ENDED IN 3	SINGLE ENDED IN 5
OUTPUT2	OUTPUT4	POWER SUPPLY	DIFF INPUT2 POSITIVE	DIFF INPUT2 NEGATIVE	SINGLE ENDED IN 4	SINGLE ENDED IN 6

Inputs (Analog or Digital)
2 x differential inputs that can be configured for voltage or 4-20 mA loop current sense, 4 x single ended inputs
0-10V dynamic range (12 bit resolution, 0.3% accuracy)

4 Digital Outputs
500 mA sink capability, overload protection
Open drain configuration

1 x output power (5-36 V)

14 position, dual row 3.5 mm pitch Term Block

Plug Wieland part #: 27.631.3753.0

8. General Vehicle Installation Criteria

The following general vehicle installation criteria shall be adhered to by the City of Calgary and the CFOS Sub Contractor Cypress Vehicle Installation Team regarding fitment of the CFOS in-vehicle device, cables, antennae, and power connections within each of the 500 City vehicles fitted with the CFOS components:

a. The City of Calgary's Fleet Commissioning will represent Fleet Services at the time when the Cypress Vehicle Installation Team installs a CFOS modem, cables, antennas, etc., in the first vehicle of group of similar type of vehicle/equipment.

b. The CFOS Cypress Vehicle Installation Team is required to provide The City with an installation procedure of the Cypress Solutions Cypress CTM gateway modem/hardware (Provided herein).

c. The Cypress Vehicle Installation Team shall ensure the following occurs:

1. **Pre installation inspection**- Ensure all City CFOS vehicle components are working in accordance with the steps outlined in Section 9, and Appendices D-1 through D-2 that are reflective of the specific City Business Unit's vehicles ;

2. **Post-Installation Inspection** – Ensure all City CFOS vehicle components are in working order and the post installation documentation is completed and provided to Fleet Services as outlined in Section 10, and Appendix A;

3. **Post-Installation Check Boxes** - The Cypress Vehicle Installation Team shall complete the post-installation check box at Appendix B and C, and include a list of all materials and tasks performed on the unit in the work completion sign off document. Send the copies of signed sheets to the Fleet Services Commissioning representative for final City installation and acceptance.

4. **Post Installation Wiring Diagram.** A Wiring diagram, as well as routing of wires & their attachment detail, will be provided by the Cypress Vehicle Installation Team for each vehicle as part of the post-inspection and City acceptance of each the 500 CFOS Solution wired vehicles.

5. **Some Dos and Don'ts.** The Cypress Vehicle Installation Team shall:

i. Ensure that the fasteners used do not pierce any wiring or component on the unit;
ii. All wires follow the same color coding, and connections are crimped then heat shrunk;
iii. Do not run wire with the wiring of safety equipment from the original manufacture e.g. Air bags, ABS braking, Body control modules etc.;
iv. No blue scotch lock connectors shall be used in the vehicle installation; and

v. The Cypress Vehicle Installation Team shall use proper steel/aluminum butt connectors or solder the connections. Then shrink wrap the whole wire harness/splice."

9. Pre-Installation Inspection

Prior to the CFOS in-vehicle installation work, the CFOS Cypress Vehicle Installation Team shall complete the following:

a. Each vehicle must be inspected by the Cypress Vehicle Installation Team to ensure all components are working, and indentify and record the components that are not;

b. The City Pre-Vehicle Use Inspection forms provided at Appendices D-1 through D-6 shall be completed by the Cypress Installation team to record the status of the specific Business Unit's vehicle's components;

c. Should the pre-inspection note a concern to a vehicle body component, (i.e. Fender, door, etc.,) that concern shall be entered in the pre-inspection comment column and the CFOS Cypress Vehicle Installation Team may proceed with the installation work when the checklist is completed;

d. However, should the CFOS Cypress Installation Team identify a concern with a powered component (i.e., horn, lights, etc.) the installation team shall note that concern in the pre-inspection checklist and contact the respective business Unit's CFOS coordinator prior to instillation and request guidance to proceed to install on the next vehicle in the schedule; and

e. A completed copy of each City Pre-Vehicle Use Inspection form for each of the 500 CFOS equipped vehicle shall be included with the post installation wiring acceptance documentation that includes the Cypress wiring diagram(s), photos of the installation work as described within later sections of this guideline.

