

Connectivity Matrix

CKAS Generation III
Controller



CKAS Gen III Connectivity Matrix Produced Dec 2016 by CKAS Mechatronics.

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Front Cover Picture – Fully electric CKAS W25 6DOF Motion System in action © 2016.

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1 Preface

1.1 Introduction

This document describes all the various methods to interface to any CKAS electric motion system which is equipped with the CKAS Gen III controller on board. The Gen III controller from CKAS is the latest cutting edge motion system controller design available, and includes a list of features which are staggering. Essentially, ALL required capabilities for a motion system to be used in a simulation environment are “on board”. For the first time from any motion system manufacturer, the Forward Kinematics, Reverse Kinematics, Washout, Diagnostics and much more are available on the actual motion system, making a CKAS Gen III equipped motion system the most capable system available on the market.

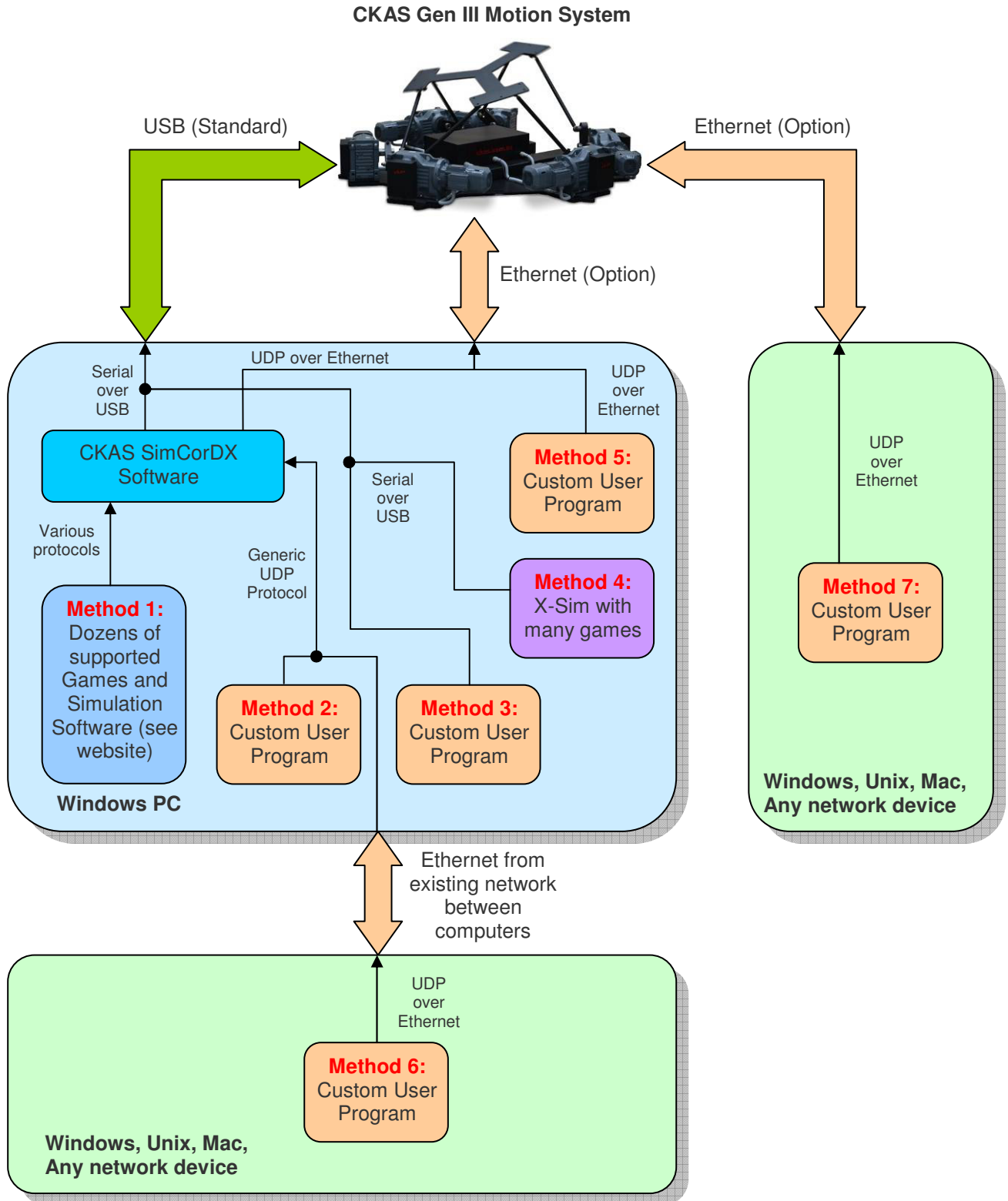
1.2 Glossary of Terms

The following terms are used throughout this document, so it is advisable for the user to familiarise themselves with them.