10. Post Installation Documentation

a. The Cypress Vehicle Installation Team shall complete the Appendix B check box with a list of all materials and tasks performed on the unit and include this information within the sign off document and, when completed, send a copy of signed acceptance sheets to the Fleet Services Commissioning representatives;

b. A CFOS in-vehicle installation wiring diagram, as well as routing of wires and their attachment detail, will be completed by the Cypress Vehicle Installation Team in Appendix A and provided to the Fleet Services Commissioning representative for each CFOS fitted vehicle as part of the post-inspection and City acceptance of each CFOS Solution wired vehicle;

c. The post-installation documentation shall mention the name and dimensions of the hardware including mounting location of each component & details of the mounting. Fastener specs material, type, size etc.;

d. If existing components are removed to facilitate the Cypress CTM in-vehicle modem, cable, and antenna installation they have to be re-installed to OEM specifications; and

e. All units of the same type are done the same. All components are in the same locations and all wiring is standardized.

11. Post-Installation Inspection

After the installation, each vehicle shall be inspected by the City to ensure all components are working and that the installation is in accordance with the guidelines listed within this document. If the installation is approved The City Fleet Commissioning shall sign each vehicle's post installation documentation. If the installation is deemed unacceptable, the City Fleet Commissioning representative shall contact the respective Business Unit CFOS coordinator and request that the installation be corrected by the Cypress CFOS vehicle Installation Team to acceptable standards.

12. Wiring Guidelines

All wiring to be 18 AWG gauge stranded wire (CSA TEW, UL1015 or equivalent) routed in such a way to prevent snagging, or damage to wiring. Wiring should be concealed in trim molding and headliner where possible.

All wires follow the same color coding.

All units of the same type are done the same. All components are in the same locations and all wiring is standardized.

If existing components are removed to facilitate CTM Gateway installation, they have to be re-installed to OEM specifications.

Do not run wire with wiring of safety equipment from the original manufacturer. E.g. air bags, ABS braking, body control modules, etc.

Routing of wires to external points on the the vehicle must be in such a way as to prevent moisture ingress.

Power tap from the the fuse block either inside the passenger compartment or inside the engine bay with an external fuse (5 amp).

All ground connections to be connected to the chassis ground. The connection points should be free from paint, rust or any materials that may prevent solid ground contact.

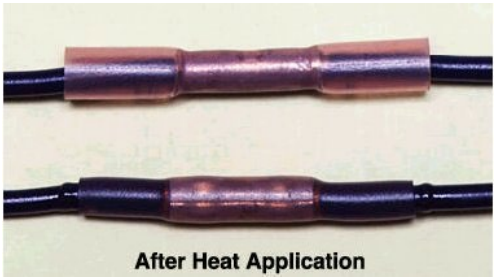
13. Terminating guidelines

In all cases automotive grade terminators/splices must be used for wiring splices for power, CAN, and GPIO.

Preferred installation of wiring splices is to use a solder/heat shrink solution where possible. Properly crimped automotive grade splice terminals are acceptable when soldering is not available.

Ensure that the fasteners used do not pierce any wiring or component on the unit.

Do not use IDC style connectors, e.g. Blue Scotch Lock connectors.



For antenna wiring use only proper crimping tools for re-terminating wiring and low loss LMR-100 cable for antenna extension cables

Technical Support

Cypress Solutions Service Support Group
1.877.985.2878 or 604.294.4465
9.00am to 5.00pm PST
support@cypress.bc.ca

Appendix A

Requirements:

Vehicle Unit #:

Appendix B

CTM-200 Post Installation Checklist:

		Notes
Installation date	*YYYY/MM/DD*	
Customer		
Vehicle Unit #		
CTM MAC (LAN) last 4 digits		
CTM Mounting Orientation:		
Power	Yes ☐ No ☐	
Cell antenna	Yes ☐ No ☐	
GPS antenna	Yes ☐ No ☐	
WiFi antenna	Yes ☐ No ☐	
WPAN antenna	Yes ☐ No ☐	
OBD II (CAN or E-VDT)	Yes ☐ No ☐	
J1939	Yes ☐ No ☐	
GPIO interconnect	Yes ☐ No ☐	
Other (spreader controller etc)	Yes ☐ No ☐	
Attachments: Wiring diagram, cable routing	Yes ☐ No ☐	
Attachments: Photos of installation	Yes ☐ No ☐	
Installed by:		
Inspected by:		

Appendix C

CTM-200 Post Installation Validation:

		Notes
Vehicle Unit #		
Engine starts normally	Yes ☐ No ☐	
CTM Gateway boots normally	Yes ☐ No ☐	PWR LED on solid initially, after 60~90sec, GPS, MODE, IP/DATA & RF LEDs turn on
Digital Input 1 sensing	Yes ☐ No ☐	
Digital Input 2 sensing	Yes ☐ No ☐	
Ignition sensing	Yes ☐ No ☐	Turn off engine & remove key, all LEDs turn off except PWR LED starts blinking in ~20sec. Restart vehicle.
Engine Diagnostics Connect a laptop to the CTM-200 via serial cable (RS-232). Set Com port to: 115200,N,8,1 Type at # prompt: cmd obddata and look for response of any "p" messages	Yes ☐ No ☐	Example of valid engine diagnostic data: / # cmd obddata These OBD engine parameters were updated 000 seconds ago Timestamp : Thu Jan 1 02:45:18 1970 p1=250.996,p2=7640.0,p5=0,p6=0 p8=-36,p12=-272.3,p26=125,p27=125 OK Example of invalid engine diagnostic data: / # cmd obddata These OBD engine parameters were updated 000 seconds ago Timestamp : Thu Jan 1 02:45:19 1970 OK
GPS fix within 10min	Yes ☐ No ☐	Vehicle must be in clear view of the open sky, relocate vehicle if necessary. GPS on solid=GPS fix GPS LED blinking=GPS not fixed
IP acquired within 10min	Yes ☐ No ☐	Both CELL & IP/DATA LEDS on solid
Reports to VUE	Yes ☐ No ☐	

Appendix D-1

City of Calgary – CFOS Vehicle Pre-Inspection Checklist (Roads Vehicles)

Vehicle Year:	Make:	Model:
Serial Number:	Body Type:	License #:

Body Damage		
Arrival	Comments	Release
Windshield		
Door Glass		
Rear Glass		
AM Radio: Yes No		
AM Radio Aerial: Yes No		
Mirrors		
Roof		
Front Bumper		
Grille		
Front Lens		
Hood		
D/S Front Fender		
D/S Front Door		
D/S Rear Door		
Back of Cab: D/S P/S		
D/S Rear Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
P/S Front Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
Hubcaps: D/S Front P/S Front D/S Rear P/S Rear		
Jack: Yes No Jack Handle: Yes No		

Wrench: Yes No:		
Auxiliary Components (where Applicable to Vehicle Type)		
Plough up/Plough Down: Yes No		
Sander/ On-Off: Yes No		
Hot Patch Enabler Switch On/Off: Yes No		
Sweeper On/Off: Yes No		
General Comments		
THE ABOVE VEHCILE WAS RECEIVED WITH ALL DAMAGES AS NOTED ABOVE. DATE (Year-Month-Day)_____		THE ABOVE VEHCILE WAS RETURNED WITH DAMAGE AS NOTED ABOVE. DATE (Year-Month-Day)_____
Signatures: Cypress/Westcan _____		Signatures: Cypress/Westcan _____

Appendix D-2

City of Calgary – CFOS Vehicle Pre-Inspection Checklist (Waste & Recycling Vehicles)

Vehicle Year:	Make:	Model:
Serial Number:	Body Type:	License #:

Body Damage		
Arrival	Comments	Release
Windshield		
Door Glass		
Rear Glass		
AM Radio: Yes No		
AM Radio Aerial: Yes No		
Mirrors		
Roof		
Front Bumper		
Grille		
Front Lens		
Hood		
D/S Front Fender		
D/S Front Door		
D/S Rear Door		
Back of Cab: D/S P/S		
D/S Rear Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
P/S Front Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
Hubcaps: D/S Front P/S Front D/S Rear P/S Rear		
Jack: Yes No Jack Handle: Yes No		

Wrench: Yes No:		
Auxiliary Components (where Applicable to Vehicle Type)		
Pickup Top of Tip: Yes No		
Hydraulic Pressure: Yes No		
Bucket Up/Dn w/GPS: Yes No		
General Comments		
THE ABOVE VEHCILE WAS RECEIVED WITH ALL DAMAGES AS NOTED ABOVE. DATE (Year-Month-Day)_____		THE ABOVE VEHCILE WAS RETURNED WITH DAMAGE AS NOTED ABOVE. DATE (Year-Month-Day)_____
Signatures: Cypress/Westcan _____		Signatures: Cypress/Westcan _____

Appendix D-3

City of Calgary – CFOS Vehicle Pre-Inspection Checklist (Water Services Vehicles)

Vehicle Year:	Make:	Model:
Serial Number:	Body Type:	License #:

Body Damage		
Arrival	Comments	Release
Windshield		
Door Glass		
Rear Glass		
AM Radio: Yes No		
AM Radio Aerial: Yes No		
Mirrors		
Roof		
Front Bumper		
Grille		
Front Lens		
Hood		
D/S Front Fender		
D/S Front Door		
D/S Rear Door		
Back of Cab: D/S P/S		
D/S Rear Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
P/S Front Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
Hubcaps: D/S Front P/S Front D/S Rear P/S Rear		
Jack: Yes No Jack Handle: Yes No		