Flying Platform	The moving upper frame of a motion system, which typically carries the payload. This is the part which the actuators move and the cabin is bolted onto in order to create the motion.
Forward Kinematics	The Forward Kinematics are the exact opposite of the Inverse Kinematics, in that they are a set of algorithms, which are capable of converting the actuator or motor positions of the motion system, into meaningful Cartesian co-ordinates of the flying platform for a client application. The Forward Kinematics are especially useful if the real-time true position of the flying platform is required by a client application, for instance if the visual system is mounted off board the motion system, and the visual scene generator must compensate for the motion system movements. Since the actual motor positions are tracked at all times, the Forward Kinematics can then solve the true current platform position. The Gen III controller has the full Forward Kinematics “on board”.
Inverse Kinematics	The Inverse Kinematics are the exact opposite of the Forward Kinematics, in that they are a set of algorithms capable of converting the desired flying platform orientation into usable actuator or motor positions. The Inverse Kinematics are especially useful to any client wanting to move the motion system to a desired position, without needing to know what motor commands are required to perform the desired motion. The Gen III controller has the full Inverse Kinematics “on board”.
Inverter Diagnostics	The current state which the inverter parameters are in. These parameters are essential for diagnosing the performance and configuration of the motion system. The Gen III controller provides the full inverter diagnostics to the client software.
Motor Diagnostics	The current state which the motor parameters are in. These parameters are essential for diagnosing the performance and configuration of the motion system. The Gen III controller provides the full motor diagnostics to the client software.
Reverse Kinematics	See Inverse Kinematics above.
Washout Filters	The Washout Filters are a set of algorithms capable of converting simulated accelerations and velocities into motion for the flying platform. The Washout Filters take as input the intended accelerations of the vehicle being simulated, and convert these into movements on the motion system to convince the occupant that they are performing the original vehicle motion. The Gen III controller has fully configurable Washout Filters on “on board”.

2 Connectivity Overview

A CKAS Gen III equipped motion system can interface to various software, over various platforms in the following way



3 Connection Capability and Features Matrix

Method	1	2	3	4	5	6	7
User level	Basic	Intermediate	Advanced	Intermediate	Advanced	Advanced	Advanced
Operating System	Windows 7/8/10 only	Windows 7/8/10 only	Windows XP/Vista/7/8/10	Windows XP/Vista/7/8/10	Windows XP/Vista/7/8/10	Any OS or Network Device	Any OS or Network Device
Ethernet Module Required	NO	NO	NO	NO	YES*	YES*	YES*
Difficulty to implement	Very Easy (Plug and play out of the box)	Medium (coding required)	Medium (coding required)	Easy (configuration of X-Sim Required)	Medium (coding required)	Medium (coding required)	Medium (coding required)
Connection Protocol	Propriety	UDP Connection	Serial Port Connection	Serial Port Connection	UDP Connection	UDP Connection	UDP Connection
Inverse Kinematics	YES	YES	YES	YES	YES	YES	YES
Forward Kinematics	NO	YES	YES	YES	YES	YES	YES
Washout	YES	YES	YES	YES	YES	YES	YES
Inverter and motor diagnostics	YES	YES	YES	YES	YES	YES	YES
CKAS Support Documents	YES	YES	YES	MINIMAL X-Sim Community	YES	YES	YES
Typical Applications and description	Home User or OEM Simulator Builder using “off the shelf” software to create the simulation (eg P3D). Very much a turn key instant operation unit in this case.	Semi Advanced home user or OEM simulator builder creating a custom simulation or experiment on a late Windows platform – possibly to integrate an “unsupported” game or program, or completely new development. This method requires some basic software coding capabilities	Advanced home user or OEM simulator builder creating a full custom simulation or experiment on a Windows platform – possibly to integrate an “unsupported” game or program, or completely new development. This method requires some intermediate software coding capabilities	Home User or OEM Simulator Builder using X-Sim software combined with a consumer level game to create the simulation (eg F1 2014). Some configuring of X-Sim required in this case which may be difficult for novice users.	Advanced home user or OEM simulator builder creating a full custom simulation or experiment on a Windows platform – possibly to integrate an “unsupported” game or program, or completely new development. This method requires some intermediate software coding capabilities	Advanced home user or OEM simulator builder creating a full custom simulation or experiment on ANY networked platform – possibly to integrate an “unsupported” game or program, or completely new development. This method requires some intermediate software coding capabilities	Advanced home user or OEM simulator builder creating a full custom simulation or experiment on ANY networked platform – possibly to integrate an “unsupported” game or program, or completely new development. This method requires some intermediate software coding capabilities

* Special Note, the Ethernet Module CANNOT be added “in the field” once the machine is delivered. The client needs to make the decision on whether Ethernet capability is ever to be required for the unit at the time of purchase.