Wrench: Yes No:		
Auxiliary Components (where Applicable to Vehicle Type)		
Weight of Load: Yes No		
Hydraulic Pressure: Yes No		
Pump On-Off (PTO): Yes No		
Trailer Connected: Yes N0		
Weight per Lift: Yes No		
General Comments		
THE ABOVE VEHCILE WAS RECEIVED WITH ALL DAMAGES AS NOTED ABOVE. DATE (Year-Month-Day)_____		THE ABOVE VEHCILE WAS RETURNED WITH DAMAGE AS NOTED ABOVE. DATE (Year-Month-Day)_____
Signatures: Cypress/Westcan _____		Signatures: Cypress/Westcan _____

Appendix D-4

City of Calgary – CFOS Vehicle Pre-Inspection Checklist (Calgary Fire Dept. (CFD) Vehicles)

Vehicle Year:	Make:	Model:
Serial Number:	Body Type:	License #:

Body Damage		
Arrival	Comments	Release
Windshield		
Door Glass		
Rear Glass		
AM Radio: Yes No		
AM Radio Aerial: Yes No		
Mirrors		
Roof		
Front Bumper		
Grille		
Front Lens		
Hood		
D/S Front Fender		
D/S Front Door		
D/S Rear Door		
Back of Cab: D/S P/S		
D/S Rear Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
P/S Front Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
Hubcaps: D/S Front P/S Front D/S Rear P/S Rear		
Jack: Yes No Jack Handle: Yes No		

Wrench: Yes No:		
Auxiliary Components (where Applicable to Vehicle Type)		
PTO Input: Yes No		
General Comments		
THE ABOVE VEHCILE WAS RECEIVED WITH ALL DAMAGES AS NOTED ABOVE. DATE (Year-Month-Day)_____		THE ABOVE VEHCILE WAS RETURNED WITH DAMAGE AS NOTED ABOVE. DATE (Year-Month-Day)_____
Signatures: Cypress/Westcan _____		Signatures: Cypress/Westcan _____

Appendix D-5

City of Calgary – CFOS Vehicle Pre-Inspection Checklist (Parks Vehicles)

Vehicle Year:	Make:	Model:
Serial Number:	Body Type:	License #:

Body Damage		
Arrival	Comments	Release
Windshield		
Door Glass		
Rear Glass		
AM Radio: Yes No		
AM Radio Aerial: Yes No		
Mirrors		
Roof		
Front Bumper		
Grille		
Front Lens		
Hood		
D/S Front Fender		
D/S Front Door		
D/S Rear Door		
Back of Cab: D/S P/S		
D/S Rear Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
P/S Front Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
Hubcaps: D/S Front P/S Front D/S Rear P/S Rear		
Jack: Yes No Jack Handle: Yes No		

Wrench: Yes No:		
Auxiliary Components (where Applicable to Vehicle Type)		
PTO On-Off : Yes No		
Accessories On/Off: Yes No		
Water Pump On/Off Yes No		
General Comments		
THE ABOVE VEHCILE WAS RECEIVED WITH ALL DAMAGES AS NOTED ABOVE. DATE (Year-Month-Day)_____		THE ABOVE VEHCILE WAS RETURNED WITH DAMAGE AS NOTED ABOVE. DATE (Year-Month-Day)_____
Signatures: Cypress/Westcan _____		Signatures: Cypress/Westcan _____

Appendix D-6

City of Calgary – CFOS Vehicle Pre-Inspection Checklist (Fleet Services Vehicles)

Vehicle Year:	Make:	Model:
Serial Number:	Body Type:	License #:

Body Damage		
Arrival	Comments	Release
Windshield		
Door Glass		
Rear Glass		
AM Radio: Yes No		
AM Radio Aerial: Yes No		
Mirrors		
Roof		
Front Bumper		
Grille		
Front Lens		
Hood		
D/S Front Fender		
D/S Front Door		
D/S Rear Door		
Back of Cab: D/S P/S		
D/S Rear Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
P/S Front Fender		
Rear Bumper		
Tailgate		
Rear Lens		
Inside Box		
P/S Rear Fender		
P/S Rear Door		
P/S Front Door		
Hubcaps: D/S Front P/S Front D/S Rear P/S Rear		
Jack: Yes No Jack Handle: Yes No		

Wrench: Yes No:		
Auxiliary Components (where Applicable to Vehicle Type)		
N/A		
General Comments		
THE ABOVE VEHCILE WAS RECEIVED WITH ALL DAMAGES AS NOTED ABOVE. DATE (Year-Month-Day)_____		THE ABOVE VEHCILE WAS RETURNED WITH DAMAGE AS NOTED ABOVE. DATE (Year-Month-Day)_____
Signatures: Cypress/Westcan _____		Signatures: Cypress/Westcan _____